

Dark Skies and Light Pollution: An Art-Historical Approach

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Abstract. The sight of vast numbers of stars is becoming increasingly obstructed from view for most of humanity by increasing light pollution in the ‘civilised’ world. From the ancient Greeks and medieval Europe to the industrial age and our own times, the sight and contemplation of stars, planets and galaxies have inspired religions and philosophies, as well as traditional myths and stories. Understanding the complexities of the universe led to the development of scientific theories, yet it is science and its effects on pollution and climate change that now seem to be removing from sight the astronomical phenomena that surround us. Consideration of visual images of the dark sky over time is an essential backstory to the movement to protect the Dark Sky from obliteration. Ancient and traditional depictions of heaven and the night sky (particularly of the Milky Way) will be examined to provide a context for the fascination with the night sky in relation to problems of ever-increasing light pollution.¹

The Night Sky

The spectacle of vast numbers of stars, as seen from the time when the earliest inhabitants of the planet looked up to the skies, is becoming increasingly obstructed from view by the growing light pollution of the ‘civilised’ world. In 1836, Ralph Waldo Emerson wrote, ‘If the stars should appear one night in a thousand years, how would men believe and adore!... But every night come out these envoys of beauty and

¹ This paper, shown as a poster at INSAPXI, builds on an earlier version entitled ‘The Medieval Dark Sky’ given at the *14th European Symposium for the Protection of the Night Sky*, 3-5 November 2019, Mulranny, Co Mayo, Republic of Ireland as a PowerPoint presentation, for which there were no published proceedings. (<https://www.mayodarkskyfestival.ie/symposium>).

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light the universe with their admonishing smile'.² From the ancient Greeks and medieval Europe to the industrial age and our own times, the contemplation of stars, planets and galaxies have inspired philosophies, myths and religions as well as art and scientific theory. But, as Emerson indicated, the wonder and admiration of the stars has long been taken for granted. Views of the heavens were familiar recently, but astronomical phenomena are increasingly being removed from common sight.

The once commonplace vision of the night sky is being lost at an alarming rate due to the rapid increase of light pollution. Long term artificial lighting has had an enormous effect upon our ability to view the skies above and around us, whilst perpetual daylight conditions have been instigated in some areas.³ The long-term effects are immense, not only for astronomical observations, exploration and navigation, but also significantly for human health and well-being, climate, biodiversity and the ecology of the planet, let alone the wastage of a vast amount of limited energy and resources.

The 'health' of the Dark Sky is inextricably linked with the health of life forms on the planet.⁴ Darkness is important not only for scientific research but for nature's cycle of day and night. In addition, starry night skies have inspired art and poetry as well as science, and an art-historical approach can provide an essential backstory to demonstrate how astronomical phenomena were so readily observable from ancient times. As light pollution increased alongside population expansion, such spectacles, as well as the benefits of star-filled skies, have diminished – becoming less and less familiar to the greater proportion of the Earth's population. Visual images can be regarded as an indication (or index) of the fascination with the night sky, and historical perceptions of the dark sky can provide a foundation for the current aim of protecting the Dark Sky from obliteration in the face of ever-increasing light pollution.

The nature and origin of the stars and other astronomical phenomena has stimulated philosophical, theological, and scientific thought on 'where it all came from' and 'where (and how) it will all end'. Whilst it is true that grasping the complexities of the universe has led to highly important

² Ralph Waldo Emerson, 'Nature', in *Nature* (Boston and Cambridge: Thurston, Torrey and Company, 1849), pp 8-9 (p. 8). First published by James Munroe and Company 1836

³ See: The International Dark Sky Association, <https://www.darksky.org/>, especially <https://www.darksky.org/light-pollution/> [accessed 26 June 2023].

⁴ See <https://www.livescience.com/light-pollution;> and <https://www.darksky.org/light-pollution/human-health/> [accessed 26 June 2023].

scientific theories, it now seems that science is removing astronomical phenomena from common sight, due to light and other forms of pollution which is inextricably linked to population increases. This historical investigation will look at images from Classical, Byzantine and medieval artists' impressions of heaven and the night sky and the legacy of this tradition. Due to the immensity and wide-ranging nature of images of the dark sky in art, a focus will be placed in particular on depictions of our Galaxy, the 'Milky Way'. It has been noted that the Milky Way is no longer visible to one third of humanity, including 60 percent of Europeans and 80 percent of Americans. When a minor earthquake knocked out the power to much of Los Angeles on 17 January 1994 at 4:31 a.m., residents called the 911 emergency number when they saw a mysterious silvery cloud, the Milky Way, for the first time. The phenomenon of the Milky Way, so familiar outside everyone's front door in previous centuries, caused widespread alarm. Professor Ed Krupp, Director of the Griffith Observatory, noted how people fled their houses, seeing the strange sight of a star-filled sky unobscured by city lights for the first time.⁵

Light Pollution and Population: a Correlation

It is not possible to find statistical evidence of the extent and growth of light pollution over the whole period of human history, but a correlation with increase in world population (which can be fairly accurately estimated over the last two millennia) seems reasonable. Population growth from 10,000 BCE (as traced at www.ourworldindata.org) shows an accelerating, almost vertical curve in the past few centuries, in contrast with the more static growth up to about 1400 CE.⁶ Another useful analysis of population growth, from the year 1CE, can be found on the 'Population Education' website.⁷ Here, the mapping system uses dots to indicate centres of approximately one million persons in a particular place/area, which gives

⁵ Edwin C. Krupp, 'Cosmos on parade: a year, more-or-less, of sky jinks and earth tremors, part one, eclipses and earthquakes', *Griffith Observer* 58, no. 12 (1994): pp.1–17.

⁶ See <https://ourworldindata.org/world-population-growth#all-charts-preview> [accessed January 2023] for images of world population growth that can be approximated to increases in light pollution up to the twentieth century. World population growth since 10,000 BCE is estimated to be from about 4 million in 10,000 BCE to 7.7 billion in 1999 (accessed November 2020).

⁷ See: <https://populationeducation.org/>, specifically: Population Education - <https://vimeo.com/130468614> accessed November 2019 and January 2023 [accessed January 2023].

an idea of how population might correlate with and provide a picture of the growth in light pollution. The world maps thus generated will be used for the purpose of a basic analogy with growth in light pollution.

The world population increased from one billion in 1800 to around eight billion by November 2022, but it is not only the largest cities that have led to significant increase in light pollution.⁸ For example, the most densely populated nation is actually the principality of Monaco. In 2019, the population of Monaco was 37,550 in an area of 0.78/2.02 sq. mile/kms, giving a population density of 48,145/18,589 per sq. mile/km. Hong Kong and Singapore are usually cited as the brightest (most light-polluted) cities – and affluent, brightly lit cities are connected, worldwide, by brightly lit motorways. The effect on light pollution is dramatic.⁹

The Ancient World

Familiarity with the night sky thus decreases as population and light pollution grow. In the Ancient World, the oldest surviving depiction of the cosmos or Night Sky is the Bronze Age *Nebra Disc*, dating from about 1600 BCE and showing such familiarity. Knowledge of the dark night sky can be demonstrated by many works from ancient Babylon and Egypt, one early type being images of the Egyptian goddess Nut arched over the earth as the ‘Milky Way’, of which several examples exist, on papyrus. Artefacts from Babylonia also frequently focused on the phenomena in the night sky, such as the Babylonian Boundary stone, dating from around 1125-1104 BCE showing the Sun, Moon and stars.¹⁰

In Ancient Greece, Plato observed that ‘None of the accounts... concerning the Universe would ever have been given if men had not seen the stars or the sun or the heaven.... The vision of day and night and of

⁸ See: <https://ourworldindata.org/world-population-growth#estimates-of-ancient-population> [accessed January 2023].

⁹ For illustrative material, see:

https://commons.wikimedia.org/wiki/File:Monaco_by_night.JPG [accessed January 2023]. See, for example, Ben Panko, ‘Nighttime light pollution covers nearly 80% of the globe: More than one-third of people can’t [sic] see the Milky Way at Night’, *Science* 10 June 2016, <https://www.science.org/content/article/nighttime-light-pollution-covers-nearly-80-globe>. doi: 10.1126/science.aaf5777.

¹⁰ See: https://www.britishmuseum.org/collection/object/W_1882-0522-1800 [accessed January 2023]; and featured in Project Gutenberg’s *The Babylonian Legends of the Creation* (British Museum, e-book #9914, 2011), <https://www.gutenberg.org/files/9914/9914-h/9914-h.htm> [accessed 13 April 2023].

months and circling years has created the art of number and has given us not only the notion of Time but also means of research into the nature of the Universe'.¹¹ And examples from ancient Greece abound with images of stars, ranging from the detail of a Krater by the Dipylon Master of the late Geometric period, 760-750 BCE in the Louvre (A517) to the Athenian red-figure painting showing Asteria, the Goddess of falling stars and night (Amphora, c. fifth century BCE, Museum of Fine Arts, Boston). The notion of a goddess specifically relating to falling stars demonstrates the well-known nature of the phenomenon.

In Rome, too, Cicero (second century CE), in his *De Re Publica*, Book 6, observed in his account of Scipio's *Dream* that after death people might inhabit '... that circle that shines forth among the stars which... the Greeks call the Milky Way'. Macrobius's fifth-century *Commentary on Cicero's Dream of Scipio*, also describes the meeting with ancestors in the 'Milky Circle', which is taken as the location of souls, or even the location of paradise in some texts.¹² The well-known story provided an explanation of the phenomenon of the Milky Way, such a common sight to everyone. Identification of the constellations was also prevalent and, for example, the Pleiades (or Seven Sisters) constellation was often depicted in art as one of the most conspicuous formations. This even extended to coinage, as in the silver Denarius of the Emperor Hadrian that clearly depicts the constellation.¹³ At this time, ancient settlements would have been lit at night by rush lights, torches, or oil lamps, with special slaves responsible for lighting the lamps.¹⁴

In Northern Europe, archaeological sites from around 40,000 to 800 BCE can similarly reasonably be taken as an indication of the size and distribution of the population.¹⁵ In spite of cloudier skies and wetter

¹¹ Plato, *Timaeus*, 47 A-B; W. K. C. Guthrie, *In the Beginning: Some Greek views on the origin of life* (Cambridge, 1957).

¹² Macrobius, *Commentary on the Dream of Scipio*, trans. W.H. Stahl (New York: Columbia University Press 1990 [1952]). And see the British Library collection: <https://www.bl.uk/collection-items/dream-theory-illuminated-manuscript-of-macrobiuss-commentary-on-the-dream-of-scipio> [accessed 13 April 2023].

¹³ Silver denarius (showing the *Pleiades*) of the Emperor Hadrian, 115-28 CE, for example The British Museum, https://www.britishmuseum.org/collection/object/C_R-10913 and https://www.britishmuseum.org/collection/object/C_1950-1006-419 [accessed January 2023].

¹⁴ See also Linda Harris, 'Visions of the Milky Way in the West: The Greco-Roman and Medieval Periods', *Culture and Cosmos* 16 (2012): pp.271-282.

¹⁵ Map derived from S. Shennan et al., *Nature* 4, no. 2486 (2013).

weather than areas of the middle east or Mediterranean, the dark sky of northern Europe was similarly crucial for civilisation, and the evolving of myths and legends linked to spiritual and philosophical traditions. At this time, although without written records (as in Greece and Rome), celestial alignments were, of course, crucial – such as at Stonehenge.¹⁶ The Norse legends were also based on astronomical imagery, such as the account of the primeval being Ymir whose body-parts were thrown into the sky to form the sun, moon, stars and planets, as later recorded in the *Poetic Edda*, in the thirteenth century (from earlier legends).¹⁷

The Judaeo-Christian tradition

The appearance of the dark sky thus underlies much theological and philosophical thought of ancient civilisations but most significant of all, perhaps, is the Judaeo-Christian tradition as conveyed in the scriptures. Given pride of place in Genesis, the opening book of the Old Testament, an emphasis is placed on the light and dark nature of the heavens: ‘And God made two great lights; the greater light to rule the day, and the lesser light to rule the night: he made the stars also’.¹⁸ Linked to the theology behind the creation and nature (and eventual ending) of the universe, the perception of the heavens and universe spilled over into Christian art and architecture. Domed architecture, for example, is imitative of natural eye observation of the flat earth covered by the dome of heaven, and particularly the night-time view of this. The Early Christian and medieval worlds include many examples of the dark sky depicted on the interior of domes, such as *The Mausoleum of Galla Placidia*, Ravenna, begun in 425 CE (Fig. 1). Of a slightly later date but also at Ravenna is the mystic image of the Cross of Christ in the midst of the starry sky in the domed apse at S Apollinare in Classe Ravenna (seventh century).¹⁹

¹⁶ Clive Ruggles, 'Astronomy and Stonehenge', in Barry Cunliffe and Colin Renfrew, eds., *Science and Stonehenge* (Oxford: Oxford University Press, 1997), pp.203–29.

¹⁷ See *The Poetic Edda*, trans Henry Bellows (The American Scandinavian Foundation, 1923), pp.100–101 for the poem *Grimnismál*. Stanza 40. Available online at <https://www.sacred-texts.com/neu/poe/index.htm> especially <https://www.sacred-texts.com/neu/poe/poe06.htm> [accessed 26 June 2023]. D.A. and M. Leeming, *A Dictionary of Creation Myths* (Oxford: Oxford University Press, 1994), pp.133–35 and 226.

¹⁸ Genesis I:16.

¹⁹ David Talbot Rice, *Byzantine Art* (Harmondsworth: Penguin, 1964), especially pp.148f and 164–67.



Fig. 1. *Mausoleum of Galla Placidia*, Ravenna, dome interior, c. 425 (Public Domain via Wikimedia Comms).

In later Byzantine churches, images of the starry heavens are widespread. Stars feature prominently in many images of God creating the universe, such as the Italo-Byzantine mosaics at the Cathedral of the Assumption, Monreale, Sicily, *God Creating the Universe*, 1180s. In manuscripts, also, stars are ubiquitous. Hildegard of Bingen's *Six Days of Creation* from *Scivias* (twelfth century) and the St Sever Apocalypse, 1028-72, are two such examples.²⁰ Whilst manuscripts were produced for limited audiences

²⁰ Andre Grabar, *Romanesque Painting from the eleventh to the thirteenth century* (New York: Skira, 1985), pp.132 and 138. See also: <https://commons.wikimedia.org/w/index.php?search=Hildegarde+of+Bingen+cr>

such as monks, nuns, or wealthy patrons, larger scale mosaics and frescoes in cathedrals and churches would have been more accessible and well-known. The limited population, and hence lighting at the time (as shown on the population map for the tenth century, Fig. 2) clearly rendered such starry landscapes well-known and familiar.



Fig. 2. World population tenth century (945), from Population Education - <https://vimeo.com/130468614>.

Domed architecture and images of the familiar starry skies above continued throughout the medieval period, significantly featuring in Christian art and architecture from the twelfth century.²¹ In St Mark's Venice (twelfth century), the *Ascension Dome* shows Christ in a starry dome, seated on an 'arc-en-ciel' that could well represent the Milky Way. Both in churches used by the general population and in manuscripts (for monks, and the 'select few'), the familiar image of the starry heavens was used, as here, to demonstrate God's handiwork in the creation of all nature. In fact, manuscripts show that there were so many stars normally visible that the Milky Way was depicted as a solid circle. The significance attached to the stars and the Milky Way in particular is ubiquitous and

eation&title=Special:MediaSearch&go=Go&type=image [accessed January 2023].

²¹ Valerie Shrimplin, 'Domed Architecture: Image of the Universe', presentation, *Second Conference on The Inspiration of Astronomical Phenomena*, Malta (1999). Unpublished, but available online at: <https://www.valerieshrimplin.com/pdfs/2000domedarchitectures45c918073012310pdf.pdf>.

demonstrate its familiarity, from ancient Egypt, Greece, Rome, Armenia, Viking, Hindu and Irish traditions to Maori, Cherokee and Aboriginal themes, too numerous to itemize here.

Medieval Manuscripts

By the time of the Crusades, the population and, no doubt, a measure of light pollution had increased but not so as to obscure the night sky from the populace. In the twelfth-century manuscript, *Galaxia, The Milky Way as Circle of Stars*, in the Biblioteca Nacional Madrid, the Milky Way is significantly shown as a white circle.²² The exquisite thirteenth-century manuscript by Thomas Cantipratensis, *De Rerum Natura*, c. 1290 (Fig. 3) takes a rather different approach to the image of the Milky Way, showing it writhing and reeling across the sky, but its magnitude and presence is as great, if not greater, as where it is depicted as a solid circle.²³

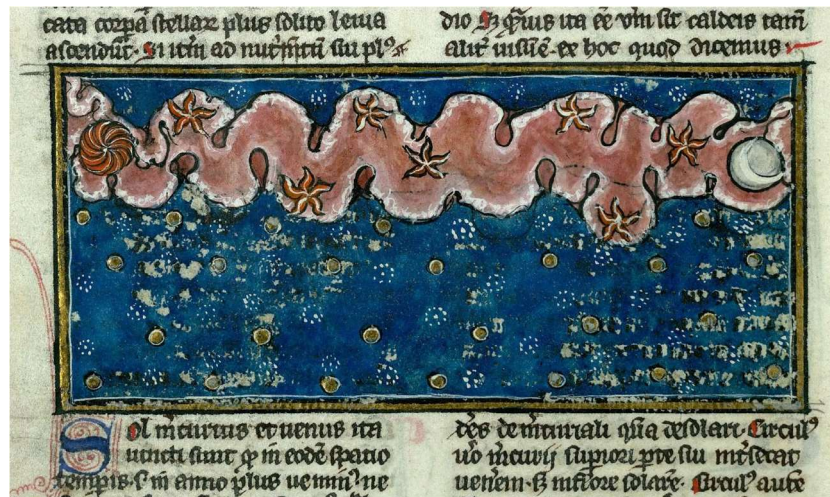


Fig. 3. Thomas Cantipratensis, *De Rerum Natura*, c. 1290 (Valenciennes, Bibliotheque Municipale; Institut de recherche et d'histoire des textes CNRS).

²² *Galaxia*, *Codex Matritensis*, A 16, fol. 68v, twelfth century, Madrid. A similar approach was later taken by the artist of the Heidelberg *Via Lactea* (Milky Way), Manuscript Cod. Pal. germ. 832, AD 1491, Universitätsbibliothek Heidelberg.

²³ Thomas Cantipratensis, *De Rerum Natura* (c. 1290) Valenciennes, Bibl. mun., ms. 0320, f. 194v.

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The fourteenth-century Breviary by Matfré Ermengau of Béziers (Breviari d'Amour Spain, Catalonia) suggests movement as well, since the stars rotate by the actions of angels, turning crank-handles (like those on an early automobile). Other examples refer back to the Classical Roman tradition. The Milky Way is effectively shown in Macrobius's *Commentary on Cicero's Dream of Scipio* in the manuscript from Bologna c 1383, now in the Bodleian (Figure 4).²⁴



Fig. 4. Cicero's dream of meeting his ancestors in the Milky Way, Macrobius, *Commentary on the Dream of Scipio*, Bologna c.1383, Lat. 256, fol. Iv (Oxford, Bodleian Library).

²⁴ Cicero's dream of meeting his ancestors in the Milky Way, Macrobius, *Commentary on the Dream of Scipio*, Bologna c.1383, Lat. 256, fol. Iv, Oxford, Bodleian Library MS. Canon. Class. Lat. 257: <https://digital.bodleian.ox.ac.uk/objects/b4db98b4-da2c-4282-b677-68505482d963/> [accessed January 2023].

It was still a standard motif a hundred years later, the *Comentum Macrobianum Ambrosii in somnium Scipionis* produced in Italy in 1469.²⁵

There are many other manuscripts that indicate popular knowledge of the Milky Way, such as ‘*Galaxia*’, Cod. Lat. 10268, fol. 83v (Padua fourteenth century, Munich Bayerisch Staatsbibliothek).²⁶ Printed versions of Hyginus's *Poeticon Astronomicum* (Venice 1482) demonstrate the enormous knowledge and importance of stars and constellations, including images of the Milky Way. Multiple versions and printings demonstrate that such images would have been extremely widespread.²⁷

The Renaissance

By the fifteenth century, investigation into the night sky was swiftly proceeding, but the sheer wonder of the night sky was also depicted in art, not only in specialised manuscripts but also for the general population in churches across Europe. Giotto's painted ceiling vault of the Scrovegni Chapel Padua (1305) gloriously represents the heavenly, starry night sky. A contemporary of Dante, Giotto's painting can remind us of the lines from Dante's *Divine Comedy* (the concluding words of *Inferno*, XXXIV.134–140): ‘I saw the lovely things the heavens hold and we came out to see once more the stars’, reflecting relief at being able to see the stars again.

Similar starry vaults in churches include the vault of the Upper Church of the Basilica of St Francis, Assisi (early fourteenth-century); the Church of Santa Maria Assunta, San Gimignano (mid-fourteenth-century); and the Nave and the vaults (late fifteenth-century) of Siena Cathedral. These show the continued popularity of the approach and that not only sun and moon symbols but also stars were important in Christian iconography. Further examples are not hard to find and even include the Chapel Royal at Hampton Court Palace London.

In Northern Europe, in spite of the more intemperate weather and cloud

²⁵ Albeit with a colour change from white to a dark blue: *Comentum Macrobianum Ambrosii in somnium Scipionis*, Italian, 1469 British Library, <https://www.bl.uk/collection-items/dream-theory-illuminated-manuscript-of-macrobiuss-commentary-on-the-dream-of-scipio>.

²⁶ Illustrated in Harris, ‘Visions of the Milky Way’, p.282.

²⁷

See:

https://commons.wikimedia.org/wiki/File:Fotothek_df_tg_0004720_Astronomie_%5E_Sterne.jpg [accessed January 2023] for an example of a woodcut of the Milky Way from a printed version of 1535.

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cover, the skies were widely depicted as the image of God's creation which was familiar to all. The Ste Chapelle upper level, Paris, 1248 (restored in 1836, in accordance with the original schema) is a good example, whilst the sculpture on Freiburg Cathedral of 'God creating the Universe and stars' (thirteenth century) would have been more widely seen.²⁸

In Renaissance Italy, also, the tradition of depicting the starry night sky continued as in the dome of the Old Sacristy, dated to 1439, at S Lorenzo, Florence, showing the constellations in the astrologically significant dome (Fig. 5).



Fig. 5. Old Sacristy San Lorenzo, 1442 (Public Domain via Wikimedia Comms).

Even in the Sistine Chapel itself, known for its cosmological symbolism, the original (pre-Michelangelo) ceiling decoration was one of the starry night sky, as shown by the painting of the Sistine vault, which was originally brilliant blue with gold stars.²⁹ Images of the stars and Milky

²⁸ For Freiburg: https://www.wga.hu/html/zgothic/gothic/2/22g_1251.html [accessed January 2023].

²⁹As shown by the *Contractual Drawing: Design of the Sistine Ceiling Before Michelangelo* (recto); by Piermatteo D'Amelia (Piermatteo Lauro de' Manfredi) Italian, 1481-82,

Way also continued in popularity in the late sixteenth and early seventeenth centuries, as in works such as Tintoretto's *Birth of the Milky Way*, dated to 1575-80 (National Gallery) and Peter Paul Rubens' version of the same subject, from around 1637 (Prado).

Literature

Widespread interest and knowledge of the stars, especially, those known collectively as the Milky Way, was also reflected in the literature, such as the poem '*The Milky Way*' by Geoffrey Chaucer (c. 1340-1400), written in about 1380:

.... cast up thine eye
 See yonder, lo! the galaxie
 The which men clepe [call] the Milky Way
 For it is white ...³⁰

Rather later, innumerable references to the stars and astronomy in the works of Shakespeare also demonstrate popular knowledge of the stars, astrology, and astronomy. Juliet asks that Romeo should be turned into stars so that 'he will make the face of heaven so fine... that all the world will be in love with night' (*Romeo and Juliet*, III, ii) and Cassius tells Brutus, 'The fault, dear Brutus, is not in our stars, but in ourselves...' (Shakespeare, *Julius Caesar*, I, iii). In *King Lear*, as well as commenting on phenomena such as 'eclipses in the sun and moon' (I, ii) and 'the thick rotundity o' the world' (III, ii), Shakespeare also includes an astronomical riddle for light relief in the midst of tragedy: 'The reason why the seven stars are no more than seven is a pretty reason?', to which the reply is given, 'Because they are not eight?' (*Lear*, I, v). This is highly significant since it shows that Shakespeare knew that his audience would be aware of the constellation of the Pleiades (popularly known as the Seven Sisters); the dark skies were familiar to everyone.

<https://www.metmuseum.org/art/collection/search/382313> [accessed January 2023].

³⁰ Chaucer's poem was significantly included by Ralph Waldo Emerson in his *Parnassus: An Anthology of Poetry*, 1880. Geoffrey Chaucer, 'The Milky Way', in Ralph Waldo Emerson. *Parnassus: An Anthology of Poetry*, 1880, <https://www.bartleby.com/lit-hub/ralph-waldo-emerson/geoffrey-chaucer-c-13401400-2/>. [accessed 13 April 2023].

Lighting

At this point, we can return to consider the changes in population growth and lighting issues. Although some communal street lighting had existed since ancient times mainly for security and safety (especially in Rome), it was not until the Renaissance that street lighting systems really took hold. As shown by population maps, at the time of the Crusades and the Renaissance age of exploration, the population expanded and the growing classes of merchants and gentry sought more sophisticated town living. In London, the first organised lighting of streets was instigated by Mayoral decree in 1417, and other major cities followed suit in a similar way.³¹

It was in the nineteenth century, however, that organised street lighting developed on a large scale. In 1802, more efficient coal-fuelled lighting was developed in England by William Murdoch, with London's first gaslit road following in 1807. By 1816, the idea had reached America where Baltimore was the first to introduce gaslit streetlights, as did Paris in 1820 (with the first electric lighting there in 1878). Thomas Edison's incandescent lamps led to the real development of light bulbs for street lighting in 1879. World population maps since the rise of the industrial revolution show huge increases in population over the last 200 years, which would be commensurate with increases in light pollution. Art and literature also reflected this.³²

In 1804, William Wordsworth (1770–1850) was inspired by the daffodils in the Lake District to write his poem, 'I wandered lonely as a cloud/That floats on high o'er vales and hills,/ When all at once I saw a crowd,/ A host, of golden daffodils;/Beside the lake, beneath the trees...'. Less well known is the way in which he then chose to compare them to the stars: 'Continuous as the stars that shine/And twinkle on the milky way...' demonstrating the interest shown by the poet in the dark skies in the remote Lakeland area. Soon afterwards, in Regency London in 1814, Lord Byron (1788–1824) was also inspired by the stars as he wrote the poem, 'She walks in beauty like the night of cloudless climes and starry skies'. Writing in honour of his cousin's wife, Anne Beatrix Wilmot, he compared the wonder of starlight with 'gaudy day'.

³¹ For Mayor Henry Barton, see:

http://www.historyofparliamentonline.org/volume/1386-1421/member/barton-henry-1435#footnote16_z5bp14d. Whale oil would have lit much of Europe and North America in the following centuries (seventeenth to nineteenth).

³² For the history of street lighting, see <http://www.historyoflighting.net/electric-lighting-history/history-of-street-lighting/> [accessed 13 April 2023]

Nineteenth-century artists, in particular members of the Pre-Raphaelite Brotherhood (PRB), continued to show significant interest in the dark night skies, not yet lost to view. In paintings such as Dante Gabriel Rossetti, *Dantis Amor* (1860); Edward Burne-Jones, *Night* (1870); and Edward Hughes' (1851–1917) *Night with her Train of Stars* (1912), the PRB's clear interest in natural, scientific and astronomical depiction of the world is demonstrated in their manifesto.³³ The actual reason, time and place of creation of a work is significant, as also shown by Jean-François Millet's *Nuit Étoilée* (1850-65), and Van Gogh's *Starry Night Over the Rhône* 1888 (Arles) and *Starry Night* 1889, Saint-Rémy-de-Provence.³⁴

Population maps from the mid and late twentieth century following the Second World War record further dramatic expansions (Fig. 6).³⁵

³³ The PRB manifesto was recorded by William Michael Rossetti and cited in his *Dante Gabriel Rossetti. His Family-Letters with a Memoir* (Vol. 1) 1895, p.135, <http://www.rossettiarchive.org/docs/pr5246.a43.rad.html> (accessed 27 June 2023). See also: Valerie Shrimplin, 'Astronomical Imagery in the work of the Pre Raphaelite Brother (and Sister)hood', *Proceedings of the Tenth Conference on the Inspiration of Astronomical Phenomena, Santiago del Compostela*, in *Mediterranean Archaeology and Archaeometry* 18, no 4 (2018): pp.353–61.

³⁴ Van Gogh, *Starry Night*, 1889, painted from his room at the asylum at Saint-Paul-de-Mausole in Provence, southern France, supposedly shows spiral galaxies, discovered at this time.

³⁵ Max Roser, Hannah Ritchie, Esteban Ortiz Ospina and Lucas Rodés-Guirao, 'World Population Growth', <https://ourworldindata.org/world-population-growth> [accessed 26 June 2023]; see also 'World Population', Population Education - <https://vimeo.com/130468614> ; <https://ourworldindata.org/world-population-growth#all-charts-preview> [accessed January 2023].



Fig. 6. World population late 20th century (1992), from Population Education - <https://vimeo.com/130468614>.

However, population increase from this time would not always correlate quite so closely to increase in light pollution. Large population increases in India, China and African countries are often now in poor areas where lighting would be limited in comparison with other parts of the world. Space exploration and observations, significantly from outside the earth's atmosphere have become possible, and 'enhanced' images taken from the Hubble telescope launched in 1990, show more accurate visions of the stars than ever before. More recently, the James Webb Space Telescope (JWST), launched 25 December 2021, has provided stunning visual images, as well as scientific data. Apart from astrophotography (whether enhanced or not), other art works continue to be inspired by astronomy and cosmology. The International Association of Astronomical Artists (IAAA) was founded in 1982 and NASA itself utilises space art.³⁶ In areas less affected by light pollution, examples of artworks other than astrophotography remain significant. In the very centre of Australia, where light pollution remains minimal, the artist Norah Napaljarri Nelson (b. 1956) produced *Milky Way Dreaming* after 2004.³⁷ Based on legends of

³⁶ See the International Association of Astronomical Artists, <https://iaaa.org/> [accessed January 2023].

³⁷ <https://www.aboriginalartstore.com.au/artists/norah-napaljarri-nelson/milky-way-dreaming-1/> [accessed January 2023].

the Warlpiri, astronomically-based myths are re-told in paintings. The Pleiades constellation is clearly shown.

The Twenty-First Century

This account of dark skies as told through visual images demonstrates how perceptions of the night sky have changed in relation to increases in population and consequent light pollution. Light pollution is an increasing problem, and not only for scientific observation, or simple enjoyment of the dark sky with its multitude of stars. So many areas are affected. The Dark Sky Association (IDA) was founded in 1988, with the aim of protecting the night sky from light pollution, and held an important global conference on the subject in 2022.³⁸ The effects of light pollution on astronomical and scientific study can be countered to an extent by use of more remote areas for increasingly powerful telescopes, or by even space exploration. Light pollution represents a waste of energy and precious resources. More significant perhaps are the effects on the natural world and biodiversity. The disruption to life cycles and other effects on animals and insects, from bats to mayflies, has been examined in depth in ‘Dark Sky’ parks, research units and international conferences. It cannot be ignored. In addition, the effects on the health, well-being and circadian rhythms (or ‘biological clock’) of human beings is also crucial. Key aspects examined by the IDA include: disruption of wild life and ecosystems, increasing energy consumption and energy waste (and climate control); harming human health, architectural design and lighting; effect on crime and safety. There seems to be less a fear of the dark (nyctophobia) than a fear of what might be in it, and there is no clear scientific evidence that lighting reduces crime.³⁹ While it may make us feel safer it has not been demonstrated as making us safer’.⁴⁰ Thankfully, much discussion is now taking place on light pollution, including solutions

³⁸ See: <https://www.darksky.org/> [accessed January 2023]. For details of the global conference ‘Under One Sky’, 11-12 November 2022, see <https://conference.darksky.org/>. A brief recording of these ideas (‘Dark Skies and Light Pollution: An Art-Historical Approach with Valerie Shrimplin’) is at: https://www.youtube.com/watch?v=3_oXhwL_fxg [accessed January 2023].

³⁹ See International Dark Sky Association, <https://darksky.org/> [accessed 13 April 2024].

⁴⁰ See International Dark Sky Association <https://www.darksky.org/light-pollution/lighting-crime-and-safety/> [accessed January 2023]. See also Johan Eklof, *The Darkness Manifesto: How light pollution threatens the ancient rhythms of life*, trans. Elizabeth DeNoma (London: Bodley Head, 2022).

for best practices for dark sky-friendly lighting. The problem should be accorded significant status as part of climate control in general.

The Inspiration of the Night Sky

The juxtaposition of maps showing population and corresponding likely light pollution maps with artworks of the time show that as light pollution increased, familiarity with the night sky (formerly accessible to all) has decreased, and this has been reflected in art. Although there is great popular interest in images of the universe, such as those from the JWST, these have necessarily been created from telescopes outside the earth's atmosphere. The normal view from planet Earth of the night sky is rapidly diminishing, and far less accessible, or even noticed by populations in urban areas.

Visual images convey complex ideas and depictions of the night sky, stars and Milky Way demonstrate the knowledge and understanding of past generations with such phenomena, not only for the initiated (priests/scientists) but also for 'ordinary' people. The contemplation and study, of the night sky helps us to realise how small we are in the cosmos in the grand scheme of things. But are we now losing this? The astronomical phenomena that inspired the art of previous generations and civilisations are becoming increasingly obscured. It is becoming increasingly clear how much damage artificial light can do to the natural environment. It is increasingly vital that such loss must be halted, and measures taken to prevent further loss in order to protect the Night Sky for future generations. Light shows us the world, but darkness shows us the stars.