

What particular technical problems did the manuscript illuminator face, and how were they solved?

"You do not know what it is to write. It is killing work." Thus wrote a monk of St. Aignan of Orléans.¹

It is likely the whole process of illuminated manuscript production was similarly 'killing work'. Part of the killing work arose because of the technical problems associated with illumination. The illumination of manuscripts involved embellishing vellum-manuscript books with painted pictures, ornamented letters and geometric designs in gold and other colours.² Strictly speaking an illuminated book required the use of gold or silver to 'light up' the page; in fact the term is derived from the Latin *illuminare*, 'light up' or 'brighten'.³ The technical problems of illumination therefore centre on the use of gold but the broader problems of the complete manuscript production will be mentioned first to put them in context.

Although it is impossible to define exact dates the illuminated manuscript was an important object throughout Western Europe for over a thousand years from about the fourth century to its high point in the fourteenth and fifteenth centuries. In fact, illuminated manuscripts are *the* major form of medieval graphic art as the paintings they contain outnumber panel paintings many times over.⁴

In the early Middle Ages, the scribe, as well as writing the text, generally decorated the pages and illuminated the initial letters but for the historiated⁵ initials and larger illustrations an experienced master of miniature painting was usually employed. These masters were called illuminators (Latin *illuminatores*) and their job was to embellish manuscripts by painting and drawing.⁶ During the Romanesque period (conveniently 1049-1180) there was no centre of production and manuscript illumination was a truly international activity.⁷

¹ d'Ancona, P., Aeschlimann, E. *The Art of Illumination* (London, Phaidon, 1969), 1969, p. 11.

² Diring, D. *The Illuminated Book Its History and Products* (London, Faber and Faber, 1967), p. 21.

³ Diring, 1967, p. 22.

⁴ Backhouse, J. *The Illuminated Manuscript* (Oxford, Phaidon, 1979), p. 1.

⁵ Adorned with the figures of humans, animals, or birds.

⁶ Diring, 1967, p. 21.

⁷ See Turner, *Romanesque Illuminated Manuscripts*, 1966, p. 23, and *Early Gothic Illuminated*

By the late medieval period the ownership of books increased enormously and powerful and wealthy individuals owned books and towards the end of the period even less wealthy individuals, such as doctors, owned them.⁸ To cope with the increased demand the production of a manuscript was often undertaken by a team of specialists.

Manuscript Production

The technical problems involved in the complete production process will be considered first including design, layout, materials, writing, drawing, colouring, gold inlaying and finishing. It must be borne in mind that we are talking of a period of a thousand years and the whole of Europe so particular techniques, processes, materials and styles varied enormously. This is illustrated by the examples shown in Figures 1 to 5 below.

When a particular process, technique or material is mentioned it should be regarded only as an example, as counter examples can typically be found. For example, gold was important but it was not used on all manuscripts that are today regarded as illuminated, particularly early manuscripts; parchment is covered in a few paragraphs but books have been written on different methods for creating it (for example, Ronald Reed, *The Nature and Making of Parchment*, Leeds, Elmete Press, 1975) and the production process changed radically over the period from a monastic activity, with most tasks performed internally, into an industry where most tasks were 'sub-contracted'. My aim has been to steer a path through some of the most important technical problems often faced by illuminators through the period.

Let us first consider the process of production and the stages involved.

- **Agree the specification and contract.** Towards the end of the period being considered most manuscripts were made to commission and contracts specified the price, size, number pages, quality and amount of materials, the length of time for completion (often lengthy, for example, the

Manuscripts, 1965, p.26.
⁸ Alexander, J.G. *The Printed Page. Italian Renaissance Book Illumination* (London, Prestel and the Royal Academy of Arts, 1995), p.11 and p. 18-20.

fifteenth century Borso Bible contract stipulated six years) and let-out clauses.⁹ The illuminator had the problem of estimating the cost accurately and the time and materials required.

- **Layout and design the book.** The illuminator and the scribe needed to decide the detailed page layout, the range of size of initials and headings and the number, size and position of pictures and the use of illumination and therefore the materials they will need. Many levels of heading were used and each was precisely defined in terms of how many lines high each heading would be and how each heading level would be coloured (red and black were often used but sometimes the more expensive blue and gold). As book production became an industry and the various tasks were distributed the management of the process became an important issue. For example, a 'gathering' (see below) could be sent to an illuminator who had not been involved in the specification. It was therefore necessary for the required colour, illumination or picture to be clearly marked and this was often done on the parchment itself with a small code letter or picture.¹⁰
- **Obtain materials.** By the fourteenth century book production had become an industry with specialists for ink and parchment making, book-binding, goldsmiths, and apothecaries for pigment and so on. In cities such as Paris the various craftsmen involved in book production tended to live side by side in specific streets or neighbourhoods, which made co-operation easy.¹¹ The problems with some of the materials are considered later.
- **Create the pages.** This involved folding the parchment pages into quires or gatherings that were later stitched down the centre fold and then sewn together to make the book. The basic gathering was 8-leaf as this involves folding in half three times but gatherings of 6, 10 and even 24 leaves are

⁹ Alexander, 1995, p. 18.

¹⁰ de Hamel, C. *The British Library Guide to Manuscript Illumination History and Techniques* (London, British Library, 2001), p. 74.

¹¹ Backhouse, 1979, p. 36.

found.¹² The gathering was the basic unit of work and they could be distributed among several craftsmen working simultaneously.¹³

- **Line the pages.** Nearly every medieval manuscript was carefully ruled before the scribe began to write and the rulings were left as part of the overall design. The scribe would first rule two vertical and two horizontal margin lines (with a further vertical line if there were two columns and sometimes lines were doubled), often pricking holes with an awl or other sharp point through corners to ensure alignment from page to page. The margins were well proportioned and often used for glossing. The central area was then marked with horizontal lines and pricked through to create a framework for writing and to define the height of heading and initials. Before the early twelfth century lines were scored with the back of a knife and the person involved had to be careful not to cut through the page. The advantage was that several pages could be marked at once but the disadvantage was that ink could run into the groove or be rubbed off the projection on the other side of the page. The scribe would write between the lines to avoid these problems.¹⁴ Some time in the eleventh century scribes started to use something like graphite. It is not known what this material was but experts speculate that it was probably plummet (ingots of metallic lead). By the thirteenth century they were ruled in ink.¹⁵
- **Mark non-text areas.** The agreed design would then be laid out, for example, marking the areas where initials and miniatures would later be painted. The headings, initials and picture areas could be marked to indicate the required colour or letter or even a tiny drawing of the type of picture required. Sometimes the code was misinterpreted by the illuminator and the wrong initial letter was drawn.¹⁶

¹² de Hamel, 2001, p. 39.

¹³ de Hamel, 2001, p. 40.

¹⁴ de Hamel, 2001, p. 46.

¹⁵ de Hamel, 2001, p. 47.

¹⁶ de Hamel, 2001, p. 50.

- **Write the text.** The next step was to write all the text. The pages would be given or sent to the scribe or scribes for the text to be written in the agreed typescript and colours.
- **Draw the pictures.** When all the text had been written the pictures would be sent out to be drawn, illuminated and coloured. The first step was to draw the images (the 'underdrawing') with a hard point, plummet or charcoal and then produce a finished drawing in light brown ink as shown in Figures 6 and 10. When finished the first sketch was sometimes erased or brushed off.¹⁷ Some drawings must have been done by eye and some were traced or pounced (by pricking holes in the original and dabbing over with charcoal or colour). Creativity was not expected and images were often copied from pattern books.
- **Lay the gold.** Burnished gold was often the first colour on a page. Gold was added first to prevent it sticking to the colours. However, this meant that the illustrator had to take great care during the colouring process. Figure 12 shows this stage. The problems of gilding are described below.
- **Colour the images.** The colours were typically mixed with fish or animal gums, especially egg white (glair) although egg yolks were also added to create a richer colour.¹⁸ Painted and gilded pages need to be kept as flat as possible as bending the pages may crack the pigment or the size. This problem can be minimized by selecting the correct flexibility of parchment, consistency of size and by binding using a cross stitch. More information about pigments is given below.
- **Tidy the book.** Once all the gatherings were finished the complete book would be reassembled and checked. Any marks in the margin, such as sketches or colour indications would be removed and the whole book tidied up ready for binding.¹⁹

¹⁷ de Hamel, 2001, p. 57.

¹⁸ de Hamel, 2001, p. 78.

¹⁹ That this was not a trivial task is indicated by the note that has been found that in 1397 Pierre Portier

- **Bind the book.** The first step when binding was to compress the pages and plane all the edges of the pages to the same size. Sometimes this resulted in the margins becoming very narrow. The pages would then be sewn together and tied between wood panel covers. The covers would often be decorated and illuminated and finished with clasps or tied with ribbon.

Materials and Techniques

The above description of the process highlighted particular technical problems concerned with materials and methods which will now be covered in more detail.

Parchment. Manuscripts were written on animal skins called parchment, strictly speaking sheep skin, or, for the finest quality, vellum, strictly speaking calf skin. Loosely the word parchment is used for a writing material made from the skin of sheep, goats or calves.

The pelts were first soaked in a lime solution for three to ten days to loosen the fur, which was then removed. While wet on a stretcher the skin was scraped using a knife with a curved blade. As the skin dried, the parchment maker adjusted the tension so that the skin remained taut. This cycle of scraping and stretching was repeated over several days until the desired thinness had been achieved.²⁰ The skin was then 'pounced' by rubbing it with pumice powder and then often dusted with a 'whiting' (commonly made from chalk). The aim was to produce a non-greasy, soft skin (not 'horny', stiff and shiny) with a smooth velvety nap.

The parchment sheets had to be large enough for the size of the manuscript. For the larger manuscripts (such as the half metre high Arnstein Bible shown in Figure 3) it would be difficult to find large enough calf skins that were undamaged.

The skin of a parchment has a smooth (whiter) side, the original flesh side, and a rougher yellowier side, the original hair side. The smooth side is better for

charged extra for cleaning, lightening and correcting ("*pour avoir nettoyé, blanchy, corrigé*") a Book of Hours (De Hamel, 2002, p. 79.)
²⁰ <http://www.getty.edu/art/exhibitions/making/>

writing but with a book both sides must be used. According to the Getty Museum video on manuscript production errors made when writing could be scratched out with penknife as the parchment surface was very resilient. However, Johnson points out that the smooth side is easily damaged when erasing and a very sharp knife must be used carefully.²¹

Finally parchment could be stained. One method is described by Cennini, a fifteenth Century craftsman who provides recipes for tinting parchment a variety of colours including purple, indigo, greenish grey, red, peach and flesh colour.²²

Writing and drawing materials. Manuscripts were written and areas marked using a quill pen or brush with black or coloured ink. Ink was used for drawing and ruling as well as for writing and, when diluted, could also be applied with a brush as a wash.

Pens were made from the feathers of large birds, such as geese, and hardened in warm sand before having the end cut with a penknife.²³ Care needed to be taken when cutting the quill as it could split too far and it was recommended that the slit should be started with a penknife but then pushed ("twitched") to the correct length (0.25" to 0.375") using the end of the finger.²⁴ The creation of a fine nib from which the ink flowed smoothly was important but nibs had to be cut many times a day so it was no doubt a skill learnt early by an apprentice.

There were many formulae for ink and the aim was to both lay a fine line of colour on the parchment and to slightly eat into the surface of the parchment to ensure permanence. In fact the word ink derives from Latin encaustum ("burnt in") as the acids and the oxidation of its ingredients cause it to eat into the writing surface. According to the British Library²⁵ ink was typically made from a solution of gall (from gallnuts found on oak trees) and gum, coloured by the addition of carbon (lampblack) and/or iron salts. The formula and method of production for the ink was

²¹ Johnston, 1908, p. 174

²² Cennini, 1954, p. 10-12.

²³ Cennini, 1954, p.8.

²⁴ Johnston, 1908, p. 53-61 on making quill pens.

²⁵ The British Library Digital Catalogue of Illuminated Manuscripts Glossary at <http://prodigi.bl.uk/illcat/welcome.htm>

therefore important as it might either not eat into the parchment or eat too far. The ink could also discolour if incorrectly formulated, for example, ferrous ink produced by iron salts sometimes faded to a red-brown or yellow and ink made from copper salts sometimes faded to grey-green. Problems also arose if the ink did not "stick" to the surface, faded or did not bite into the surface.

Pigments. Every colour has its own method of production, its own problems and limitations because of its interaction with other colours. Lead white is particularly difficult to combine with other colours

There were many pigments used from different sources. Some were expensive and some, particularly the yellows (orpiment and realgar), were very poisonous. The most expensive was ultramarine as it was made by crushing lapis lazuli from mines in one small area of Afghanistan. Cennini describes the process of producing and preparing pigments. The illuminator had to have a reliable source of good quality pigments particularly lapis lazuli (recognised by its brilliant blue colour, as long as it is not azurite which has an enamel look).²⁶

Gold. The epitome of the illuminator's art was the application of gold, either as gilding or as paint. During most of the period being considered Western Europe was an economy based on silver, and gold was in short supply. In the late medieval period Western Europe was wealthier and gold became readily available and we find gilding used extensively. In fact, it was so common that a thirteenth or fourteenth century student textbook would probably start with an initial letter burnished with gold.²⁷ Gold had a great status value as it was the epitome of wealth.

Gilding is the application of very thin sheet called gold leaf. Gold is precious, it does not tarnish and it can be beaten into a sheets only one hundred thousandth of an inch thick. This means one ounce of gold will produce a sheet about 10 feet square (100 square feet). The amount of gold in an illuminated manuscript was therefore relatively small compared to say jewellery. This, and obviously the status

²⁶ Cennini, C. d'A. *The Craftsman's Handbook "Il Libro dell'Arte"* (New York, Dover, 1954, translated by D.V. Thompson 1933, written c.1400), p. 20-39.

of gold, may account for the widespread use of gold in the thirteenth century and fourteenth centuries but I have not found an analysis of the relative cost of the gold and its associated labour compared to the other materials and labour. In other words adding gold leaf (material and labour) may have been a small percentage of the other costs.

As Cennini points out it was important to purchase gold from a reliable source as it could be adulterated with cheaper materials that would not burnish so finely and could tarnish. Cennini gives guidelines on recognising pure gold leaf – "rippling and mat, like goat parchment".²⁸

It is clear from studying Cennini and Johnson that laying and burnishing gold requires considerable experience. In early manuscript production the leaf is stuck directly to the parchment using size but later it was stuck to a thick layer of 'bole'. The advantage of the raised area of bole is that the gold catches the light from many directions and scintillates. After it has been stuck down it was burnished using a smooth, hard material such as a piece of agate, a tooth (dog's teeth were used) or, according to Cennini, prepared haematite mounted in a wooden handle. Great care must be used when burnishing and a "gently and vigilant alacrity"²⁹ is required rather than a hard pressure that will crush the bole or size. Cennini also warns about chipping the burnishing tool and making sure the surface is absolutely dust and grit free before burnishing.³⁰

Johnson takes twenty five pages of his book to describe the technique and the numerous problems associated with gilding.³¹ The following table based on information in his book summarizes some of the problems an illuminator could face with this expensive material.

Problem	Cause
Size not sticking to parchment.	Dirty, greasy, 'horny' or non-porous parchment.

²⁷ de Hamel, 2001, p. 66.

²⁸ Cennini, 1954, p. 85.

²⁹ Johnston, E. *Writing & Illuminating, & Lettering* (London, John Hogg, 1908), p. 171.

³⁰ Cennini, 1954, p. 83.

³¹ Johnson, 1908, p. 146-171.

Size not sticky enough or size crumbling off.	Faulty composition or mixing of the size.
Gold-leaf not sticking to size.	Size not damped enough or insufficient breathing on, or too absorbent size. Not sufficient rubbing and pressing of gold. Size not sticky enough. Not enough size. The size may have been touched accidentally.
Gold leaf not burnishing properly.	Size too sticky due to damp weather, insufficient time allowed for drying or too much sticky matter in size. The surface of the size is too rough and it needs further smoothing and burnishing. The burnisher has become dirty, it must be cleaned frequently.

As an indication of the expertise required Johnson points out that the surface of horny or greasy parchment must be slightly roughened with a penknife until little hairs are raised which will hold the size, care being taken that the roughened area does not extend beyond the area to be covered with size.³² The exactitude of the process is emphasized by his insistence that the gold is laid on the size "*at or near the same time the next day*" (his italics).³³ However, Cennini says that depends on the temperature and humidity, "In summer, lay your gold one hour, and burnish it the next."³⁴ Obviously there is no simple rule.

Finally, gold paint (sometimes called 'shell gold' as it was poured into an old sea shell to use), unlike gold leaf, is applied after painting. It is more expensive than gold leaf and can add a few dazzling highlights to a painting but if overused could spoil the picture in the final stages.³⁵

³² Johnson, 1908, p.146

³³ Johnson, 1908, footnote p. 148.

³⁴ Cennini, 1953, p. 83.

³⁵ de Hamel, 2001, p. 78.

The Illuminator's 'Killing Work'

"Dear reader, in turning over these pages with your fingers, take care not to damage the writings; no one who is not a calligrapher can have any idea of the labour involved. It is as sweet to the copyist to reach his last line as it is to the sailor to reach his port. Three of his fingers hold the reed for writing, but his whole person has painfully to work."³⁶

We have seen the numerous technical problems faced by the illustrator but for the end result we are eternally grateful, as a character in Bernard Shaw's *Saint Joan* says on being shown an illuminated Book of Hours, "There is nothing on earth more exquisite than a bonny book...But nowadays...a book might as well be one of those orders for bacon and bran that you are scribbling."³⁷

³⁶ d'Ancona, 1969, p. 11, quoting a monk from the monastery of Corbie.

³⁷ Bernard Shaw, *Saint Joan*, Scene IV, The Nobleman.

Examples of Illuminated Manuscripts

The following examples are from the British Museum collection and have been selected to show the diversity and development of manuscript illumination between 700 and 1500.

Fig 1: The Lindisfarne Gospels. One of the most famous and was probably made around 715-20 by Bishop Eadfrith of Lindisfarne.

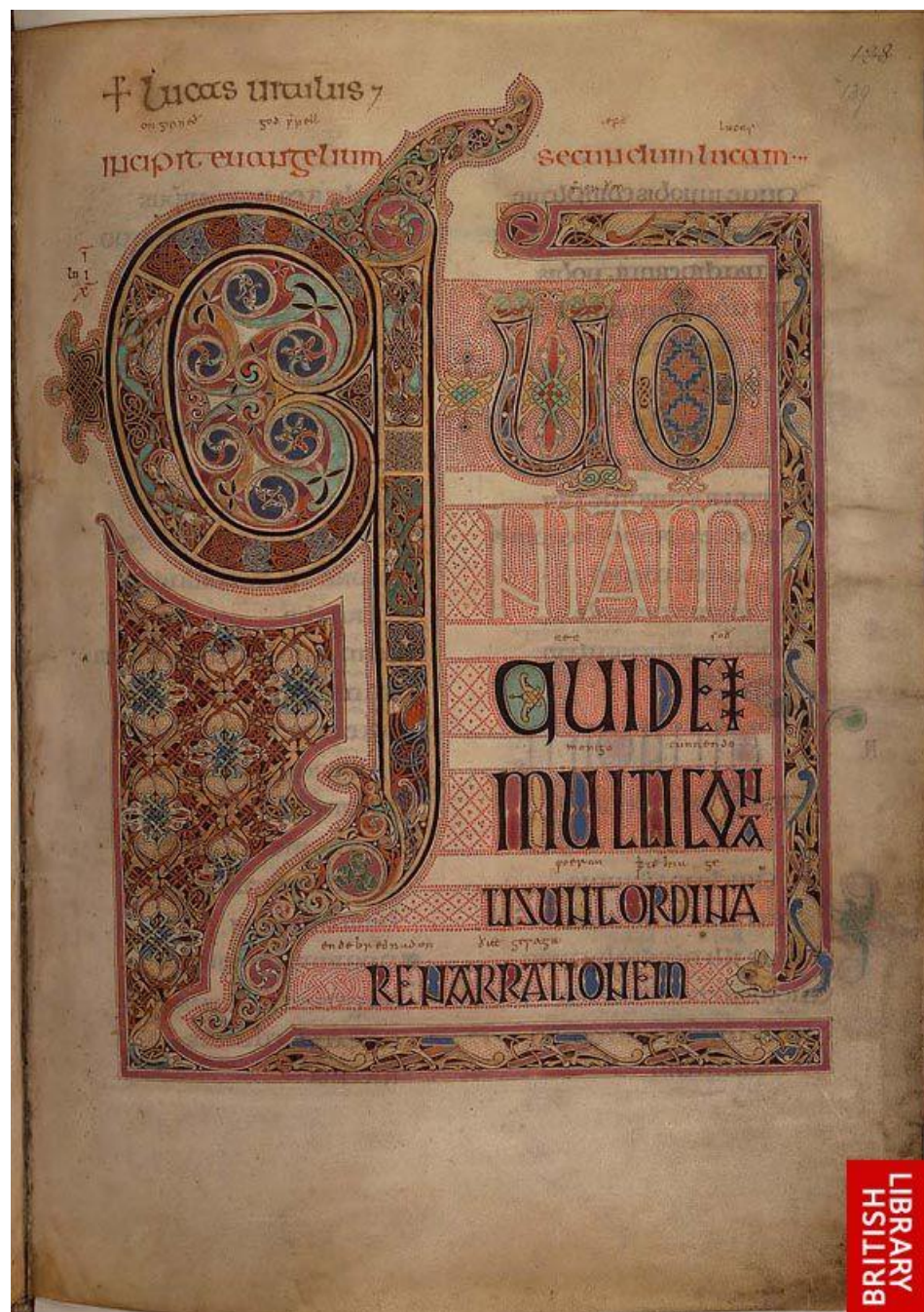


Fig 2: A Greek Gospelbook. This manuscript was written in Constantinople in the middle of the tenth century. The manuscript contains the New Testament in Greek and this is from the beginning of Luke's Gospel showing Luke writing into a book.

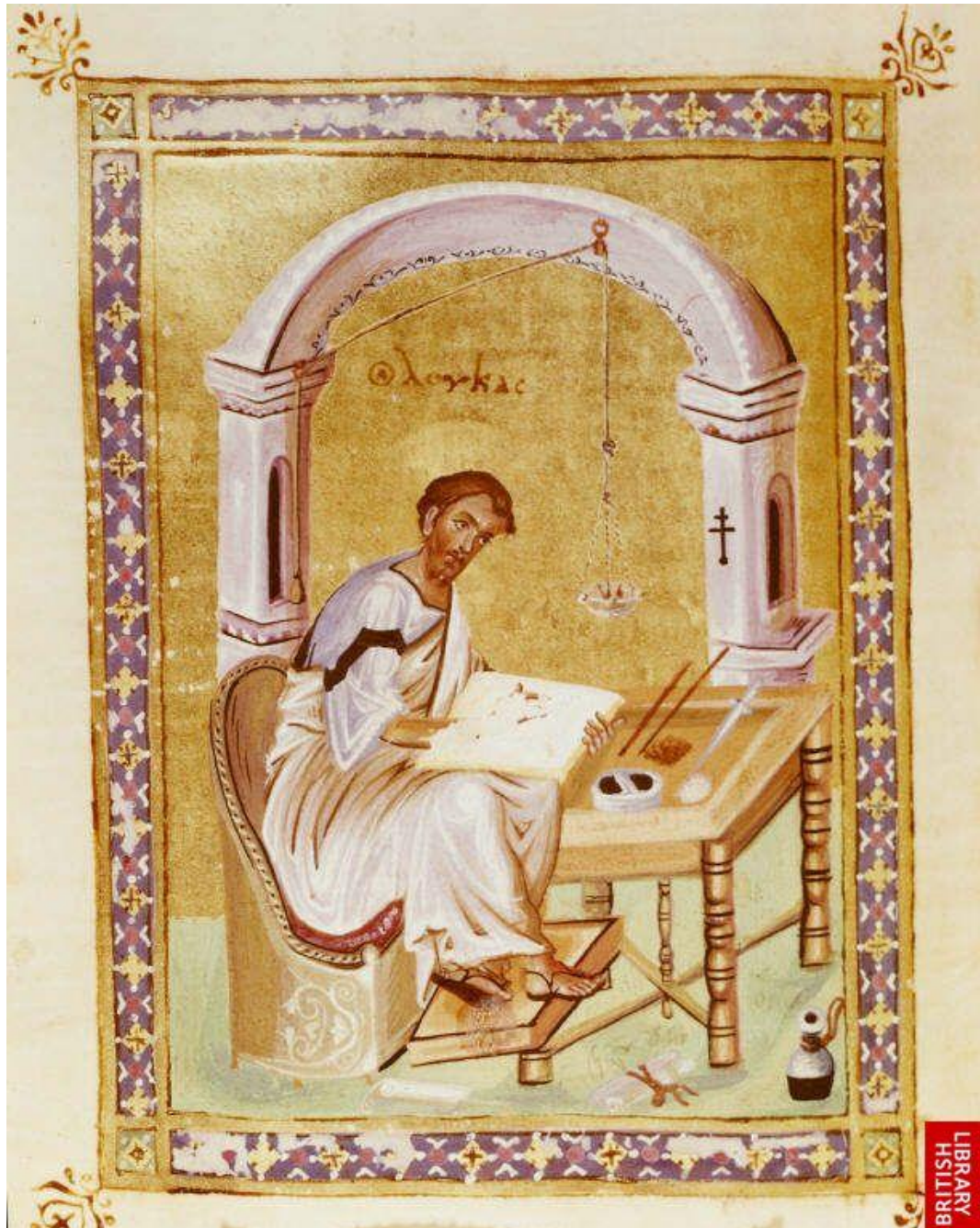


Fig 4: The de Brailes Hours. This book, written about 1240, is the earliest surviving English Book of Hours. The artist is probably William de Brailes who lived in Catte Street in Oxford. At this time Catte Street was mostly inhabited by people involved in the production of book. Books of Hours were the most popular sort of medieval illuminated manuscript and show the production of illuminated manuscripts for lay use.

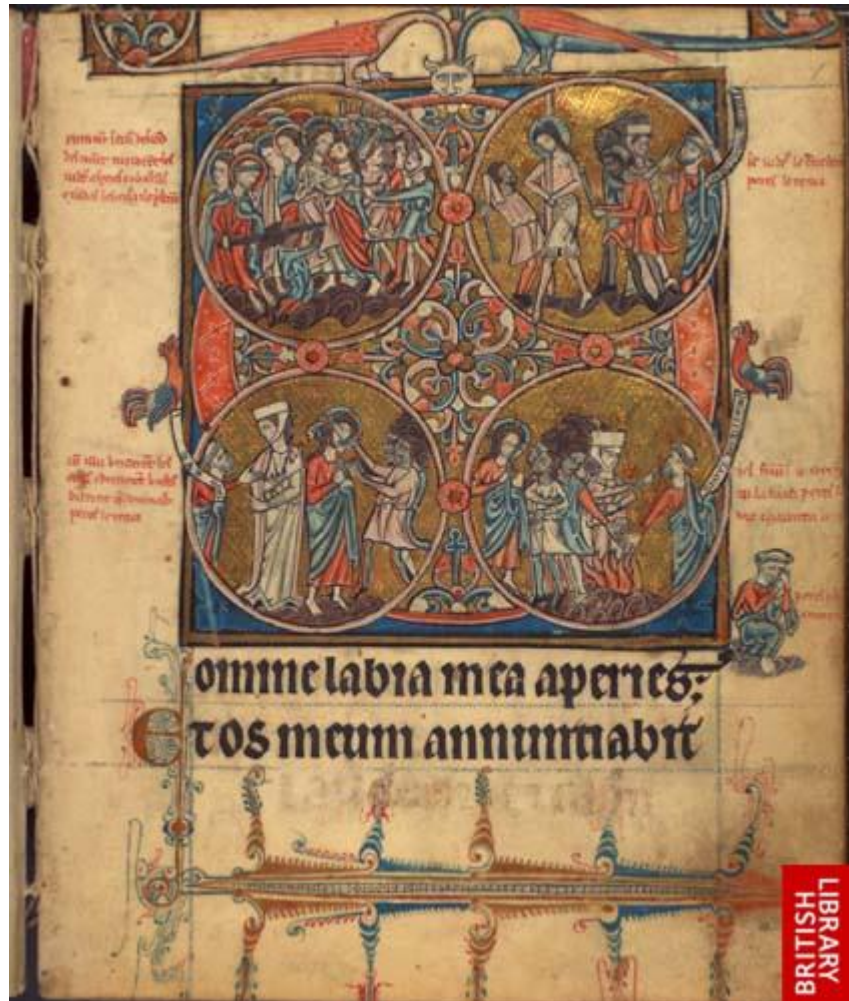
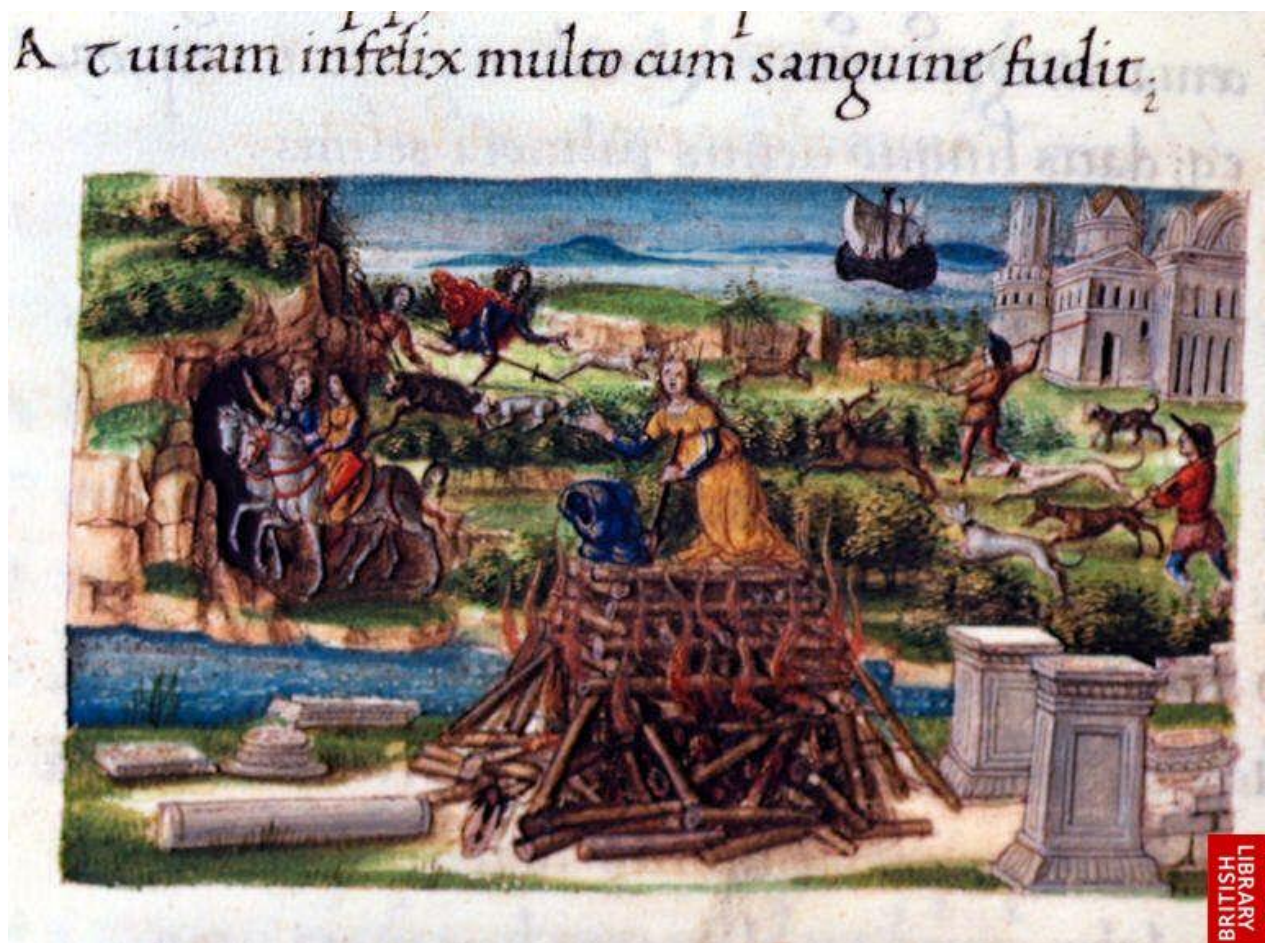


Fig 5: Fifteenth Century Italian Manuscript. This manuscript of Vergil's Eclogues and Aeneid was written between 1497 and 1499 by a scribe called Bartolomeo Sanvito. It shows the development of the illuminated manuscript for secular books. Although secular books had been produced previously there was a rapid growth from the fourteenth century. This page shows Dido and Aeneas riding into a cave during a hunt, Aeneas sailing away leaving Dido, who becomes mad and throws herself on a pyre.



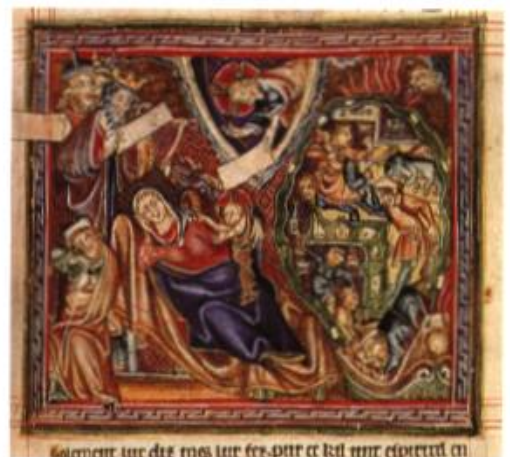
Examples of the Stages of Illumination

The following eight images are from de Hamel. They show a part finished Anglo-Saxon manuscript that demonstrate the stages of production.

Figures 6 - 9. First the approximate shapes of colours are applied over a faint sketch (Fig. 6, top left), the bodies are then outlined in ink and further colours added (Fig 7., top right), faces are drawn in and draperies emphasized with pale and dark lines of ink (Fig. 8, bottom left) and finally the frame has been faceted, outlines have been strengthened and final details such as hair and beards have been added (Fig. 9, bottom right).



Figures 10 – 13. On the next four pictures show how a mid-thirteenth manuscript was first drawn in brown and blue-black ink (Fig. 10, top left), then gesso mixed with brown pigment added (Fig. 11, top right), the gold leaf added over the gesso and burnished and colours roughly blocked in (Fig 12, bottom left) and finally worked up with layers of highlights into a complete miniature (Fig. 13, bottom right).



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