4 DOCUMENTARY ILLUSTRATION

Learn this ye painters of dead stumps,
Old barges, and canals, and pumps,
Paint something fit to see, no view
Near Brentford, Islington, or Kew—
Paint any thing,—but what you do.

The Rev. John Eagles

Science and the graphic arts were closely linked. Since the fifteenth century the development of woodcutting and of engraving on wood and copper, as of printing generally, was greatly stimulated by the revival of learning. In turn, the woodcutters, engravers and printers provided both the scientist and the artist with an immense new public.

Line, Aquatint and Lithograph

Woodcutting was the first method of duplicating designs and pictures. The wood is cut with the grain. Those parts of the design to appear white are hollowed out by a knife or gouge. The parts in relief hold the ink. The technique was originally used for printing fabrics, but was applied to paper as soon as this became readily available from about the middle of the fifteenth century. It was common for the artist to prepare his design on the face of the block, which was then cut by a craftsman, a very early example of the division of labour.

The woodcut lends itself to the production of broad, direct and powerful images,
and the illustrations of mines and mining in Agricola’s De Re Metallica, first published in 1556, are typical. Although in the hands of a master such as Albrecht Dürer (1471–1528) and his cutters a woodcut can display a wealth of detail and shading, the preparation of such elaborate blocks requires the highest skill and is extremely laborious. By the eighteenth century the woodcut had returned to the broad and coarse styles of the early Middle Ages and was used mainly to embellish the popular prints, broadsheets and chapbooks of the time. The technique petered out in the nineteenth century, except in the hands of a few masters such as Sir William Nicholson (1872–1949).

Wood engraving was introduced in the eighteenth century. It is essentially a line technique, using a graver across the grain of a block of boxwood. However, the raised portions of the block still carry the ink, and the lines cut in it print white. The art of wood engraving was perfected by Thomas Bewick (1753–1828). It was a great advance on the cruder woodcut, being simple, elegant, and cheap. The blocks could be cut relatively quickly. Though small they were durable and did not lose their quality, even after long printing runs. They could be used in combination with ordinary type to produce a page carrying both text and illustration. This made possible the production of cheap, illustrated periodicals, notably the Penny Magazine and the Penny Encyclopaedia, founded in 1852 and 1855 by that great popular educator Charles Knight (1791–1875), and Punch and the Illustrated London News, founded in 1841 and 1842 respectively.

In metal engraving, the metal itself is directly scored by the graver. The engraved lines carry the ink, while the surface of the plate prints white. In an etching, the metal plate is covered with a coating or waxes, gums and resins, called the etching ground. The artist draws on the coating with an etching needle, laying bare the metal beneath, which is then bitten by the application of acid.

Till well into the nineteenth century the metal plates used for engraving and etching were usually of copper, a soft metal from which it was impossible to take large numbers of prints without signs of wear. For this reason, copper engraving and etching could not be applied to the mass production of illustrated books. Engraving on steel was first practised in 1810 in America for the production of banknotes. Between 1815 and 1860 line engraving on steel almost completely superseded copper engraving for cheap book illustration.

The process was often regarded with contempt, perhaps because of the very fact that it enabled reproductions of pictures and works of art to be circulated cheaply to rich and poor alike. This offended the exclusive attitudes of the well-to-do con-

noiseur, who was liable to dismiss steel engravings as being so coarse as to debase the whole art of engraving. Yet there can be no doubt that the process has a charm and delicacy of its own which is only now coming to be appreciated. In addition, the large, cheap editions of topographical works revealed views of English scenery to people previously cut off from enjoying them because of the relatively high prices of books illustrated in traditional ways. Just how large were some editions using the new process is apparent from the Address to Westmoreland, Cumberland, Durham & Northumberland Illustrated, published by Fisher, Son & Co. in 1852. (Reissued in an enlarged form, under the title Picturesque Rambles in Westmoreland . . . etc, in 1847.) Steel engravings reveal, states the Address, ‘with Claude-like grace and effect . . . [the] . . . unequalled beauty of British Landscape’, and have helped to produce ‘a new era in the empire of taste’. So great a number of fine impressions can be taken ‘that the treasures of art are sold at a price so trifling, as to place these beautiful productions within the reach of all who take an interest in them,—and who does not?’ Fisher, Son & Co. claimed that they had spent on this work alone no less than £5,000 on artists and engravers, £2,750 on printing the steel plates, £2,750 on paper and paper duty, and £500 on the letterpress—£11,000 in all.

The mezzotint process of engraving, introduced in the second half of the seventeenth century, consists of traversing the whole plate with a ‘rock’ having a serrated edge, which causes a uniformly indented surface. A print from a plate treated thus would be uniformly black. The plate is then worked over with a ‘scraper’, the indentation being smoothed away in varying degree where the light portions are to appear. The stipple process, introduced in the middle of the eighteenth century, depends on both engraving and etching. The plate is covered with an etching ground which is then perforated to produce great numbers of small points which are etched to give tone. The aquatint was introduced in France by Jean Baptiste le Prince (1754–81), and first used in England in 1775. The process depends on etching the plate through a porous ground of powdered resin or asphaltum. The plate is immersed in acid, which is left to bite as deeply as is required for the lightest parts, which are varnished to protect them from further attack. The plate is returned again to the acid for further and deeper biting. The next lightest portions are then varnished, and the process is continued till the darkest portion is reached.

Mezzotint, stipple, aquatint, and a number of variants were devised in order to convey gradations in tone as well as line. Mezzotint, in particular, was applied to
the reproduction of paintings and portraits, aquatint to topographical scenes and descriptive illustrations of all kinds. The first British book to be issued in aquatint was *Views in Aquatinta ... in South Wales*, by Paul Sandby (1725–1809), published in 1776 and reproducing wash drawings made in that and the previous year.

The process of lithography was invented by Johann Aloys Senefelder (1771–1834), of Munich, apparently by accident. The principle is simple. A flat surface of fine-grained absorbent limestone is polished. The design is drawn directly on to the stone with a greasy crayon. The surface of the stone is wetted. The water is absorbed except by those parts of the surface touched by the crayon. The stone is next inked, the ink being retained by the parts touched by the crayon, but rejected by the rest. The paper is then pressed on to the surface, and picks up the image in reverse.

Senefelder's first lithographs date back to about 1800. He attempted to keep the process secret, but it was much pirated, though he did not publish an account of it till 1818. The publisher Rudolf Ackermann (1746–1834) issued a translation in English in 1819 under the title *A complete Course of Lithography*, and, with the lithographer Charles Joseph Hullmandel (1780–1850), did much to popularize the process. It was particularly attractive, not only because it was cheap and the stones durable, but because the artist could work on the stone directly without the intervention of copyist-craftsmen. Lithography revolutionized the art of reproducing pictures and, from about 1850, drove out almost all other techniques except mezzotint for reproducing portraits and paintings, steel engravings for cheap topographical and other books in long runs, and wood engravings for illustrating both periodicals and books. All of them were finally superseded by the various photo-mechanical processes of reproduction.

**ILLUSTRATIONS IN COLOUR**

From the Middle Ages to the end of the nineteenth century woodcuts, engravings and lithographs were issued in enormous numbers, either as book illustrations or independently, many of them in black-and-white, and some coloured by hand. (The number originally issued in colour today appears exaggerated owing to the practice adopted by unscrupulous dealers of colouring up prints and engravings to enhance their value.) But the art of true printing in colour, which had long been the cherished dream of the illustrators and picture-makers, was much more difficult to master. Until Newton's analysis of the spectrum supplied the theoretical foundation of colour printing by means of multiple plates, the only feasible method of producing coloured prints on a commercial scale was to tint or 'stain' the individual sheets by hand. The practical significance of Newton's theory to printing did not escape Erasmus Darwin, who devotes a good deal of attention to the primary colours in Part 1 of *The Botanic Garden*.

He indulges in prophetic fantasies even more far-seeing in Part II, where he discusses the relation of painting and music. After pointing out that Newton had observed that 'the breadth of the seven primary colours in the Sun's image refracted by a prism are proportional to the seven musical notes of the gamut', he suggests that this idea should be taken a step further by producing 'a luminous music, consisting of successions or combinations of colours, analogous to a tune in respect to the proportions above mentioned. This might be performed by a strong light, made by means of Mr Argand's lamps, passing through coloured glasses, and falling on a defined part of a wall; with movable blinds before them, which might communicate with the keys of a Harpsicord; and thus produce at the same time visible and audible music in uniform with each other. The execution of this idea'—he adds—'is said by Mr Guyot to have been attempted by Father Castel* without much success. Erasmus Darwin then touches on experiments by his son, Dr Robert Darwin,* to assess the relative degrees of pleasure or pain produced by exposing the eye to different colours in succession. He suggests his inquiries should be taken a step forward: '. . . if visible music can be agreeably produced'—he argues—'it would be more easy to add sentiment to it by representations of groves and Cupides, and sleeping nymphs amid the changing colours, than is commonly done by the words of audible music."

Although Erasmus Darwin thus dimly foresaw the coloured sound film of the present age, he was shrewd enough to appreciate what was practicable in his own time, and did not pursue this tempting theme. Instead, he continued his note on Newton's observations on primary colours by stating that experiments based on them 'might much assist the copper-plate printers of calicoes and papers in colours; as three colours or more might be produced by two copper-plates. Thus suppose some yellow figures were put on by the first plate, and upon some parts of these yellow figures and on other parts of the ground blue was laid on by another copper-plate. The three colours of yellow, blue and green might be produced; as green leaves with yellow and blue flowers.'

Newton's theory had, in fact, already been applied on these lines to the art of printing many years before Darwin wrote *The Botanic Garden*. In 1719 James
Christopher Le Blon (1667–1741), who had started experiments in 1704, took out an English patent for ‘multiplying pictures and draughts by natural colours, with impression’, using three plates for the primary colours and often a fourth for black. The process he used was mezzotint. In 1720 he formed a company in London for its exploitation. His invention failed as a commercial venture, just as Savery’s steam engine had failed, and for the same reason: the special skill required to operate either invention was not yet sufficiently disseminated to enable them to be applied successfully on a commercial scale. Instead, colour printing remained the jealously guarded secret of a small number of artists both on the Continent and in England. Not even Matthew Boulton, who in 1777–80 had entered into a partnership with the Birmingham engraver Francis Eginton (1757–1805) to exploit the latter’s process of ‘mechanical painting’ with oil and water colours, could make the new technique a commercial success. Indeed, printing in full colour in mezzotint or aquatint never became established on a large scale. In aquatint, however, it was common to use one plate for the design proper and another for a tint. The same principle was extended to lithography. In either case further colouring was often laid on by hand.

Colour printing on a large scale was not practised until well into the nineteenth century, when George Baxter (1806–67) introduced wood and steel engravings in colour, and Thomas de la Rue introduced chromolithography in 1852, using flat oil colours for the printing of playing cards. This process, of which the modern poster is a direct descendant, was first applied on a serious scale to book illustration by the architect Owen Jones (1809–1874) in *Plans, Elevations, Sections, and Details of the Alhambra*, published in two huge folio volumes in 1842 and 1845. It came into its own with the publications generated by the Great Exhibition of 1851.10

Until true colour printing had been mastered on a commercial scale the demand for coloured prints could only be met by colouring prints by hand. Printmaking came to be split up into three specialized but interdependent crafts: making the original drawing or ‘design’; engraving; where required, tinting or staining.

During the first half of the eighteenth century line engravings formed the principal basis for making colour prints. Their style was perfectly adequate for the clean-cut architectural prospects and technical drawings of the period. But it was far less satisfactory for rendering the graded tones of painting or the chiaroscuro effects demanded by the growing taste for the picturesque. Mezzotint and aquatint were introduced primarily to meet this need. These enabled the whole tonal structure of a painting or drawing to be reproduced in sepia or black and white, so that only the actual colours remained to be washed on by hand. The art of designing for the engravers was modified accordingly, and line drawings were gradually replaced by ink or sepia wash drawings in delicately graded tones of grey or brown.11 Often enough the engravings from these were also issued in monochrome. For example, the early impressions of Paul Sandby’s *Pistes . . . in South Wales* were in sepia. Colour was only applied to later, weak impressions of the plates (Fig. 18).

The drawings after which coloured prints were to be made were tinted with a few light touches of transparent watercolour as a guide to the engravers and stainers. At first only parts of the engraving were tinted, the effect of the remainder depending entirely on monochrome tones. Though the tinting process was both subtle and important, it was often undertaken by children. Both Thomas Girtin (1775–1802) and Joseph Mallord William Turner (1775–1851) started their careers as engraver’s colour-washers. Even in the last decade of the eighteenth century, when the whole surface of a drawing or engraving came to be coloured, the grey or sepia foundation remained until Girtin and Turner dispensed with it altogether in their designs and so created the technique of watercolour drawing as an independent art in its own right.12

While, therefore, the technique of designing for engravers developed from a subsidiary craft into the independent and essentially English art of watercolour drawing, the collaboration between designer, engraver and colour-washer produced a great tradition of coloured illustration that has never been surpassed. It flourished until about 1850, when it was rapidly replaced by the new techniques of lithography and steel engraving at a time when that jack-of-all-trades, the millwright, was being replaced by the mechanical engineer proper. The changes both in technique of illustration and in engineering are exemplified by the successive editions of a pamphlet by John Berkinsworth describing his epoch-making patent for making rails from wrought iron instead of cast iron. The first two editions of 1821 and 1822 are illustrated by a line engraving of a horse-drawn train of coal wagons; the third, 1824, edition has a line engraving of a train of coal wagons drawn by a Stephenson locomotive; the fourth, 1827, edition goes over to lithography with an illustration of a train on the Stockton and Darlington, drawn by a Stephenson locomotive and including a passenger coach among the coal wagons, all packed to bursting with passengers.

With the spread of literacy and the progressive development of publishing and printing, the art of illustration came to flourish at every level from the crudest woodcut to visually subtle mezzotints and aquatints. The print-sellers of the
eighteenth century catered for every section of the people, from fairground purchasers of chapbooks illustrated by woodcuts to prosperous farmers and inn-keepers buying the coloured engravings published by Carington Bowles and other old-established City firms. Connoisseurs collected portfolios of expensive reproductions of paintings in line and mezzotint. In subject-matter the prints not only embraced anything from caricature and literary illustrations to portraits and historical paintings, but also entered a broad field ranging from straightforward technical illustration and factual record to imaginative compositions of great subtlety, a development of special significance in English art. For, like the documentary film of the 1950s, many of them were inspired by an enthusiasm for science, technology and industry in the broadest sense. Just as the documentary film prepared the way for a distinctly British style of feature film in the Second World War, so the equivalent drawings and prints of the eighteenth century developed by clearly defined stages into the great English schools of art of the romantic era. Both involved ‘the creative treatment of actuality’, in John Grierson’s vivid phrase.12

ENGINEERING DRAWINGS AS WORKS OF ART

In its development from the sixteenth to the mid-nineteenth century technical illustration passed, broadly speaking, through the same sequence of styles as the other graphic arts. The illustrations of Georg Agricola’s De Re Metallica of 1556, with their mountain scenery and busy miners, are in the best manner of the German woodcutters. Although they often combine realistic and diagrammatic presentation in the same design, both elements are so imaginatively fused that their inconsistency is not obtrusive. Agricola also introduced many modern conventions. On occasions he cut away the ground to show parts of engines otherwise invisible. Sometimes he placed an array of the parts in the foreground, ‘exploded’, or shown individually.14

On the other hand, the Italian technical illustrations of the sixteenth and seventeenth centuries might well serve to exemplify the principles of mannerist design. In many of them, landscape or architectural backgrounds set off visual descriptions of intricate machines, themselves exercises in perspective, and often seen from a viewpoint higher than the background against which they stand out in relief. Pictures with such double or even triple stances enabled the artist to combine in one plane landscapes, cities and architectural effects stretching back to the horizon, with a detailed appreciation of a machine or piece of engineering seen from a position chosen to give equal emphasis to all the details. The workers, engineers or admiring visitors, rarely absent from these illustrations, have the exaggerated muscles and heroic poses of the saints and heroes in contemporary paintings. Like them, they can trace their ancestry to the Sistine ceiling.

English technical drawings of the late seventeenth and early eighteenth centuries often show marked traces of this tradition, though the ambiguity of perspective is usually more subdued. Indeed, at this period the rules governing technical illustration are very similar to those governing topographical prospects in general, by which, ‘the views . . . are formed on a curious union of distinct systems of perspective, having, it may be, three different horizons to one picture. Of the main object, usually a grand Elizabethan or Jacobean mansion standing amidst avenues and gardens laid out in the quaint geometrical style of the time, we have perhaps a strictly bird’s-eye view; but the winged observer drops to a lower level to survey the distant landscape; while living objects in the foreground are seen as by a spectator on foot. . . .

‘Notwithstanding the inconsistency of their arrangement, these representations convey a curious sense of reality. They are carefully, in many cases vigorously, engraved; and the whole scene being represented in full sunshine, the several objects are made to stand out solidly from the earth; and a certain unity is effected which prevents an uneducated eye from perceiving the incongruity of the drawing. They are full of matter; enlivened with countless figures and objects which, small as they are, tell their historic tale of the habits and manners of the time.14

Topographers and technical illustrators alike adopted a formula designed to convey a clear picture of the main features of the subject, together with a generalized impression of its setting. They combined map-like projections with landscape vistas and picturesque details in the foreground. A typical example of a technical illustration of this type is the first known engraving of a Newcomen engine done in 1717 by Henry Beighton of The Ladies’ Magazine (Fig. 6) whose enigma on the steam engine has already been quoted. Not only is the landscape seen from one viewpoint and the engine from another, but there is an ambiguity of style as well, the engine being partly realistic, partly diagrammatic. The side walls of the engine house have been removed to reveal the mechanism within. The engine-man sits in the shadow of the wall supporting the beam. An elegantly dressed gentleman watches the operation of the pump-rods outside. Flames play beneath the boiler and smoke rises from the chimney.
Although specialization in scientific and technical drawing or in topography tended to become the rule as the eighteenth century advanced, many designers and engravers remained equally proficient in either discipline. At the beginning of the eighteenth century, for example, Bernard Lens the Younger (1682–1740), the son of a Flemish engraver and draughtsman, engraved portraits and historical subjects after Antoine Coypel (1661–1732), Rubens, and other masters, while at the same time publishing engraved views of Bath and Bristol in 1718–19. Among his works in the Print Room of the British Museum are wash drawings of the waterworks and mill at New River Head in Islington, and a proof of an engraving after him by John Stuart (1658–1750), of "A Prospect and Section" of Rudyard's Eddystone Lighthouse, built of wood and first illuminated on 28 July 1708. Though the intention is technical, the engraving has highly decorated borders of mermaids and the four winds of heaven, borrowed from contemporary cartographers. Indeed, the lighthouse is handled less as a diagram than as a map of a piece of architecture.

Stuart is best known as an engraver and letterer responsible for a Book of Common Prayer published in 1717, with pages engraved from silver plates, each with an historical vignette at the top. Similarly, Sutton Nichols (fl. 1725), an architectural draughtsman and medalist, engraved the Newcomen engine at the York Buildings in 1725.

There is a primness about some of the early eighteenth-century technical illustrations, particularly Beighton's Newcomen engine, that is characteristic of its period and yet foreshadows a new style of technical illustration, found particularly in the plates of the semi-popular scientific dictionaries and encyclopedias that were issued in increasing bulk throughout the eighteenth century in England as well as in France. Here realistic and diagrammatic styles are no longer compounded but exhibited side by side. One half of such an illustration may contain a general view of a tilt-hammer with men at work, while the operative parts of the machinery and the tools used may be shown separately, just as, in many contemporary botanical illustrations, a general view of the plant is shown separately from the detail of stamen and petals. The artist gained freedom to deal with the work process or the workshop as a whole by concentrating the technical detail in accompanying drawings which are often diagrammatic. Sometimes the general account of a process was separated altogether from the technical detail, which might be relegated to a separate page. For example, when Jean Morand commissioned William Beilby to make drawings of the Newcastle wagonways for the first volume of his L'Art d'exploiter les Mines de Charbon de Terre (1768–79), the general view of a coal wagon was given a page to itself (Fig. 25), supported by two further pages of technical detail of the permanent way. William Beilby was one of four Newcastle engravers, all brothers, Richard, William, Thomas, and Ralph, of whom the last was the master of Thomas Bewick (1753–1828). They undertook miscellaneous engraving of all kinds, not only preparing plates for printing invoices, billheads, trade cards and even bank notes, but also cutting seals, etching sword blades, and engraving door plates, coffin plates, clock faces and the like. They were provincial craftsmen, which accounts for the old-fashioned style and mixed perspective of William Beilby's engraving of the wagon.

By the second half of the eighteenth century, under the stimulus of the rapid developments in technology, most of Beilby's contemporaries had adopted a freer style of technical illustration combining scientific lucidity with outstanding aesthetic qualities and appealing not merely to technicians but to the educated generally. This freer style appeared also in the later eighteenth century in the drawings by engineers of steam engines and other large machines. Its growth can be traced in the original drawings of John Smeaton (1724–92) preserved in six large volumes in the library of the Royal Society and entitled Designs of the late John Smeaton F.R.S. made on Various Occasions in the course of his employment as a civil Engineer from the year 1744–1790. One or two drawings dating from the 1740s are in the stippled manner of Henry Beighton, but Smeaton rapidly freed himself from that convention. From about 1765 onwards many of his drawings are marvels of execution and perfect examples of free design.

According to the engineer John Farey, Jun. (1790–1831), Smeaton was a man of 'laborious habits' who made all his drawings himself. When he became more established he employed a draughtsman. Even so, he continued to do the outline of all his drawings to scale. These were then fair copied by the draughtsmen, who included William Jessop (1745–1814), himself a distinguished railway and canal engineer, and Henry Eastham. One of Smeaton's daughters often "assisted in the shadows and finishing in Indian ink [wash] which was very well executed." 18

Much of the work of James Watt and his assistants from the last quarter of the century, now preserved in the Birmingham Reference Library, shows the same fluency, as do the drawings prepared by William Jones in 1798 for a M.S. Report on mills by Thomas Telford (1757–1834) in the Library of the Institution of Civil Engineers. A typical example of the style is a wash drawing by Joseph Clement (1799–1844) of a rotative engine by Fenton & Co. of Leeds (Fig. 8). It was engraved in 1827 by George Gladwin for The Steam Engine by Thomas Tredgold (1788–1829).
This style of drawing continued to be employed in engineering works until the middle of the nineteenth century. The Goodrich Collection in the Science Museum contains many splendid examples from the first quarter of the century, while Mesers Hick, Hargreaves & Co. Ltd., of Bolton, still preserve a fine series of drawings of locomotives made by their founder, Benjamin Hick, in the 1850s and '40s. Such works influenced the illustrators of books of popular science and technology, as witness the large coloured engravings of a locomotive and a stationary engine by John Emslie (1815–75) in James Reynolds’ *Diagrams of the Steam Engine*, published in 1848 (Plate II).

From the engine books and other records in Mesers Hick, Hargreaves' archives, it is plain that this elaborate finish was not used merely in the large drawings that might be shown to prospective customers, but also in the ordinary working drawings and records made for the engineers' own use. How intimately it was associated with the engineer's pride in his craftsmanship is shown by a sketchbook kept by John Nuttall, a smith born in 1818 who worked for various Lancashire engineering firms and who ended up in the 1890s as works manager for James Nasmyth. His book, entitled *Sketch Book Old Things from 1831 to 1850*, contains drawings of locomotive wheels, driving gear and valve mechanisms, with brief notes. One of these, accompanying a fine drawing of the smith's work required for a gab motion, runs: 'Making this kind of work I was in my glory.'

The peculiar fascination of the large engineering drawings of the late eighteenth and early nineteenth centuries is that, unlike modern blueprints, they are not reduced to a formal system of lines and measurements. The objects illustrated are carefully shaded to give the impression of solid bodies. Yet they are isolated from their normal setting and shown, partly in their natural appearance, partly in section, as required by the need for elucidation. This was possible because the machines illustrated were still sufficiently simple to enable their construction to be explained with a measure of realism. Unfortunately, reproduction cannot convey a just impression of their aesthetic appeal, dependent for its effect both on their very many large scale and, often, on their strictly functional yet harmonious colouring—blue for wrought-iron, grey for cast-iron, yellow for brass, and so on. Although these old engines and machines appear before us as solid bodies in space, clean-cut and precise, the artist often could not resist the temptation to endow them with life by adding flames burning lustily beneath the boiler.

That such drawings, the purest expression of the rational element in the outlook of the time, are relieved by flashes of sentiment underlines the fact that the unity of thought and feeling was not yet broken. The process of specialization, of which the scientific and technical illustrations represent one side, still served to enrich and deepen a romantic outlook in which science and poetry were partners. This is shown even more dramatically by the sumptuous pictures in R. J. Thornton’s *New Illustration of the Sexual System of Carolus von Linnaeus*, published in 1799–1807 and better known as *The Temple of Flora*. In his dedication, Thornton claimed that 'the Science of Botany, advanced as it is . . . by the glowing imagination of modern Poets . . . seemed, likewise, to have a claim to enlist the fine arts into her service'. Many of the best designers and engravers of the period collaborated in the production of the plates, in which huge plants, minutely detailed, appear with the precision of nightmare images before dreamy landscape background. Scientifically, this work represents one of the first attempts to relate plants to the environment peculiar to each.

**TOPOGRAPHY**

The topographical artist is an explorer who makes a visual record of his discoveries. When Erhart Reuwich, a Utrecht artist, accompanied Bernhard von Breydenbach, Canon of Mainz, to the Holy Land in 1483, he illustrated the latter's *Peregrinationes in Terram Sanctam* with vivid woodcuts recording the actual appearance of the cities they visited and their inhabitants. In doing so, he started one of the most fascinating chapters in the history of graphic illustration.

In England the demand for topographical views developed step by step with the growing popularity of topographical literature, already mentioned in Chapter 2. At first the majority of topographical prints comprised architectural ‘prospects’ recording the appearance of both cities and gentlemen's country seats. But as the great feats of road- and canal-building broke down the isolation of rural Britain, bridges, aqueducts and other great engineering works came to occupy a progressively more important place in the range of subject-matter. And even early eighteenth-century topographical prints may be of interest as sources of industrial history. For example, in the vast series of views and prospects of cities produced between 1720 and 1755 by the brothers Samuel and Nathaniel Buck (1696–1779?), that of 'The South East Prospect of the City of Bath' (Fig. 5), engraved in 1754, includes the earliest known representation of an English railway other than the diagrams in Desaguliers' *Course of Experimental Philosophy*, published in the same year. The railway is shown leading to a wharf with a crane on the banks of
the Avon. It brought stone blocks down the valley from Ralph Allen’s quarries on Combe Down for transhipment across the river to John Wood’s Bath. Daniel Defoe considered it almost the only thing worth looking at in the district. It is featured in every guide to the city, and is the subject of constant comment in the diaries and travel books of the day.24 A local poetess, Mary Chandler (1697–1745), even worked it into her Description of Bath.25

View the brown Shadows of yon pathless Woods;
And craggy Hills, irregular and rude!
Where Nature sports romantic; Hence is seen
The New Made Road, and wonderful Machine,
Self-moving downward from the Mountain’s height,
A Rock its Burden of a Mountain’s Weight.

Another picture of Ralph Allen’s railway appeared in 1752, engraved on copper in 1750 by Anthony Walker (1726–65), who worked for Boydell and designed vignettes and frontispieces for the book trade. In the background stands Ralph Allen’s great mansion, Prior Park. In the foreground, running down the hill, is the railway with flat trucks loaded with blocks of stone, watched by elegant ladies and gentlemen who have come out to inspect so marvellous an engine (Fig. 4).

Walker’s engraving is a good example of the type of topographical prospect with multiple perspective. The style lingered on till almost the end of the century. As we have seen, there are traces of it in Beilby’s engraving of the coal wagon, and also in ‘A South Prospect or Perspective View of Stour Port’ (Fig. 22), engraved by Peter Mazell (fl. 1770–1800) after James Sherriff in 1776. In the latter a tree in the foreground serves to plant the observer solidly on the earth, although the main works at the terminal of Brindley’s Stafford and Worcestershire Canal are spread out before him in bird’s-eye perspective.

In 1752 John Boydell (1719–1804) devoted one of his engravings of the Thames to a view of the Chelsea waterworks and its pump driven by a Newcomen engine (Fig. 5). The son of a Derbyshire surveyor, Boydell walked to London. Apprenticed to William Henry Toms, the engraver (d. c. 1750), he became a prolific and skilled engraver of landscape and topography. In 1767 Boydell and his nephew, Josiah Boydell (1750–1817), started a publishing business, issuing topographical, portrait, and old master engravings on an enormous scale. Their most notable work was The Shakespeare Gallery, to which thirty-three of the most celebrated artists of the day and two sculptors contributed designs. They also published theCoalbrookdale line engravings after George Robertson (1742–88) considered in Chapter 5 below (Figs. 14, 15, 26) and the mezzotints after Joseph Wright (Figs. 51, 52, 53) discussed above. Altogether, the Boydells are known to have issued nearly 4,500 plates. They virtually created the English school of line engraving. The French Revolution destroyed their export trade and, like Valentine Green, they were almost ruined. They were able to survive only by obtaining leave to dispose of their property by a lottery. John Boydell was elected Lord Mayor of London in 1791, and served the city with great distinction.

That the artificial formula for ‘prospects’ was abandoned and replaced by straightforward views based on direct observation from a single viewpoint was mainly due to the influence of Paul Sandby26 who, as we have already seen, introduced aquatint to England in 1776. Sandby was the leading topographical artist of the second half of the eighteenth century. Starting his career as a draughtsman attached to the military survey that opened up communication in the Scottish Highlands after the suppression of the Jacobite Rebellion in 1745–6, he combined the precision of the trained surveyor with a true feeling for landscape. The luminous quality of his drawings and their delicate colouring reveal also the influence of Canaletto (1697–1768), who worked in England from 1746 to 1755, and of Samuel Scott (c. 1700–75), whose serene and confident paintings along the banks of the Thames were among the first to reveal the changing architectural face of London.

When Paul Sandby left Scotland in 1751 he settled for a time with his brother Thomas (1721–98), who had recently been appointed Deputy Ranger of Windsor Great Park, and who was also a distinguished draughtsman. But Paul was the more prolific of the two, and his influence on contemporary styles in the ‘70s and ‘80s was strong. His early aquatints emphasize the unity of his compositions in which buildings, landscapes and accessory figures are harmoniously combined. From the earlier tradition he took the bright sunlight effect and the crisp detail. With Paul Sandby, documentary recording of the landscape entered its classical phase, comparable to the clear-cut engineering drawings of the same period.

The demand for drawings from the new viewpoint was stimulated by Wedgewood and Bentley, who required no less than 1,282 views of country mansions and gardens for the table service the Empress Catherine of Russia commissioned them to make in 1775, the year she purchased ‘An Iron Forge, viewed from without’ from Joseph Wright. Finally, the great manufacturers themselves were inspired to emulate the gentry by designing their factories in the style of country houses. One such was the Soho Manufactory of Boulton and Watt. In an aquatint by Francis Eginton in Shaw’s History . . . of Staffordshire (1798–1801),27 the
buildings are shown standing in what appears to be a splendid park with cattle grazing on the banks of an ornamental lake which is, in fact, the mill pool in disguise. The industrial reference is played down almost to insignificance.

An exact parallel is the description of the same place by James Bisset (1760–1852) in his A Poetic Survey round Birmingham, published in Birmingham in 1800:

On Yonner gentle slope, which shrubs adorn,
Where grew, of late, 'rank weedle', gone, ling, and thorn,
Now pendant woods, and shady groves are seen,
And nature there assumes a nobler mien.
There verdant lawns, cool grotts, and peaceful bow'rs,
Luxuriant, now, are streww'd with sweetest flow'rs,
Reflected by the lake, which spreads below,
All Nature smiles around—there stands Soho!
Soho!—Where Genius and the Arts preside . . .

Equally, the artists of the day often introduced into their works of topography, architecture, and travel specimens of the great industrial and engineering monuments springing up all round them. Those who dedicated themselves to recording the ruins and ancient monuments of the past on occasions turned aside to extol the great undertakings of their own day that 'rivalled the noblest works of the Romans', when masters of the world, and the legendary tales even of Semiramus herself'. How literally Arthur Young's sentiments express the attitude of the artists becomes apparent when their works and those of the designers and engravers of the industrial prints are examined as a whole.

Samuel Scott's painting of the building of Westminster Bridge in 1748–9 is one of the first of a long series of pictures showing the great bridges of the eighteenth century in course of construction or completed. On a minor scale, Gideon Yates (fl. 1798–1857) produced an apparently inexhaustible flow of watercolours and a few canvases of bridges, starting with Rennie's aqueduct over the River Lune, which he must have executed in about 1798 (Fig. 57). Though full of charm, this sepia wash drawing is in the old-fashioned eighteenth-century style of artists like William Beilby and James Sheriff, with its mixed perspectives and the clumsy but engaging division of the picture into two by the central bastion of the aqueduct, the whole anchored firmly to the ground by the scraggy tree on the right. When Yates came to London, he seems to have confined himself almost exclusively to studies of the Thames bridges, developing for the purpose a cheerful, bustling, bright-coloured style in the fashionable idiom of the day.

John Claude Nattes (c.1765–1822) found nothing incongruous in incorporating, in his brilliant folio of coloured aquatints of Bath, published in 1806, the Dundas Aqueduct built by Rennie to carry the Kennet and Avon Canal over the Avon valley near Limpley Stoke (Plate III). Edward Pugh (d. 1815) was responsible for the superb illustrations for Cambria Depicta, published posthumously in 1816, and took the early railway viaduct at Risca in his stride (Fig. 59).

Of the many artists who painted Italian landscapes and monuments as well as industrial subjects, George Robertson (1742–88) made six striking paintings of Coalbrookdale which were engraved in line and are considered in the next chapter. The ruins of Persepolis, Babylon and other ancient sites in the Near East were drawn by Sir Robert Ker Porter (1777–1842), who astonished the public in 1800 by exhibiting a picture 120 feet long of the storming of Seringapatam. In 1809 he published Travelling Sketches in Russia and Sweden, which included a view of the Dannemora Iron Mine (Fig. 52). Thomas Allom (1804–72), a prolific topographical artist who worked extensively in Britain, Europe and the Near East, was the author of countless industrial illustrations in the 1850s and '40s. Of three families who distinguished themselves as illustrators or publishers of graceful volumes on the scenery, monuments and customs of the East, Daniel and William Orme (1765–1802; fl. 1797–1819) also executed a view of Brindley's aqueduct over the Mersey at Barton. William Daniell (1769–1857) who, with his brother, Samuel (1775–1811), and his uncle, Thomas Daniell (1749–1840), published many works on the Far East, also did a series of aquatints for A Voyage Round Great Britain, issued in eight volumes between 1814 and 1823. This great work contains many studies of harbours and other fests of engineering by Smeaton, Rennie, and Telford. It included, too, one of the earliest views of a steamship—Henry Bell's Comet, launched on the Clyde in 1811, and sketched by William Daniell in 1815 (Fig. 48). The brothers Daniell and Robert Havell (fl. early c. 19) aquatinted The Costume of Yorkshire (1813–14) (Figs. 44 and 62) for George Walker (1781–1856), and conform, at the highest creative levels, the kinship between topography and scientific illustration. For the Havells were also the 'engravers, printers, and colourists' of the 455 matchless plates of Audubon's Birds of America published in 1827–50.

The same kind of combination of artistic, scientific, industrial, and even antiquarian interests is found in the exquisitely designed penny and halfpenny tokens that were issued in large numbers between 1786 and 1797, and again between 1810 and 1812 (Fig. 117). With the exception of a few small issues minted in