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From Industrial Revolution to Consumer Revolution:

international perspectives on the archaeology of industrialisation

De la Révolution Industrielle à la Revolution de la Consommation:

perspectives internationales sur l'archéologie de l'industrialisation

edited by Marilyn Palmer and Peter Neaverson

Editors of *Industrial Archaeology Review*

On behalf of

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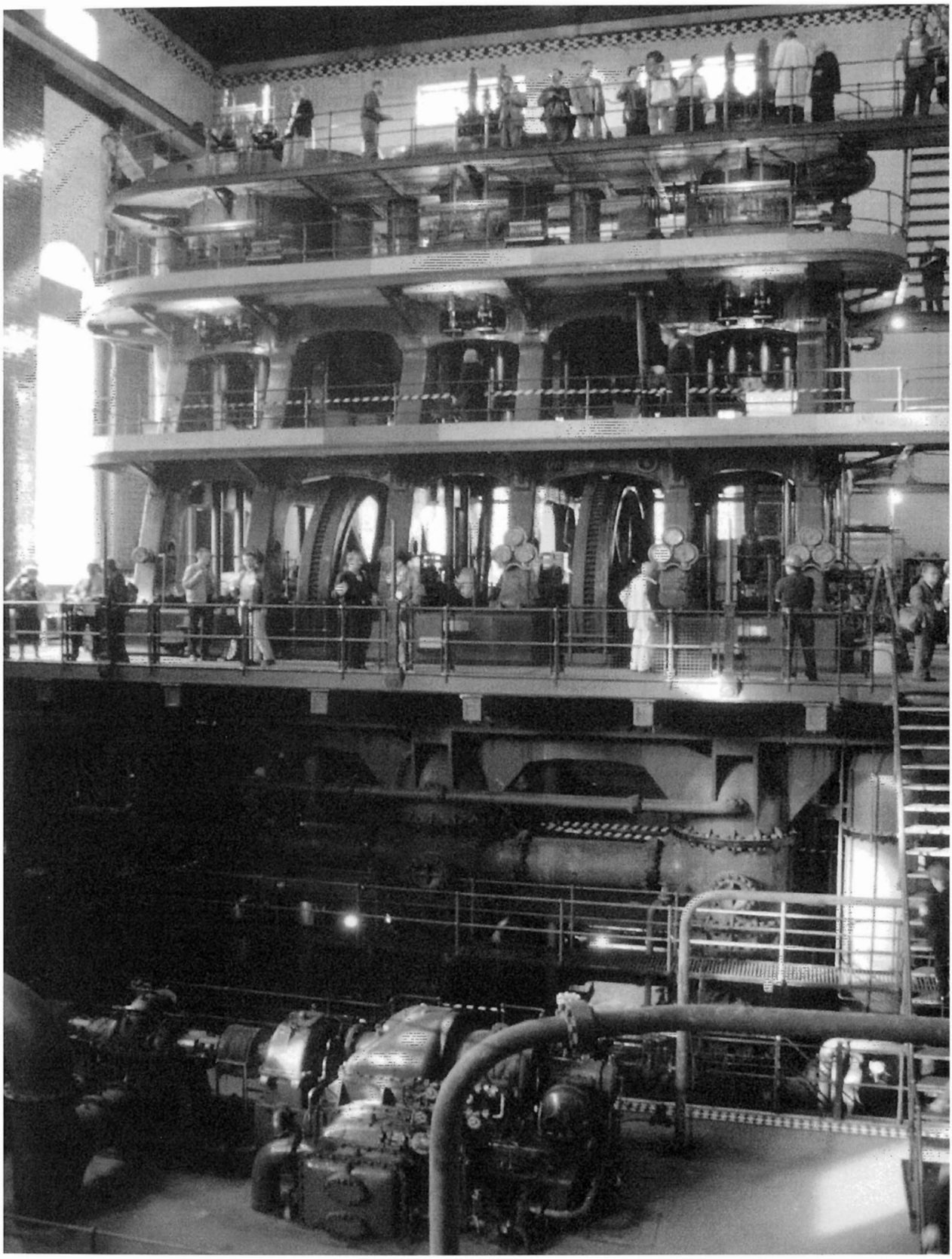
TICCIH2000 CONGRESS TRANSACTIONS

CONTENTS



TICCIH2000 Congress delegates aboard one of the two triple expansion steam engines at the Kempton Park Pumping Station of the former Metropolitan Water Board. They were built by Worthington Simpson of Newark (Nottinghamshire), commissioned in 1928 and were in use until 1980. The Kempton Great Engines Trust was formed in 1996 and has now nearly completed the restoration of one engine to working order (Photo: Marilyn Palmer).

Foreword and Acknowledgements

This publication brings together the papers given in the plenary sessions of the TICCIH2000 Congress held in London in August–September 2000. There were two plenary sessions, each including six papers and entitled respectively, 'The Industrial Revolution of the Eighteenth Century' and 'Mass Production and Consumerism, 1850–2000'. The plenary papers were selected from over 100 abstracts of papers received by members of the Academic Panel which is listed on the inside front cover and were given in Imperial College, London, on 31 August and 1 September 2000. They have since been revised for publication and one additional workshop paper, that of Michael Mende, added. The Editors have provided an Introduction which draws together some of the themes of these papers.

The languages of the Congress were English and French. In this publication, English and French summaries are included, but all papers apart from that of J.-F. Belhoste are presented in English. The Editors are extremely grateful to Paul Smith of the Inventaire Général in Paris for providing the French summaries.

The publication of these papers is dedicated to Dr Michael Stratton, an outstanding British industrial historian and archaeologist who died in April 1999. Michael had long been a regular delegate to TICCIH conferences, and an appreciation of his life and work has been provided by Dr Barrie Trinder, to whom the Editors are grateful not only for this but also for his Chairmanship of the Academic Panel of TICCIH2000 and his help and advice in editing these papers.

The Editors acknowledge financial subventions towards the cost of this publication from the Association for Industrial Archaeology, the British Academy and English Heritage.

Marilyn Palmer
Peter Neaverson
University of Leicester

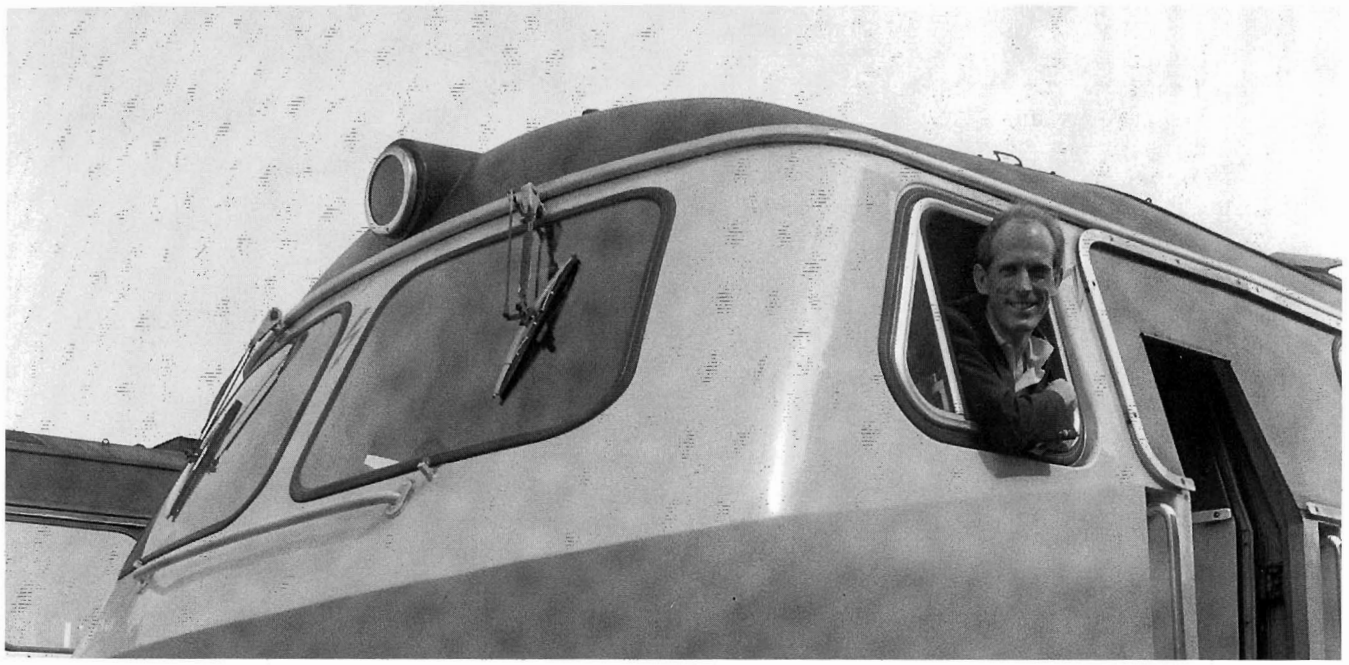
Michael Stratton: A Memoir

Barrie Trinder

The loss of Michael Stratton was much remarked at TICCIH2000 in London. He was only 45 when he died in April 1999 but his invigorating presence had been part of TICCIH for as long as all but the most seasoned delegates could remember. He would have contributed much more to the conservation of the industrial heritage both in England and internationally. The Steering Committee of TICCIH2000, responding to calls at the conference to acknowledge Michael's achievements, resolved to dedicate this volume of proceedings to his memory. This memoir attempts to evaluate his contribution to scholarship, his advocacy of the value of conserving artefacts, buildings and landscapes as a way of understanding our past. In his opening address to the conference, Sir Neil Cossons reminded delegates of the need constantly to explain to a wide public the rationale for conserving the industrial heritage. Michael Stratton had done this for more than 20 years. He stood in a long tradition of English scholars and artists who have changed our ways of looking at our inheritance from the past.

Michael was born and went to school at Barnet in North London near to the Great Northern Railway main line, and developed a lifelong love of railways. One of his strongest childhood memories from the 1950s was the majestic sound of the Canadian whistle that had been fitted to Sir Nigel Gresley's streamlined pacific locomotive No. 60010 *Dominion of Canada* as it made its way into King's Cross station. He studied Geography at the University of Durham from 1972–75, after which he did Master's degrees in Town Planning at the University of Sheffield and in Victorian Studies at the University of Leicester. One of his teachers at Leicester was Professor Tony Sutcliffe who suggested in 1978 that he might apply for one of several doctoral studentships at the University of Aston, which were to be based at the Ironbridge Gorge Museum. His application was successful and under the supervision of Professor Jennifer Tann he began a thesis on the terracotta industry, for which he was awarded the degree of Doctor of Philosophy in 1983. In 1980 he was appointed to a temporary lectureship at the University of Birmingham with a brief to develop postgraduate teaching at what was then called the Institute of Industrial Archaeology (it was re-named the Ironbridge Institute in 1985) based at the Ironbridge Gorge Museum. I was appointed to lecture part-time at the Institute, combining it with other work in Shropshire, and met Michael in the summer of 1980 when we first considered a strategy for developing a programme of teaching and research.

One of Michael's main achievements was the postgraduate programme in Industrial Archaeology which was developed at the Institute from 1982, but which, sadly, was discontinued from 1996. The programme provided training for a generation of industrial archaeologists, many of whom now occupy responsible positions in conservation and recording agencies, national and local government departments, museums and archaeological consultancies, not only in Britain but in Australia, Canada, Denmark, Germany, Greece, Japan, the Netherlands, New Zealand, South Africa, Spain and the United States. Michael was also much involved in the planning of the Institute's postgraduate programme in Heritage Management, the first of many



Michael Stratton at Friedrichshafen en route to TICCIH1987.

to be established at British universities, which was launched in 1985. He was designated Director of the Ironbridge Institute in 1989.

Michael Stratton had subtle diplomatic skills. He succeeded in establishing respect for the Ironbridge Institute and for the discipline of Industrial Archaeology in the face of hostility within the University, a task in which he was sustained by the support of the late Professor J.R. Harris (president of TICCIH, 1978–84). He negotiated funding from the Wolfson Trust for the extension of the Institute's accommodation in the Long Warehouse at Coalbrookdale, and from the Nuffield Foundation for a study of the archaeology of the Ironbridge Gorge, which added to the Institute staff two talented graduate researchers. In 1989 Michael married Annabel Pears, a former student. By 1994 they had a baby son, and changes within the University of Birmingham seemed to threaten the future of the Ironbridge Institute. On New Year's Day 1995 he took up a post at the University of York, as lecturer in the Institute of Advanced Architectural Studies. With his experience both of industrial archaeology and of building conservation he did much to facilitate the subsequent incorporation of the Institute into the Department of Archaeology. He was appointed Senior Lecturer in Conservation Studies in the department in the summer of 1998.

Michael's other principal achievement at Ironbridge was to involve the Institute in consultancy projects, some of them concerned with interpretation or conservation policy, and some with the academic evaluation of particular structures. The first, in 1986, was concerned with the future role of a late 17th-century transit shed in the Riverside area of Exeter, a building which was subsequently adapted, as the Institute report had recommended, into a visitor centre, providing guidance both for those who wished to explore the ancient port, and for those intending to ascend to the city centre and the cathedral. Michael showed much skill in negotiating a way through the city's tortuous conservation politics, an experience put to good use a few years later when the Institute was concerned with the seemingly intractable problem of the future of the Saltford Brass Mill near Bristol, where, perhaps as a result of the report, the roof was restored a few years later. He was also concerned with a series of reports which helped to lay the foundations for English Heritage's Monuments Protection Programme, in as far as it relates to industrial monuments.

Perhaps his most important contributions to the development of Industrial Archaeology were projects relating to particular buildings or industries. Stanley Mill in Gloucestershire had been lauded in many books describing the industrial heritage, but it was not until the Institute's report on the mill in 1986 that its significance as a unique building within its region and an unusual building within the broader context of the textile industry was recognised. Michael and I worked together during the summer of 1991 on a study of Fazeley, the textile community established by Sir Robert Peel 200 years previously. He had injured his ankle and I well remember his determination to walk in some pain and at the height of the season for hay fever, from which he suffered, across several fields to the point where Peel's workers had begun to dig the leat that powered Fazeley's mills. He undertook for English Heritage and with the assistance of Paul Collins a study of the buildings of the British motor industry, following it with a parallel investigation of buildings used for the manufacture of aircraft. Involvement in such work was of incalculable benefit to an institute concerned with the training of postgraduate students. It led to a clear appreciation of what was happening in the field of conservation practice, and of the knowledge and skills that were appropriate to students seeking careers in that field.

Michael also developed the international presence of the Ironbridge Institute. He energetically sought students

from overseas, encouraged British students to work as interns with the Historic American Engineering Record, and developed links with a conservation project at Briançon in the French Alps which enabled students of both Industrial Archaeology and Heritage Management to gain valuable experience. He contributed to the *Blackwell Encyclopedia of Industrial Archaeology*, which I edited from the Institute. He was a supportive member of the editorial board, and was responsible for the articles on ceramics, on Italy, a country where he had travelled extensively and for which he had great affection, and on Greece, where he had provided valued advice on the conservation of industrial monuments. The article on Athens epitomises his enthusiastic approach to the exploration of cities. As well as discussing the city's 19th-century buildings, its railway stations and the plans for its gasworks, he draws attention to a restaurant located in three railway freight wagons and duly recorded their makers and dates of construction. In more recent years his interests had extended even further. He led a party of students from York on a tour of the republic of Georgia, and took a leading part in a conference in Hong Kong.

Terracotta was the subject of Michael's doctoral thesis, and, building on earlier work at Ironbridge on the decorative tile industry, he enlarged our understanding of architectural ceramics. His great achievement in his book, *The Terracotta Revival*, which incorporated much research undertaken after the completion of his thesis, was to demonstrate the close links between the manufacture of terracotta in Britain and the United States. The book reflects the thorough understanding that he had gained of the technology of terracotta production and his profound knowledge of architectural history. It is also evidence of his determination to achieve his objectives and his capacity for hard work. His research in the United States was sustained by a Hagley Fellowship, a Winston Churchill Fellowship and a grant from the US Embassy in London. He studied the Blashfield correspondence in Boston, Mass., and spent some considerable time working on the archives of the Gladding McBean terracotta works at Lincoln, California. He also did much to promote the study of architectural ceramics, and when the Tiles and Architectural Ceramics Society was formed in 1981 he became its first secretary.

Michael Stratton's other principal historical interest was the study of 20th-century Industrial Archaeology, the subject of a paper presented to the TICCIH conference in Austria as early as 1987. He became an authority on the manufacture of motor cars and aircraft, and produced a book on the power stations at Ironbridge that takes a much broader view of the history of electric power generation than the title suggests. It was his ambition to produce a comprehensive study of 20th-century Industrial Archaeology in Britain in time for TICCIH2000. Michael sought sponsorship for the volume, we had planned it in some detail, and in December 1998 we spent two days planning illustrations at the National Monuments Record at Swindon. Within less than a month he was stricken with the illness from which he died, and it was left to me to write most of the book, although, with characteristic determination, Michael provided incisive comments on some draft chapters, and completed one draft chapter himself only a few days before he died.

Michael also published extensively on conservation, particularly during his time at the University of York. He developed links between his department and the Institute of Railway Studies, a joint venture of the University and the National Railway Museum, and with Sue Taylor was responsible for a database of conservation and regeneration projects in Britain and Ireland that is now the starting point for any study of the subject. He was a valued member of the English Heritage Industrial Archaeology Advisory Panel from 1985-89 and from 1993 until his death. As a panel member he was particularly concerned with the project which resulted in the publication in 1998 by PLB Consulting of the report *Public Access to England's Preserved Industrial Heritage*.

Michael Stratton attended the TICCIH conferences in Lyons and Grenoble in 1981, in Lowell and Boston in 1987, in Vienna and Styria in 1987, in Brussels in 1990, in Barcelona and Madrid in 1992, in Montreal and Ottawa in 1994, and in Athens and Thessaloniki in 1997. He presented papers at all but the first, and jointly wrote the national reports for the United Kingdom between 1981 and 1994. He made many friends through TICCIH, and exchanged information with scholars from other countries on many topics. He enthusiastically explored cites where he happened to be staying, often undertaking pre-breakfast rides to the extremities of tramway systems. He took the opportunities offered by conferences to experience cities and buildings en route, and many of his friends can recall journeys that were enlivened by his knowledge, inquisitiveness and capacity for delight. I travelled with him to the TICCIH meeting in Vienna in 1987. We each had long agendas for the four-day journey. Leaving Ironbridge in mid-afternoon we travelled on the Glasgow-Harwich boat train and observed a new generation of supermarkets being built all round the northern rim of London. After crossing to Hook of Holland we travelled the length of the *Schwebebahn* at Wuppertal, and spent the night at Worms, where Michael was anxious to photograph the sculptures on the cathedral that had inspired the Victorian architect Alfred Waterhouse and was impressed by the surviving portal tower of the Niebelungen bridge. We moved on to Ulm, from where we took an evening trip to Munich, where Michael was anxious to locate terracotta buildings that he had made arrangements to visit on his return journey. The following day we travelled to Friedrichshafen, where we enjoyed the Zeppelin museum, and participated in the boisterous celebrations of the 140th anniversary of the opening of the railway from Ulm. A steamer took us along Lake Constance, enabling us to enter landlocked Austria by water, and after a night at Bregenz we spent nine hours of the following day travelling the length of Austria by train. In the Viennese capital we experienced the Ferris wheel before taking Wiener Schnitzel and Sachertort in a café near the Rathaus that had changed little since the end of the Habsburg Empire.

Michael had been involved with the planning for TICCIH2000 as a member of the Academic Panel, and contributed substantially to the determination of the topics to be discussed at the conference. He put forward

imaginative ideas for excursions outside of conference hours, only one of which, to Smithfield Market, was eventually realised. Many delegates at the conference expressed their sense of loss. Michael was only 28 when he went to the meeting in France in 1981 and there was a widespread feeling that care should be taken that TICCIH meetings should always be readily accessible to young scholars. TICCIH gained much from Michael's participation. Its meetings provided him with opportunities to flourish as a scholar, and such opportunities should be readily available to succeeding generations.

The bibliography that follows summarises Michael's academic achievements, but these cannot be divorced from his personality. He was breathlessly enthusiastic, and charmingly loyal, glorying in sailing, mountain biking and kite flying. He recorded much of what he saw in tiny, leather-bound notebooks, accompanying his notes with sketches about which he was unjustifiably modest. His legacy remains in the achievements of his students as well as his publications, but above all in the positive influence he had on all who worked with him. Undertaking a project with Michael involved a commitment to unlimited hours of hard toil, but it also brought the promise of intellectual stimulation and a sense of fun.

MICHAEL STRATTON: A SELECT BIBLIOGRAPHY

This bibliography includes only published works, and omits reviews, notes in bulletins and newsletters, and consultancy papers produced for clients of the Ironbridge Institute.

Stratton, Michael, *The Manufacture and Utilisation of Architectural Terracotta and Faience* (PhD thesis, University of Aston, 1983).

Stratton, Michael, 'Factory-made Building Materials in Industrial and Commercial Architecture', in Wright, H.E. & Vogel, R.M., *Industrial Heritage '84: Proceedings* (Washington DC: Society for Industrial Archeology, 1985), 208–13.

Stratton, Michael, 'The Terracotta Industry: its Distribution, Manufacturing Processes and Products', in *Industrial Archaeology Review*, VIII (1986), 194–214.

Stratton, Michael (ed.), *Interpreting the Industrial Past* (Telford: Ironbridge Institute, 1987).

Stratton, Michael, & Trinder, Barrie, 'Stanley Mill, Gloucestershire', in *Post-Medieval Archaeology*, XXII (1988), 143–80.

Stratton, Michael, 'Industrial Monuments: a Protection Programme', in *Industrial Archaeology Review*, XII (1990), 35–49.

Stratton, Michael, 'The Recording and Conservation of Twentieth Century Industry: a case study of car factories', in Georgeacopol-Winischhofer, U., Swattalek, P., & Wehdorn, M. (eds), *TICCIH1987, Transactions Vol. II: Conference Papers and Results* (Vienna: Federal Office for the Protection of Monuments, 1990), 205, 222–3.

Stratton, Michael, articles on 'Ceramics', Italy, Greece, in Trinder, Barrie (ed.), *The Blackwell Encyclopedia of Industrial Archaeology* (Oxford: Blackwell, 1992).

Stratton, Michael, 'The Archaeology of Industrial Buildings', in Vanderhulst, G. (ed.), *Industrial Monuments and the Landscape* (Brussels: TICCIH Belgium, 1992), [on published disk].

Stratton, Michael, *The Terracotta Revival* (London: Gollancz, 1993).

Collins, Paul, & Stratton, Michael, *British Car Factories from 1896* (Godmanstone: Veloce, 1993).

Stratton, Michael & Trinder, Barrie, 'L'Archeologia Industriale dell'area mediterranea: impressioni del nord Europa', in *Il Coltello di Delfo*, XXVI (1993), 6–13.

Stratton, Michael, *Ironbridge and the Electric Revolution: The History of Electricity Generation at Ironbridge A and B Power Stations* (London: John Murray, 1994).

Stratton, Michael, & Trinder, Barrie, 'Hermoupolis: the archaeology of a Mediterranean industrial city', in *Industrial Archaeology Review*, XVI (1994), 184–95.

Stratton, Michael, 'The Multi-Storey Model Factory and the Single Storey Shed: a case study in the Industrial Architecture of the Twentieth Century', in *TICCIH, ACTAS VIII Congresso Internacional para la Conservación de Patrimonio Industrial* (Madrid: CEHOPU and Ministerio de Obras Públicas, Transporte y Medio Ambiente, 1995), 449–58.

Stratton, Michael, 'Evaluating Twentieth Century Sites for Protection: a case study of the Coventry motor industry', in Palmer, Marilyn, & Neaverson, Peter (eds), *Managing the Industrial Heritage: its identification, recording and management* (Leicester: University of Leicester School of Archaeological Studies, 1995).

Stratton, Michael, & Trinder, Barrie, 'The Foundations of a Textile Community: Sir Robert Peel at Fazeley', in *Textile History*, XXVI (1995), 185–201.

Stratton, Michael, 'Skating Rinks to Shadow Factories: the Evolution of British Aircraft Manufacturing Complexes', in *Industrial Archaeology Review*, XVIII (1996), 223–44.

Stratton, Michael, 'Open-air and industrial museums: windows on to a lost world or graveyards for unloved buildings?', in Hunter, Michael (ed.), *Preserving the Past: The Rise of Heritage in Modern Britain* (Stroud: Alan Sutton, 1996), 156–76.

Stratton, Michael, & Trinder, Barrie, *The English Heritage Book of Industrial England* (London: Batsford/English Heritage, 1997).

Burman, Peter, & Stratton, Michael (eds), *Conserving the Railway Heritage* (London: Spon, 1997).

Collins, Paul, & Stratton, Michael, 'Evaluating 20th century sites for protection: a case study of the Coventry Motor Industry', in Trottier, Louise (ed.), *From Industry to Industrial Heritage: Proceedings of the 9th International Conference on the Conservation of the Industrial Heritage 1994* (Ottawa: Canadian Society for Industrial Heritage, 1998), 57–64.

Stratton, Michael, 'New Materials for a New Age: Steel and Concrete Construction in the North of England, 1860–1939', in *Industrial Archaeology Review*, XXI (1999), 5–24.

Stratton, Michael (ed.), *Industrial Buildings: Conservation and Regeneration* (London: Spon, 2000).

Stratton, Michael, & Trinder, Barrie, *Twentieth Century Industrial Archaeology* (London: Spon, 2000).

From Industrial Revolution to Consumer Revolution: an introduction

De la Révolution Industrielle à la Revolution de la Consommation: avant-propos

Marilyn Palmer & Peter Neaverson

Industrial archaeology grew from a perceived need in the mid-20th century to record and preserve the fast-vanishing remains of early industrialisation in Europe, America and further afield. In most European countries, the immediate priorities were the compilation of inventories of the industrial monuments which remained and obtaining for these some degree of statutory protection. For Britain, this process was admirably summed up in the papers in *Perspectives on Industrial Archaeology*, edited by Sir Neil Cossons and presented to delegates at the TICCIH2000 Congress.[1] Marilyn Palmer and Peter Neaverson have provided a short summary of similar activities in Europe and the USA in *Industrial Archaeology: Principles and Practice*,[2] while Barrie Trinder's *Blackwell Encyclopaedia of Industrial Archaeology* contains entries on the surviving material evidence for industrialisation in Europe and the USA.[3]

It is now, however, almost half a century since industrial archaeology was first recognised. The discipline has matured considerably in that period, and has perhaps moved in two separate but related directions. On the one hand, it has begun to formulate policies on the preservation and presentation of the industrial heritage and on sustainable development, which have influenced both central and local governments. On the other, it has developed into a period archaeology, including within its remit not just the physical evidence for industrial activity over the past 250 years or so but also that for the associated social, cultural and economic developments which accompanied the process of industrialisation. Important among these are the agricultural context of industry, expressions of religious activity in the form of chapels and cemeteries, changes in the relationships between entrepreneurs and their employees and the evidence for measures taken by both employers and the authorities to control a burgeoning workforce. The papers in this volume are concerned with the latter development of the discipline of industrial archaeology and jointly contribute towards a deeper understanding of the processes and outcomes of industrialisation.

In 1995, English Heritage characterised the field of industrial archaeology as one that was concerned with the 'classic constituents of the Industrial Revolution — capital investment, organised labour, technological development and the factory scale of production', while acknowledging that the crafts and industries of earlier periods paved the way for later achievements.[4] This is an acceptable definition as long as it is recognised that those 'constituents' are not thought of as taking place solely within a factory environment. Many of the papers in this volume indicate the longevity of outwork, although those who continued to labour at home were nevertheless part of an organised, capital-intensive system of production. Equally, the 'constituents' listed above could exist well before the period of the classic Industrial Revolution, particularly in enterprises which were state-financed. Jonathan Coad points out that the dockyards of the British Royal Navy were extraordinarily complex manufacturing centres by the 1760s, employing nearly 17,500 people in shore establishments which supported more than 900 warships. The dockyards pioneered the use of machine tools for mass production, were in the forefront of the use of cast and wrought iron for buildings and also experimented with fire-proof construction. It would be very interesting to compare these dockyards with those of other European countries to obtain some idea of the industrial scale of the shore establishments which supported both the naval and merchant fleets which had grown enormously in the 17th century.

Equally, in the 17th century and earlier, there was an extensive network of industry based in the countryside, making use of water power for various processes in the iron and textile industries as well as hand power.[5] Both Marie Nisser and Eva Dahlström point out the relevance of Franklin Mendels' concept of proto-industrialisation to the Swedish situation, where a self-supporting social structure or *bruk* grew up around the rural ironworks which were so prevalent in Sweden. Palmer and Neaverson show how, in both Britain and Europe, cloth-working centres developed around the fulling mills that had often been adapted from rural corn mills to make the best use of available water power. This well-established rural industrial network did not just disappear as new technologies were developed in the late 18th century, but adapted to new economic conditions. In the Eichsfeld area of Germany, throughout the 18th and early 19th centuries, thousands of woolcombers and spinners provided yarn for conversion into cloth in towns such as Gottingen, acting as an 'industrial backyard' (as Michael Mende describes it) to its more prosperous neighbours. Many of the *bruks* of Sweden adopted new technologies in ironmaking and built machine shops, but did not lose the paternalism which had characterised their social structure until well into the 19th century. The material remains of industry in the countryside strongly reinforce the argument that industrialisation did not automatically mean a rush to the towns on the part of the labour force: many chose to remain in their old habitations, even at the cost of

long treks to the new sources of raw materials and markets.

Understandably, accounts of the process of industrialisation based on documentary sources such as diaries, topographical accounts, newspapers, trade journals and so on lay great emphasis on the importance of innovation and change, since it was the new, not the mundane, which attracted the attention of contemporaries. The surviving material remains help correct this view, placing the emphasis back where it really belongs, on the people who carried out the production processes. Perhaps the chief characteristic of the period of industrialisation in Europe is the great increase in the size of the workforce, and it is possible to argue that increased production, certainly in the late 18th and early 19th centuries, was achieved not so much by the introduction of new technology as the increased exploitation of this immense resource of human labour. In some ways, the long continuation of outworking rather than a vast increase in factory production was to the benefit of both employer and employee: the former did not have to invest capital in working premises, while the latter was still able to work within the family unit. However, the independence of these outworkers was illusory: they formed part of a system of organised labour, working within a capitalist system of production. Several papers in this volume support this view, notably those on aspects of the textile industries (Mende, Campion, Palmer and Neaverson) and the boot and shoe industry (Campion and Menuge). They also show that outworking became an urban as well as a rural phenomenon, the labour force operating within purpose-built or adapted domestic workshops in towns. This is a well-known phenomenon in British cities such as London and Birmingham, but J.-F. Belhoste shows that it also operated in Paris, which housed a host of small workshops such as those which produced articles of furniture in the faubourg Saint-Antoine.

The whole built environment of industrial production, not just the mills and factories which have traditionally caught the attention of the industrial archaeologist, is vitally important to understanding both the nature of work and the relationships between employer and employee in the Industrial Revolution. A major difference between craft and industrial production is that in the former the workman is responsible for the whole article: in industrial production, as often as not, he is responsible for only one aspect of the manufacturing process. One effect of this division of labour on the built environment is demonstrated in Menuge's article on the boot and shoe industry of Northamptonshire, where different processes are carried out in different types of buildings, the small factories where the leather is cut out being surrounded by the houses and workshops of the domestic workers who stitch together the leather uppers and attach the soles to them. Campion, too, shows how manufacturing processes in the hosiery and lace industries in the East Midlands of Britain were also split between the factory which produced yarn and the domestic workshop where stockings and shawls were made, being returned to the urban warehouse for marketing.

Although the survival of outwork might seem to indicate successful resistance to the factory on the part of the workforce, it was to some extent to the benefit of the employer who effectively exercised a policy of 'divide and rule' over his employees. Social control and surveillance of the workforce could be practised both inside and outside the factory. Both Mende and Palmer and Neaverson point out the often close physical relationship in the textile industries between the home of the employer and his working premises, reinforcing the practice of paternalism but also enabling a degree of surveillance over the workforce. Palmer and Neaverson also discuss the factory colonies in the cotton industry, where paternalism and social control went hand in hand, the former perhaps giving way to the latter in the late 19th century, as Dahlstrom also suggests happened in the Swedish engineering industry.

Although we have been arguing that the early phases of industrialisation in Europe witnessed resistance on the part of the workforce to enter the factory, as well as the reluctance of many employers to invest their capital in machinery when they had an exploitable workforce, it cannot be denied that considerable technological change also took place within the period. Nowhere was this more apparent than in the chemical industry, whose products supported so many other industrial processes. Colin Russell's paper indicates how mass production of sulphuric acid and soda affected the textile and glass industries, as well as pointing out how a by-product in the transformation of coal into coke, gas, transformed home life, education, crime prevention, theatrical performances and also working conditions in factories during the 19th century. Palmer and Neaverson discuss how the introduction of the power loom into textile mills by the 1830s created wholly new settlement patterns, dominated by the provision of speculative housing rather than paternalistic factory colonies. The physical fabric of a building can indicate the introduction of new technology, as in the Swedish engineering industry, where workshops were reconstructed as new machinery was introduced, yet retain sufficient of their original fabric to enable earlier processes of production to be deduced.

The transfer of technology from one country to another has long been of interest to both economic historians and industrial archaeologists, and several papers in the volume throw new light on the process. Marie Nisser shows how introduced technologies often needed adaptation to the different conditions existing in another country. Sweden, unlike Britain, continued to use charcoal rather than coke as a fuel in the smelting of iron, but this did not prevent the introduction into Sweden of the hot blast process or the use of blowing cylinders instead of bellows in Swedish iron furnaces, nor the method of forging iron which Gustav Ekman brought over from Lancashire in the first half of the 19th century. Two other papers reveal some of the cultural problems associated with technology transfer. Jan af Geijerstam is in the process of studying the reasons for the failure of ironworks built in India in the 1860s by two Swedish metallurgists, attributing their problems partly to the cultural differences between the introduced technology and the older traditions of Indian iron making and partly to the lack of a supporting technological system, since the British-dominated colonial government preferred British iron to be

imported rather than iron to be manufactured on any scale in India. David Gwyn also looks at the cultural problems experienced in technology transfer in a very different environment, that of Gwynedd in north-west Wales. This area, described by the author as one of 'peripheral culture', was dominated by loyalty to the Welsh language and the traditions of Protestant dissent, yet was not immune to the processes of industrialisation which were experienced through the development of its mines and slate quarries as well as the construction of roads through the fastnesses of Snowdonia and across the Menai Straits. Technology transfer, however, took place not by formal scientific or technical training but through the medium of personal contact between individuals, many of whom were 'outsiders' who had to come to terms with the area's cultural make-up. David Gwyn argues that the processes of technology transfer can only be understood if the human agents of change are understood within the context in which they had to operate.

The majority of the papers in this volume deal with the context of the manufacture of goods rather than their consumption. However, Louise Trottier and Liv Ramskjaer take us from the 19th into the 20th century with their discussions of changing consumer demand. In both Canada and Norway, industrial production was revolutionised by the introduction of hydro-electricity which made possible the mass production of new materials such as aluminium and plastics. These were utilised for new appliances for the home, not only electrical goods such as irons, refrigerators, vacuum cleaners and cookers but also plastic goods such as floor coverings and kitchen units. However, these were at first totally unfamiliar to the consumer who had to be persuaded of the advantages to be gained by their use. Liv Ramskjaer uses the terms 'technology push' and 'demand pull', suggesting that the former rather than the latter was more influential in achieving sales for the new products. In both countries, aggressive marketing was necessary to change the habits of consumers and was aimed particularly at women. This was a wholly new development but one, of course, with which 21st-century consumers are now only too familiar.

The papers in this volume, then, throw new light on the ways in which the material culture of the past 250 years can add to our understanding of the complex nature of industrialisation. Their geographical range is limited, but they do indicate how the take-up of new technology varied in both introduction and intensity, reinforcing the idea that industrialisation was very much a regional phenomenon in the late 18th and early 19th centuries. Technological inertia is as much a feature of these pages as technological change: the very size and consequent exploitability of the labour force delayed the introduction of new technology into many industries. And, when new ways of doing things were disseminated between countries, the process was one of adaptation rather than wholesale adoption: not only the economic but also the cultural differences between countries needs to be taken into account when studying the process of technological transfer. Finally, the last two papers in the volume suggest that consumer demand for the everyday domestic appliances that we all take for granted had to be created: new technology pushed rather than demand pulled. The Editors hope that the many ideas raised in these papers will be of interest to the international delegates who attended the TICCIH2000 Congress, as well as to other readers, and encourage more of the comparative research which is greatly enhancing our understanding of the processes and outcomes of industrialisation.

Notes and References

[1] Cossons, N. (ed.), *Perspectives on Industrial Archaeology* (London: Science Museum, 2000). See especially the papers by Angus Buchanan, Barrie Trinder, Keith Falconer and Anthony Streeten.

[2] Palmer, M. & Neaverson, P.A., *Industrial Archaeology: Principles and Practice* (London: Routledge, 1998). See 'The International Context', pp. 8–15.

[3] Trinder, B., *The Blackwell Encyclopaedia of Industrial Archaeology* (Oxford: Blackwell, 1992).

[4] English Heritage, *Industrial Archaeology: a Policy Statement* (London: English Heritage, 1995), 1.

[5] For an account of this network in Britain, see Crossley, D., *Post-Medieval Archaeology in Britain* (Leicester: Leicester University Press, 1990). References to similar networks in Europe can be found in the articles by Nisser and Mende in this publication.