Chapter One

The scope of industrial archaeology

The serious study of industrial archaeology is a phenomenon of the second half of the twentieth century, but even in that comparatively short period it has come to mean different things to different groups of people. Practitioners from backgrounds as diverse as public and private museums, railway preservation societies or canal restoration groups, and academics from a variety of disciplines as well as professional archaeologists and architects concerned with the recording of historic buildings would all class themselves as 'industrial archaeologists'. Such a diversity of interests has resulted in a continuing debate concerning the scope of the subject but the general consensus now favours a definition of industrial archaeology as the systematic study of structures and artefacts as a means of enlarging our understanding of the industrial past. On the basis of this definition, the subject is now achieving a respectable professional standing not only in Britain but throughout the world. It has not yet, however, achieved a comparable academic standing, the result being that many of its practitioners have received no formal training in the specialist techniques required. The purpose of this book is to discuss these techniques in their wider archaeological context so that industrial archaeology can take its place in normal undergraduate courses to satisfy the demand for trained personnel to enter this new and exciting field.

The origins of industrial archaeology

There have been various attempts to demonstrate that the term 'industrial archaeology' has its origins in the late nineteenth century, but it did not pass into popular usage until the mid-1950s in Britain. It arose out of a concern to record and even preserve some of the monuments of the British industrial revolution at a time of wholesale urban redevelopment. Its earliest champion was Michael Rix, whose work with Workers' Educational Association (WEA) classes at the University of Birmingham highlighted the rapid transformation of the major iron and steel district of the Black Country. In an article entitled 'Industrial archaeology' in *The Amateur Historian*, he wrote:

> Great Britain as the birthplace of the Industrial Revolution is full of monuments left by this remarkable series of events. Any other country would have set up machinery for the scheduling and preservation of these memorials that symbolise the movement which is changing the face of the globe, but we are so oblivious of our national heritage that apart from a few museum pieces, the majority of these landmarks are neglected or unwittingly destroyed.
>
> (Rix 1955: 225)

Unlike previous industrial historians, Rix placed the emphasis firmly upon what could be learnt from the physical remains of industrialisation. His use of the term 'archaeology' inspired

the Council for British Archaeology (CBA) in 1959 to set up a Research Committee on Industrial Archaeology and to call a public meeting, at which it was resolved that recommendations be made to national government urging the formation of a national policy for the recording and protection of early industrial remains. Before any formal action was taken, a significant monument from the earliest days of locomotive railways, the Euston arch, designed by Philip Hardwick as a triumphal entrance for the London terminus of the railway to Birmingham, was demolished. This caused a public outcry, and in 1963 the Industrial Monuments Survey was established jointly by the CBA and the Ministry of Public Buildings and Works. Rex Wailes became the first Survey Officer and a basic index record was begun, known as the National Record of Industrial Monuments (NRIM). From 1965 this passed under the direction of R. A. Buchanan in the Centre for the Study of the History of Technology at what was later to become Bath University. The data collected was not, however, transferred to the county Sites and Monuments Records, which were themselves in their infancy, and this transfer is only now beginning to take place in the 1990s.

The Royal Commission on the Historical Monuments of England (RCHME) had included some industrial buildings such as malthouses and watermills in its county inventories, but was then working to a cut-off date of 1700. In Scotland, on the other hand, nineteenth-century industrial buildings had been included in the county inventories prepared in the 1950s by the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) at the instigation of the then secretary to the commission, Angus Graham. This emphasis on compiling lists of industrial sites was also reflected in the earlier publications on industrial archaeology, many of which took the form of regional gazetteers, but little attempt was made to prioritise these sites on a national basis. From the late 1960s, however, a number of industrial monuments were added to the schedules, largely as a result of recommendations from the CBA's Advisory Panel which considered lists of sites prepared by the Survey Officer and others on either a thematic or a regional basis. The scope of the thematic surveys depended on the interests of the volunteers prepared to undertake them, and included lighthouses, water-raising by animal power and existing steam plant in water supply, sewage and drainage pumping stations. While creating a valuable record, the scope of these thematic surveys was obviously highly selective and did not enable the majority of sites to be placed in their context. The Industrial Monuments Survey, then the responsibility of Keith Falconer, followed the NRIM to the University of Bath in 1977 and both were transferred to RCHME in 1981. From a national point of view, then, the CBA was the first archaeological organisation to espouse this new aspect of archaeology but did not altogether maintain its interest, whereas the Royal Commissions were slightly later in the field but have been responsible for maintaining and developing the records created in those early years.

The Newcomen Society, which was formed in 1920 to pursue the study of the history of engineering and technology, encouraged the new discipline to the extent of supporting the *Journal of Industrial Archaeology*, first published in 1964. A series of annual conferences, mainly at the University of Bath, resulted in 1973 in the foundation of the Association for Industrial Archaeology (AIA) with L. T. C. Rolt as its first president. The aims of this organisation were to encourage improved standards of recording, research, conservation and publication as well as to assist and support regional and specialist survey and research groups and bodies involved in the preservation of industrial monuments. The AIA in 1976 launched *Industrial Archaeology Review*, first published by Oxford University Press but becoming the AIA's house journal in 1984 and now the only surviving national journal in the discipline. The aims of the AIA reflect the dichotomy within industrial archaeology between research and preservation, which has perhaps hindered its acceptance as an academic discipline. Recently, however, the Association has played

a much greater role in influencing national trends in industrial archaeology, notably through its publication of a policy document entitled 'Industrial archaeology: working for the future' (Palmer 1991) which stated the objectives of industrial archaeology in the 1990s and offered recommendations for their implementation.

At the local level, the cause of industrial archaeology was taken up by a variety of people who all brought their own particular skills and expertise to bear on the subject. It flourished in university adult education and WEA courses, while numerous preservation groups were established to maintain monuments, particularly those containing prime movers such as waterwheels and steam engines. The cultural resource management of industrial sites in Great Britain will be discussed in Chapter Seven, although some mention is made of the international dimension of the conservation movement in this chapter. The landscape, however, is not a static environment; it is constantly evolving and to conserve more than a selection of the physical evidence of the industrial past is neither possible nor desirable. Preservation is only part of industrial archaeology, and its main thrust should be towards the recording of artefacts and structures and illuminating the context of people at work in the past. This balance has not always been achieved, but the over-emphasis on monuments is now disappearing and industrial archaeology can now take its place as a fully fledged branch of archaeological studies if it will at the same time accept the need for a research agenda with a theoretical content.

INDUSTRIAL ARCHAEOLOGY AND ARCHAEOLOGICAL THEORY

Industrial archaeology became an accepted area of study in the 1960s at the same time as archaeology itself was adopting a more theoretical stance. Yet, as E. G. Grant has said:

> Industrial archaeology has neglected almost all theory in some kind of mistaken belief that it could approach the material remains of industrial society with no particular methodological or explanatory framework.
>
> (Grant 1987: 118)

It is undoubtedly true that much of the work carried out in industrial archaeology has been of a descriptive rather than an analytical nature, concentrating on the physical remains of past industries as entities in themselves rather than as expressions of human endeavour. Or, as Matthew Johnson has put it: 'most work in this area has concentrated on the archaeological elucidation of the development of the technologies involved rather than the social and cultural parameters' (Johnson 1996: 12). This is partly because much of the work undertaken in industrial archaeology, as in post-medieval archaeology, has been small-scale site work which has not been susceptible to the generalisations beloved of processual archaeologists. Explanations have often been limited to site-specific ones framed in an historical mode, in the belief that if all the details leading up to the establishment of a site or structure are known, this is in itself sufficient explanation. Industrial archaeology has hitherto lacked a broader research agenda and has rarely tried to contribute to wider historical debates, e.g. on the origins and effects of industrialisation.

If the 'new archaeology' did nothing else, it taught archaeologists to approach both fieldwork and the analysis of data with a series of often complex questions in mind. But the data of industrial archaeology is generally limited to the physical remains of sites and structures plus map, documentary and photographic evidence; what is nearly always lacking is normal artefactual material for analysis. There are large numbers of industrial museums which all display artefacts, often in their social context, but no real attempt has been made to build up reference collections of pottery, glass, metal artefacts, slags, etc. Few British archaeologists working on sites of the

industrial period have treated artefacts in the same way as, for example, historical archaeologists in America or Australia (Deetz 1977; Glassie 1975). The stratigraphy of artefacts on industrial sites has rarely been noted, and the assemblages have been discarded rather than preserved. If we accept that material culture is meaningfully constituted, we therefore lack the raw data from which to extract those meanings. Even the documentary sources so successfully used by Lorna Weatherill to determine consumer behaviour in early modern Britain (Weatherill 1988) are more fragmentary for the industrial period, which makes it even more important to take note of artefacts. An example of how consumer attitudes can be inferred even from contemporary articles of material culture is the comparative work carried out by Shanks and Tilley on the design of contemporary beer cans in Britain and Sweden, which can be shown to indicate the differing attitudes of the two countries towards the consumption of alcohol (Shanks and Tilley 1987). Despite the problems of retaining the often vast assemblages derived from sites of the recent past, some attempt should be made both to build up reference collections of basic types of artefacts and to use the data as evidence of the material culture of the period.

Industrial archaeologists at present, therefore, concentrate on the interpretation of sites, structures and landscapes rather than artefactual material. This does not, of course, mean that they are excused from working within a theoretical framework but that the data used is rather different from that of the prehistoric archaeologist. The various approaches used by archaeologists are intended to provide a means of extracting the maximum information from material remains by making observations within a framework of inference. Yet industrial archaeologists have usually contented themselves with a functional analysis of sites and structures, or by giving them an economic or technological context. The necessity of locating the earliest example of a particular process, or the most complete surviving site for the purposes of listing and scheduling, as discussed earlier, has inevitably led to an approach which concentrates on the positive aspects of human progress and therefore has much in common with the processual school of the new archaeology. Yet the majority of sites in the industrial period provide structural evidence for the social upheaval and redefinition of the class system which accompanied the process of industrialisation. A Marxist approach would be more appropriate in many cases, since the period under study certainly witnessed contradictions between the forces and the relations of production, i.e. between capitalist organisation utilising new technology and the social organisation of the workforce who were forced to adapt to a new working and often also a new domestic environment. Looked at in this way, the introduction of a new steam engine to a previously water-powered mill, a common phenomenon in the nineteenth century which can be identified both from physical and documentary evidence, probably involved the workforce both in learning new skills and also in more rigorous shiftwork, since the owner would wish to recoup his capital expenditure by keeping the engine working on a continuous basis. The resolution of this conflict between the new technology and the social organisation of the workforce which operated it would be, in Marxist terms, an example of the way in which society advanced.

Of course, not all sites of the industrial period lend themselves to this kind of approach. Many mundane structures, such as lime-kilns or buddles, seem far removed from conflicts within human society. They have usually been examined typologically to assess technological development (Palmer and Neaverson 1989; Stanier 1993), yet any industrial structure is not an isolated monument but part of a network of linkages relating to the methods and means of production. In these instances, Ian Hodder's use of 'contextual archaeology' is relevant, 'the full and detailed description of the total context as the whole network of associations is followed through' (Hodder 1986: 143). These associations include not only the economic ones of sources of raw materials, methods of processing and transport networks which industrial archaeologists do normally consider, but also the social context of production. Industrial archaeologists have the

advantage of documentary as well as material evidence, and should not be afraid to use it to help explain the sites and structures with which they are dealing. The social context of production has frequently figured in the display material accompanying museum or conservation projects, but has less often formed part of the agenda for recording industrial sites. It is, however, a vital element in understanding the relationship between the different components of complex sites and also their social symbolism.

From the point of view of the entrepreneur, his industrial empire could be used as a vehicle for the expression of personal prestige. The mill-owner adopted new fashions in architecture, from the Palladianism of the late eighteenth century to the Gothic and Italianate traditions of the late nineteenth. Boulton and Watt in 1765 employed Benjamin Wyatt to design their manufactory at Soho, Birmingham, which for a time became the largest of its kind in Europe. The Palladian façade disguises the more mundane reality of the forges, rolling mills and other aspects of the production carried out by this international firm. The Italianate style became popular for textile mills in the north of England, where several magnificent mill chimneys were modelled on Italian campaniles. A supreme example is Manningham Mill in Bradford (Plate 1), designed by local architects for Messrs Lister, manufacturers of velvet and other fancy cloths. The six-storey mill, with its campanile chimney 249 feet [75.9 metres] high, dominated the Bradford skyline, and enabled its owners to maintain their position in relation to other local entrepreneurs such as Sir Titus Salt, whose model community and huge mill had been built twenty years before. Similar fashions were also often adopted in the homes of the mill-owners: the wealthy cotton-spinning family, the Fieldens of Todmorden, had the vast pile of Dobroyd Castle constructed for themselves in the 1860s as well as providing their town with a town hall, the scale of which was designed to reflect their own prestige rather than to be in keeping with the rest of its buildings. These symbols of power are as important to the understanding of the dynamics of nineteenth-century society as the personal possessions of the elite are to that of Bronze Age Wessex.

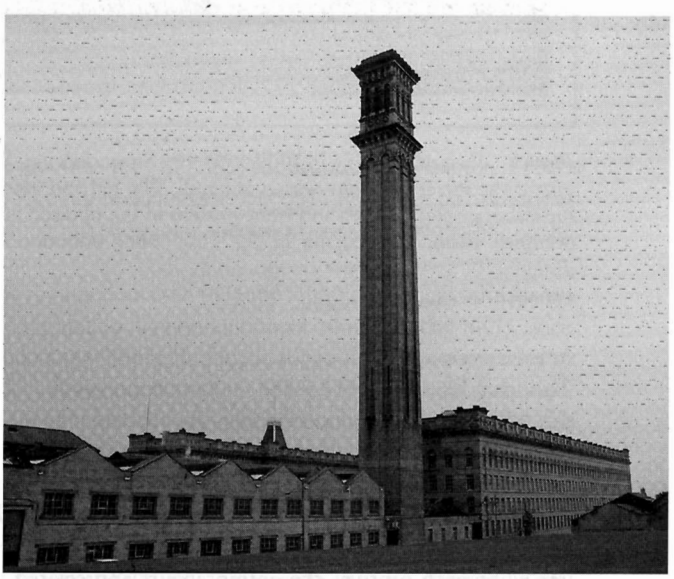

Plate 1 The dominant Italianate chimney stack of Manningham Mill, built 1871–3 on a hilltop site, which helped to establish Lister's as a landmark in Bradford, West Yorkshire.

Many industrial sites developed over time as sources of power and methods of technology changed, and have primarily been analysed in these functional terms. But these sites can also indicate the changing social dimensions of production, the landscape of weavers' cottages with isolated fulling mills representing a different type of organisation from that of Sir Titus Salt's model community of Saltaire (Plate 2). The spatial layout of the purpose-built industrial complex, which was typical of much industrial society from the late eighteenth century onwards, shows how time was regulated in the interest of the maximisation of profit. Continuous production, whether powered by the waterwheel or

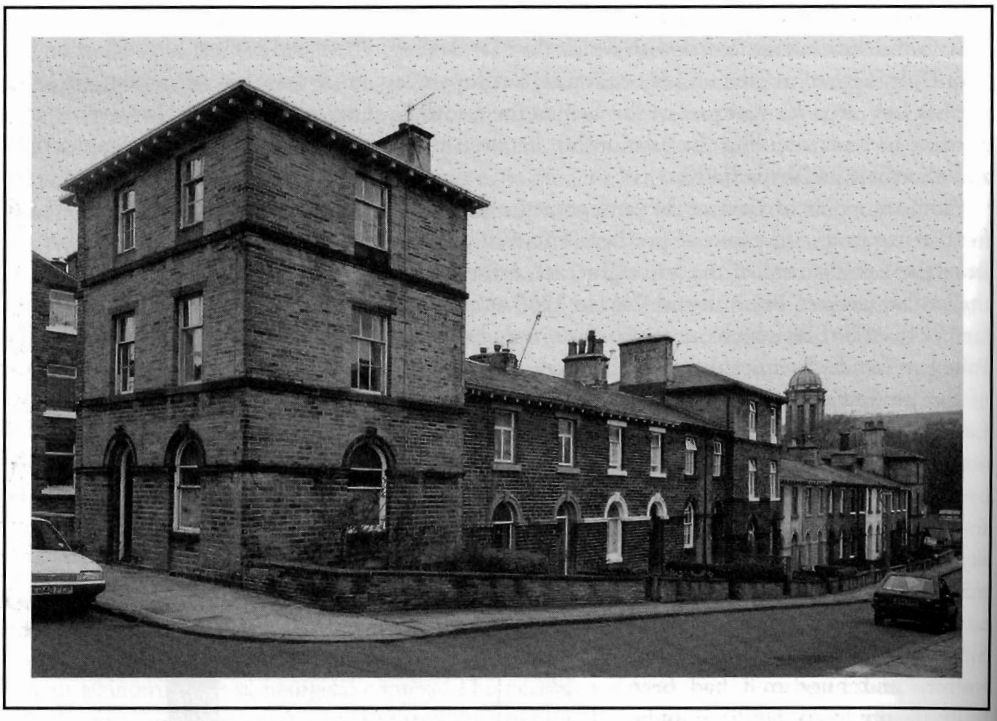

Plate 2 Workers' housing in William Henry Street, Saltaire, West Yorkshire, built 1854. The varied façades mirror the social hierarchy within the mill. The tall end blocks were intended for boarding houses, while the elaborate stone lintels and front gardens of the terraced houses reflect the status of the overlookers who occupied them. The cupola of Sir Titus Salt's elaborate Congregational church can be seen in the distance.

steam engine, necessitated a degree of social control by the entrepreneur over his workforce. This can be observed by the industrial archaeologist in the organisation of space both for the actual processes of production and in the provision of living accommodation. In the iron industry, for example, the furnace was often in blast for campaigns of over a year and demanded continuous attention. The ironworks were arranged to enable easy movement of raw materials to the furnace and to allow for shifts of men continually on site, occasionally living in cottages contrived under the charging bridge of the furnace itself. In the new cotton industry of the late eighteenth century, the entrepreneurs appreciated the value of social control from the very beginning. Menuge (1993) has shown how the entrance to Arkwright's first cotton mill in Cromford, erected in 1771, was only from within the mill yard: the site was provided with a high perimeter wall, and no ground-floor windows overlook the mill road. Documentary evidence indicates that Arkwright was very concerned over the secrecy in which his newly patented machines operated, but the layout of the mill yard also enabled close supervision of the workforce: this was perhaps symbolised by the dominant position of his new home, Willesley Castle, in relation to his works. This is equally true of the earlier Derby silk mill, for which the layout of the great circular throwing machines and the power transmission have recently been reconstructed by Calladine (1993) (Figure 1). This stood on an island in the River Derwent, closed off from prying eyes by elegant wrought-iron gates. Access into these mills by the workforce was therefore more closely supervised than had ever been possible in the proto-industrial

'putting-out' system of organisation which had preceded them.

Inside the buildings, the workforce operated in a controlled space, made necessary by the ratio between the narrow width of the building to admit maximum light and its length which was determined by horizontal systems of power transmission. They no longer had the power to dictate their own working conditions, and the spatial layout of each floor of the mill made supervision very easy. The overlooker could ensure that no one wasted the time paid for by their employer, the mill-owner. Using the technique of access analysis, Markus (1993) has attempted to delineate the relationship between social and spatial structures in a number of early textile mills but all too quickly reverts to straight historical analysis. More will be said on the use of this technique in Chapter Three. However, looked at in this way, these early flagship mills become less monuments to technological development than controlled spaces in which a wholly new system of social relations had to be worked out.

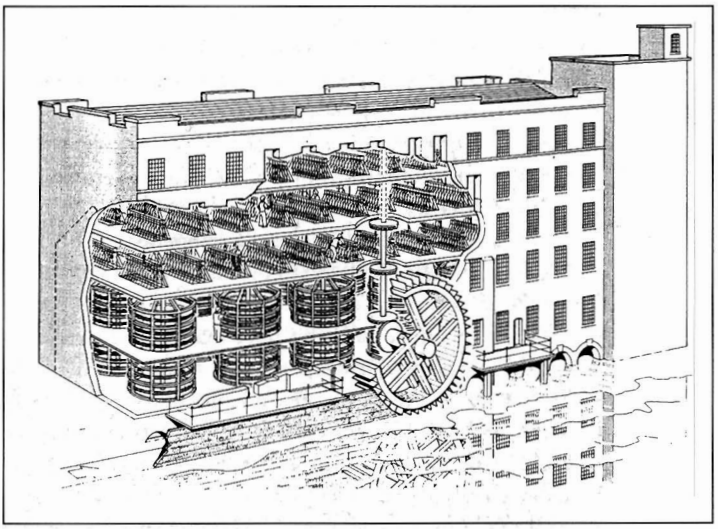

Figure 1 A reconstruction drawing of Lombe's pioneering silk mill at Derby as it may have appeared in 1721. The workforce operated in a space dictated by the circular and transverse silk-throwing and -twisting machines, which were themselves dependent on the power of the great waterwheel.

Arkwright had advertised for 'weavers with large families' to come and work in Cromford, and the village symbolises a new era in gender relations: female and child labour in the mills, with the houses he built for his workforce containing workshops for the men. The close proximity of the housing to the mills, as in other model communities such as Belper, New Lanark and Styal, may suggest benevolence on the part of the mill-owner but in spatial terms it symbolises the discipline of the factory, needing a contiguous workforce who were available to meet the demands of a continuous power source. This spatial relationship could, however, be more widespread. The stocking knitter or handloom weaver, working in his garret, or the nail-maker in his back-yard workshop, was subject to the discipline imposed by an entrepreneur even though direct supervision was not possible and the worker retained the illusory independence of working at home. The linkages between the provider of raw material, whether factory-spun yarn or mill-produced bar iron, and the producer of the finished goods need exploration if it is to be understood how the nineteenth-century outworker was usually equally part of a capitalist form of production (Palmer 1994a).

What this suggests is that an important theoretical stance for the industrial archaeologist is one that acknowledges the role of the individual in the creation of material culture – that objects or structures are the result of deliberate choice rather than environmental determinism. Of course, environmental factors like the presence of raw materials, the existence of a good water-power site and the immediate topography all influence the location of a particular structure, but human agency is ultimately responsible both for its existence and for its form. Typological study of a series of structures may enable generalisations to be made about their development and may

also help to establish the position of a particular object in a chronological sequence, but the role of the individual cannot be omitted from the equation. As Ian Hodder has argued (1982, 1986), material culture is not a passive reflection of society but an active constituent of it. It can be deliberately used by individuals to negotiate social position and bring about social change. For example, the adoption of 'polite' architectural styles for textile mills, discussed above, may well have been intended to prove that those in trade were as well versed in current trends as the builders of country houses and to facilitate the admittance of the entrepreneur into the ranks of landed society, as indeed frequently happened.

Unlike colleagues working in pre-literate periods, the industrial archaeologist has an advantage here in that documentary evidence may help to put a name or a face to some of the innumerable shadowy individuals who have made these choices throughout human history. A surviving lime-kiln in north Derbyshire departs from the functional norm in having openings resembling Gothic windows in the façade: documentary evidence shows that it was built on the estate of Samuel Oldknow, an entrepreneur who was an associate of Richard Arkwright and one with equal pretensions to emulate the landed gentry. Although constructed alongside the Peak Forest Canal, one of whose objectives was to enable the cheap carriage of limestone, it was in fact run by Oldknow at a loss for a period of only fourteen years and, like many other pretentious structures of the industrial period, is a monument to a failed enterprise.

Finally, it is important to recognise that objects and structures do not necessarily retain the cultural meaning they had when first created, but that this may change over time. Landowners utilised ruined abbeys and castles as romantic images in designed landscapes in the course of the eighteenth century, giving them a totally different meaning from that of their builders. Industrial structures have achieved this transformation only in the latter part of the twentieth century, now being seen as icons of an innovative industrial past rather than as functional structures operating within a manufacturing environment. They are regarded as objects in themselves rather than part of the culture-historical process. It is partly for this reason that industrial archaeologists have become so divorced from the human aspect of industrialisation by accepting the contemporary meaning invested in the structures and not seeking that of their original creator and builders.

To summarise, as in any other field archaeology, the material evidence prompts a series of questions which the industrial archaeologist is often fortunate in being able to answer from documentary evidence. But a broad range of questions will not be asked unless there is a theoretical agenda which embraces not only functional and technological questions but also those concerned, for example, with social relations and the symbolic meaning of structures. If it is to be accepted as a credible aspect of archaeology, industrial archaeology has to adopt a more theoretical stance and will become richer in the process. It will be responsible not only for recording the appearance of structures and artefacts of the recent past, and for attempting to set them in an economic and technological context, but also for trying to explain how they indicate change or continuity in human behaviour. In this way, industrial archaeology may make a distinctive contribution to an understanding of the development of human society.

The international context

The origins of industrial archaeology are considered to be essentially British by the rest of the world, yet in some respects its study had commenced elsewhere before becoming generally accepted in Britain. In many instances there were elements of government support for the creation of inventories of monuments, including those of industry. Some were politically motivated, such as the establishment of the Historic American Buildings Survey (HABS) in the

1930s as a means of providing work for unemployed architects. A pioneering survey of New England textile mills was undertaken by HABS in 1967–8. This programme still continues with industrial buildings now being recorded by the Historic American Engineering Record (HAER), established in 1969 under the aegis of the National Park Service, which itself dates back to 1916. HAER utilised a technique similar to the NRIM in England, producing a card index of industrial sites in each state to determine what was worthy of more detailed recording (Figure 2). The records are maintained by the Library of Congress in what is termed 'preservation by documentation', a concept similar to the British National Monuments Records (NMR). Whereas the NRIM in England utilised amateur enthusiasts in the recording process, the HAER surveys are undertaken by university staff and students working under contract to the National Park Service. They have usually been architects and engineers: only after twenty-five years of activity did the National Park Service first employ an archaeologist on a HAER project, a survey of a hard-rock mining site in the Mojave Desert of California, and they envisage further co-operation between the various disciplines (Andrews 1994). Recording has not always ensured preservation and the HAER records form an invaluable inventory of the industrial built environment of the USA (Burns 1989).

In Europe, the value of the physical remains of industry took rather longer to be appreciated. Although French historians had for a long time been interested in industrial history, little notice was taken of industrial sites until the 1970s and the first national study of industrial archaeology in France was not published until 1980 (Daumas 1980). The *Inventaire Générale*, established in 1964 to create a record of the French cultural heritage, began to include industrial sites in 1983 with the foundation of an industrial heritage group within it, the Cellule du Patrimoine

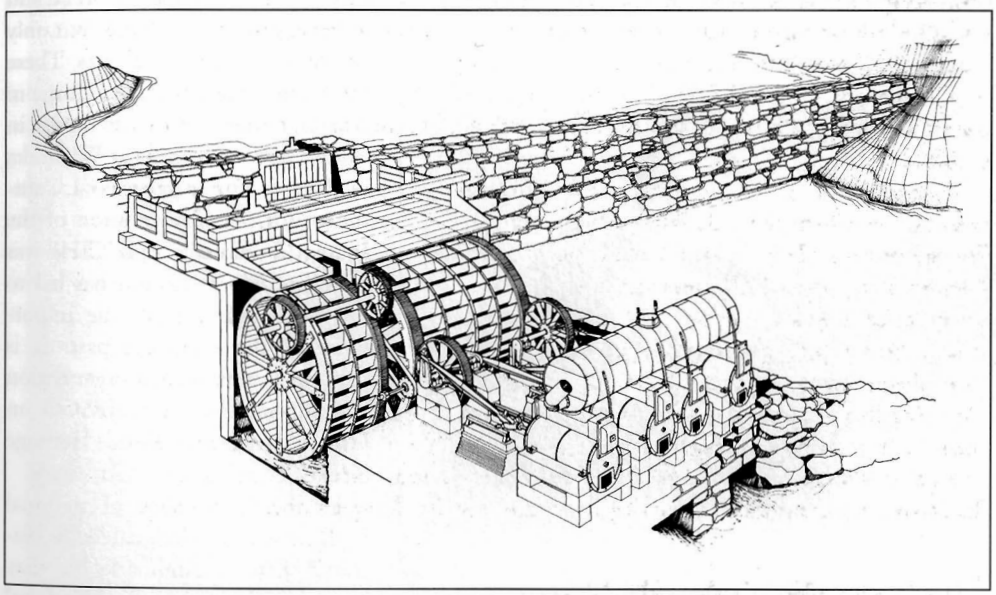

Figure 2 A drawing illustrative of the work of the Historic American Engineering Record. The blast machinery and dam of the Adirondack Iron and Steel Company in Tahawus, New York, were in a ruinous condition when recorded in 1978, but have been graphically re-assembled to produce this interpretative drawing of the original plant. No attempt was made to reconstruct the building which once covered the machinery.

Reproduced by permission of HAER. Drawing by Barry A. Richard, 1978.

Industriel. Various thematic surveys are being undertaken by this group and several regional publications have emerged (Belhoste *et al.* 1984; Belhoste 1988, 1991). A long-term project to create a national database of French industrial sites was initiated in 1986. The same year, a similar database project was begun in the Netherlands. While the French surveys go back into the post-medieval period, the contrasting industrial development of the Netherlands is recognised in this survey which concentrates on architecture and town planning between 1850 and 1945 (Nijhof 1991). Responsibility for the industrial heritage has now passed to the Projectbureau Industrieel Erfgoed (PIE) which was created in 1992. In Belgium, various categories of industrial building have been surveyed, particularly watermills and windmills, and a national survey published (Viaene 1986). The Scandinavian countries have an important industrial heritage which is increasingly being recognised by their governments. In Norway, buildings and sites of industrial interest have been recorded both by the Council for Culture and the Norwegian Technical Museum, while in Sweden the Central Office of National Antiquities is monitoring various recording initiatives. The ending of the Cold War has resulted in various countries of eastern Europe having greater contact with western traditions and recognising the wealth of their industrial heritage. Further afield, industrial archaeology has made rapid progress in Australasia since the 1960s with National Trusts in each state including industrial sites and buildings in their registers (Donnachie 1981).

The conservation of many industrial sites preceded the compilation of systematic inventories but undoubtedly these have helped to determine priorities for more selective preservation in the future. In both America and Europe, voluntary effort and enthusiasm have been responsible for saving many sites which have often later passed into public guardianship.

At an international level, the General Council of the United Nations Educational, Scientific and Cultural Organisation (UNESCO) has adopted a policy of designating important cultural and ecological sites as World Heritage Sites. Around 300 have now been accorded this status, but only a handful are industrial sites. These range from the Ironbridge Gorge in Britain to the Potosi tin mines in Bolivia and a salt mine at Wieliczka in Poland. The International Committee for the Conservation of the Industrial Heritage (TICCIH) was established in 1973 and has led to increased awareness of the importance of the industrial past. It is seeking a more formal organisation and consultation by UNESCO on further industrial World Heritage Sites.

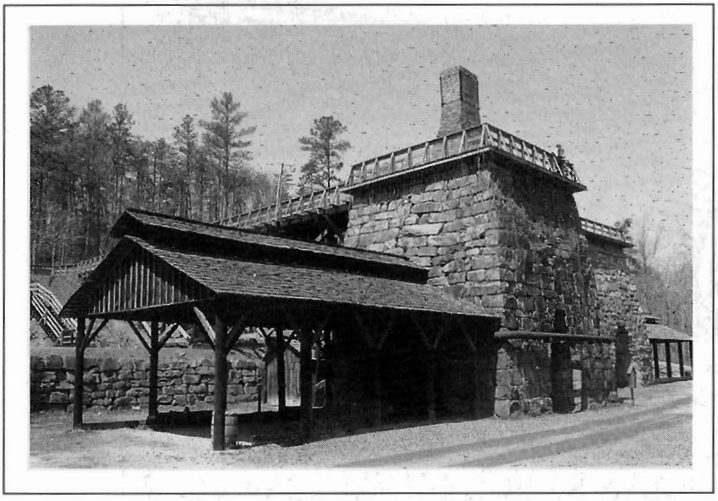

Plate 3 Two of the blast furnaces at Tannehill in Alabama, USA, which were built to supply arms to the Confederate armies in 1863 but destroyed two years later by the Union armies. These have been totally rebuilt and even fired: despite their reconstructed state, they have been declared a National Metallurgical Engineering Landmark. They stand in a Historical State Park, which also includes some of the housing for the 600 slaves who worked the furnaces, and a museum of ironmaking.

In the USA, sites of national significance are designated as National Historic Landmarks but may be maintained by the National Park Service or a variety of state and other local organisations. For example, America's recent Industrial Heritage Project in South-western Pennsylvania is a community project

designed to commemorate the significant contribution of the region's iron and steel, coal and transportation industries to the industrial growth of the USA through a series of heritage trails around conserved sites. The iron industry of the eastern states of the USA was a key factor in their economic development and its importance has been recognised through the designation of a wide range of structures as National Historic Landmarks. Only two, the Saugus Ironworks in Massachusetts and Hopewell Furnace in Pennsylvania, are in the care of the National Park Service and consequently well maintained and interpreted. Two other Pennsylvanian furnaces are preserved as isolated structures, Greenwood within a state park and Scranton by the state museums service. By contrast, the Sloss furnaces in Birmingham, Alabama, a vast complex dating from the 1920s, survive in entirety and are maintained by the city: no comparable examples have been preserved in Britain. There is little hesitation in the USA over the heavy restoration and even rebuilding of particularly important structures: Saugus was America's first integrated ironworks, built in 1646, but the present site is an almost total rebuild based on extensive archaeological excavation. The Tannehill furnaces in Alabama, suppliers of armaments to the Confederates, were totally destroyed by Union armies but have been reconstructed and even refired at the centre of a state park (Plate 3). Canada's first ironworks, Les Forges du St Maurice, are similarly preserved by Parks Canada.

In Europe, the conservation of industrial monuments is more haphazard. They have increasingly figured in schedules of historic structures, but there is no real equivalent to the comprehensive schemes operated by the National Park Services of North America. The decline in the numbers of Dutch windmills after the First World War led to the foundation by a group

Plate 4 In no other place in the world can a landscape of windmills be more appreciated than at Kinderdijk, north of Dordrecht in the Netherlands. Two ranges of tower drainage mills, eighteen in all, lift water by means of scoop wheels from the Alblasserwaard polders into channels which flow into the River Lek.

of enthusiasts of the Association for the Preservation of Windmills in 1923. Their efforts have been rewarded in that over a thousand windmills now enjoy a degree of protection, many of which are fully operational like the splendid landscapes of the Kinderdijk drainage mills near Dordrecht (Plate 4) or the industrial mills at Zaandam north of Amsterdam. The Dutch founded the Netherlands Open Air Museum at Arnhem in 1912, which contains several rural industrial buildings such as a paper mill and a horse-driven oil mill that were moved on to the site. The more recent museum at Enkhuizen was opened in 1983 to perpetuate the vanishing maritime life of the now infilled Zuiderzee. A similar motive encouraged the creation of the Écomusée in 1974 at Le Creusot in Saône-et-Loire, France. This ironworking complex was established in the 1780s under the direction of an Englishman, William Wilkinson, brother of the better-known John. The works were later taken over by the Schneider family and became the largest in France. The Écomusée pioneered a novel approach, now adopted elsewhere in Europe, of involving the local community in the interpretation of their own environment, in this case an industrial one.

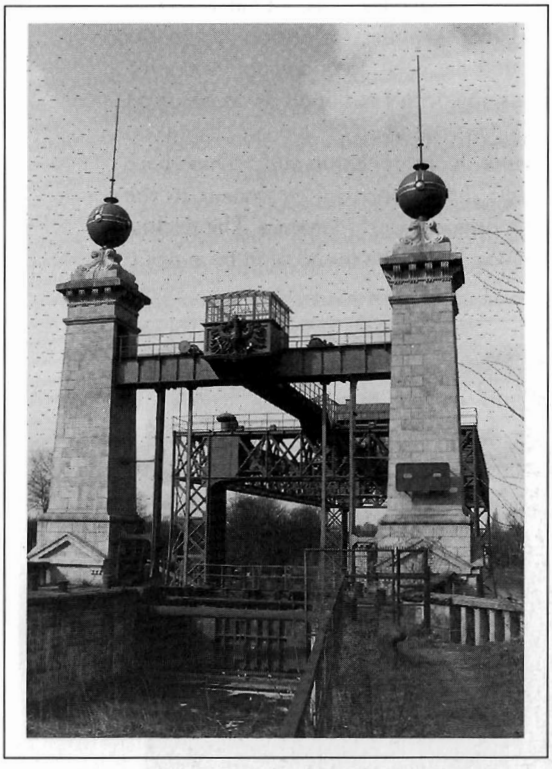

Plate 5 The original Henrichenburg ship lift on the Dortmund–Ems Canal, one of several sites preserved by the Westphalian Industrial Museum. This impressive structure was built in 1899 to transfer boats, mainly coal barges, through 14 m from the Dortmund branch to the main canal to Emden. This is now the centrepiece of a unique canal landscape, which demonstrates alternative means of overcoming differences in level. The first lift was supplemented in 1917 by a lock which is now also an industrial monument: this was followed by a second larger lift in 1962: and finally in 1989 by an even larger lock to accommodate standard European 1350-tonne [1328-ton] barges.

Belgium followed Britain in the change to industrial production in the late eighteenth century and had become a major industrial nation one hundred years later. An early museum of iron and coal was set up in Liège, and an Écomusée has been created around the colliery village of Bois-du-Luc near La Louvière. Generally, industrial buildings received no legislative protection until the 1970s and responsibility is now divided between the Flemish and Walloon areas of the country. In the Flemish area, much important conservation work has been carried out by the Vlaamse Vereniging voor Industriële Archeologie, a volunteer organisation established in 1979.

The importance of heavy industry to the German economy was recognised as early as 1930, when the Deutsches Bergbau-Museum was founded in Bochum on the initiative of the mining industry. Now housed in a striking modern building, this internationally important collection includes artefacts from all periods of mining activity. The heavily industrialised area of the Ruhr was the key to Germany's economic prosperity from the second half of the nineteenth century and the province of North Rhine-Westphalia has financed the preservation of several important monuments. These include the architecturally impressive Zollern II–IV coal mine complex, the Henrichenburg ship lift on the Dortmund–Ems Canal (Plate 5) and several of the Malakoff winding towers which once dominated the coalfield. Of greater international significance are the retention of the iron-cased blast furnaces at Völklingen in the Saarland and the Thyssen AG

plant at Duisburg-Meiderich, since few twentieth-century steelworks are preserved anywhere else. By contrast, in the Harz Mountains of Lower Saxony, the illustrations from Agricola's *De Re Metallica* are brought to life in the lead and silver mines of St Andreasberg and the Rammelsberg (Agricola 1556). Here, wooden waterwheels, headgear and man-engines vividly recall the techniques of metalliferous mining practised in early modern Europe.

Austria was also an important centre of mining, and a heritage trail, the Styrian Iron Trail, has been created to link a series of ironworking sites and blast furnaces in the Erzberg. Similar mining landscapes have been conserved in Scandinavia, dating from the seventeenth century when much of Europe's copper was produced in this area. At Falun in Sweden, a vast open pit, the Stora Stöten, was caused by the collapse of extensive underground workings. The Stora company itself realised the importance of their mining remains and a mining museum was opened in the 1920s. Especially striking is the miners' housing district, the Elsborg, in which the wooden houses stand on foundations of copper slag blocks and are painted with iron-based Falun red paint. Several early blast furnaces are also preserved in Sweden, notably the estate ironworks at Engelsberg where both the owner's eighteenth-century house and those of his workers remain. Company housing is an equally outstanding feature of the mining town of Røros, in Norway. The small wooden houses have grassed roofs and are dwarfed by massive slag heaps of copper-smelting waste while, by contrast, the town is dominated by the Baroque company church (Plate 6). The initiative for a local museum came from local trade unions, and the displays in the underground hall are particularly informative on working conditions. Røros became one of the first industrial complexes to be designated as a UNESCO World Heritage Site in 1982.

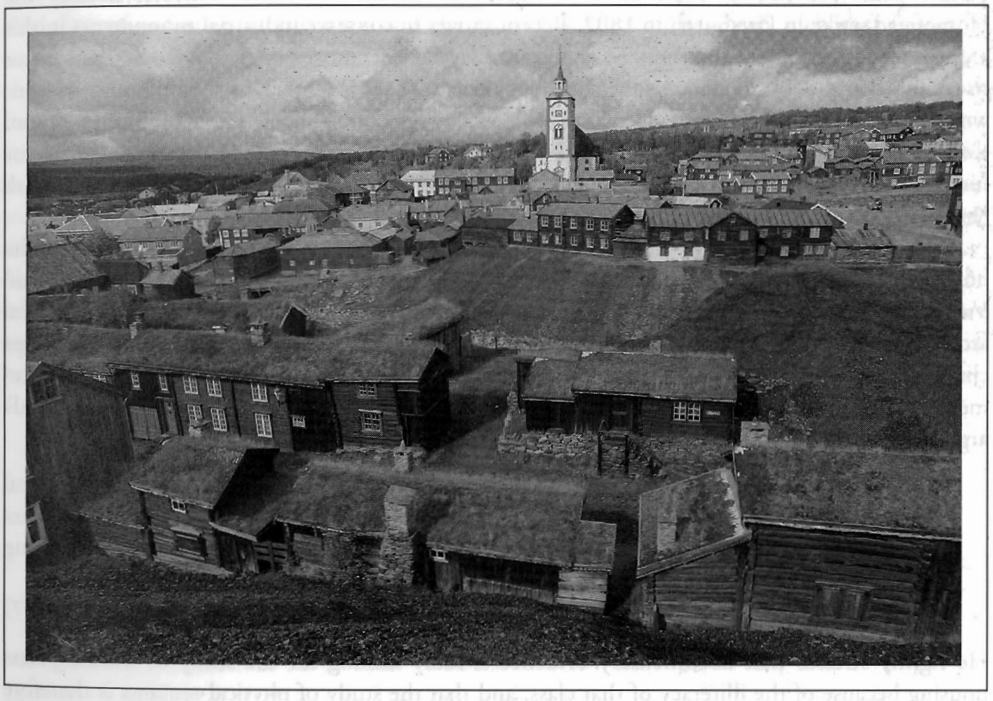

Plate 6 Copper-mining and -smelting have dominated the Norwegian town of Røros since its foundation in the late seventeenth century. Below the slag heaps are the ramshackle wooden workers' houses with their grassed roofs, while the company town is dominated by the late eighteenth-century Baroque church. Mining continued in Røros well into the twentieth century, but the importance of the town's historic remains was recognised and they were carefully conserved and accorded World Heritage status in 1982.

The emphasis placed on the human element in these Scandinavian sites is not always found elsewhere. In Britain, as discussed above, technological achievements have often been stressed at the expense of human effort, perhaps understandably in a country where so many developments were pioneered. Yet, in the 1960s, a leading industrial archaeologist could write:

> Industrial archaeology is, of course, ultimately concerned with people rather than things: factories, workshops, houses and machines are of interest only as products of human ingenuity, enterprise, compassion or greed – as physical expressions of human behaviour. From whatever standpoint the subject is approached, man is the basic object of our curiosity.
>
> (Smith 1965: 191)

Some notice has now been taken of this approach in Britain, with displays, for example, in the Kelham Island museum of working conditions in the Sheffield cutlery industry and often nostalgic glimpses of life below ground in various museums of coal-mining. In the United States, on the other hand, equal weight has been always been given to both technological and human achievement. The rapidly expanding textile towns on the Merrimack River in Massachusetts made extensive use of female labour from farming districts in the mid-nineteenth century. The women lived very regulated lives in boarding houses, the essence of which is captured in excellent archival displays and conserved buildings in both Lawrence and Lowell. Later in the century, the labour force was vastly augmented by European immigrants, who were again highly regimented. Labour troubles were rife, notably the 'Bread and Roses' strike of 1912, which dominates the displays in the interpretation centre at Lawrence. The iron and steel industry of Pennsylvania also had its share of labour problems in the nineteenth century, notably the Homestead strike in Pittsburgh in 1892. Recent moves to conserve industrial monuments in this area have concentrated on their relevance to the labour movement as well as their place in technological development. In the southern states, the employment of Negro labour in iron-works as well as many other industries is a recurring theme in schemes of interpretation. Congress in 1991 authorised a National Historic Landmark Theme Study on American labour history, with a view to adding significant sites to those already in the care of the National Park Service.

Industrial archaeologists in Europe have also drawn attention to the need to consider the human dimension of past industrial activity. Manuel Cerdà, the president of the Associaió Valenciana d'Arqueologia Industrial, would go so far as to suggest that the study of industrial archaeology is mainly concerned with the period when worker–master social relationships changed as a result of the beginnings of factory production, a view echoed in the policy statement on industrial archaeology published by English Heritage (English Heritage 1995b). Cerdà argues that:

> Industrial archaeology must treat the study of the physical remains of a specific historical period of capitalist industrialisation, since it is from this moment on that society establishes new forms of organisation based upon new relationships among the main factors affecting production, i.e., capital and labour, which allow for the formation of new social classes.
>
> (Cerdà 1991: 407)

He rightly stresses that documentary evidence is sadly lacking for the study of working-class housing because of the illiteracy of that class, and that the study of physical remains is therefore essential. However, it is precisely this aspect of the built environment which has undergone most destruction, not least in Spain where there is no national policy towards the industrial heritage. Areas of housing associated, for example, with the textile town of Alcoi in Catalonia and the copper-mining and -processing areas of Rio Tinto do remain but, certainly in the latter case,

are the houses of the immigrant English overseers and not truly representative of the working classes. This is also the case in Britain, where the status of Conservation Area has been granted to exceptional enclaves of working-class housing such as the textile villages of Cromford or New Lanark or garden cities such as Port Sunlight, but typical urban terrace or tenement housing have, understandably, been cleared away. The industrial archaeologist is often limited to sources such as maps and photographs, which are selective in themselves, for the study of the working-class neighbourhoods that mushroomed around mills and factories.

Industrial archaeology is really a way of looking at a period of human history using all the evidence available and not just the documentary. The parameters of that period have not been strictly defined, since industrialisation began earlier in some industries than others, but it is probably true to say that industrial archaeology concentrates on the period when the manufacture of goods ceased to be at the level of domestic or craft production and moved into industrial or capitalist production. However, this form of production was not entirely factory-based, many goods still being manufactured on a part-time, domestic basis but normally under the control of an outside entrepreneur as in the case of handloom-weaving or nail-making. The essence of industrial archaeology is the analysis of surviving field evidence but this is enhanced by the use of a variety of other sources. It also has to be accepted that certain aspects of human activity lend themselves to this type of analysis better than others, and the study of political elites or religious belief, which play a major role in other periods of archaeology, are perhaps best left to the historian of the industrial period.

It was concern for the survival of field evidence which first prompted the creation of the discipline of industrial archaeology, and the rate of destruction has been such that industrial archaeologists have had to be more concerned with the preservation movement than archaeologists of other periods. The recent establishment of inventories of industrial sites in both Europe and America has been prompted by the need to establish priorities in a time of scarce resources. But industrial archaeology is a discipline which has matured in the last decade to look beyond the industrial monument to a consideration not just of its significance in technological and economic terms but also of its cultural meaning as a symbol of changing human relationships. The two chapters which follow attempt to analyse the two major areas of field evidence, first the landscape and townscape and second the buildings, structures and machinery, while the other chapters concentrate on the practical techniques of the discipline, including documentary research. The final chapter returns to the difficult question of the conservation of the industrial heritage and considers examples of what the authors regard as good practice.