The drama of illumination: artist’s approaches to the creation of HDR in paintings and prints

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ABSTRACT

For many centuries artists have considered and depicted illumination in art, from the effect of sunlight on objects at different times of the day, of shadows and highlights as cast by the moon, through indirect light as that through an open window or the artificial light of the candle or firelight. The presentation will consider artists who were fascinated by the phenomena of natural and artificial illumination and how they were able to render the natural world as a form of dynamic range through pigment. Artists have been long aware of the psychological aspects of the juxtaposition of colour in exploiting the optical qualities and arranging visual effects in painting and prints. Artists in the 16th century were attempting to develop an extended dynamic range through multi-colour, wood-block printing. Artists working at the height of naturalist realism in the 17th through the 19th century were fascinated by the illusory nature of light on objects. The presentation will also consider the interpretation of dynamic range through the medium of mezzotint, possibly the most subtle of printing methods, which was used by printers to copy paintings, and to create highly original works of art containing a dynamic range of tones.

Keywords: painting, printmaking, HDR, perspective, illumination, chiaroscuro

1. INTRODUCTION

Early descriptions [1] on the phenomena of light and illumination, as exampled by Aristotle (384 BC-322 BC) considered how objects appear coloured in the presence of light (The Soul), the colours of the rainbow (Meteorologica) the effects of atmospheric light (fog, cloud, smoke, water) and in the environment (Sense and Sensible).

Artists have been fascinated by both natural and artificial illumination and how to capture the natural world using coloured pigments to depict light, shade and all the tones between. The chiaroscuro prints - meaning light and dark - from the 16th century are early examples of how artists were attempting develop an extended dynamic range through multi-colour wood-block printing. Printers, who had worked with Albrecht Dürer (1471-1528), began to make complicated images using line and tone blocks in three or more colours; interesting examples include prints by Lucas Cranach (1472-1553), Hans Burgkmair (1473-1531) and Hans Wechtlin (about 1480- after 1526), Hans Baldung (1485-1545). [2]

During the 17th century, generally regarded as at the height of naturalist realism, artists were considering the illusory relationship of light on objects and the application of perspective. Paintings from the Delft School such as Samuel Van Hoogstraten’s (1627-1678) mastery of tromp l’oeil, and still life compositions (figure 1) by Pieter Claesz (1597-1661), in which the use of directional light and cast shadows was a significant means of expression; Juan Sánchez Cotán’s (1560-1627) work in particular Quince, Cabbage, Melon, and Cucumber (1602), in which the highly detailed observation of the fruit appear to be hanging mid air in the darkness; of Johannes Vermeer’s (1632-1675) pensive and quiet figures in domestic interior scenes that are softly illuminated by the light of a window; or as in Baroque Spanish paintings by Diego Velázquez (1599-1660), who’s optical rendering of gold, silver metal work and glittering brocade are rendered in high contrast. In the 18th century, Joseph Mallord William Turner (1775-1851) having studied colour theorists such as George Field (1777-1854) and Johann Wolfgang von Goethe (1749-1832), developed theories on light and shade through his paintings [4]. John Constable (1776 – 1837), as did
J.M.W. Turner, sketched directly from the landscape, thus recording changes in illumination, weather patterns and climate. Joseph Wright of Derby (1734 – 1797), working during the industrial revolution, was interested in recording the social and scientific changes of the time. In his painting he combines the dramatic illumination of fire, candlelight and moonlight and the contrast effects on his subjects. Caspar David Friedrich (1774 -1840) gained a reputation for vast spiritualised light-infused landscapes as exampled in The Watzmann (1824-25). Eugène Delacroix (1798-1863) was influenced by the French chemist Michel Eugène Chevreul’s (1786 –1889) theories and teachings on simultaneous contrast, as were the Post Impressionists in the 20th century such as Andre Derain’s (1880-1954) experiments on colour contrast, and Claude Monet’s (1840-1926) meticulous recording of the same scene at different times of the day.

During the 18th and 19th century artists were developing their theories on optics, light and colour, which was not necessarily a straightforward transition between science and art. The physicists studied the transmission of light through a prism, whereas, artists understood that light was reflected from a pigment. Even as pigment colours were being improved they could not match the ideal purity of a prismatic colour. For artists the science of colour was not so crucial, their developing knowledge and understanding of colour and light through painting and more precisely through the study of the landscape, was formulated from the perspective of “of artistic perception and spectator response”. [5] A 2005 exhibition and catalogue entitled, La Lumière [6] demonstrated the 17th and 18th century preoccupation for the European pastimes for ‘science games’, which were intended to be educational whilst entertaining; scientific discoveries were presented as curious experiments and intellectual play. [7] This highly experimental yet competitive period for philosophers and scientists gave rise to many discoveries and richly illustrated publications, Ephraim Chambers’ Cyclopaedia or, An Universal Dictionary of Arts and Sciences (1728) was a significant example. The term lumière, referring to both light and the Enlightenment, can be understood in a variety of ways: as a ray of light it may refer to Newton’s discovery and theory of the colour spectrum as published in 1704; or as empirical proof, according to Nassau, [8] it was Newton’s experiments on the production of the colour ‘spectrum’ that benchmarked colour as a scientific enquiry based on experience and observation. It was through the introduction of Sir Isaac Newton’s Opticks (1704) that invoked an irrevocable shift of understanding away from philosophical sciences and the arts towards scientific methods that are recognisable and used today. Newton successfully achieved through Opticks, detailed observations and experiments of so many aspects of the phenomena of light and colour, from physics to pigments, that he became a dominant influence on scientific thought. However, Newton was not without adversaries - his experiments were opposed by artist William Blake, who regarded him as limited and lacking in imagination and his ‘rigidity and standardisation’ as ‘repressive’ [9] The poet John Keats believed that Newton had ‘destroyed the poetry of the rainbow by reducing it to a prism’ [10] (although if these adversaries had known of Newton’s life’s obsession with chymistry they might have considered him differently).
2. EARLY DEVELOPMENTS OF TONAL PRINTING

The process of translating painting to print in the 16th century in The Netherlands, Germany and Italy, involved the layering of ‘chiaroscuro’ woodblocks to create a composite image. Woodblock printing is a relief printing process, the block is cut away with chisels and the surface of the block is inked with a roller, paper is pressed onto the surface and a print is taken. The success of the completed image in the 16th century relied on the master-printer to choose and mix a range of colours to convey the essence of light and shade. Normally two blocks were utilised - one tone-block and one line-block - although in some cases more sophisticated images were created through three blocks, as exampled by Hans Burgkmair’s Lovers Surprised by Death (1510), which has one line-block in dark-grey and two tone-blocks in a light-grey and salmon-pink (figure 2) [2].

![Fig.2. Hans Burgkmair, Lovers Surprised by Death (1510) 21.2 x 15.1 cm](image)

Artists were also interested in creating a dynamic range through intaglio methods such as etching, engraving and mezzotint. Intaglio is a printing process that describes a range of techniques by incising a plate with a sharp instrument to create an image. Methods such as cutting, carving or engraving into a plate may be employed. The process of etching employs a sharp needle onto a copper or zinc plate that has been coated with an acid resistant wax ground. The needle is used to draw lines to obtain detail and cross hatching to create tones. The plate is dipped into acid and where the surface has been scratched by the needle the acid ‘bites’ into these exposed areas. The wax ground is removed and the plate is inked and surplus ink is wiped away. Paper is pressed onto the surface and run through an etching press. The lines of the ink from the plate are transferred onto the plate.

Printmakers reproducing paintings used mezzotint because of its ability to create chiaroscuro images, smooth gradations in tone and rich, deep velvet blacks. The mezzotint process is possibly considered the subtlest of printing methods. The mezzotint is a process by which the engraver roughens the entire surface of a copper plate with a curved ended very sharp cutter with a serrated edge (‘rocker’). The lines are incised into the surface at many angles, which is uniformly...
roughened so that the surface ‘ground’ has tiny prickly burrs. If the plate is inked at this stage the print taken from the plate will appear completely black. The engraver then works back into the plate to remove portions of the burr or burnish areas to hold less ink, to obtain a range of dark areas, mid-greys and light areas. [11-12]

The mezzotint method was used by printers to copy paintings. Prints were an important source of artistic production in circulating and expanding awareness of the original paintings, to generate an income from an original painting through reproduction. Often these prints were the primary source of graphic representation for the public and scholar, therefore the information needed to be precise. The translation of brush strokes to printed marks, colour to tone, required skill and knowledge. Furthermore the transcribing had to be undertaken in reverse on the plate.

The art of transcribing full colour paintings into black and white, for example Valentine Green’s (1739-1813) reproduction of Joseph Wright of Derby’s Experiment on a Bird in the Air Pump, demonstrated the subtle and wide range of tones that were achievable through the medium and the skill of the artist. Full colour mezzotint reproductions of paintings were also achieved by Jacob Cristoph Le Blon who devised a method for combining three coloured mezzotint plates using red, blue and yellow inks. The mezzotint method was also used to create original works of art containing a wide dynamic range of tones and deep blacks. The artist John Martin (1789-1854), who was interested in a highly apocalyptic subject matter, incorporated the rich and smooth transition of tones to create a high dramatic impact.

3. CONSTRUCTION OF A DYNAMIC RANGE: CAMERAS, PAINTINGS AND PRINTS

Although modern cameras are increasingly able to store pixel values that span a range of illumination at 32 bits per colour channel, if compared to the human visual system, cameras still remain poor processors of a full dynamic range. How did the artist consider the effect of light, the range of tones through pigment and resolve the different types of illumination in their paintings? Did artists simply paint what they saw? [13-15] Or did they welcome these different opportunities to demonstrate their skills and their knowledge of the technological advances and optical drawing devices by depicting highly detailed and illuminated works to create a version of reality [16-18]?

Landscape artists - photographers and painters in the past and the present - are faced with a similar dilemma: how to capture the light range of a scene, that even on a sunny, windless day, the environment is in constant flux: sun, clouds and shadows are changing position, as well as people, traffic and objects may be moving within the scene. One approach is to return to the same scene at different times of the day, or to make many quick sketches that capture the essence of a weather pattern, or to construct and image from many separate components that are then layered or stitched together. In creating a composite dynamic range image, the photographer of today faces similar problems to the artist of the past. In considering the complexity of capturing multiple exposures, the current answer is to construct a final image from separate pictures or sketches that when put together conveys the effect of a scene. The illumination of the objects and direction of the illumination is an important factor in conveying a convincing version of reality. The artist/photographer can create an interior or a still life that is entirely fictional but using their skill and mastery convey the illusion of reality through directional lighting and false perspective (figure 1). The objective for the photographer is to obtain a balance of dark and light and smooth tones in between.

If comparing the full dynamic range of light by comparing Luminance to the f stops on a camera one can begin to appreciate the difference, where a full range of illumination from the sun to starlight, the luminance is about 1,000,000,000,000:1 (one thousand million) or 40 f stops on a camera; the full range of human vision with dark adaption the luminance is about 100,000,000:1or 27 f stops; whereas for the typical digital SLR the luminance is about 500:1 or 9 f stops. [19] Currently HDR images in photography have to be generated from different exposures and then constructed to create a composite of light to dark. Therefore when the exposure settings are changed and a new image is captured, the subject cannot move.

Veiling glare in the camera adds unwanted scattered light to the desired scene information in the camera images. Capturing accurate scene information is not possible. Even if the actual scene information were captured and displayed, intracocular scatter prevents the scene information from reaching the retina. Human spatial contrast mechanisms synthesize appearance that tends to cancel glare, and render the information in HDR scenes. [20, 21]

In order to fully understand the parameters of a typical dynamic range, Freeman makes the following classifications:
- A low dynamic range might be considered as a cloudy day with no shadows.
- A medium dynamic range might be considered as a bright day where the sun is obscured by the clouds, where there are shadows, thus creating a contrast.
• A high dynamic range could be described as pointing the camera and shooting towards a light, where the shadows are increased, the light might be obscured by a figure or a building.
• A very high dynamic range might include direct sunlight or spots of light that are contrasted with complex environments, such as very dark, snow, water, highly reflective surfaces. The light may be reflected from a highly polished surface producing glints of light. The image might be captured in a medium or dark room, but there might be a range of different light sources i.e. a bright light in the room and a further light source outside.

Artists have attempted to convey these different lighting conditions based on their knowledge of tools, techniques and materials. Their quest was to find what could closely match the appearance of the object within the scene. There may have been limits in their knowledge as well as the material restrictions. For photographers today the obstacle is the same: the limits of knowledge as well as in the technology. The benchmark in quality remains the comparison between our visual system and how images are captured, created or printed. Since the 15th century, the colour image has evolved through an incremental process of refining, comparison and redefining. For example, the current standard of inkjet technology has developed out of 19th century photomechanical processes and methods of halftoning. The printed colour has been advanced by electrostatic and inkjet technologies, enabling colour, text and image to print in one pass. However these do not always match our expectations of appearance and we return to how making comparisons between what is possible given the current material restrictions.

4. ARTISTS’ APPROACHES TO THE REPRESENTATION OF ILLUMINATION

The following section of this paper will describe a selection of painters and printmakers, who included a range of illumination, for example, sun, fire, moon, lamplight, to create very different dramatic artworks. The selection is by no means definitive, but these examples demonstrate different methods as to how the artist depicted the illumination in their work, including the illusionary, the closely observed, and the highly theatrical. The selection includes artists who used coloured pigment to describe light and dark; how through the medium of etching and mezzotint, printmakers were able to transcribe the colours of paintings into a range of tones; and lastly how printmakers used the tonal qualities of the mezzotint to create original works to convey a drama through illumination.

4.1 Samuel Van Hoogstraten (1627-1678)

Samuel Van Hoogstraten is possibly best known for his illusionistic works of art, which required a balance of lighting, colour and perspective to achieve the effect. In his treatise on painting, Introduction to the High School of the Art of Painting, published in 1678, he refers to his own work in which he describes his fascination for perspective, “through the knowledge of this science one also makes the wonderful perspective box.” [22]

The inside of these wooden ‘perspective boxes’, as exampled by A Peepshow with Views of the Interior of a Dutch House (c.1655-60) The National Gallery London, Van Hoogstraten paints objects, including a dog, chairs, a broom that are placed within a series of rooms, onto the inside of the box. Through the use of perspective he transforms the two-dimensional painted walls into a three-dimensional multi-roomed domestic interior. Light enters through the front of the box, which might have been covered with a translucent paper [23], two holes are set on each side of the box for the viewer to gain a precise vantage point. The rooms, objects and floor patterns are distorted, which when viewed at the wrong angle appear to drift between the second and third dimension, but when viewed from the hole the interior appears perfectly aligned and continuous. He uses illumination and strong directional lighting as a way of drawing the eye through rooms, for example, light flooding through an open door or a shadow cast by a window frame. All corners of the rooms are perfectly lit and balanced so as to be able to perceive all the architectural details. As described by Brusati, “The device graphically demonstrates Van Hoogstraten’s understanding of how the eye is deceived both by the painter’s art and by the act of seeing itself. As such it offers and invaluable presentation of the assumptions about the nature of vision and picture making that inform Van Hoogstraten’s art and writing.” [24]

On a grander scale, Van Hoogstraten created a wall sized, still-life illusionary work of art, for a corridor in Dyrham Park near Bath. The painting was designed to convey the idea of a continuation of the corridor, transforming the Baroque 17th century English country house into a 17th century Dutch interior. Van Hoogstraten cleverly creates a scene that suggests the viewer’s arrival at a crucial point of the narrative or drama. With side illumination from a series of windows on both sides, the rooms along corridor are well lit so as to be able to perceive the objects and social interactions, and a glimpse at the far end of the hall of rooms beyond.
4.2 Giovanni Antonio Canaletto, (1697 – 1768)

Giovanni Antonio Canal, known as Canaletto, was the son of a theatrical scene painter. Canaletto’s architectural landscapes demonstrate his eye for the framing of a scene, for illumination, the use of perspective and his attention to detail. It is also suggested that he used optical equipment to assist in the construction of these perspective superstructures. [25, 26] As illustrated in his Venetian paintings, Canaletto was highly skilled in his observation of the world around him and the use of paints to depict the illumination of light upon water, buildings and figures. George III who enjoyed topographical representations commissioned a series of 50 paintings and 150 drawings that recorded, picture by picture, the length of the Grand Canal. [27] The complete collection of these works can be found through the Royal Collection e-Gallery.


In the 1740s, due to the war in Europe and the demise of the tourist trade, Canaletto temporarily gave up painting and began etching. Canaletto was an accomplished etcher, as exampled in the etched view of the Lock Basin at Dolo (figure 3). The face of the house is bathed in a bright intense sunlight, but Canaletto has included enough detail to show the broken plasterwork. The sun is just behind the buildings on the left, which are in deep shadow but again he has provided sufficient detail in the darker areas to show the texture of the bricks, wood and cobbles. Although this etching is monochrome there is a sensation of the brightness and intensity of the sun, which is demonstrated by the contrast between the different houses, the highlights on the clothing of the figures, and also, the shadows from the shutters on the house appear elongated, suggesting the day is mid afternoon.

Although Canaletto is primarily known for his paintings of Venice, he also lived in England and made many paintings there. His idea of the ‘real view’ greatly influenced English watercolour artists, of his “symmetry of elegant facades, and the smoothness of dressed stone”. [28] The works such as Warwick Castle, East Front from the Courtyard, (1752) is rendered with such subtle tones and balance of light and shade the castle has an almost photographic quality, as exampled by the smoothness of tones and shadows of the tower on the right and its contrast against the blue sky. Similarly the painting London: Interior of the Rotunda at Ranelagh (1754), although a scene of the inside of a building could be considered as the equivalent to retinex, or ACE, spatial image processing of today.

![Fig.3. Canaletto, Al Dolo, (c.1745) etching (29.4 x 42.8 cm)
Reproduced with permission from The British Museum, London](image-url)
4.3 Joseph Wright ‘of Derby’ (1734-1797)

Although known mainly for his portraits of the rich and famous in the mid to late 18th century, Joseph Wright ‘of Derby’ was also interested in depicting the current social notions of science as a form of public entertainment or educational performance. It is unclear as to whether he was interested in science per se, but it is more than likely that he was reflecting on the social and industrial changes that were occurring at the time. He also gained the reputation for rendering in his paintings the effects of different illumination. Wright used different incandescent lights, such as the light emitting from a glass vessel (The Alchymist), the light of an oil lamp (The Philosopher, The Alchymist, The Orrery), the moon (The Alchymist, The Air Pump, the Blacksmith’s Shop), candlelight, (Two Girls Decorating a Cat), the furnace and white-hot metal (The blacksmith’s Shop). Within each scene, the light is used to illuminate the faces of the figures and to play with the contrast of highlights and shadows. In order to study and record the effects of light in detail, Wright created still-life arrangements with the appropriate light in a darkened room. [29] His fascination resulted in highly theatrical paintings that considered how illumination utilised in nocturnal settings could heighten the drama in his works.

As well as many other works that incorporated artificial light, he completed a series of paintings that were loosely based on scientific subjects, for example, astronomy (The Orrery), physics (The Air Pump) and chemistry (The Blacksmith’s Shop and the Alchymist). In the painting An Experiment on a Bird in the Air Pump (1768), the figures in the scene are illuminated by the central light, which is obscured by a glass containing a skull. There is also a second illumination from the moon, which can be seen through the window. Here again he creates a sense of high drama from the single light. The light fully illuminates the different expressions on the faces of the audience, of which some are appalled, whilst others appear unmoved. The shadows cast by the figures upon the wall creates a greater sense of drama and theatricality.

As Wright’s observational studies advanced, he also returned to paintings in order to improve on the composition and illumination. For example, in the painting of the Blacksmith’s Shop he paints a second version, he changes the composition and increases the saturation and contrast. The brightness of the white-hot glowing metal and the surfaces

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Fig. 4. Willam Pether, A Philosopher Giving a Lecture on the Orrery, (1768) mezzotint (48 x 58cm)
Reproduced with permission from The British Museum, London
reflected from the metal, such as the walls and the faces of the blacksmiths appear to be more saturated, and have more contrast and texture. The shadows are also more pronounced, the moon in the sky, although partially clouded, contains more contrast and appears brighter. The second light source in a neighbouring stall to the blacksmith’s shop is reduced so as to heighten the focus and drama of the central figures. Many of Wright’s painting were reproduced as prints and were very popular amongst collectors. Printmakers reproducing paintings used the mezzotint process because of its ability to create subtle gradations in tone. The range and contrast of tones that could be achieved made it a particularly suitable medium for rendering the dramatic lighting effects for which Wright was famous. In the mezzotint of *A Philosopher Shewing [sic] an Experiment on an Air Pump* (1769) by Valentine Green shows the printmaker’s mastery of the medium. Green has increased the lightness and detail of the ceiling and sharpened the shadows on the walls, and provided more detail in and around the window. Similarly the mezzotint by William Pether (1728-1821) is a mezzotint of Wright’s other most famous painting *A Philosopher Giving a Lecture on the Orrery* (1768). Here Pether has successful captured the light and dark of the painting, as exampled in the frame of the orrery, which is particularly in sharp contrast against the jacket of the philosopher and the assistant (figure 4).

4.4 John Constable (1776-1837)

In the mid 18th century, artists were moving away from the studio to make direct observations from the landscape. Constable’s approach to the depiction of light and dynamic range was through his observation of the restless phenomena of the changing patterns of weather, of the air, light and clouds, and the effect of shadows on the landscape and the glints of sun on water, “Atmosphere was a matter of theatre, achieved by grand design and colouring”. [30] At first, painters to painted only the landscape but then became increasingly fascinated with the sky, so much so that, for many, the sky began to dominate the picture and the figures became increasingly diminished.

![Fig. 5. David Lucas, Summer Afternoon - After a Shower, a mezzotint after John Constable (1831) Reproduced with permission from The British Museum, London](image)

Constable conducted many sketches and preparatory drawings in the open-air, which were then later developed into larger paintings in the studio. In some cases he semi painted the works and moved on to quickly another, confident that they could be completed in the studio. On other occasions he created some small paintings that became the exhibition
John Martin was primarily a painter, and was well known for large-scale sublime paintings and prints. His theatrical range of marks and tones (figure 5). Of the painterly marks from brush to his burin was designed specifically for converting colour and texture into a full deepening the shadows in some sections and increasing the contrast in others. Lucas' method of transcribing the syntax mezzotint could be considered as an equivalent to the photographer’s approach to sharpening, dodging and burning, Working from the paintings by Constable, what Lucas had attempted and succeeded through the medium of the paintings, resulting in a wide variation of interpretation, which resulted in a great deal of reproofing and retouching. [33] Constable’s supervision. This was not an easy task, as Lucas worked from Constable’s sketches rather than the finished paintings, resulting in a wide variation of interpretation, which resulted in a great deal of reproofing and retouching. [33] Working from the paintings by Constable, what Lucas had attempted and succeeded through the medium of the mezzotint could be considered as an equivalent to the photographer’s approach to sharpening, dodging and burning, deepening the shadows in some sections and increasing the contrast in others. Lucas’ method of transcribing the syntax of the painterly marks from brush to his burin was designed specifically for converting colour and texture into a full range of marks and tones (figure 5).

4.5 John Martin (1789-1854)

John Martin was primarily a painter, and was well known for large-scale sublime paintings and prints. His theatrical imagery made his work a good subject to copy, especially for the production of painted panoramas or dioramas, which were fashionable in theatres in the 19th century. And from a theatrical point of view one could understand the popularity “While the theatre was still setting the standard for thrills, Martin’s arrangements were doubly thrilling: the foreground group invoked the best sensational elements of melodramatic stage, but at the same time the viewpoint was pulled far back, away from the actors; and behind the gesticulating hero, the astounded eye was forced to scan amazing vistas from the secret theatre of dreams.” [34] His painting Belshazzar’s Feast which was presented at the British Institution exhibition in 1821 was so popular that it had to be roped off from the public.

Martin was interested in highly apocalyptic subject matter, images included: lightening strikes, craggy hillsides, fantastic temples built into mountainous landscapes, boiling seas, shafts of light, burning clouds, fiery molten rock. The figures in the works played minor parts and were certainly overshadowed by the tempestuous landscapes. A critic in the Edinburgh Review writing in 1828 describes Martin’s art, “No painter like him has made light pour down in dazzling flood from heaven and painted the darkness visible of infernal deeps. [35] However, he also painted more celestial paintings, as exampled in The Plains of Heaven (1851-53), which includes clear blue lakes and mountains and a light infused sky. These are certainly a contrast to the mezzotints that capitalise on the strong chiaroscuro quality of the medium.

Martin’s mezzotints can be placed into three categories: those reproduced by others from his paintings, those reproduced by Martin from his own paintings, and the third, which was the most popular were his original engravings and mezzotints. The largest project by Martin was based on John Milton’s (1608-1674) Paradise Lost and comprised twenty-four etchings measuring 19.05 x 27.4cm, which were produced around 1824. [36] Martin experimented with the mezzotint process and incorporated the rich and smooth transition of tones to create a high dramatic impact. One has a sense that he was burnishing an image out from darkness to light. He experimented with different inks and inking methods to expand the tonal range of the prints. He used different ratios of oil to ink, the heaviest ratio of ink and oil for the darkest areas and a thin mixture of oil and ink for the lighter shades, for the lightest areas whiting was used with some burnt umber to add a “warm tint to the cold white”. Wiping off the ink required a great skill to blend the various inks. [37] Large works such as The Fall of Nineveh (1929) (53 x 81 cm) required a steel plate and paper that had to be specially manufactured. As exampled in the Fall of Babylon (figure 6), the swirling black cloud and the temple are illuminated by a blazing sky and lightening strikes that zig-zag across the image. In the valley bellow
the fires are raging and torches can be seen along the balcony of the temple. The figures and the tree are rendered in contrast against the light of the sky and fires.

![Image](image_url)

**Fig. 6.** John Martin, *The Fall of Babylon* (1831) mezzotint with etching (46.4 x 71.9 cm)
Reproduced with permission from The British Museum, London

### 5. CONCLUSION

The aim of this presentation was to draw together examples by artists who had considered illumination in their paintings and prints. The artists are selected from the mid 17th century through to the mid 19th century, during which there were significant scientific theories and industrial developments that began to impact artistic theories. As described in the introduction, artists were (and still are) frustrated that pigments and paints could not match the purity of prismatic colours, instead they used their skill in depicting a version of reality by enhancing the contrast and tonal range. Van Hoogstraten used a medium dynamic range to create an illusion of reality in his *tromp l’œil* paintings. Canaletto used paint and etching to depict high dynamic ranges of outdoor and indoor scenes. Joseph Wright ‘of Derby’ used illumination to create highly charged dramatic theatre pieces in which the figures are brightly lit in darkened rooms. In the work of John Constable we move outside to the drama of the restless phenomena of nature, and his studies of the effects of the sun’s illumination, the formation of clouds, and the atmospheric effects on the landscape. Finally to the work of painter and printmaker John Martin who’s dramatic illuminated scenes demonstrate the extreme range of tones that were achievable through the mezzotint medium.

The limits in knowledge and in the material restrictions may be overcome by gaining a better understanding of the key mechanisms in vision and psychology. The complexity of the human vision system still sets the benchmark when comparing nuances in colour, texture and tone. In terms of the approaches of the HDR photographer, one could suggest that a few of the problems have been considered in the different fields of painting and printmaking. For the HDR photographer the issue of how an image is stitched and layered shares similarities with many painters. Both photographer and painter have attempted to convey an essence of appearance based on their knowledge of (software) tools, techniques and materials.

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• Giovanni Antonio Canaletto, *Al Dolo,* (c.1745) etching (29.4 x 42.8 cm) The British Museum, London

• Joseph Wright 'of Derby', *A Philosopher by Lamp Light* (1769), Oil on Canvas, (128.3 x 102.9 cm) Derby Museum and Art Gallery

• Joseph Wright 'of Derby', *Two Girls Decorating a Cat by Candlelight* (1770), Oil on Canvas, (90.8 x 72.4 cm) Kenwood House, London, English Heritage

• Joseph Wright 'of Derby', *A Blacksmith’s Shop* (1771), (first version) Oil on Canvas, Collection (128.3 x 104 cm) Yale Centre for British Art, Paul Mellon

• Joseph Wright 'of Derby', *A Blacksmith’s Shop* (1771), (second version) Oil on Canvas, (125.7 x 99 cm) Derby Museum and Art Gallery

• Richard Earlom (1743-1882), *A Blacksmith’s Shop* (1771), (mezzotint of the first version), Gallery (61.1 x 43.4 cm) Derby Museum and Art

• Joseph Wright ‘of Derby’, *The Alchymist, in Search of the Philosopher’s Stone, Discovers Phosphorus* (1771), Oil on Canvas, (127 x 101.6 cm) Derby Museum and Art Gallery

• Joseph Wright ‘of Derby’, *A Philosopher Giving that lecture on the Orrery, in which a lamp is put in place of the Sun* (1766), Oil on Canvas, (147.3 x 203 cm) Derby Museum and Art Gallery

• Joseph Wright ‘of Derby’, *An Experiment on a Bird in the Air Pump* (1768), Oil on Canvas, (183 x 244 cm) The National Gallery London

• Valentine Green, *A Philosopher Shewing [sic] an Experiment on an Air Pump* (1769) Mezzotint (first state), (51 x 62cm) The National Gallery London


• John Constable, *Cloud Study* (1822) Oil on paper laid on board, (60.5 x 70.5 cm) Tate Gallery London (N06065)

• John Constable, *Study of Clouds at Hampstead,* (1821), Oil on paper laid on board, Royal Academy of Arts, London

• John Constable, *The Gleaners, Brighton* (1824) Oil on paper, laid on canvas (15.9 x 30.2) Tate Gallery, London (N01817)

• John Constable, *Yarmouth Jetty* (after 1823) Oil on canvas, (32.4 x 50.5 cm) Tate Gallery, London (N02650)

• David Lucas, *Yarmouth, Norfolk* (1832) Mezzotint on paper (14 x 22 cm) Tate Gallery, London (T04018)

• John Constable, *Sketch for Hadleigh Castle* (c.1828-9) Oil on canvas (122.6 x 167.3 cm) Tate Gallery, London (N04810)

• David Lucas *Hadleigh Castle near the Nore* (1832) Mezzotint on paper (15.2 x 22.9 cm) Tate Gallery, London (T04058)

• John Constable, The Haywain (c.1820) (130.5x185.5cm) The National Gallery London

• John Constable, *Salisbury Cathedral from the Meadows,* (c.1829-31) (151 x 189.9cm) private collection

• John Martin, *Mountain Landscape with Rocks* (1851) Oil on canvas (25.4 x 35.5 cm) Victoria and Albert Museum London

• John Martin, *The Plains of Heaven* (1851-3) Oil on canvas (198.8 x 306.7 cm) Tate Gallery, London


• John Martin, *Creation of Light* (1824) Plate from 'The Paradise Lost' by John Milton, Mezzotint. (25.6 x 35.6 cm) Victoria and Albert Museum, London