rowned by hatred of the philosophy that was the inspiration equally of the older
the younger poets. No longer content merely to persecute booksellers, Non-
formists, and Radicals, reaction prepared itself to tear out by the roots the whole
em of dangerous ideas, the faith in science. It is testimony to the influence of
win's poem that Canning should have singled out "The Loves of the Plants,
out ten years after it was first published, for an attack in The Anti-Jacobin under
ite The Loves of the Triangles, savagely inscribed to Dr Darwin:

Debased, corrupted, groveling, and confused,
No Definitions touch your senseless mind.

he poem was an easy target, for where the faith is lacking the form becomes
ulous:

Lol! where the chimney's sooty tube ascends,
The fair Trochis from the corner bends!
Her coal-black eyes up-turn'd incessant mark
The eddying smoke, quick flame, and volant spark;
Mark with quick ken, where fashing in between,
Her much-loving Smoke-Jack glimmers thru' the scenes;
Mark, how his various parts together tend,
Point to one purpose,—in one object end;
The spiral grooves in smooth meanders flow,
Dread the long chain, the polish'd axles glow,
While slowly circumvolve the piece of beef below:
The conscious fire with flickering radiance burns,
Eyes the rich joint, and roasts it as it turns.92

ow quickly the mood of enchantment with its temporary union between art
science was dispelled may be seen from Francis Horner's comment on the
ning influence of the Lunar Society, when he visited Soho in 1809: "The
ition which they made is not yet worn out, but shows itself, to the second and
ervation, in a spirit of scientific curiosity and free enquiry, which even yet
'some stand against the combined forces of Methodism, Toryism, and the
if gain."93

3 JOSEPH WRIGHT
OF DERBY

So Wright's bold pencil from France's tight
Hivory his red lineus to the troubled night;
From Calpe starts the intolerable flash,
Shake burst in flames, and blazing oceans dash—
Or birds in snoot repeat his shade reveals,
Winds the still lone, and slopes the velvet mead;
On the pale stream expiring Zephyr sink,
And Moonlight steps upon its heary brick.94

ERASMUS DARWIN

INDUSTRIAL DESIGN

THE TYPICAL product of the Staffordshire potteries till well into the eighteenth
century was the heavy red or brown slipware, often called Toft ware, with its
bold cross-cross pattern, naïvely drawn figures and crude lettering. On the other
hand, after about 1769 even the ware made by Wedgwood for common use was
spacially designed by artists, while a large proportion of his output consisted of
purely ornamental cameoos, medallions, vases, and other objets d'art. Similarly,
one of the original products of the ironmasters in the old forest foundries of Sussex
was the cast-iron fire-back with its delightful unselfconscious decoration in relief.
In the end it was driven out by the exquisite grates produced by manufacturers such
as the Carron Company, which was closely associated with many of the fashionable
designers and artists of the day, including the brothers Adam, of whom John was a
partner. In the case of both these industries, what might be called 'peasant art'

45
came to be replaced by ‘industrial design’. In effect, the revolution in taste brought about by the industrial pioneers was as profound as the revolution they wrought in the organization and technique of production.

The change was general throughout the industrial field. Matthew Boulton achieved an international reputation as a producer of elegant buckles, buttons, sword-furniture, and other ‘toys’ long before he engaged in the engine business. The Sheffield and London manufacturers of plate and cutlery were his close rivals in excellence of design and craftsmanship. In the cotton industry, Samuel Oldknow (1756–1828) made his fortune with high-quality muslins before he built his great spinning mill at Marple and turned to the manufacture of coarse yarns for mass consumption.

What happened in all these spheres is an excellent illustration of Adam Smith’s principle of the division of labour. Goods which had previously been made from start by a single craftsman were now produced by specialists in stages which ‘improved dexterity and saved time’. Perhaps the most fundamental division was that between designing and making. Once design became the specialized task of the ‘artist’, who did not himself actually work at the wheel or bench or lathe, the spontaneous taste of the craftsman was inevitably undermined. Instead, his inventiveness showed itself in the solution of technical problems of execution. Hence the division of labour resulted, not only in marked changes in the level of design, but also in changes in the level of manufacturing technique.

The main stages of the development can be followed fairly clearly in the case of the pottery trade, particularly in Staffordshire. The first improvement over the traditional English slipware was made in 1672, when John Dwight of Fulham (1657–1705) took out a patent for making salt-glazed stoneware—that is, pottery fired at a high temperature to the point of great hardness and vitrification, and glazed by throwing salt into the kiln when the fire is at its hottest. Though the process was already well known on the Continent, it does not appear to have been practised before this time in England. A little later, the Wedgwoods started the manufacture of stoneware in Burslem at the instigation of John and David Elers, Dutchmen who had followed William of Orange to England.

Some eighty years later John Eler’s son asked Josiah Wedgwood to inscribe a medallion to his father as the inventor of English pottery, something Wedgwood declined to do. In a letter of 19 July 1777 to his partner, Thomas Bentley (1750–98), he doubts the validity of Eler’s claim to have introduced salt-glazing, but credits him with the improvement of refining the common red clay of the district, ‘by casting it in plaster moulds, & turning it upon the outside upon Lathes, & ornamenting it with the Tea branch in relief, in imitation of the Chinese manner of ornamenting this ware.’ After the Eleres had left the district, Wedgwood goes on to say, the firm had introduced white stoneware, using pipe clay mixed with powdered calcined flint, in yet another attempt to imitate Chinese porcelain.

As a result of his enterprise and his inventiveness Josiah Wedgwood was the first English potter to attain a European reputation. Less a craftsman than an entrepreneur, he became one of the great captains of the eighteenth century, combining resources of imagination with a lively power of administration. According to W. B. Honey, ‘his actual achievement was a contribution to amenities rather than to art. His cream-coloured ware was not only cleaner and more durable in use than anything as cheap that had preceded it, but in its forms it showed a practical intelligence that gave attention for the first time to the fitness for their purpose of spouts and strainers, handles and lids, securing at once an economical lightness and a “modern” efficiency . . . His notions of art as embodied in his decorative wares were largely those of his age; it was an “educated” taste, accepting what was fashionable, not a native sense of beauty or of traditional craftsmanship . . . His ideal of a minute mechanical perfection was entirely consonant with the taste he showed for pure and dry classical forms.’

The desire to emulate more elegant foreign products turned the Staffordshire potters, led by Wedgwood, from their traditional methods and started them on the search for improved materials, techniques and standards of design. Other trades producing high-quality consumption goods followed suit. This trend led inexorably to the introduction of mass production for an international market in factories employing many hundreds of workers, a phase inaugurated by the opening of Matthew Boulton’s Soho Manufactory in 1762 and Wedgwood’s Etruria in 1770.

How immensely all problems of production and design were complicated by this development may be seen from the correspondence between Wedgwood and Bentley, who was in charge of the London sales office of the firm until his death in 1780. Special clays, imported from Cornwall and other districts, including small quantities from America, were used for different kinds of wares, and the completion of the Trent and Mersey Canal in 1777 made production all but independent of local supplies of raw material. Gradually, all the preliminary processes, such as the grinding of flints and the sifting and mixing of clays, were mechanized. Finally, the actual making of pottery, which could not then be mechanized, was subdivided,
specialized throwers, turners, moulders, decorators, setters and their numerous assistants taking the place of the former all-round potter. Production problems such as these stimulated the systematic organization of scientific research. Wedgwood himself was made a Fellow of the Royal Society in 1765 for his invention of a pyrometer.

In the sphere of design, the urge to emulate or surpass the best products of past or distant civilizations continued unabated. The Chinese models imitated earlier in the century were replaced by the 'Etruscan' ware and by the ancient medals, cameos and reliefs which the taste of the later part of the eighteenth century proclaimed as the finest products of the potter's or sculptor's art. Wedgwood ransacked the most famous collections of the time for models. The trouble he took to reproduce not only the design but also the texture of the Portland Vase with his new materials shows his eagerness to rival the noblest works of the ancients. More important than such direct copies, however, was the drive for a continuous supply of original designs, which were produced both by artists employed as wage-earners in the factory itself and by free-lance designers. It is interesting how many of the problems, familiar to industrial designers today, concerning conditions of employment or the artists' property in their ideas, already occur in the Wedgwood-Bentley correspondence. Both partners were constantly on the lookout for unknown talent, and had a flair for recognizing it. Among the well-known sculptors of the late eighteenth century both John Flaxman (1755-1826) and John Bacon (1740-99) owed much to Wedgwood.

But the most serious problem introduced by the increased scale of production arose from the need 'to truck, barter and exchange'—in short, marketing—which Adam Smith recognized as the essential concomitant of the division of labour. 'Fashion', Wedgwood wrote in 1779, 'is infinitely superior to merit in many respects; & it is plain from a thousand instances that if you have a favorite child you wish the public to fondle & take notice of, you have only to make choice of proper sponors'. Although the creators of fashion, Wedgwood, Boulton and the other manufacturers of luxury goods, especially silk fabrics, were also its slaves. Already in the second half of the eighteenth century the real arbiter of taste was no longer the designer or even the manufacturer, but the salesman, whose business it was both to sense every fluctuation in the public mood and, if possible, to anticipate change and to motivate fashion by a ceaseless flow of 'novelties'.

It is not difficult to understand why the improvement of design and craftsmanship, which was the immediate effect of the division of labour, proved to be short-
lived and was followed by the catastrophic debasement of both in the nineteenth century. Competition, and the progress of technique, forced the manufacturers to produce on an ever larger scale. To sell their increased output they had to aim at cheapness and no longer primarily at quality. They had to find a market precisely among those former craftsmen, now turned wage labourers, whose natural sense of design had been destroyed by the division of labour. But as 'taste' became the exclusive attribute of an ever narrower circle of specialists, the appreciation of design vanished as rapidly among the middle and upper classes as among the workers. Hence the salesman's search for indications of public 'taste' became a scramble for 'selling points'. These developments did not, however, become decisive in the period now under review. Indeed, the experience of the later eighteenth century is particularly significant today, because it proves that, given certain conditions, industrial technique is not incompatible with the highest levels of design. But that the tendency to debasement was present even at that early period is shown by Matthew Boulton's ceaseless struggle to eradicate the taint attached in the public mind to 'Brunswigen' ware.

(So Klingender, writing in 1946–7. It is certain that, were he revising his text today, he would have modified his views about the worth of Victorian taste and culture. For there is now abundant evidence that, in the nineteenth century, mass production and the new industrial processes stimulated popular art forms no less vigorous and attractive than the 'peasant' art preceding mechanization. With its searing drive and transgressions of iron and glass, the Crystal Palace of 1851, one of the great architectural monuments of Britain, was at once the product of mass production and of standardization, and a reflection of popular taste (Figs. 99–102). The things of common use, from the cast-iron detail of a station roof to locomotives, repainted in brass and bright paint, from lamp standards to garden seats, from furniture to fabric, and from steel engravings to chromolithographs, often had a grace, delicacy and functional beauty Wedgwood himself would have admired.

It is true, of course, that large sections of the middle and upper classes lost their appreciation of design. Appalled by the industrial landscape, and at the same time enriched by the squalor it engendered, they retreated into parlours and drawing-rooms stuffed with bric-a-brac. To separate themselves from the new proletariat of the cities they erected a sterile system of privilege and gentility derived from the aristocratic principles of the previous century. A literate, dedicated minority, represented on one side by William Morris and on the other by the art-for-art's-sake movement of Oscar Wilde, himself appalled by the poverty surrounding his
own luxury, tried to find its way out of the impasse by a retreat to earlier modes of work and thought.

Between the two great wars of the present century a proportion of the middle classes, led by Bloomsbury, attempted with ephemeral success to create a personal haven of cultural exclusiveness by the systematic denigration of Victorian art and culture. The Second World War swept them away, and left behind a kind of vacuum of taste which every petty mercantilist and speculative builder has hastened to fill, to the enduring detriment of our age.

That Wedgwood, like Boulton and other manufacturers of the time, should have adopted the classical forms fashionable in the second half of the eighteenth century was inevitable in view of his dependence on the international luxury market. But that he produced portraits of Newton, Franklin and Priestley in the manner of ancient cameos was not as incongruous as it might seem, for Wedgwood's classicism, like that of Erasmus Darwin, had a thoroughly modern twist. Quite apart from the elements that made the classical revival, sponsored by J. J. Winckelmann (1717–68), Denis Diderot (1715–84) and other intellectuals, an expression of the growing influence of middle-class 'enlightenment' in the latter half of the eighteenth century, Wedgwood had a special motive for emulating the ancients—the enterprising manufacturer's desire to excel the noblest works produced at any place or in any period.

The strength of this motive is shown by a letter in which Wedgwood appears, not as an employer of industrial designers, but as a patron of painters. It was written on 5 May 1778 to Bentley, who had urged him to buy a painting by a certain Joseph Wright (1754–97), who was exhibiting six pictures at the Academy for the first time. 'I am glad to hear'—Wedgwood wrote—'Mr Wright is in the land of the living, & continues to shine so gloriously in his profession. I should like to have a piece of this gentlemen's art, but think Debutade's daughter would be a more apropos subject for me than the Alchymist though one principal reason for my having this subject would be a sin against the Costume, I mean the introduction of our Vases into the piece, for how could such fine things be supposed to exist in the earliest infancy of the Potters Art.—you know what I want, & when you see Mr Wright again I wish you could consult with him upon the subject. Mr Wright once began a piece in which our Vases might be introduced with the greatest propriety. I mean the handwriting upon the wall in the Palace of Nebuchadnezer.12

It was not its Gothic gloom that made Wedgwood reject the picture which Wright painted in 1771 and called 'The Alchymist in search of the Philosopher's Stone, discovers Phosphorus, and prays for the successful conclusion of his operations, as was the custom of the Ancient Chymical Philosophers'. His principal reason for turning it down was that he was more anxious to publicize his achievement as a potter than his fame as a modern 'chymical' philosopher. Hence 'Debutade's Daughter' that Bentley had suggested as an alternative to the 'Alchymist' seemed more appropriate, for the mythical Debutade was supposed to have been connected with the earliest infancy of the potter's art at Corinth. His daughter 'invented' sculpture when she traced the outline of the shadow cast by her sleeping lover on a wall, and filled in the intervening space with clay. After much further discussion the subject that was ultimately commissioned, and duly carried out by Wright in 1782–4, was 'The Corinthian Maid', now in the Mellon Collection.

The story does not end here, for the claims of chemistry as a suitable subject for a picture were strengthened in Wedgwood's mind early in 1779, when Priestley's assistant, Warlike, came to Etruria and arranged a course of lectures and private instructions for the Wedgwood children and friends.13 Their theme was just the kind of thing for which Wright was famous. But just then Wedgwood was particularly interested in George Stubbs (1724–1806), who had been experimenting since 1775 in the form of enamel painting. He had produced nineteen new fireproof tints, but he could not obtain copper tablets that were large enough for his purpose. After many fruitless trials he approached Wedgwood and Bentley with the suggestion that they should employ him to make tablets of earthenware instead. Wedgwood took up the idea in the autumn of 1778 and obtained the first useful results by the following May. In a letter to Bentley, of 30 May 1777, he stated:

Mr Stubbs wishes . . . to do something for us by way of setting off against the pictures. My picture, & Mrs Wedgwood's in enamel will do something. Perhaps he may take your gracious & you in by the same means. I should have no objection to a family piece, or rather two, perhaps, in oil, if he should visit us this summer at Etruria. These things will go much beyond his present trifling debt to us. The two family pieces I have hinted at above I mean to contain the children only, & grouped perhaps in some such manner as this.

Some playing upon her harpsichord, with Kitty singing to her which she often does, & Sally & Mary Ann upon the carpet in some employment suitable to their ages. This to be one picture. The pendant to be Jack standing at a table making fixable air with the glass apparatus & his two brothers accompanying him. Then jumping up & clapping his hands in joy & surprise at seeing the stream of bubbles rise up just as Jack has put a little chalk to theacid. Joa with the chemical dictionary before him in a thoughtful mood, which actions will be exactly descriptive of their respective characters.
My first thought was to put these two pictures into Mr Wright's hands; but other ideas took place, & remembering the labourers, &c in the exhibition, with paying for tablets &c I ultimately determin'd in favour of Mr Stubbs. But what shall I do about having Mr S. & Mr W. here at the same time, will they draw kindly together think you?24

His anxiety may well have been justified, for Wright too aspired to work in enamel and in this connection proposed to visit Etruria at the end of 1779 to catch any help from its fires.25 However, everything went smoothly and Stubbs painted a charming conversation piece when he came to Etruria in 1780. Josiah and Mrs Wedgwood are sitting on a bench underneath a large oak in their park, his elbow resting on a small table on which one of the famous vases is displayed. In front of them are the four older children on horseback and the three little ones playing with a go-cart.

Both Stubbs and Wright remained on excellent terms with Wedgwood for the rest of their lives, painting further pictures for him and supplying him with designs and models for his pottery. Though Stubbs despised the Academy as much as Hogarth, he was not opposed to the classical ideas as Wedgwood understood it, in spite of his view that nature was superior to art.18

GEORGE STUBBS27

Born in 1724, the son of a Liverpool saddler, from his earliest youth George Stubbs displayed a passionate interest in anatomy. He began studying bone structures at the age of 8. He worked for a time under Hamlet Winstanley (1800–61), a minor portrait painter and engraver, but broke away at the age of 22 to become a lecturer in anatomy to medical students at Hull. There he dissected the dead body of a pregnant woman, and engraved his own embryological drawings for Dr John Burton's An Essay towards a Complete New System of Midwifery, published in 1751. After short visits to Rome and Morocco, where he actually saw a lion attack a horse, he returned to England and spent the years 1756 to 1769 on a lonely Lincolshire farm, dissecting horses and making a series of anatomical studies which he published in 1766 as The Anatomy of the Horse. Its scientific precision makes this work a landmark in the history of its subject. It won Stubbs the friendship of the greatest natural scientists of his day and the patronage of wealthy owners of horses and livestock. But his most ambitious project, started in 1795 when he was 72, was A Comparative Anatomical Exhibition of the Structure of the Human Body, with that of the Tiger and Common Pools. This was left unfinished at his death in 1806, but the text and those engravings he had completed were published posthumously in 1817. They have recently been issued in facsimile.

His particular qualities have been analysed by Geoffrey Grigson in a penetrating article in Signature.26 Keeping 'neither the scientific than the aesthetic tendencies' of his age, his tastes were those of an experimenter and observer. He avoided both the picturesque make-believe of Sir Uvedale Price (1747–1839) and the apocalyptic elements of Edmund Burke's conception of the sublime. In his paintings he succeeds in combining affective observation with a kind of cool lucidity.

Stubbs' excellence as a painter was grounded in his indefatigable research into anatomy and the structure of the living body. It expressed itself in his treatment of trees no less than in his studies of animals and man.

Stubbs' peculiar conception of the classical is best illustrated by his plaque of Phaeton and the Chariot of the Sun, showing Phaeton straining desperately to arrest the headlong descent through the clouds of a fiery team of English thoroughbreds while the axles of his chariot are bursting into flames. One version of this subject was exhibited in 1762, and another two years later. And in 1785 Stubbs designed yet a third 'Phaeton' as a black basalt plaque for Wedgwood. It is now in the Etruria Museum.

The bond of sympathy that tied Wedgwood both to Stubbs and to Wright was their passionate devotion to science.

JOSEPH WRIGHT OF DERBY28

Joseph Wright was the first professional painter directly to express the spirit of the industrial revolution. His portraits link the circle of Wedgwood, Darwin, and the Lunar Society with that of the first cotton lords, Arkwright, Strutt and Crompton. But Wright was not only a painter of natural philosophers and industrialists. He was also a natural philosopher himself, preoccupied with the problem of light, which was the subject of his ceaseless experiment. The cold light of the moon mingled with dim candlelight; the glow of phosphorus in a chemical laboratory; dark trees silhouetted against blazing furnaces and a star-lit sky; the glare of molten glass or red-hot iron in glowing workshops; the flaming pottery ovens at Etruria. By studying effects such as Wright achieved that distinct and personal style that marks his position in the history of art. As a painter of artificial and natural light effects, Wright links the chiaroscuro style of Caravaggio (1569–1609) and his followers, from Gerard von Honthorst (1590–1656) and Georges de
la Tour (1595–1652) to Godfried Schalcken (1645–1706), with the romantic naturalism of the later English landscape school. That Wright’s preoccupation with the problems of light was largely due to his own scientific temperament and to the influence of his environment is suggested by his isolated position among English artists.

The son of a Derby lawyer, he was born in 1754, some twelve years after the Lombe’s silk mill had been completed. He studied under the portrait painter, Thomas Hudson (1701–79), Reynolds’ master, from 1751 to 1755, and for a further fifteen months in 1756–7. In this way he acquired the sound craftsmanship which the English face painters of the early eighteenth century had inherited from the Dutch, and it was as a portrait painter that he started his career when he returned to Derby after completing his training.

One of the first of his studies of artificial light, ‘Three Persons viewing the Gladiator by Candlelight’, exhibited in 1765 at the Society of Artists, was probably painted under the influence of the Dutch ‘candlelight’ painters, especially Schalcken, who twice visited England and was a favourite of William III. In order to give the most natural effect to his candlelight pieces, Schalcken placed the object he intended to paint in a dark room. Looking through a small hole, he painted by daylight what he saw by candlelight. At first Wright painted in one room by daylight, posing his sitters in an adjoining room which had been darkened. Later, he invented a contrivance of panelled screens in the corner of his studio behind which he could pose his subjects in the dark. By opening one panel and then another, he could study them from different angles.45

Wright’s handling of light and, in one or two instances, his themes, were anticipated by George de la Tour of Lorraine. Though it is almost certain that Wright did not know his pictures or even his name, there can be no doubt that the two painters had a common point of view towards their subjects. With a very few exceptions, all de la Tour’s works were illuminated either by a shaft of sunlight or by the light of candles or torches, sometimes flaring nakedly, sometimes shielded by a hand or arm. Everything except the particular aspects he wished to reveal is lost in deep shadow. Most of his subjects are Biblical or religious, but his treatment of them is one of dramatic actuality. His native, for example, is less a Biblical reconstruction than a study of a family in his native village of Lunéville. Cool, austere and undetailed, his pictures have a penetrating realism that puts them out of their epoch. They have little in common either with the grandeur and luxurious beauty of the works of the court painters of the day or with the bright, classical imagery of his contemporary, Caspar Peale (1615–1675), and still less with the secular elegance of such painters as Antoine Watteau (1684–1721). It was for this reason, perhaps, that de la Tour was scarcely recognized, even in his own day, and disappeared completely from the canon of French art, till his splendid talent was at last recognized by the art historians of the nineteenth century.46 To a lesser extent, both Stubbs and Wright suffered the same treatment. Perhaps the phrase, already quoted, used by Grignon of Stubbs, can be applied to all three. They suffered because they kept nearer the scientific than the aesthetic tendencies of their lifetime.

PHILOSOPHERS IN ART

In 1766 Wright exhibited one of his best and most original pictures at the Society of Artists—A Philosopher giving that Lecture on the Orrery, in which a Lamp is put in the Place of the sun’ (Fig. 31). In 1768 he repeated his success with ‘An Experiment on a Bird in the Air Pump’ (Fig. 32). Both were mezzotinted, the former in 1768 by William Pether (1731–95), the latter in 1769 by Valentine Green (1750–1815). Pether was a portrait painter of note and a skilful engraver. He was, respectively, cousin and father of two famous painters of moonlight scenes, Abraham and Sebastian Pether (1756–1818; 1790–1844). The former, known as Moonlight Pether, combined painting with science and mechanics, designing and constructing telescopes, microscopes, air pumps and scientific instruments. His moonlights are notable for their astronomical accuracy, and he painted also scenes of fire and volcanoes in eruption. Sebastian painted similar subjects, and is said to have invented the stomach pump. Green was one of the most celebrated and expert engravers in mezzotint of the eighteenth century, specializing in portraits after Reynolds, historical subjects, particularly after Benjamin West (1758–1820), and old masters. He built up an extensive connexion on the Continent and was almost ruined by the French Revolution.

Wright’s essentially modern attitude is evident even in the one picture of his scientific series in which he was deliberately antiquarian, ‘The Alchemist in search of the Philosopher’s Stone, discovers Phosphorus’. Despite its Gothic setting and picturesque embellishments, this work is utterly opposed in spirit to most of its seventeenth-century predecessors. Without a trace of satire, its mood is as serious as that of the ‘Orrery’ and ‘Air Pump’. Its purpose is not to ridicule the superstitions of the past, but to commemorate the birth of modern science from those superstitions. For it was the discovery of phosphorus that stimulated the
subordinate place in Christian art, as in the illustrations of Biblical texts and stories, such as the labours in the vineyard, the construction of the Ark or the building of the Tower of Babel, and in the representation of craftsmanship-saints like St Elia, a farrier, or St Crispin, a cobbler. But more important than these occasional work-themes was the ancient peasant calendar, depicting the labours of each month, which the Church found it expedient to embody in its canon, together with other survivals of pre-Christian imagery. The cycle of the labours of the months, which can be traced in ancient times in Athens and Alexandria, occurs in countless variations as a symbol of the mutability of earthly life in medieval manuscripts and in the carved decorations and misericords of the great Romanesque and Gothic cathedrals. It culminated gloriously as one of the most fruitful subjects for the reawakening naturalism of the fourteenth century in the miniatures of the Livres d’Heures of the school of Burgundy.

In contrast to the ancient cycle of the rural occupations, the appearance of the urban craftsman in medieval art was a result of the growing power of the guilds. Since no less than forty-seven out of the 106 stained-glass windows of Chartres Cathedral, of which the earliest dates from A.D. 1194, were given by guilds, it is not surprising that they depict the occupations of their donors. Similarly, the power of the merchants and craftsmen of Venice is reflected in the splendid reliefs that illustrate their activities on the upper arch of the main porch of St Mark’s, erected in the early thirteenth century. Miners and mining are a constant theme in the decorations of ecclesiastical and secular ceremonial plate associated with the Erzgebirge. This shift in the social relationships of medieval society also led to a modification of the doctrine of the Church. According to the Dominican theologian, Vincent of Beauvais, the arts were a means of mitigating the curse of original sin. Henceforth, the crafts became symbols of the artes mechanicae in the scholastic picture of the universe. As such, they appear in the reliefs on the campanile of Florence Cathedral, designed by Giotto (1266–1357) and executed after his death by Andrea Pisano and his assistants.

When the invention of printing created a vast new field for popular art, the scholastic theme of the artes was absorbed, in a modified form, in the specula or mirrors of human life, illustrating the occupations of all ranks and conditions of men. They were issued in many versions from the fifteenth century onwards. The Books of Trades, published in Britain until the middle of the nineteenth century, are the final offshoots of this tradition. While the illustrations in these series are objective records of secular life, their scholastic origin is often betrayed by the moralizing character of the captions, some of which have little direct bearing on the illustrations they are supposed to explain. They reflect the growing tension in industrial relations since the later Middle Ages, for they generally censure the idleness of journeymen and apprentices and exhort them to obey their masters. Hogarth’s link with the medieval tradition of popular art is evident, for there is an important element of moral exhortation in his cycle ‘Industry and Idleness’ (1747). He chose the Spitalfields silk trade as his setting at a time of extreme friction between masters and men.

There are, however, two other developments that should be borne in mind in evaluating Wright’s achievement—the tradition of technical illustration that sprang up independently in the sixteenth century with the invention of printing, the revival of learning and the growth of industry; and the first appearance, at about the same time, of industrial themes as subjects for the fine arts.

Joseph Wright’s attitude to industry can be related to the illustrations added to scientific and technical treatises, such as that of Vitruvius, when they were printed for the first time. The art of technical draughtsmanship, of which the drawings by Leonardo da Vinci (1452–1519) are the outstanding example, spread quickly. It is splendidly represented in many of the great technical, military, architectural, and anatomical works of the sixteenth century, especially in De Re Metallica by Georg Agricola (1494–1555), published at Basle in 1556, and Le Divers et Artifices Machine by Agostino Ramelli (1551–90), printed in Paris in 1588. During the seventeenth and eighteenth centuries technical works and compendia appeared in ever-increasing numbers, culminating in Diderot’s Encyclopédie, published in 1751–65, with its separate volumes of plates, and in the Description des Arts et Métiers, published by the Académie Royale des Sciences at Paris in twenty-seven volumes in 1761–82. Till-hammers of the type depicted by Wright are illustrated in both.

The first formal attempts by painters to introduce industrial scenes and themes into the fine arts occurred during the Reformation, when the struggle against Catholicism inspired landscapes and genre paintings designed to re-establish the common man in the face of the aristocratic revolution of the Spanish rulers of the Low Countries. The earliest is perhaps ‘Paysage avec haut Fourneau’ or Blast Furnace, painted in about 1520 by Joachim Patenier (c. 1480–1524), now in a private collection. It was followed by a number of mining landscapes of the Erzgebirge and the Liège industrial basin. Sometimes, as in an industrial altarpiece at Ansbach, painted in 1521 by Hans Hesse (fl. fourteenth to fifteenth century), the
miners are associated with angels in evidence of better times to come in after-life. But often the detail of their life and work is shown with an objectivity unembellished by supernatural aid. These paintings are the first to foreshadow the concept that manual labour has a self-sufficient dignity and strength of its own. Something of the kind is evident in the splendid drawing of miners at work by the younger Holbein (1474–1543) in the British Museum. At Brussels there is a landscape by Lucas van Gassel (c. 1500–70), painted in 1544, depicting the surface workings of a mine in extensive sympathetic detail, and including one of the earliest known views of a mine truck on wooden rails. (The earliest of all is probably that in Der Uebergang Gemeyner, a textbook on mining published anonymously in about 1519.) The French artist Henri met de Bles (c. 1490–c. 1550), who worked at Malines, interspersed a number of striking mining pictures among his religious paintings. There is one in the Uffizi and another at Prague. Most remarkable of all is an extraordinary series of industrial landscapes in the Liege basin by the brothers Lucas and Martin van Valkenborch (c. 1550–97; c. 1555–1622), two German Protestants who dedicated themselves to the struggle against Spain, and of whom Lucas was a pupil of Pieter Brueghel the elder (c. 1520–69).84

In the south, this movement is echoed by a striking series of industrial murals ordered by Vasari in about 1570 for the study of Francesco I de’Medici in Florence. Executed by such artists as Jan van de Straat (c. 1525–1605), they depict the life and work not only of alchemists but of jewellers, glass-workers and dyers, in a style partly heroic, partly realistic. They represent a strange intrusion into a world not usually preoccupied with the springs of its own commercial success.85

With the rise of the Reformation and the defeat of Spain, a new and wealthy bourgeoisie established itself in the Low Countries. Industry and manual labour were virtually eliminated as serious themes for formal painting. Instead, there was a call for scenes illustrating the secure and prosperous lives of the merchants. The lower classes were kept severely in their place in innumerable village and tavern scenes of low life. If work scenes appeared at all, they usually came in mythological or allegorical disguise with the revival of classical themes from the fifteenth century onwards.

That such a retreat from industrial realism brought its strains and contradictions is illustrated by ‘Venus at the Forge’ by Pieter Brueghel’s son, Jan (1568–1625), a contemporary of the van Valkenborch brothers. In this picture, in the Kaiser Friedrich Museum in Berlin, the nude figures of Venus, Cupid, and Vulcan occupy only a small part of a canvas dominated by the ruins of a Roman palace with Mount Etna in the distance. The centre of the foreground is piled high with armour. A stall on the left displays splendid specimens of contemporary goldsmiths’ work, together with the tools of that craft, while the remainder of the composition is devoted to a minutely detailed record of the iron industry. Miners are raising and shifting ore in the foothills of Mount Etna; a mill installed on the bank of a stream drives a tilla-hammer and grinding wheels; the ruined palace contains a cannon foundry and boring mill of the type that continued in use until the days of John Wilkinson. The figure of Vulcan is in sharp, incongruous contrast to a group of blacksmiths in contemporary dress.

The clash between the mythological figures and the workers is heightened by the fact that the former were painted by Hendrik van Balen (1574–1632), either because Brueghel found it impossible imaginatively to bridge the two conventions, or, as his unkind critics alleged, because his mastery of the human figure was weak. He evidently gave up the unequal struggle, and thenceforward directed his talent to a series of beautiful studies of the new fruits and flowers then being introduced to the tables of the wealthy, earning the nickname ‘Velvet’, apparently because of his sumptuous clothes.88 Jan Brueghel was not the only artist to find mythological themes incompatibale with realism. In Velasquez’ ‘The Forge of Vulcan’, painted at Rome in 1650 and now at the Prado, the mythological element, though still incongruous, is subordinate to the artist’s interest in actual life. It is into a real smithy that the divine messenger is stepping. The smiths with their tools are rendered with dramatic realism, their work suspended with astonishment at the appearance of such an unaccountable visitor. Later, at the height of his power, Velasquez took the decisive step of abandoning the mythological theme entirely. His ‘Tapestry Weavers’ (Las Hilandoras), painted in 1657 and also at the Prado, is one of the earliest and will always be one of the greatest of factory paintings.

At about the same time the brothers Le Nain similarly resolved the conflict between classical convention and realism. ‘Venus at the Forge of Vulcan’ at Rheims, attributed to Mathieu Le Nain (1607–77), is close in composition to ‘The Forge’ by his brother Louis (1588–1646) at the Louvre. But in the latter Vulcan has been reduced to the role of onlooker, and Venus and Cupid replaced by the blacksmith’s wife and child. It seems probable that the former picture is the original composition and the Louvre picture a brilliant variation.89

Joseph Wright tackled a similar theme in his ‘Blacksmith’s Shop’ (Fig. 55), painted in 1770 or 1771. In this he combines classical and realistic elements, both
subordinated to a romantic mood that is new. While Velasquez and the Le Nains chose a moment of rest, when work was suspended, Wright chose a dramatic moment, when the smiths are actually striking the iron.

Though Wright's figures are full of action, they are often placed in settings that can have only the remotest resemblance to an actual workshop. The 'Blacksmith's Shop' (Fig. 33), for example, is a ruined classical building where the smiths are working at night. Only the walls and some arches are standing, while a shelter of wood and thatch has been erected inside. This is the kind of setting that Italian painters of the sixteenth century often chose for pictures of the Nativity or Adoration. In fact, this picture echoes the stable in Veronese's 'The Adoration of the Magi', now in the National Gallery but in Wright's day still in San Silvestro in Venice. The resemblance between the two extends even to such details as the thatched shelter or the sculptured angels in the pendentives of the arch.

There is a marked similarity, too, between the old smith in the right-hand foreground of Wright's picture and the corresponding figures in both the forge paintings by the Le Nains. In Mathieu's picture he is Vulcan, and therefore, with Venus, the main figure in the composition. In the pictures by both Le Nain and Wright he has been reduced to an onlooker, and it is difficult to believe that there is not a connexion between the two, even though in 1770 the former was not in the Louvre but still in the collection of the Duc de Choiseul. However, Wright may have seen an engraving of it. One appeared in a book of engravings after pictures in the Choiseul Collection, published in 1761, and there were others.

In 'The Iron Forge', exhibited in 1772, Wright abandoned the classical ruin. Although there is still an old man, echoing Vulcan, sitting in the foreground, the shed and the billet of iron under the water-driven trip-hammer give a good impression of a small forge of the period. The idyllic, sentimental element so characteristic of the circle that produced 'Sandford and Merton' is charmingly represented by the presence of a young mother, a baby in arms, and a young boy.

'The Iron Forge, viewed from without' which Catherine of Russia bought in 1775 has a new, almost theatrical, even mystical, intensity (Fig. 19). The dramatic persona consists of the smith, with a tall, youngish man on the left, leaning on a staff, an old man (who may be in charge of the furnace and the bellows), and a woman. They are housed in a kind of ruined Gothic barn, with one side broken away. The whole building stands like a stage set in a rugged landscape, fitfully illuminated by a moon glimmering behind a wreck of storm clouds. The smith, his back to the onlooker, is turning the workpiece on the anvil, his body silhouetted, and shielding the glare of the white-hot metal. The classical reference has all disappeared, though in another context the onlooker on the left might have been Vulcan and the woman Venus.

Three pictures, and others like them, with their disguised allusions to classical and Christian myths, are the counterpart of 'The Botanic Garden'. What distinguishes Wright's industrial paintings from most earlier pictures with similar themes is his interest in the labour process as such. This is particular striking, if his work is compared with the thousands of Dutch genre pictures of the seventeenth century depicting scenes from daily life, of which only a handful illustrate manual labour. There are few pictures of farriers or blacksmiths. Philip Wouwerman (1619-68), Gabriel Metsu (1629-67), Jan Steen (1626-79), the brothers Adrian and Isaac van Ostade (1610-1685; 1621-49), and other artists Ter Borch (1617-81) painted a knife-grinder, Quiryn Broukema (1605-98) coppers, and Cornelius Decker (fl. mid-seventeenth century) weavers. But only kind of work that occurs sufficiently often to prove that picture buyers liked to see it on their walls is the domestic labour of women. The rich merchants of Dutch Republic felt as superior to manual work as the slave-owners of class Greece.

**Wright's Later Work**

Wright's later pictures blend classical, romantic and sentimental elements. Ancient mythology and motifs taken from Shakespeare, Milton, Percy's *Reliquiae Beattiae* and Sterne's *A Sentimental Journey* provide a backdrop for scenes from 'The Siege of Gibraltar' and such subjects as 'The Old Man and Death', 'The Widow of an Indian Chief watching the Arms of her Deceased Husband', or 'The Dead Soldier'. Engravings after last works were so successful that Wright was urged to paint 'A Shipwrecked Man and Woman' as its companion.

But it was the play of light in nature that more especially fascinated Wright during the last twenty years of his life. The eruption of Vesuvius, which happened to witness during his visit to Naples, provided a climax to the dramatic effects of his earlier work, and he continued to paint it repeatedly in later years. Catherine of Russia bought a splendid example for £500 in 1779-80. It is now in the Hermitage. Though he became increasingly responsive to nature's lyrical mood as he grew older, he never lost the spirit of scientific curiosity. 'The water is further advanced than ye rest of ye picture,' he wrote of a small view of R, which he was painting in 1795, two years before his death, 'for I was kee
produce an effect which I had never seen in painting of shewing pebbles at the bottom of the water with the broken reflections on its surface.

It was to the 'grand paintings of the eruptions of Vesuvius, and of the destruction of the Spanish vessels before Gibraltar, and to the beautiful landscapes and moonlight scenes' that Erasmus Darwin alluded in a note to the stanzas, added to later editions of The Botanic Garden, and quoted at the head of this chapter.

PEHR HILLESTRÖM AND LÉONARD DEFRAINE

Wright was not the only eighteenth-century artist who brought scientific and industrial themes into the orbit of the fine arts. The same thing happened at two other key centres of the industrial revolution, Sweden and Belgium. The Swedish court painter Pehr Hilleström (1732-1816) was born two years before Wright, and survived him by nineteen years. After working in the Stockholm tapestry factory on furnishings for the new royal palace, he went to Paris in 1757-8 and studied painting with François Boucher (1703-70). But the artist whose manner he adopted when he returned to Sweden was Jean Chardin (1699-1779). In 1776 Hilleström was appointed court painter by Gustavus III, but soon tired of the mock-medieval tournaments and theatrical displays his royal master ordered him to depict.

However, the sumptuous court of the ruler who had overthrown the constitutional liberties of his realm was not the only centre of culture in eighteenth-century Sweden. The dominant role the Swedes were able to play in European affairs during the seventeenth and eighteenth centuries was based on their great mining and iron industry. Annual exports of bar-iron from Sweden exceeded 50,000 tons during the latter part of the century. Britain in particular, with its expanding industries, provided an inexhaustible market. There was thus great prosperity in the Swedish mining areas and a thriving bourgeois cultural life. Here Hilleström found a market more congenial than the court, although he did not abandon his official position. He paid his first visit to the famous copper-mine at Falun in 1781, and henceforth adopted industry as one of his main subjects. If a few pictures of blacksmith's shops he painted between 1775 and 1780 are included, the total number of his industrial paintings is 124. Apart from copper- and iron-mines, he painted smelting works, cannon foundries, forges, the Soderfors anchor factory, and the Kungsholmen glassworks. Like Wright, he uses for illumination the glow of furnace and forge, the dazzling light of white-hot metal and the flame of torches. Though he is a painter of action, catching the men at work in striking attitudes, he is more of a reporter than Wright and less of a dramatist.

The other continental artist who painted modern industrial subjects at this period had a more adventurous career than either Wright or Hilleström. This was the Liégeois, Léonard Defrance (1755-1805). After finishing his apprenticeship with a local painter he walked to Rome in 1755 and spent five years there, supporting himself by painting saints and portraits of popes for the dealers. He then set off to Naples and thence by gradual stages to way of Montpellier, Toulouse and Bordeaux, back to Liège, which he finally reached in 1760. During the next thirteen years he had a hard struggle to support himself by doing portraits and routine pictures for the Church, a field he found restricted and frustrating, for he had made many friends in progressive circles during his travels through France. In 1773, therefore, he went to Holland, where he spent a year copying the minor Dutch masters for sale in Paris. From these, and from Jean Honoré Fragonard (1752-1806), who encouraged him in his work, Defrance acquired the light touch and brilliant colouring that distinguish his later pictures.

After returning to his native town in 1774 he chose his subjects by preference from popular life. Apart from market scenes, mountebanks, miners at an inn, and similar genre subjects, his pictures preserved in public and private collections in the Liége area depict a coal-mine, a rolling mill, a foundry, a cooper's shop and tobacco factories. It is interesting that the social comment so pronounced in the work of Constantin Meunier (1851-1905) and other Belgian and Dutch artists of the late nineteenth century already appears, a century earlier, in Defrance. In his pictures of a tobacco factory, for example, the ragged clothes of the children sitting on the floor picking tobacco leaves, are contrasted with the smart silk frocks of ladies who are being shown round the factory by its owner. After his appointment as Director of the Liége Academy in 1778, Defrance paid an official visit to Paris every second year to attend the Salon. While he was there in 1789 he received the news that the revolution had started in Belgium. He returned at once and threw himself into the political struggle, playing a prominent part in the confiscation of Church property and other revolutionary measures during the following years. One of his pictures commemorates the suppression of the monasteries.

Later, however, he returned to his academic duties, which he carried on until his death in 1805.

Although Wright was far less prolific, his influence as a painter of industrial