WARWICKSHIRE Industrial Archaeology Society

WIAS

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NEWSLETTER

FROM THE CHAIRMAN

Maintaining momentum

During this year's AIA Conference in Chelmsford it was interesting to hear of the way in which many industrial history and industrial archaeology societies were struggling to maintain membership and attendance at meetings. The ageing demographic structure of membership, the diminished interest of current generations in past industrial eras, plus the proliferation of other societies that often touch on industrial subjects (e.g. local history and family history societies), were identified as possible factors, with the first of these seen as the main explanation.

The increasing membership of WIAS and the buoyant attendance at meetings seemed to buck the trend, and the committee is determined to maintain this momentum.

Principal amongst these is the goal of providing a range of monthly meetings that can prove attractive to a cross-section of our members and visitors - from the talks on the technologies of the past to interpretations of urban and social history; from the local to the national and even international context; from the lecture that occupies a whole evening to the shorter presentations, often given by members. These shorter 'add-ons' that usually occur in the latter part of the meeting have contributed greatly to the diversity of material that seems to interest the industrial archaeologist!

We hope that this year's programme fulfils this goal, and that no-one should feel reluctant about offering input to a meeting, either via comment, question or additional talk.

Planning the year's programme is probably the principal work of the committee, all of whom apart from Richard Hartree - retiring after several years of loyal service - are willing to serve another year. Alain Foote will be joining the committee for 2012-2013. These and others (e.g. Jan Coulls and Barbara du Bois providing the refreshments at meetings; the website run by Peter Riley who also works with Richard Storey on the bookstall; the Newsletter largely written and edited by Mike Hurn) all combine to produce a highly effective team.

As you will notice, this Newsletter - in response to member requests - has an additional four pages containing photographs and text provided by members. We hope that this will become a regular feature and the editor Mike Hurn is very happy to receive contributions, either handed over at a meeting or sent via e-mail mikedhurn@btinternet.com.

This project obviously relies on the volume of contributions from members, so please send in material - particularly relating to Warwickshire - that you feel would be of interest to the industrial archaeologist.

The display boards purchased by the Society are also available at meetings should anyone wish to mount a display of material. Please contact the Chairman on wiaschairman@aol.com.

Other goals for the committee include making the AIA Journal more readily available to members; seeking the spread of the IA message into other parts of the county where we are not well represented (e.g. Rugby, Nuneaton); gathering knowledge and photographs of local firms with a view to mounting a presentation at one of our meetings, with the first of these concentrating on the Ford Foundry of Leamington, co-ordinated by Peter Grenfell (rpgrenfell@ntlworld.com), with a presentation at our June 2013 meeting.

The Fenny Compton Kiln Preservation Trust

Many will be aware of WIAS's close involvement with the project to restore the Fenny Compton Brick Kiln. The Guild of Bricklayers and The River and Canal Trust (formerly British Waterways) are prime movers in this project, and members might know of the Fenny Compton Kiln Preservation Trust. The Trust was formed in 2010, and is committed to restoring the kiln and the surrounding area, thereby enabling the public to have a greater understanding of brick making, the canal network and local history. The trust is extremely keen to attract volunteers. For further information, please contact Steve Barlow, Secretary of the Trust stevebarlow@live.co.uk. Tel: 07932 310710. Membership is £5 per annum, with a joining fee of £5.

PROGRAMME

November 8th 2012
Ian Mackintosh (of the Stroudwater TextileTrust):
400 years of Stroudwater Textiles.
December 13th 2012
John Berkeley OBE:
From Pens to Particle Physics: the story of a Birmingham family business.
January 10th 2013
Alain Foote:
The English Electric Company 1918-1968.
February 14th 2013
Members' Evening
March 14th 2013
John Yates (Inspector of Historic Buildings, English Heritage)
The First Iron-framed Building in the World: Ditherington Flax Mill -History and Restoration.

Meeting Reports

June 2012: Jeromy Hassell

Coventry Machinists and Coventry Victor

Jeromy Hassell has talked to the Society on two previous occasions; in March 2007 (Newsletter 27) on his ancestor Joseph Wright – a Coventry Watchmaker and in June 2006 (Newsletter 23) on engine makers White & Poppe. On this occasion he gave us his understated but penetrating observations on two other famous Coventry names: The Coventry Machinist's Company and Coventry Victor.

The history of these two companies was traced through a pageant of product illustrations and memorable pictures of factory conditions giving a vivid recreation of the bygone age of late Victorian and Edwardian England before WWI. This was the time of luxury toys for the well-to-do and horrendous working conditions under which the toys were produced.

Whilst some of the history of each company was familiar to many members, Jeromy's wry approach brought new insights into their activities and uncovered new material.

The story of the Coventry Machinist's Company starts with James Starley. His natural flair for invention led to an improved sewing machine, said to have been the first capable of stitching around the hems of cuffs and trouser legs.

Starley moved to Coventry in 1861and started the Coventry Sewing Machine Company backed by a group of financiers wishing to provide employment for skilled workers laid-off through the decline in the watchmaking industry. The sewing machine went into production but with increasing American competition other products were needed.

Michaux in France had introduced pedal power with the Velocipede. Starley obtained an order to make 400 machines for sale in France, but the Franco-Prussian war resulted in their being sold in the UK. The Velocipede had a cast iron frame and weighed 160lb! It sold for about £12, at a time when the average wage was around £1 a week.

Starley started to make improvements, modifying the brake, fitting a mounting step and reducing weight. He introduced larger front and smaller rear wheels plus leg-rests over the front wheel. Starley's developments led to him becoming known as 'the father of the British bicycle'.

Jeromy explored the development of the 'penny-farthing', which was introduced to provide higher gearing and a better ride on uneven surfaces, through a series of illustrations highlighting brakes, chain drives, tricycle derivatives, free-wheels and rocking lever pedals. We even saw single and double coolie cycles for Colonial use and a tricycle which could be changed from single to double configuration, although perhaps not as smoothly as in the powerpoint transformation!

A Royal Warrant was granted in 1883 and bicycles began to take on a more modern appearance with the rider seated between two equal-sized wheels. Passenger carrying tricycle tandems allowed 'a lady to mount or dismount with perfect ease without soiling her dress'.

The review of Coventry Machinists concluded with nostalgic pictures of the Cheylesmore factory both inside and out and some of the eccentric machines it produced including four and five-seaters. Commercially the company languished. It was sold in 1896 and the name changed to The Swift Cycle Company. The purchaser was the flamboyant Ernest Terah Hooley whose practice was to buy well-run private companies and float them with a great fanfare. As with all his flotations, that of Swift was heavily oversubscribed. The future went well for the Company, but not so well for Hooley, who two years later when, after acquiring a series of companies for £9m, and then selling them for £14m, declared himself bankrupt on refusing to settle a small debt which he considered unjustified. During his career, over £100m passed through his hands, and the companies he launched included Boots, Schweppes, Dunlop, Singer Sewing Machines and Raleigh Bicycles. Swift expanded its site at Cheyslemore and went on to manufacture motor vehicles but eventually folded in 1931.

Jeromy then turned his attention to the inventive William Weaver and his Company, Coventry Victor. Born in Peterborough in 1885, Weaver served an engineering apprenticeship in Manchester and moved to Coventry in 1904. He has been described as an individualist working on his own account, paying scant attention to anyone else and having the pioneer's obsession with his own ideas which he produced 'as a catherine wheel produces sparks'.

In Coventry, Weaver established Moreton & Weaver, in Hillfields to carriy out experimental work and make machine tools and components for the motor and aircraft industries.

Weaver was attracted to the new field of aeronautics and built some pioneering ornithopters (aeroplanes with flapping wings) of which little is known save that the original machine was tested on the Hampton in Arden golf course and subsequently destroyed in a gale. However, Flight magazine in May 1910 did record the successful trial of an ornithoplane designed and built by a Mr Weaver of Coventry with a flight of a quarter of a mile.

In 1911 Weaver founded The Coventry Victor Motor Company Limited to manufacture engines and motorcycles under his own patents. The first engine was a horizontally opposed twin-cylinder, four-stroke which in due course established Weaver as Britain's major producer of such engines. At this time Weaver also produced parts for man-lifting kites and the Cody biplane. During WW1 he made some of the first bombing devices for aircraft and by the end of the war Coventry Victor was producing motorcycles powered by their own engine.

A series of illustrations, culled from the Coventry City archives, of Coventry Victor promotional material showed many machines of originality and included a bullet shaped sidecar of polished aluminium with air cushion upholstery 'of superior quality'. Of even greater interest were photographs of the works, some of which included Weaver himself, that gave another glimpse into the manufacturing processes in early twentieth century Coventry.

The three-wheeled cyclecar, originated by Morgan in 1910, flourished in the post-war years being cheaper to buy, tax and run than cars and more comfortable than a motorcycle. Weaver launched the first Coventry Victor cyclecar at the 1925 Olympia Cycle Show. Unlike Morgan, Coventry Victor made both the chassis and the engine – a water-cooled version of the old twin.

A wide variety of models followed over the next decade but as tax concessions for small four-wheelers eroded the cyclecar's advantages and, despite good press comment and a loyal customer base, production ceased in 1937. Thereafter the company concentrated on manufacturing and supplying engines, always flat twins, both petrol and diesel, for vehicle, marine and stationary applications. There was even an air-cooled aircraft engine in 1955.

In 1965 production was moved to a new site in Willenhall Lane. William Weaver died in 1968 and in 1969 the company went into voluntary liquidation. Weaver's son then purchased the sole rights to manufacture Coventry Victor engines and trades today as A N Weaver (Coventry Victor) Ltd.

A most interesting meeting concluded with one of the Chairman's finds – a silent film from 1929 extolling the variety of activity to be found in the Port of London. A considerable contrast indeed to Coventry's manufacturing heritage.

Members' Contributions

Martin Green:

Two Modern Structures: Two new views of London's Industrial Heritage

One of the unexpected inclusions in the AIA Conference at Chelmsford was a talk on the structures of the Olympic Park, sites with which we had all become increasingly familiar via the extensive TV coverage of the Olympic and Paralympic Games. Love it or hate it, Anish Kapoor's and Cecil Balmond's ArcelorMittal Orbit certainly became one of the lasting images of those games, and will have a permanent place in the re-modelled Olympic Park in the future. It is Britain's tallest art sculpture at 115 metres high, and, as its appearance suggests, it presented a considerable challenge in terms of structural engineering, with Arup providing the necessary expertise. Sadly, the Orbit will remain closed to visitors for the time being and will not re-open until late 2013 or early 2014.

In addition, The Emirates Airline – the cable car across the Thames from the O2 arena on the Greenwich peninsula to the ExCel Centre at Royal Victoria Dock - had been built with impressive speed to be open in time for the Olympics. The cable car - capable of carrying 2,500 passengers an hour - stretches over three spiralling towers, designed by architects Wilkinson Eyre, and manufactured in Bolton. The towers are mounted by specialist cable car equipment supplied by Austrian-Swiss company Doppelmayr.

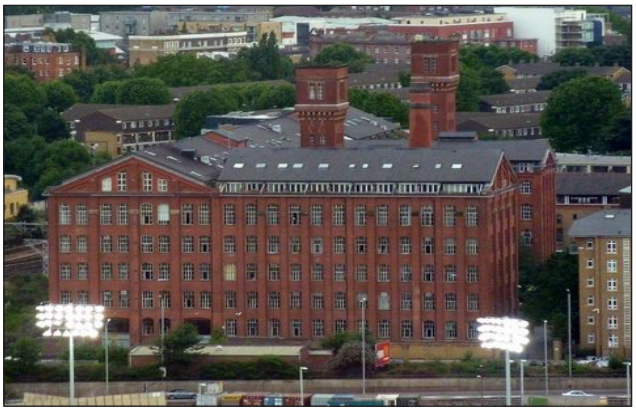
These two structures have generated an unexpected bonus for the industrial historian, by giving access to new views of some of the industrial sites of the area. During the Olympics it was possible to ride to the top of the Orbit and to enjoy the magnificent 360 degree views of the Olympic park and this part of east London. One building that was probably not on many people's radar was the (former) Bryant & May match factory in Bow. This has now been converted for residential use and is known as 'Bow Quarter', but remains one of East London's most important industrial sites.

Industries such as match-making were typical of the area, and the industrial activity on the north bank of the Thames continues this theme. 'Noxious trades' tended to be pushed eastwards of the City of London, partly because regulations on industrial use were far more lax east of the river Lea.

The sequence of wharves along this riverbank towards Silvertown illustrate the diversity of this past industrial activity. As we look downriver we see Clyde wharf (location of former sugar refinery), Pinchin's wharf (former Pinchin and Johnson paints and varnishes now Nuplex Resins), Peruvian wharf (location of former Anglo-Continental guano works with land now awaiting development) , Plaistow wharf (Lyle's Golden Syrup still in active production), Knight's Royal Primrose soap works (now J.Knight : Animal by Products). – and many more beyond, including Tate and Lyle's sugar refinery. Each wharf has a story to tell, but seeing these either by land or riverboat was always difficult or inaccessible. The cable car has changed all that. A trip is strongly recommended, not only for the views of the Greenwich peninsula, Canary Wharf and the Royal Victoria Dock, but for a glimpse of the area's past and present industrial activity. Much of it is changing, with new residential developments built or in the planning process.

The only criticism is that the cable car travels too quickly, and the opportunity to really study the area quickly disappears. This makes a return trip almost imperative!

The Orbit close to completion, with just the viewing gallery still boarded up, and the Aquatics Centre in the background.



The former Bryant & May factory in Bow as viewed from the Orbit, with the tops of the Olympic Stadium floodlights in the foreground.

The view of the industrial riverside of the north bank of the Thames as viewed from the cable car across the river. The main wharf in the picture is the site of Pinchin and Johnson's paint works which passed through various owners before being sold recently by AkzoNobel to Nuplex Resins, a NZ-based multinational company. Beyond that lies the vacant ground of Peruvian wharf, and then Lyle's Golden Syrup works.

Members' Contributions

Roger Cragg:
Early Reinforced Concrete Bridges in the West Midlands Region

The technique of building bridges and other structures using reinforced concrete was developed by a French engineer – François Hennebique (1842-1921). He appreciated that the weakness in tension of plain concrete could be overcome by placing steel bars within the concrete in regions where tensile stresses occurred, most notable in the bottom face of concrete beams. In France this technique was known at that time as Béton Armé and in Britain as 'Ferro-Concrete', a term which has now gone out of use but may still be encountered in older publications.

The construction of reinforced concrete bridges using the Hennebique technique started in the UK with Chewton Glen Bridge in Hampshire in 1902, the British agents for the patented process being L.G. Mouchel and Partners.

The oldest reinforced concrete bridge in the West Midlands Region is the 96 ft. span arch bridge at Stanford upon Teme in Worcestershire, built in 1905.

Stanford Bridge

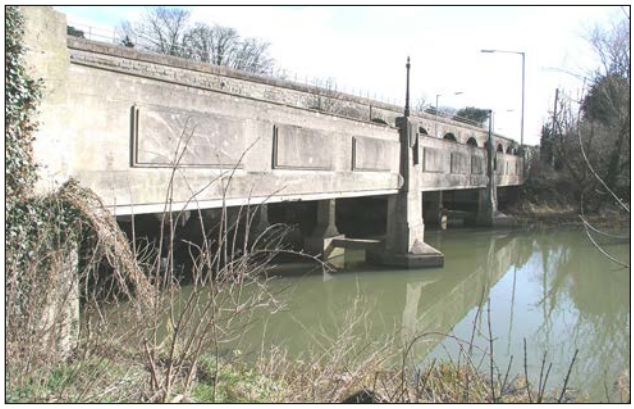
Another early bridge is Dogpole Lane bridge in Birmingham (SP061822) of 1908 with a skew span of 45 ft. This bridge has a very flat arch and is currently propped and awaiting replacement due to its inadequate strength.

Dogpole Lane Bridge

Early Mouchel-Hennebique bridges which also still survive in the Region are in Birmingham – Cranford Street Bridge (1906) SP035883 and Bond Street Bridge (SP052814) and Umberslade Road Bridge (SP053814) in Stirchley, both 1908. More locally there is Binley Road Bridge, Coventry (1911) at SP369786.

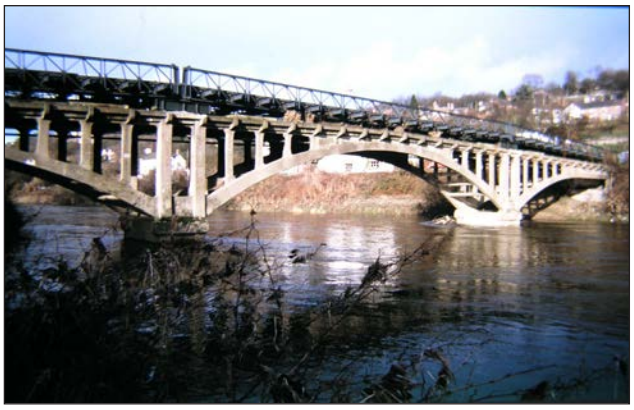
Bond Street Bridge

Princes Drive Bridge in Leamington Spa dates from 1923 but is of interest as it was built by the Trussed Concrete Steel Co.



Princes Drive Bridge

In 1909 a new reinforced concrete bridge was designed by Mouchel and Partners and built by the Liverpool Hennebique Company over the River Severn at Jackfield, downstream from the Iron Bridge (SJ681033). This bridge, named the Free Bridge as it was the only toll free crossing of the Severn in the area, had three open spandrel reinforced concrete arches of 66, 87 and 66 ft. span. Unfortunately, despite frequent repairs the concrete deteriorated and, due to its narrow width, the concrete parapets were subject to frequent damage by vehicles.



Old Free Bridge (1909)

In 1991, after lengthy discussion in which the author took part, it was decided to demolish the bridge and replace it with the present structure, a single span cable stayed bridge with a single tower on the south bank. The new bridge was opened in August 1994.

Also in Shropshire is Cressage Bridge (SJ594045), dating from 1913, with three spans of 40, 80 and 40 ft. It carries the B4380 road over the River Severn. A conventional reinforced concrete arch bridge, it is a good example of the transition from masonry to reinforced concrete, the external design, by Mouchel and Partners in conjunction with Shropshire County Council, being strongly based on masonry practice.

Cressage Bridge

Similarly dating from 1913 is Wergins Bridge over the River Lugg north-east of Hereford. (SO529447). It has a single span of 50 ft., was designed by the Considere Construction Company and built by Andrew Scott, Contractor, of Port Talbot. The bridge is rare in that it utilises the Kahn system of reinforcement. In this system the main horizontal steel reinforcing bars have 'wings' which are bent up at 45° to provide shear reinforcement.

New Free Bridge (1994)

Wergins Bridge

Another early reinforced concrete bridge over the River Severn is situated at Atcham, Shropshire (SJ541093). This large bridge has five arches of 60, 100, 120,100 and 60 ft. span. Until recently it carried the A5 Holyhead Road. It was built in 1927, parallel to John Gwynne's 1779 masonry arch bridge a few yards away, the original bridge being preserved for pedestrian use. Another Mouchel & Partners design together with Shropshire County Council Engineer Mr. W.H.Butler, the bridge used coloured cement and a bush hammered finished to match the Grinshill stone of the old bridge.

There is a fine bowstring arch bridge of 110 ft. span over the River Avon at Evesham dating from 1928 (SP034431) but this bridge is under threat.

Although reinforced concrete bridges continued to be built until the 1950s the technique has now largely been superseded by the use of prestressed concrete.

Members' Contributions

Martin Green, Peter Coulls, Peter Chater and George Sayell
End-Piece: The Archaeology of the Inevitable

It was the submission of photographs by Peter Chater that prompted thoughts about a (potentially) untapped source of material for the industrial historian. The archaeology of death sounds a distinctly unattractive topic, but the cemeteries, churchyards and funerals that record the inevitable do contain much material of interest. This ranges from the content of inscriptions as a source of information, through the materials and techniques used for gravestones and memorials, to the manufacturing of all the components for funerals, burials and cremations. No doubt members will have knowledge of local churches, churchyards and cemeteries that contain material of an industrial connection, and we would be delighted to hear of them. An obvious and well-known source would be London Road Cemetery in Coventry - designed by Joseph Paxton in the middle of the nineteenth century - where several of Coventry's most eminent industrialists are laid to rest including James Starley.

This is a serious component of archaeological study and I am reminded of a conference I attended at Ironbridge where a lecture on this theme was given by Dr. Harold Mytum, of the University of Liverpool, and an old boy of Warwick School. He is author of a book *'Recording and Analysing Graveyards'*, a CBA Practical Handbook in Archaeology. This theme also fits in well with one of our monthly meetings where Elizabeth Perkins (Director, Birmingham Conservation Trust) will talk on Newman Brothers Coffin Works in Birmingham. This is a fascinating insight into the wide variety of materials (including 'soft goods') that were produced in Birmingham and elsewhere to supply the industry. This tradition lives on with John Wilde and Co Ltd of Devon Street, Birmingham, Europe's largest manufacturer of funeral furnishings with factories in both Birmingham and Glasgow, although competition from China – where else? – has become a serious challenge.

A few examples of local interest are included here. Peter Coulls, writing below, answers the questions over the identity of John Whitehead Greaves and the reason he is buried at St Mary Magdalene's Church, Lillington, Leamington Spa; George Sayell reveals a significant memorial in Old Milverton churchyard to Philip Kench of Emscote Mill fame; and Peter Chater asks whether anybody has more information on buildings which might be described as 'mortuary chapels'

Who was John Whitehead Greaves (Born 21 June 1807; Died 12 February 1880) and why is he buried in this Churchyard? He was born in St Albans, Hertfordshire to John Greaves, a Quaker from Radford Semele and Mary (née Whitehead) in 1807 the third of four sons. His elder brothers were taken into the family banking business and he was advised to look elsewhere for employment such as Canada. In 1830 he travelled to Caernarfon, from whence transatlantic tickets were readily available. He appears to have been deterred from leaving after seeing the conditions which he would have to endure in order to reach the other side of the Atlantic.

Whilst in Wales he met Edwin Shelton and formed a partnership to take over a slate quarry in Llanberis. The partnership acquired new quarries in the Blaenau Ffestiniog area. The nearby Ffestiniog Railway, then in its infancy, enabled slate shipments to be taken to 'Port Madoc' which was being developed. In 1843 Greaves became Treasurer and ultimately the Chairman of the Railway Company that survives to this day as J.W.Greaves & Sons. At the age of 63 he announced his intention to retire to a house he had had built at Bericote (Bericote House) in 1870. He handed over the business to his son J.E.Greaves.

J.W.Greaves died in Brighton in 1880 as the result of injuries sustained in a riding accident. His body was returned to Leamington Spa for burial in St. Mary Magdelene. The Company he founded survives today producing slates and slate products in conjunction with operating a very popular tourist attraction, Llechwedd Slate Caverns, in Blaenau Ffestiniog.

(acknowledgements to *http://warkcom.net/live/cme810.htm* and *Victorian Slate Mining* by Ivor Wynne Jones, Landmark Publishing)

The Memorial to John Whitehead Greaves in Lillington.

George Sayell with the memorial to Philip Kench of Emscote Mill which is to be found in the churchyard of St James in Old Milverton.

The 'Mortuary Chapel' found by Peter Chater adjacent to Farnborough Churchyard. It is thought that the original use was to hold a body overnight awaiting burial. This was before there was a road network and bodies were carried sometimes a distance over rough tracks by hand to the church the day before burial.

September 2012: Martin Green

The Industrial Heritage of Essex - A Personal selection

The annual conference of the Association for Industrial archaeology was held in Essex this year, and the Chairman chose the industrial heritage of that county as the theme of the opening lecture of the season. He began by explaining that he was no expert on Essex, but hoped that the (perhaps unanticipated) delights of the industrial sites in the county might stimulate interest, and might even tempt some to make the intrepid journey eastwards.

Industrial activity pays no heed to county boundaries, but an additional complication in Essex's case is that the current county was previously a much larger area. The major difference is that a large strip of land bordering the river Thames on the eastern edge of the county is now part of Greater London. This strip had become extremely industrialised (including sites such as the Tate and Lyle sugar refinery at Silvertown and the Ford motor plant at Dagenham), and there was a case for treating estuary-side Essex as a specific area. Such an area would include Tilbury docks, passenger terminal and power station, as well as the oil terminals at Thames Haven. The estuary location has dictated the nature of industrial activity at these locations.

For much of the rest of Essex, the nature of the land, its underlying geological make-up, and the pattern of rivers (Stour, Colne, Chelmer and Blackwater, Crouch, Roach, Thames) draining eastwards into the North Sea have been powerful determinants of the pattern of industry. The land is generally flat, with no coal or metal ores, nor significant quantities of building stone. Agriculture has dominated - and continues to dominate - the landscape. Timber and brick have been the favoured building materials. Some parts of Essex (particularly the extensive areas of marshland) have been unproductive and remain relatively isolated. Isolation is not necessarily a handicap to the growth of industry – isolated areas make good locations for the explosives industry, for nuclear power stations and offer the potential for opportunist entrepreneurs to take advantage of a low-cost location.

In simplest terms, the geology of Essex is a bowl of chalk (outcropping in the north and south of the county) overlain with clay. The chalk deposits have been exploited in the past, but no activity remains. The chalk quarries in the south have been converted into housing estates, nature reserves and the huge Lakeland shopping centre. Given the geology, it is no surprise that brickmaking has thrived in Essex with large numbers of small-scale producers. One such works still in operation is the Bulmer Brick and Tile Company. The AIA visit to these works, led by owner Peter Minter, gave a fascinating insight into the world of producing bricks for restoration projects, including Compton Wynyates, St. Pancras Station and Hampton Court.

The rivers of Essex have long been utilised as a source of power and a means of trade and transport. River ports (such as Maldon with its salt works, broad estuary and Thames barges) and riverside and river-dependent industries have always featured strongly in any of audit of industrial activity. The improved natural waterway has been a stronger ingredient than the man-made canal. Essex has a very long coastline (particularly at high tide!) and coastal trade has been vital in overcoming the limited resource base of the county, with imports of coal from the north-east instrumental in achieving this.

The coal trade was the driving force behind the construction of the Chelmer and Blackwater Navigation which sought to supply coal to Chelmsford via Heybridge, and its story reflects many of the characteristic features of canal construction in England - local canal mania, commercial rivalries, eminent engineers (in this case, John Rennie senior), and construction controversy and crisis all had their part to play.

Riverside and canalside locations became prime sites for local industry, and Bentalls of Heybridge developed as one of the largest agricultural engineers in the country, let alone the county. A plaque on the wall of one of the few remaining buildings of the company in Heybridge gives some indication of this. It reads 'Bentall's Warehouse erected in 1883 by Edward Hammond Bentall, ironfounder and agricultural implement manufacturer, to hold up to 15,000 machines awaiting export.'

Power supply for these various activities reflected the development of technology throughout the land – wind, tide, water and steam power all made telling contributions, perhaps best exhibited at Beeleigh Mill and Langford Museum of Power. At Beeleigh, a long history of water mills and a later addition of steam power was curtailed by a disastrous fire of 1875 which left the water mill destroyed, but the (subsequently abandoned) boiler house, beam engine, and milling equipment of 1845 intact. The nearby Museum of Power houses one of the three Lilleshall Company vertical triple expansion rotative engines installed 1929-1931 that helped supply Southend with its water following the emergence of the town as a premier seaside location, much encouraged by the building of the London, Tilbury and Southend Railway. Both these fascinating sites are within easy walking distance of one another.

Processing the products of agriculture is inevitably one of the most prominent features of Essex's industrial landscape. The sugar beet industry of Felsted disappeared in the 1970s and many of the mill premises for other crops have followed a similar fate, or have been converted to other uses. East Mill in Colchester (now apartments after a brief spell as a hotel) and Moulsham Mill in Chelmsford (now a craft and business centre) are two such examples. The Marriage's Mill in Chelmsford remains as a working mill, although it now stands as part of a large modern milling complex comprising huge production buildings and flour silos, and modern steel-clad processing plants. It has long been a family firm, and still produces some stone-ground wholemeal flour as part of its product range.

Essex was described in one of the lectures as a collection of market towns, and Chelmsford possessed many of the criteria identified by Barrie Trinder in his analysis of the characteristics of the market town. For example, until the 1950s, every week Marriages's and other mill owners would visit Chelmsford Corn Exchange to buy wheat from local farmers and merchants, only for the Exchange to be demolished in 1969 as part of a 'redevelopment programme'.

Other food processing activities in Essex have prospered, and perhaps most notable of these is A.C.Wilkin and Co and their famous Tiptree brand of jams, preserves and chutneys. Originally arable famers, the Wilkin family moved into fruit farming in 1865, taking stocks by horse and cart to the local railway station for sale in London's market, and then, in 1885 turning to fruit preserving. The firm has prospered in recent years, and within a modern farm complex, a small museum exists at the Tiptree site. including exhibits on the Kelevedon, Tiptree and Tollesbury Light Railway, and opportunities, of course, to take the obligatory cream tea.

It was at this point that our Chairman had to end his talk because of time pressure, although he clearly had more to tell us, and perhaps there will be an occasion to hear the second instalment.

October 2012: Dennis Crips
A Living Dinosaur: From crystal sets to quantum computing in one lifetime

Dennis Crips' account of his engineering career was a journey through the technologies of the twentieth century. It was also a powerful endorsement of the dictum that it is the engineers who change the world – without them there would be no progress, little evolution of society and certainly much less of domestic comfort or convenience.

As Dennis said, his time as an engineer was a boy's dream. Every day was Christmas Day with new components, new techniques and new products; all of a smaller size, improved performance and lower cost a daily occurrence. Yesterday's hopes became today's realities – and, inevitably, were obsolete by tomorrow. And the process is continuing to this day.

The presentation, in four parts, covered some of the technological advances made over the past 100 years. First, the key technologies involved in creating the world in which we live. Second, the effects these had on a digital electronics designer. Third, the changing face of project management and finally, a look at some of the social and engineering problems which have arisen and which will affect us as in an uncertain future.

Looking at the technologies in more detail, silicon technology has allowed us to progress from the germanium crystal and cat's whisker radio of the 1920s to today's microchip containing tens of thousands of individual transistors. These chips, already quality controlled, are mounted onto multi-layered printed circuit boards using automated processes that minimise cost and increase reliability.

Digitisation is a highly efficient way of capturing an analogue world and using the resultant information. It has its origins in cinematography but in the digital transmission of both sound and vision, samples of the analogue signal are taken, digitised, transmitted and then reconstituted at the receiver. A single fibre optic cable can transmit up to 160,000 separate voice channels. It is also possible to mix voice, data and tv signals on the same cable.

The development of fibre optics has virtually eliminated data corruption and increased speeds, thus revolutionising communications of all kinds. It is a somewhat reassuring link with our industrial archaeological roots to know that much of the UK's fibre network, 'Fibreway', has been laid along canal towpaths. Access for the installation is relatively easy and the canals connect all major towns and cities. What would James Brindley make of it?

With all this digitised material, data storage was the last major technology considered. It has been a growing requirement driven principally by the needs for faster access, smaller size and ever decreasing cost. Over the past half century we have moved from relays, valves and transistors through integrated circuits to memory sticks. From paper to magnetic tape to floppy discs to CDs and DVDs. Size and cost have reduced by unbelievable factors as has power consumption whilst physical robustness is beyond compare.

Turning to design techniques, Dennis used the example of a bedside tea making machine to explore different methods. All begin from the need for a clear specification and the need to consider testability in commissioning and maintenance, how the device will be used, what can go wrong and what would be the consequences. We looked at designs based on electromagnetic relays, the practical approach, and ones using mathematical equations which led to computer programming to achieve the design objectives.

Following techniques came project management. Advances in technology give rise to increasingly complex systems and many schemes have failed through poor management. About 100 years ago Henri Gantt developed his eponymous chart, basically a bar chart with a bar for each critical element of the project plotted against time. It is still widely used today and enables an entire project plan to be captured on a single A3 sheet and be understandable by all parties.

In the late 1950s the US Navy introduced Programme Evaluation and Review Technique or PERT to manage the Polaris submarine project following several costly programme failures. PERT is sometimes known as critical path analysis and has become an internationally adopted process with an associated industry ranging from software to a professional body, the Institute of Project Managers.

Gantt or PERT or CPA all break down the work into well-defined work packages which can each be analysed for content, start and finish dates, dependencies on other packages, criticality to the project as a whole and resource requirements. Hopefully the project manager will get appropriate, timely feedback from whatever system he employs and complete his project, on time, to budget and satisfy his client. Lord Coe must have had an excellent project manager for the Olympics.

Dennis concluded with some cautionary tales relating to design responsibility and safety, security, artificial intelligence and finally quantum computing.

Responsibility for design and safety highlights the difficulties at the interface between the design engineer and the computer or software developer. Often some aspects of design and safety responsibility have been transferred to people who, although highly qualified in their field, may have little or no engineering background. Few if any design engineers want to learn high level programming languages or to be responsible for debugging the inevitable problems. Equally, the software specialist may not have an instinctive feel for things mechanical. Again, a crystal clear, fully detailed functional specification at the outset of a project is vital if problems are to be avoided.

The bedside tea maker involves pumping a kilowatt of power into a device sitting a few feet away from the head of a sleeping person. What if the siphon is blocked? The kettle becomes a potential bomb! Like quality, safety has to be assessed and built in at every stage of the design process, not bolted on afterwards in a so-called 'safety audit'. It was suggested that only a competent engineer was qualified to undertake such an assessment.

Today, many real-time systems such as motorway signals use two computers validating each other but only one is in control at any one time. Aircraft flight control systems will use three computers and a two out of three voting system. Such automation has led to catastrophes such as an aircraft ground test when the computer released the brakes with engines on full throttle and no pilot at the controls and an airliner plunging into the Atlantic in a deep stall with the loss of all on board.

Data security is not just preventing identity theft from computer systems. With the development of highly portable flash drives, DVDs and laptops the theft of data from the workplace is a new problem for society.

The problem of 'artificial intelligence' is not so much mankind's subservience to some master computer complex but the myriad occasions when a transaction cannot be completed because 'the computer is down', the effects of social networking on real person to person interaction and the often dangerous times when searching for that elusive mobile.

Finally, quantum computing might give unbreakable ciphers or driverless cars but will it also bring with it the surrender of human control to a machine? And who or what would be responsible for any catastrophic system failure?

Dennis twice quoted the examples of the Mars rover vehicles to demonstrate the achievements of engineering and science. They will probably continue to rove for many years yet and garner unknown information for our benefit.

Many of us echo Dennis's wish to be 50 years younger and to share the engineering design challenges that lie in the exploration of the universe in which we live.