An Archaeological Resource Assessment of Modern Derbyshire (1750 Onwards)

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Note: For copyright reasons the figures are currently omitted from the web version of this paper. It is hoped to include them in future versions.

Introduction

In 1993 the 'Destination Derbyshire Tourism Officers Group' published a leaflet bearing the following bold assertion:

"It was the people of Derbyshire who pioneered the industrial development which was to change the world during the last 200 years. Nowhere will you find such a concentration of human genius and heritage sites."

As a preliminary assessment of Derbyshire's contribution to the industrial revolution this statement may suffer from a certain partisan enthusiasm. Yet it does reflect a widely held view that Derbyshire's role in the history of industrialisation has been a significant one. The prominence of the early industrial heritage in Derbyshire has certainly promoted a considerable level of volunteer involvement in the research and recording of industrial sites.

When first established during the early 1980s the Derbyshire SMR was able to incorporate a wide range of industrial records from a variety of sources. In addition to the most useful overview publications of Nixon (1969) and Harris (1971) Derbyshire benefitted from the activities of a number of societies dedicated to their various interest areas of industrial archaeology. The SMR drew upon the recording efforts of the industrial section of Derbyshire Archaeological Society, the Newcomen society, the Peak District Mines Historical Society, the Inland Waterways Preservation Society, and the Arkwright Society to name but a few of the most prominent groups. From the outset, a large number of industrial records were incorporated into the SMR. The publication of three gazeteers of industrial sites, for Amber Valley, High Peak and Erewash, has also seen subsequent major enhancements to the record. It is in this context that the comparative failure of the IRIS initiative to enrich the SMR in Derbyshire is something of a puzzle. The one significant exception, a deluge of highly detailed and well researched records for the Peak Forest Canal and associated industrial structures, has been largely the product of one individual's efforts.

Despite this impressive background of voluntary involvement, professional archaeologists in Derbyshire, in keeping with a national picture, excluded the archaeology of the industrial period from their concerns. Until relatively recently attempts at developing archaeological research priorities for Derbyshire all but ignored the period after 1750. Indeed, the Post Medieval period as a whole has only recently received any professional archaeological attention in the identification of priorities. In 1977 Courtney and Hart saw the Post Medieval and industrial periods in North Derbyshire as being the appropriate domain of local, special interest conservation groups who should undertake the necessary work when monuments of their period were threatened. The Post Medieval did not even merit inclusion in Hart's (1981) North Derbyshire Archaeological Survey. A similar lack of interest can be detected in Dool's (1977) report on Derby City's archaeological priorities, and in Hazel Wheeler's(1977) paper on the Trent Valley. By the mid-1980s however professional archaeologists were beginning to take the heritage of the Post Medieval and the Industrial periods seriously. Derbyshire Archaeological Advisory Committee's 'Archaeology in Derbyshire: Research Potential' (1986) was promoting such topics as the study of patterns in upland settlement from before the thirteenth century to the end of the Parliamentary enclosures, the study of rural buildings 1750 – 1850, and the systematic survey of stone quarries, lime kilns and early coal workings together with the archaeology of the canals and early railways.

More recently, the extensive survey of aerial photographic holdings and of early editions of the Ordnance Survey mapping for a large part of South Derbyshire has been undertaken by the former RCHME as part of the New National Forest initiative. This survey encompassing parts of

Leicestershire, Staffordshire and Derbyshire has produced a large body of data for enhancing SMRs which contains a significant number of records relevant to the period from 1750 onwards. This data is all the more important for the fact that South Derbyshire has probably received the least attention of all of Derbyshire's districts in terms of industrial archaeology.

The historic landscape characterisation project that was discussed at some length in the paper on Derbyshire in the Post-Medieval period will provide an important resource for investigations into the changing landscape from 1750 onwards. The extensive urban survey project will also assist in addressing one of the most serious deficiencies in the coverage of the Derbyshire SMR. Urban centres, and particularly the understanding of their growth, have been poorly served by the SMR. This shortcoming is reflected in the poverty of records for urban centres from the medieval period onwards. The numerous records for the Ilkeston and Long Eaton lace industry that found their way onto the SMR were entered through a combination of the availability of both the Industrial Gazeteer for Erewash district, and of the voluntary data inputting efforts of David Cranstone. It is hoped that the extensive urban survey will provide a considered digest of evidence for the growth of urban centres within which individual and more detailed records for particular sites can be developed.

Having briefly reviewed something of the history of recording and input into the Derbyshire SMR for this period this paper can now address some of the specifics of Derbyshire's industrial heritage 1750 – 1960. In such a brief paper it is not possible to give mention or to adequately cover all topics which relate to Derbyshire's industrial past. Instead, this paper will focus upon the earliest developments in industrialisation. The exploitation of Derbyshire's mineral wealth provides a much used and convenient starting point. Yet such a discussion inevitably links with other industrial developments, such as communications. It is with the growth of the coal, iron and limestone industries after 1750 and the need to improve communications with growing cities in the surrounding area such as Manchester, Nottingham and Leicester that the impetus for the development of canals and railways was developed, along with the need to enhance the turnpike system. This paper will also address the most significant aspects of Derbyshire's role in the early development of the textiles industry, and in the birth of the factory system. With the development of water powered textile manufacture along the Derwent River and the emergence of a system of labour organised around factories Derbyshire probably made its most significant contribution to the pattern of industrialisation which has subsequently transformed economies throughout the world.

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Fig. 1: the geology of Derbyshire (taken from Nixon 1969)

Lead Mining

Within the Carboniferous limestone landscape of north Derbyshire the same traditional patterns of pastoral land-use that have enabled the upstanding earthworks of earlier periods to survive have also assisted in the preservation of the surface remains of the lead industry. Throughout the region the exploitation of lead rakes, pipes and scrins has left a scarred, hummocked and pockmarked landscape. The impact of centuries of lead mining upon the general character of the landscape cannot be overstated. It is not just that the presence of surface mining remains has influenced patterns of field enclosure. In areas such as Carsington Pasture a palimpsest of Roman to nineteenth century mining has left a lunar-like landscape appreciated equally by archaeologists, crested newts and metallophytes such as the Lead Wort. The physical remains of the lead industry provide one of the defining, formative characteristics in the limestone upland landscape of the Peak District.

The pioneering research efforts of individuals such as Nellie Kirkham, and the on-going work of the Peak District Mines Historical Society has produced a record of workings 'unrivalled in extent and particularly in publication, by data from any other British ore field.' (Crossley 1991, 127). The breadth and quality of information on the organisation, techniques and technologies associated with lead mining, of ore preparation, and of smelting is reflected in the content of the SMR.

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Fig. 2: The mineral veins of the Carboniferous Limestone (taken from Ford and Rieuwerts 1968)

The long history of smaller scale working as a supplementary activity in a broader regime of rural activity dates back to at least the roman period, as has been discussed in the previous research framework papers. The cyclical nature of the lead industry has seen the periodic working, abandonment and reworking of deposits, with the inevitable partial or total obliteration of the remains of earlier workings. Crossley (1991) has indicated how developments in the technology of mining and smelting have resulted in the reworking of earlier mining deposits. In the eighteenth century the introduction of the cupola in place of the ore hearth (Crossley and Kiernan 1992) promoted the smelting of previously rejected ore deposits. The introduction of improved smelting techniques attracted the attentions of investors and larger companies, such as the London Lead Company and the Gregory Mine Partners who were able to take up leases on small mines (Nixon 1969). These companies could afford the investments in steam powered de-watering pumps and the driving of drainage levels, or soughs, over sometimes considerable distances. This in turn enabled mines to be sunk deeper than previously, in order to access previously inaccessible ore deposits, as was the case at Magpie Mine, Sheldon.

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Fig. 3: Magpie Mine, Sheldon

This is not to say that our knowledge of the industry is either complete or evenly distributed. Almost inevitably the study of the lead industry has had a tendency to focus on the activities of the larger scale mines of the period after the mid-eighteenth century. The smaller scale mining remains of earlier periods are less well researched. Furthermore, there has been a tendency to focus research interest upon the above ground at the expense of underground remains of the lead mining industry. It is generally felt that underground mining remains have yet to be adequately researched and understood. The distribution of underground remains of the industry should also be a material consideration in the advice provided on mineral planning applications. In the absence of such information there is a real danger that this element of the lead industry will be lost without any form of recording. The scheduling of lead mines has also traditionally excluded the underground workings.

Lead Mining, Gangue Minerals and Current Threats

This history of the reworking of earlier mining deposits continues today. A growing threat is posed by the exploitation of old lead mining waste heaps, and the opencast mining of lead rakes for gangue minerals such as barytes, calcite and particularly fluorspar, the latter being used as a flux in the steel making industry. Together with the more generalised problem of the levelling and infilling of surface mining remains by farmers the mechanisation and large scale of contemporary mining threatens to obliterate the palimpsest of evidence for the mining of earlier periods once and for all. The problem of the erosion of lead mining remains has been the subject of a detailed study by the Peak District National Park Authority. Analysis of aerial photographic coverage has identified just how quickly surface lead mining remains are being eroded.

Lead Mining and Scheduling

In developing a strategy for preserving the surface remains of the lead mining industry and the landscape it has created scheduling may play an important role. Following the completion of the Monument Protection Programme for the lead industry the scheduling of some 35 sites reflects both the quality of the surviving evidence and their importance viewed in the context of the national lead mining industry.

Yet the historic importance of the Derbyshire lead industry is sometimes seen as being greatest in terms of the role it has played in the development of technologies which later found application in other industrial developments: mechanisation, surveying, drainage, smelting and communications are all areas in which problems confronted by the lead industry resulted in solutions that eventually found application in other fields of industry. In this respect the contribution of the lead industry to the overwhelming changes in economy, settlement, communications and landscape which are the hallmark of the period from 1750 onwards can be considered to be largely indirect.

Ironstone Mining and the Iron and Steel Industry

Within the clays of the lower coal measures of North East Derbyshire, Chesterfield, southern Bolsover, Amber Valley and northern Erewash the availability of ironstone, often in close association with seams of coal, had seen the development of a local iron and steel industry. In comparison with the lead industry research into the extraction of ironstone has received little attention. Following the outcrops of ironstone close to the surface deposits were initially exploited through surface extraction and by shallow bell-pitting. Subsequent urbanisation, the building of rail and road systems, and later large-scale opencast extraction methods has seen the destruction of a great deal of early evidence for both the ironstone and early coal industries.

In the seventeenth and early eighteenth centuries water powered furnaces provided the basis for the iron smelting industry. The coincidence of ironstone, streams for water power, and readily available supplies of charcoal from the extensive woodlands of the area promoted the growth of this industry. One of the better documented seventeenth century furnaces, Sitwell's 1652 furnace at Foxbrooke, was noted as being 'ruinous and in great decay' as long ago as 1749. The recent rediscovery and excavation of this site in the face of opencast coal extraction (Belford 1996) emphasises the continuing problem of erosion and loss of early iron industry sites in Derbyshire. The excavation has confirmed the presence of a furnace with water driven bellows, closely associated with a series densely packed bell pits. The latter had been cut through the shallow coal deposits to reach the ironstone, and back-filled with the extracted coal. The furnace site was subsequently reused at around 1750 for the siting of a sickle-mill, with the pre-existing water management features adapted and reused.

The late eighteenth century saw the birth of a number of major iron companies in Derbyshire. The proximity of ironstone and coal sources, combined with the improved communications offered by canals, provided opportunities for growth. Brindley's canal from Chesterfield to West Stockwith was commenced in 1771 and completed in 1777, making this one of the earliest canals in Great Britain.

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Fig. 4 : Canals and Early Tramways

The firms of Ebenezer Smith, Handyside of Derby, Barrow of Staveley, James Oakes at Riddings and the Stanton ironworks all grew through the late eighteenth century, early nineteenth century. The Butterley Company initially supplied cast iron rails and wheels for horse drawn tramways, troughs for canals, and cast iron beams. The Codnor Park works at Butterley, established in 1807, became a major supplier of wrought iron. The growth of the railways provided impetus for the production of rails and bridges. Sir John Alleyne's development with the Butterley Company in the early 1860s regarding the rolling and forge welding of plates and bars made possible the construction of structures such as the roof of St. Pancras station. Yet as a source of primary iron Derbyshire's industry began to decline after the 1850's. Cheaper ironstone was available in Northamptonshire making local manufacture uneconomical.

Coal

In previous papers we have heard how the extraction of coal in Derbyshire may date back to at least the Roman period. In the eastern coal field coal seams occur close to or at the surface along a line running from Dronfield, past Chesterfield, south to Belper and south east to Stanton. It is along this line that the earliest references to coal mining are encountered. It is also along this line that opencast coal extraction has, in the last half century, done so much to eradicate the traces of early coal mining. In response to this threat projects looking at early mining remains in Derbyshire have and are being undertaken with the aim of significantly enhancing our knowledge concerning the survival and distribution of evidence, and ultimately for enhancing the content of the SMR.

To the east of the surface outcrops of coal is the concealed coalfield where the nineteenth century deep coal mines and mining towns grew. The extensive documentary resource for many of these mines has proven an attractive focus for research efforts into the history of these communities. Despite the availability of detailed records for many of these mines and their shafts the SMR content for mines of this period is patchy. The survival of upstanding remains of engine houses at collieries appears to be one factor determining the level of recording interest or conservation effort they receive. A small

selection of mines, such as Plumbley Colliery in Eckington or Pleasley Colliery have received such attention and are now scheduled. In the former case, this late nineteenth century mine's location in estate owned woodlands has helped to preserve the colliery complex from the wholesale flattening and eradication which has been the fate of so many Derbyshire collieries. Indeed, at Arkwright the entire mining village has been demolished to make way for a major opencast mining operation, the residents being rehoused half a mile away in an entirely new, pleasant but historically sterile village development. Plumbley Colliery's remarkable 'Seldom Seen' engine house, which adorned the cover of Nixon's book on industrial archaeology back in 1969, has recently been the focus of a major conservation effort by Derbyshire County Council and English Heritage. Money from the Landfill Operators tax credit scheme has been used to secure its future. Once threatened with demolition on grounds of public safety this structure now appears to have a future as a field monument that is structurally sound, re-roofed and relatively secure from vandalism.

The eighteenth and nineteenth century saw the growth of companies with interests in both coal and iron production. Companies such as the Butterley Company, originally founded in 1790 as Benjamin Outram and Co, developed widespread interests in the coal industry. The Stanton Ironworks Co.Ltd became the largest colliery owner in the Midlands during the latter half of the nineteenth century..In the eighteenth century the requirement for smokeless fuels for the iron and steel industry and later for the railways promoted the growth of the coking industry. Prior to the eighteenth century Derbyshire coal was coked in open stacks, but gradually banks of beehive coke ovens were built and used to supply the growing demand. Often associated with collieries numerous coke oven complexes have subsequently been demolished. The scheduled ovens at Unstone have suffered through neglect and heavy vegetational growth. However, English Heritage is on the verge of obtaining a management agreement that will help to secure the monument's future.

Limestone

Derbyshire's limestone has found widespread use as a construction material, for industry and for agriculture. Quarries litter the landscape ranging from small-scale sites serving the needs of individual farms for building and field wall construction, through to the large-scale, modern quarries which are to be seen today in areas such as Wirksworth, Crich, and along the western edge of the limestone around Buxton. The production of lime for cement and for agricultural use has a long history in Derbyshire. Throughout the carboniferous limestone region the remains of earthen single and double pye kilns can be identified. Large complexes of such kilns can be seen at Grin Low and at Dove Holes. A recent search of the Derbyshire SMR identified just over 100 entries relating to lime kilns, and these certainly only represent a small sample of the total number of identifiable sites in Derbyshire.

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fig.5 : Earthen lime kilns in Dove Holes

In the late eighteenth century the continuing process of enclosure and the need for the improvement of agricultural land increased overall demand for limestone and lime. The improvement of transportation links through the construction of canals and railways enabled Derbyshire limestone and lime to be exported. Large commercial lime kiln complexes were constructed alongside canals: Edward Banks and Company shipped limestone from the Hilts Quarry at Crich to kilns based at canal wharves along the Cromford Canal, Erewash Canal and the Trent. At Calke on the property of the National Trust is preserved a large complex of lime kilns that are due to be scheduled. The lime produced at such sites was then sold on into local markets. Banks' kilns at Bull Bridge continued in use by the Butterley Company through to 1940s. In 1840 the Clay Cross Company constructed a series of kilns at Ambergate. These were supplied with limestone from Crich Cliff quarry by a tramroad, the Crich Mineral railway, which had been built by George Stephenson in 1837. The kilns continued in use until 1965. In the north-west the Peak Forest Canal was opened to basins at at Bugsworth and Whaley Bridge in 1800 providing access to Manchester for Peak District limestone. The Bugsworth basin is scheduled, and includes a series of commercial lime kilns. These too were supplied with limestone from the local Crist quarry and from quarries at Dove Holes via the Peak Forest Tramway, built by Outram in 1795. Originally a single track line, it used a 1.2m gauge and 'L' shaped rails, 1m long, spiked down to stone blocks. Loaded wagons descended using a combination of simple gravity, with a man-operated brake system, and a counter-balanced cable system, with empty wagons counter-balancing loaded wagons: the cable passed around a large drum which also had a braking system.

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Fig. 6 : Development of the railways in Derbyshire

Such was the importance of improved communications in taking advantage of the increasing demand for Peak District limestone that the Cromford and High Peak Railway began construction in 1826. As such this represents one of the earliest railways in the country, and one of the few pre-1830 railways for which substantial physical evidence survives.

Designed to link the Peak Forest canal to the Cromford canal by railway or tram road this remarkable engineering venture had to overcome the obstacle of the limestone massif, rising in places to over 1200 ft. Jessop's design incorporated a series of 9 inclines linked by relatively level stretches. A combination of railway locomotives and horses were employed for moving wagons along the level parts of the line whilst a series of stationary engines were used to move wagons up the inclines. The works, completed in 1930, required the construction of cuttings and embankments, tunnels, bridges, the inclines and their stationary engines and associated catch-pits. Remaining in use through to 1967 the troubled history of this venture has been well documented and researched by enthusiasts (Hodgkins 1983: Marshall 1996: Rimmer 1985). Yet the physical remains of this, one of the earliest railways in Britain, have not been adequately documented. There is a strong *a priori* case for seeing a full record made of this early railway system.

The construction of the railway enabled quarries and lime kilns, such as those near the Minninglow cutting high up on the limestone plateau, to transport their products to new markets. Similarly, the silica rich sands found locally within the limestone were able to be used for manufacturing high temperature bricks and exported. Two such brick kilns adjacent to the railway at Minninglow have been excavated and conserved.

Stone (general)
Derbyshire's upland limestone region is not the only geological formation to have seen extensive stone extraction and varied use. As part of a major study designed to assist in the re-establishment of the traditional roofing slate industry in Derbyshire (Hughes 1996) a significant study of the historical background to the use of traditional building materials was undertaken by Dr. Pat Strange (1996). His study provides a most useful overview of the evidence for the exploitation of Derbyshire's varied geology for building materials.

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Fig. 7 : Freestone quarries in Derbyshire listed by Farey 1811 (Strange 1996)

In particular, this study emphasises the fact that virtually every geological zone in Derbyshire was subject to the quarrying of freestone, mainly for constructional purposes, by the time that Farey published his account in 1811. In many upland areas, particularly on the gritstones , the location of large quarries provided one major factor in the formation of complexes of deeply incised trackways.

Peat
Whilst considering industrial activity in the uplands of Derbyshire it is worth noting another upland industry which has left its mark upon the gritstone landscape. Until recently virtually no attention had been given to the exploitation of upland peat deposits by individual farms and whole communities as a primary source of fuel. Recent research has emphasised the scale and importance, at least to the local economy, of this industry. The physical impact in terms of changing biotic communities, and the creation of extensive sunken trackway networks is a subject that is only just being researched. Only through the detailed farm surveys being undertaken by staff at the Peak District National Park Authority are we beginning to obtain a wider appreciation of the network of trackways which serviced quarries and peat extraction areas, and the scale of activity associated with these industries.

There are areas where the peat industry was clearly organised on a commercial footing. The impact of improved communications through the late eighteenth and early nineteenth century upon this local

upland industry has not yet been studied. It would be interesting to trace the effects of the increased availability of commercially mined coal upon this local upland fuel industry.

Clays
The use of local clays in the manufacture of pottery and earthen ware products is an industry with a long a long history in the east of the county. This industry encompassed, at one extreme, highly desirable china manufacture. In 1773 George III gave Duesbury's in Derby the right to call their fine porcelain 'Crown', and Victoria added to this 'Royal' in 1890. At the other extreme the expansion of coal mining and other major engineering works provided impetus to the growth of the local brick and earthenware manufacture. Throughout much of southern and eastern Derbyshire a brick kiln industry had developed from at least the early 1600s.

The large scale exposure of suitable deposits of clay through coal mining and railway cuttings formed the basis, particularly in the area around Ticknall, Calke, Swadlincote and Church Gresley, for the growth in the first decades of the nineteenth century of firms making refractory and stoneware products. This subsequently expanded to include salt glazed drain pipes. Bottle kilns became a major industrial feature of the industrialised landscape of this area. Many of these have since been swept away, being either replaced by electric kilns or demolished as the heavy industry of the area has declined and such pottery works became redundant. One exception to this is Sharpe's of Swadlincote. Established in 1821 this factory continued in production until 1967. Many of the original production features including one of the two kiln hovels and one of the bottle kilns survive along with a series of densely packed production buildings. The most important buildings are listed grade II but are deemed 'at risk'. In 1999 a detailed conservation plan was drawn up by Philip Heath, South Derbyshire District's Heritage Officer. This document provides a detailed survey and

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fig. 8: Distribution of potteries in the Swadlicote area. (from Heath 1999)

assessment of Sharpe's, and represents an important study of a local industry that has been all but lost.

Gypsum
Another industry in the south of the county which has disappeared is the exploitation of deposits of Calcium Sulphate which occur around Chellaston. Gypsum deposits suitable for the production of plaster of paris, and blocks of alabaster suitable for religious and secular carving and ornamentation have been exploited since the middle ages. J. Young's 1990 account of the history and evidence for the gypsum and alabaster quarrying industry around Chellaston represents, in his own words, 'an obituary' for 'an industry that played a significant part…in the history of English Alabaster'. The major extraction pits for this industry have been in-filled and returned to agricultural use. Some of the major pits were still in use in the 1960s, although now only bare surface traces survive.

Sands and Gravels
The exploitation of the sand and gravel deposits along the Trent is an industry whose early history and sites has not yet received attention with respect to inclusion on the SMR, except as an adjunct to records of finds such as palaeolithic handaxes. However, the wealth of information available in company papers and in journals such as 'Cement, Lime and Gravel' or 'Quarry Managers Journal' provides a resource as yet largely unresearched. There is no denying the relevance of this industry to the growth of industrial Britain. There is certainly no escaping from the impact of this industry upon our landscapes. Perhaps Ian Thomas' 1999 paper on the heritage of Tarmac's involvement in Derbyshire, which includes a section on the history of sand and gravel extraction, provides a starting point for the SMR. As with the opencast mining of coal, perhaps we shall be lamenting the lack of conservation concern for preserving *in situ* or by record the early traces of these industries in 50 years. Then again, perhaps we might not.

Thus far this paper has concentrated very largely upon some of the industries which developed in Derbyshire exploiting the various mineral resources of the region. It can be seen how the exploitation of mineral wealth provided a stimulus to the development of improved communication systems. Within the county it is possible to identify some of the earliest developments in canals, tramways and railways. Yet in the history of the industrial revolution it is as the place where water power and technology were first successfully applied to the manufacture of textiles for which Derbyshire will be principally

recognised. Derbyshire is the place where the harnessing of water power to manufacturing technology for the very first time transformed a cottage industry to a factory-based system of mass production.

Textiles

Lombe's silk mill in Derby, which began production in 1721, is generally considered to have been the first true factory in Britain, harnessing the energy of the River Derwent to provide an unprecedented amount of mechanical power for the throwing of silk. Lombe, drawing upon lessons learnt through Cotchett's earlier but fundamentally unsuccessful attempts to produce high quality silk fabric at By-Flatt Island on the Derwent in Derby, had the benefit of information on Italian silk throwing machinery gained through industrial espionage. Sorocold, who had designed Cotchett's mill, constructed for Lombe a mill larger than any seen previously, with enough power to drive 12 of the large Italian machines, through a water wheel for which a weir constructed across the river diverted water into the millrace. By 1730 Lombe's mill employed 300 people, although Lombe himself had died mysteriously just 12 months after the factory had opened.

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Fig. 9 : Reconstruction of Lombe's 1721 Silk Mill – taken from Calledine 1993.

Today it believed that all that is left of Lombe's mill are the lower floors including the distinctive masonry arches, which are incorporated into a twentieth century factory on the same site. Thanks to the work of Anthony Calledine (1993) using detailed eighteenth century documents and nineteenth century photographs we now have this reconstruction of the design for the Italian works as it may have been in 1721.

Designed to meet the demand for organzine silk fabric amongst the wealthier classes the mill was a huge success and was regarded as one of the wonders of the age being written about by the likes of Defoe and Boswell. Yet it was the adaptation of Lombe's processes to the growing demand for more utilitarian cotton manufacture some thirty years later that saw the next phase in the development of the factory system in Derbyshire. Arkwright, Strutt and Need leased a site on the eastern side of the small hamlet of Cromford along with the water rights. In 1771 they constructed the first mill where Arkwright's patented spinning machinery was adapted for use with water, rather than horse power, as the driving force. This is held to be the first successful water powered cotton mill and is seen as having transformed the textiles industry. A second mill was constructed in 1777, although few records for this survive. Recent excavations at Cromford have however exposed the foundations of the second mill and the water management system which operated there. The Cromford Mill site is today a rare survival of a textile mill complex dating entirely to the last part of the eighteenth century. The then conventional design of the mills at Cromford, where form was dictated by function, contrast with the impressive red-brick and façade of Arkwright's Masson Mill, built in 1783 after his partnership with Strutt dissolved, reflecting the self-assurance of a confident and successful businessman.

Arkwright also introduced a revolutionary approach to the other essential resource for the factory system, namely labour. Cromford is one of the earliest examples of a planned industrial town, built to house workers to a much higher standard than was experienced in the industrial cities of the nineteenth century. In addition to high quality workers housing he provided a market place and it's buildings – including the Greyhound Hotel.

From 1776 onwards Strutt, still in partnership with Arkwright, developed the first mills at Belper – again harnessing the motive power of the River Derwent for mechanised cotton spinning. Between 1776 and 1816 six separate mills were constructed at Bridge Foot, Belper, once again with high quality housing and community buildings. By 1811 the former rural settlement of Belper had become the second largest town in Derbyshire. The town had been transformed from a small village reliant upon nail making and framework knitting into a diverse and flourishing economy. The Strutts also built industrial farmsteads in the surrounding area to supply fresh food to the town for the workers.

At Darley Abbey Thomas Evans, a prominent banker and industrialist in Derby, is supposed to have followed the 'Arkwright model' and established the Boar's Head Mill for cotton production along with community housing and infrastructure, including an early example of a sewage treatment plant. Evans' mill was located on the site of an iron and copper mill which Evans had also owned. The first mill building, the 'Long Mill', had been thought to be much altered. Recent survey work at the mill by

Adam Menuge for English Heritage indicates however that the Long Mill retains four of the original five storeys and much of the original internal fabric. The rest of the mill complex, which includes a further four mills, dates probably from 1798 – 1821. The survey has also identified a series of associated manufacturing, ancillary and domestic buildings which may also date from the late eighteenth to the late nineteenth century. Such is the potential importance for the story of the growth of the cotton industry along the Derwent that English Heritage are preparing to undertake a further detailed survey of the Darley Abbey Mill complex.

These developments in the factory system along the River Derwent during the eighteenth century represent a key early stage in the industrial revolution. Today the mill towns of the Derwent, and particularly Cromford and Belper, represent remarkable survivals of the earliest stages in the development of the factory system. The nineteenth century growth and expansion of cotton manufacture in other centres has assisted in preserving the early evidence along the Derwent. As a material record of the development of the factory system the Derwent towns in Derbyshire represent a resource of national importance. Indeed, the inclusion of the Derwent Valley Mills on the shortlist of sites for submission to UNESCO for inscription as a World Heritage Site reflects the international importance of this area.

It is worth noting however that in spite of the considerable attention given by historians to these landmark developments doubts and uncertainties concerning the precise character of key sites does exist. Much of the original documentary evidence for the Mill complexes at Cromford and Dale Abbey was lost during mill fires. As previously noted, little is known from documentary evidence about Arkwright's second mill. Limited excavation has provided a view of the scale and organisation of the mill. A detailed survey of the fabric at the Dale Abbey mill complex is planned. Even in these key sites the potential for learning from the material record is and will continue to play an important role in unravelling the details of the industrial past and in making conservation plans for the future.

Conclusions

The discussion of Derbyshire's Industrial heritage in such a short allocation of time inevitably demands a highly selective approach. There are entire subjects that have received no discussion in this paper. Not least of these is the role of Derby in the engineering industries of the late nineteenth and twentieth centuries. Names such as Rolls-Royce have not been mentioned. Yet in a paper designed to lead towards the identification of research priorities at a regional scale it seems entirely reasonable for the focus for Derbyshire to be on the early industrial developments within the county. This paper has deliberately focussed very largely upon the subjects of mineral exploitation, developments in communication systems and upon the use of water power for textile manufacturing. If one accepts Buchanan's view of industrial monuments as being those buildings or fixed structures "significantly connected with the *beginnings and evolution* of industrial or technological processes" then Derbyshire certainly does have a most significant resource in its industrial monuments. It is high time that industrial archaeology takes its place amongst archaeological research priorities for the region.

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