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CHARLOTTE BRONTE AND THE AUTHOR PORTRAIT
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Above a pair of black doors adjacent to the junction of Ullesthorpe Road and Main Street Frolesworth is the coat of arms and motto VIRTUTI NON VERBIS (deeds not words) of Baron John Smith, Lord Chief Baron of the Exchequer of Scotland. Through the doors are the cottages and gardens of the Baron Smith Almshouses.

Coat of arms Baron Smith's almshouses

Baron John Smith was born in Frolesworth on January 6th 1656 the son of Roger Smith. He was a student at Gray’s Inn and was made a Baron of the Exchequer in 1702. Later he became Lord Chief Baron of the Exchequer of Scotland, a position he held until his death of dropsy on June 20th 1726 aged 70 in Frolesworth where he is buried. It is recorded that he was a man of great prudence, uprightness and integrity.

He had a chapel built in Edinburgh for the use of members of the communion of the Church of England and he also designed 4 cottages which were to be built in Frolesworth; “they were to be of brick and to be tiled with a brewhouse in common, each having a ground room and a chamber over it. They were to be built upon the Homestead at the Townsend of Frolesworth” this land he gave forever. He died in Frolesworth before they were completed but he directed in his will that if he should die before their completion, his Trustees and executors should complete them and also appoint the almshouses, four poor widows of the communion of the Church of England who are constantly to attend divine service in the parish church of Frolesworth. Each of the widows would receive £5 a year. The four cottages were duly completed and the four almshouses appointed.

His will also stated that any surplus money should be used to increase the number of almshouses or to increase their salaries. As there was surplus money, the Trustees decided to do both. Consequently 10 more Almshouses and 2 more Brewhouses in similar style to the former were built and each of the 14 poor widows received £12 per annum. By the end of the 18th Century sufficient money had accumulated from investments and rent for the Trustees to increase the number of Almshouses by building 4 more cottages and a brick wall was constructed to enclose the site. At the same time the payment to the widows was increased to £20 per annum and this remained unchanged until the middle of the 20th Century. The accumulation of more money led to further development in 1832 and in 1851 bringing the total number of cottages to 24 on 3 sides of a square.

In 1870 a chapel was created in the centre of the northern block of cottages and services are still held there twice a month.

A pump in the centre of the garden supplied the residents with water. The pan closets and baths were situated in a block at the south west corner, which now houses the boiler room for the heating system. In 1927 a reading room was built in the South East corner for the use of the residents; this room now serves as the Village Hall.

There has not been any additional building since that
of the Social Room but the cottages themselves have shown great changes. By 1953 major alterations had taken place when 3 cottages were made into 2 reducing the number from 24 to 16, giving each a living room, kitchen and separate entrance into the kitchen with a toilet and storage space off this passageway. Upstairs there was a bedroom and bathroom. More alterations occurred in the 1960s when a communal heating system was installed. The open fires which were their main source of heating and cooking were no longer necessary consequently these were removed along with the chimneys. In the late 1990's further changes gave each cottage a proper bathroom and in most cases the bath was replaced by a walk in shower.

The original scheme was revised in 1953 stating that the Almsperson may be required to contribute towards the cost of maintaining the Almshouses at a weekly sum of not more than a crown. It also allowed spinsters to be admitted, being women of good character of the communion of the Church of England. The rule was further relaxed to admit divorced ladies and in the late 1970s up to 4 married couples were allowed to take up residence. In the late 1990s single men were admitted for the first time. Currently there are 6 single ladies, 8 single men, and one married couple who are the warden and her husband.

In order to qualify for a cottage prospective inhabitant should be elderly, of limited means and able to look after themselves. Currently the age range is 62 to 88. When residents are not able to look after themselves they move elsewhere, however every effort is made to provide help for those who wish to stay. One cottage has had a stairlift fitted at the family's own expense; some residents have been helped by daily visits from carers.

There are 10 trustees, the rector of the parish who is also the Master of the Almshouses, 4 representatives of the parish, 1 representative of the deanery clergy, the district councillor, the county councillor and 2 co-opted; 7 of the trustees live in Frolesworth.

Although Leicestershire has fewer than a dozen Almshouses in its villages, three of these are to be found within 4 miles of Frolesworth. Like the Baron Smith Almshouses, these have been modernised and all Almshouses pay a contribution towards their maintenance.

The Reverend Stanley Burrough's Almshouses were built adjacent to the church in Sapcote in 1847. When he died he left money in his will to the benefit club but this will was found to be illegally made and it was used instead to build these Almshouses for 5 poor men of good character. These have been reordered into 4 units for married couples or single people of either gender.

In Ashby Parva the Goodacre Cottages are situated along the main road. Lucy Goodacre died in 1832 leaving her property to her niece Sarah Bowyer “to dispose of to such charitable uses as she should think fit”. She created the almshouses by converting existing cottages and adding to them to make a row of 8. In 1834 the charity was handed over to trustees who today still include members of the Goodacre family who still live in the village. The almswomen should be poor widows of good character; if there was insufficient money from land rent and investment to give a small stipend to the widows, vacant cottages were let to provide additional funds. Today these are still for women only with preference to widows.

Similarly funds were left for charitable purposes by Wakelin Welch Esquire and Elizabeth his wife, sister of the Reverend James Powell, rector of Bitteswell from 1789–1844, to their niece (daughter of the rector). Consequently the Welch & Powell Almshouses were built on the Green in 1847, consisting of 3 pairs of semi-detached cottages for families in need, being of low or no income. In the 1851 census out of a total of 14 residents 7 are specifically named as Almsmen or Almswomen. As well as modernisation of the cottages the charity built 2 flats which were completed in January 2014.

All these Almshouses were built during the last 300 years but the idea goes back many centuries to as early as 325 AD at the Council of Nicea. In 816 AD at the Synod of Aix, the Christian Church was encouraged to provide for the poor, the sick, widows and strangers with a monk or priest set in charge. Almshouses were established, closely linked to the church but not necessarily founded by it, maintained and supported by alms collected by the church. Almshouses were sometimes known as Hospitals, places of hospitality, looking after the poor and old not necessarily for the sick in today's meaning, and also travellers especially pilgrims. Bede houses were also established where the poor spent the rest of their lives praying for the souls of their benefactors. This often happened in the Almshouses and hospitals too but it was not the main reason for their foundation. The first recorded Almshouse was founded by King Athelstan in York in the 10thC.
With the conclusion of the dissolution of the monasteries by Henry VIII in 1539 and the Act for the Suppression of Guilds and Chantry under Edward VI in 1547, many of these establishments disappeared. However, some of these early foundations did survive notably Trinity Hospital Leicester, founded in 1330 by the blind Henry of Grosmont, Earl of Lancaster and Leicester, the “new work” on the south side of the castle to accommodate a warden, 4 chaplains, 50 poor and infirm people and 5 women to care for them.

The founder’s son, also Henry, greatly enlarged the establishment, the new charter naming the church dedicated to the Annunciation of Our Lady in the New Warke. The religious community was greatly increased and together with lay people looked after 100 poor men and poor women. The whole 17 acre site was enclosed within a wall with the main gateway in the east.

After 1547 all that remains is the eastern gatehouse, now called the Magazine, and parts of the Chapel of the Annunciation which lie in the basement of the Hawthorn Building of De Montfort University. Meanwhile the hospital continued under the patronage of the Duchy of Lancaster. It has experienced a chequered history because of financial problems partly due to the loss of Duchy lands. Some gifts were received from individuals but there was not enough money to maintain the buildings. In 1776 there was some rebuilding at the expense of the Duchy. The south aisle of the 14th century hospital was knocked down, the arches filled in and windows inserted.

A major blow occurred at the end of the 19th century, the corporation planned to construct a bridge across the canalised River Soar to connect the town with the growing suburb to the West; Trinity Hospital was threatened with demolition. There was opposition to this from many quarters including the Lit & Phil. This was partly successful. Six and a half bays of the medieval arcade were left but the rest of the building was knocked down and realigned. During the 20th century improvements were made as with all the other Almshouses but in 1995 a new purpose built residence was constructed just across the Newark Bridge. The Duchy of Lancaster still appoints the Chaplain and the Lord Mayor of Leicester is still the Master during his year of office.

The second major hospital foundation in Leicester was that of William Wyggeston the younger. In 1513 he founded the hospital for 12 poor men and 12 poor women adjacent to St Martin’s Church and the Guildhall. Funding came from Wyggeston’s Lordships, Manors, and lands some of which were part of the coalfields of northwest Leicestershire and some was land suitable for development. Consequently the income from the charity was and is far beyond anything that he could possibly have envisaged.

A new hospital was built 2 miles to the west of the town centre in 1867 with room on the site for expansion. One hundred years later at the beginning of the 1960’s expectations were higher and a new hospital was built behind the old one set in 5 acres of land with entry gained from the Hinckley Road. The hospital consists of new flats in a two storey block and a new chapel. The remaining 10.37 acres were sublet with a petrol station, shops, pub and low rise flats accessed from Fosse Road. A rapid rise in rents, all now professionally managed, made it possible to expand the hospital to 54 flats and to build a new block, Agnes House, for 26 frail elderly persons.

In contrast 80 miles to the south in Abingdon, the Long Alley Almshouses were established in 1446 and have been continually inhabited since then. Abingdon had a very rich abbey; there was great rivalry between the town and the abbey which resulted in the leading trade people of the town founding the Fraternity of the Holy Cross. They built the Almshouses for 13 poor,
sick and impoverished men and women on the west of St Helen’s churchyard. The act of 1547 meant the end of the Fraternity of the Holy Cross. However by 1553 it was found that Royal control of the town through a bailiff was not succeeding so in that year Christ’s Hospital was created by Royal Charter. This new body became responsible for all secular matters within the town including the Almshouses, with funding provided by bequests of several Manors and from a few properties formerly of the abbey. Today reordered and modernised the Long Alley Almshouses provide sheltered accommodation for 7 individuals.

On the south side of St Helen’s churchyard, Christ’s Hospital built the Brick Alley Almshouses in 1718 to replace an earlier Almshouse built in the early 15th C by Geoffrey Barbour, a merchant of Abingdon. Charles Twitty, who was born in Abingdon and moved to London to become deputy auditor of the Exchequer of Westminster, left money in his will of 1705 to maintain 6 poor aged industrious persons unable to maintain themselves. Twitty’s Almshouses were built on the North side of the Churchyard.

Under the will of Benjamin Tomkins, an ardent Baptist and a successful businessman, the Tomkins Almshouses were built on Ock Street in 1733 relatively close to the Baptist Chapel, specifically for poor Baptists. St John’s Hospital was re-established to the east of the town centre in 1801 being rebuilt by the Corporation to replace an earlier endowment by the Abbots of Abingdon for 12 poor persons without the Abbey Gate

Today all five of these Almshouses now modernised are under the management of Christ’s Hospital together with a new block of apartments opened in 1974.

Some hospitals were built for specific groups of the poor and needy e.g. the Royal Hospital at Chelsea founded by King Charles II for retired soldiers and the Fisherman’s Hospital in Great Yarmouth for decayed fishermen. Many of the City livery companies built homes for retired workers e.g. that of the Framework Knitters in 1729 in Hoxton, London, for retired workers of the knitting and hosiery trade. By the beginning of the 20th century there were no longer any suitable tenants as the framework knitting industry had gone. These Almshouses were sold in 1906 and the proceeds used to build 20 cottages in Oadby, Leicestershire, a site of the knitting industry. Further building of cottages and flats means that today there are 39 residents all retired with limited means having worked for the majority of their lives in the knitting industry.

These are a few of the hundreds of Almshouses that exist. 1,700 independent Almshouse charities belong to the Association of Small Almshouses of which the Baron Smith Charity is a member. These 1,700 Almshouses provide homes for 35,000 people, not much in terms of the total population but in some cases absolutely vital for the people concerned. They form an important part of our social history and many of them are listed buildings consequently forming an important part of our architectural heritage.

Some Almshouse charities have closed because of changing demands or the original criteria being unable to be fulfilled. Some cannot be modernised owing to their structure or the lack of money. For those that are listed buildings, alternative uses must be found e.g. the Fisherman’s Hospital in Great Yarmouth has been converted into 9 private residences. The livery company of Ironmongers built Almshouses in Shoreditch in 1714 and this listed building is now used for the Geffrye Museum of the Home.

Each of these Almshouses has its own unique history; nevertheless they all have features in common. They are all concerned with maintaining the independence of their residents and are run by a small group of locally recruited voluntary trustees often with the help of a paid clerk and a warden. Today they rely on the residents making a contribution towards their maintenance. Increasingly national and local governments have played a major role in looking after the elderly but these independent charities have an important role to play in their care and concern for the residents for whom they are responsible. I am quite sure that if Baron John Smith, William Wyggeston, The Fraternity of the Holy Cross and all the other benefactors could come back today they would be quietly satisfied to see that their original wishes had been carried out. Baron Smith’s motto, Deeds not Words could justifiably be used by all of them.
A PLAIN HOUSE ON A HILL
EVELYN WAUGH’S LAST HOME: COMBE FLOREY

Mr Alexander Waugh

Lecture delivered on 19th October 2015

General Editor of OUP’s The Complete Works of Evelyn Waugh
Honorary Research Fellow University of Leicester
Reconstructed from contemporaneous notes made by Geoffrey Lewis
Sponsored by the University of Leicester

Combe Florey is a small north-Somerset hamlet on the south-westerly edge of the Quantock Hills with a pub, a church built of the local rose-red stone and several listed buildings.

Evelyn Waugh, the greatest English novelist of his age, bought Combe Florey House in 1956. The original house was built in 1680 and was the principal house in the village situated behind the village church of St Peter and St Paul. Substantially altered to become a handsome, 18th century building with a fine staircase dated 1721, it has an elegant, raised ground floor and circular hall that divides the house, and is approached through an Elizabethan gatehouse, up a looping drive.

For Waugh, the purchase of Combe Florey in 1956 consolidated his sense of himself as a gentleman a role which he believed was the foundation for ‘all our national greatness’. But he never explained what he actually meant by the term. He, like most of us, assumed that you simply knew a gentleman when you saw one.

Waugh had a passion for houses and was constantly altering those he inhabited. Charles Ryder, Waugh’s alter ego in Brideshead Revisited states that “men are much less than the buildings they inhabit. A house has a life.”

Waugh published the first (and only) volume of his autobiography, A Little Learning, in early 1964, and dedicated it to his father Arthur Waugh. Evelyn also corresponded with his brother (Alec) to “regularise” the “Waugh Coat of Arms” which consisted of stars and a sheaf of corn.

Two views of Combe Florey where Evelyn Waugh wrote his last books and where he died.
He was buried in a private plot beside the church in the village in 1966 (courtesy of the estate of Evelyn Waugh)
Evelyn Waugh died suddenly in April 1966 at Combe Florey House aged 62. After a Latin mass in the parish church at nearby Wiveliscombe on Easter Sunday, he had failed to turn up at lunch and was discovered, dead of a heart attack, in the downstairs lavatory.

Waugh’s wife Laura continued to live in a wing of the house, and his eldest son Auberon Waugh moved into Combe Florey House with his family in 1970. Evelyn Waugh’s important library had been sold after his death to the Harry Ransom Humanities Research Center, University of Texas at Austin. Auberon restored the former library painting it jet black. The black paintwork complemented the William Burges furniture. Auberon lived there until his death in 2001.

Alexander Waugh is Auberon’s eldest son and was seven years old when he moved into Combe Florey with his family in 1970. After his father’s death, Alexander lived there with his sister Daisy until the house was sold out of the family in 2008. He now lives about fifteen minutes away from Combe Florey.

Combe Florey village had been the home of several notable literary personalities in its time. The wit the Reverend Sydney Smith, lived in the Old Rectory and was the village’s incumbent rector from 1829 until 1845. There is a window and a plaque to his memory in the church.

Terence Rattigan, the dramatist lived in the Old Manor House with his parents in the early twentieth century. The grounds of the Old Manor House extended to about seven acres and included a trout stream.

Prior to buying Combe Florey, Evelyn Waugh had lived in Piers Court, nicknamed by him “Stinkers” because it was set in the pretty Gloucestershire village of Stinchcombe. Waugh bought the house for £3,600 in 1937, having been given the money by his future mother-in-law when he married Laura Herbert, his second wife.

He quickly fell in love with it. A fine Georgian construction, it partly dated back to Elizabethan times, with an interior more elegant than palatial. During the Second World War, while Waugh was serving in the Army, the house was let to nuns for £600 a year, and used as a convent school. (A similar fate befalls Brideshead during World War II.) He wrote *Scoop*, *Brideshead Revisited*, *Men at Arms* and *Officers and Gentlemen* while living at Piers Court, making it a true place of literary pilgrimage.
Ford Madox Ford’s series of four novels about the First World War appeared between 1924 and 1928, and were later known collectively as Parade’s End. During Ford’s lifetime they were his most successful books, both critically and commercially, being reprinted many times before the Wall Street Crash; and then again after his death and WWII in four early orange Penguins in 1948. If the series has been less read than Ford’s better known pre-war masterpiece, The Good Soldier, it has increasingly become established as his best post-war work, and the greatest British fiction about the conflict.

When the BBC (with HBO) produced an opulent five-part adaptation of Ford’s Parade’s End in 2012, clearly in anticipation of the WW1 centenaries, many commentators assumed it had lain unknown since its original publication in four volumes between 1924 and 1928. Yet there had been an earlier version, also produced by the BBC, in 1964 (starring among others a very young Judi Dench). 1964 was of course the fiftieth anniversary of the outbreak of the war; and the year the BBC aired its landmark documentary series The Great War. Why is it that adaptations of Parade’s End have figured in both the half-centenary and centenary commemorations? No doubt serendipity had something to do with it. The Bodley Head selected edition of Ford’s work began to appear in the UK from 1962–3, edited by Graham Greene, including the first three volumes of Parade’s End alongside The Good Soldier, some poems, and Ford’s historical trilogy The Fifth Queen, about Henry VIII, Katharine Howard and –yes – Thomas Cromwell. So Ford’s novels had renewed currency as the half-centenary approached.

Similarly, Ford came out of UK copyright in 2011, leading to a number of new editions – including the first annotated one (also the first critical edition), from Carcanet Press¹. Parade’s End was thus again in clearer view just before the centenary.

A comparison of the two BBC versions, each fascinating in its own way, can tell us much, not just about Parade’s End, but about changes in British culture over the last century, and in the way the First World War has been remembered. We also need to bear in mind that the text exists in different versions too. Besides the issue of whether it should be considered a trilogy or tetralogy, there is the difference between experiencing it as one large work in several sections, or as a sequence of separate books. The Carcanet edition separated it out again into its four constituent novels, not merely to allow space for substantial introductions, annotations and critical apparatus; but also to let the distinctiveness of each volume stand forth. We wanted to get behind the monolithic versions presented by the Bodley Head edition, or the 1950 Knopf one in the US, which was the first to use the collective title Parade’s End (which Ford had suggested), and which brought all four novels into one vast volume. Reading them separately gets us closer to the experience of the work’s first readers. When they finished the opening volume, Some Do Not . . ., in 1924, it wasn’t just that they wouldn’t have known how the story might continue; they wouldn’t have known if it would continue at all.

In that first novel, Christopher Tietjens and Valentine Wannop meet, and fall in love before the war. But they are both people of high principle, and he is married – admittedly to a vindictive woman who’s been having an affair. Nonetheless, Tietjens feels it isn’t done for a man to divorce a woman, so he holds himself back from any consummation with Valentine. In the novel’s second half, the war has broken out, and Christopher is in the army and has served in France and got shell-shocked. He’s back in London, and sees Valentine again; this all about five years after their first meeting. This time they very nearly become lovers just as he is about to go back to the Front, but again he feels it would be the wrong thing to do, not least in case she got pregnant and he got killed. So the novel ends with him about to go off to the war again.
In romantic terms it’s a very unsatisfying plot; but very true to the emotions of the time. How many lovers and would-be lovers had had to part, not knowing if they would ever see their loved ones again! None of the reviewers seemed surprised by this very open, bleakly inconclusive ending, or commented on whether there would be a sequel or not. It was only with the publication of the next volume, No More Parades, which took Tietjens back to France and the war, that Ford provided a prefatory letter which made it clear he was thinking of a series:

Some Do Not [...] showed you the Tory at home during war-time; this shows you the Tory going up the line. If I am vouchsafed health and intelligence for long enough I propose to show you the same man in the line and in process of being re-constructed.²

Though again he left it open whether he was then planning just one further novel, or two. Considering the books as separate episodes, with an uncertain future, enables us to see how Ford developed the work in the form of a sequence with gaps, so as to evoke the uncertainties and inconclusivenesses of the time, set against the terrifying finalities which were always in the background, and which keep looming as each novel ends.

The different adaptations are revealing about changes in the medium of television, and the institution of the BBC over the last fifty years. The 1964 version was filmed in black and white (the BBC began broadcasting in colour in 1967). It was shot for screens with a narrower aspect ratio than today's widescreens, and which were generally smaller. The production values were minimal. Most of the action was shot indoors, including the battle scenes, which are mostly confined to a hut and adjoining trench and dugout structures, and involve only a handful of extras. The BBC showed clips from this version in its 2012 documentaries on Ford and on the new version, but wouldn’t consider the version broadcastable for today’s tastes.

Nevertheless, it remains a powerful adaptation on three counts. First, the acting, which is superb. Ronald Hines is a compellingly disturbed and disturbing Tietjens – nervy, distracted, compulsive; Jeanne Moody a glamorous, cruel Sylvia, his wife; and Valentine is played as an intense ingénue by Judi Dench. They, and the supporting cast, were products of the tradition of character-acting trained for the stage, and the television and cinema style of the period was more theatrical than today’s viewers expect. Tietjens’ fellow civil servant Macmaster, or his godfather General Campion, are exaggerated, caricatured, in the way we might still expect of an adaptation of Dickens, perhaps, but which jars against the norm of easy realism. The style of characterisation suggests a satiric edge, capturing Ford’s analysis of the performativity of pre-war social formality – precisely its ‘parade’; and also his intimation of a madness never far below the regulated surface.

Second, this style of performance is intensified by a corresponding visual style, featuring a marked chiaroscuro in the lighting, rapid and sometimes disorientating switches of close-ups, which turn the period character-actors into a gallery of grotesques. The inspiration here seems the modernist cinema of Russia (there is a private Eisenstein in Ford's sequence) and Germany, with its expressionist roots; and its translation into the Anglo-American mainstream by directors like Hitchcock and Orson Welles, and Carol Reed in The Third Man (1949).

There is also, third, a political style at work. This first adaptation was made when broadcasters’ faith in attention spans was greater, and when the public service ethos of the BBC was committed to disseminating works of major intellectual and literary significance. Hard to imagine it now putting on a 13-part dramatization of Sartre’s Roads to Freedom trilogy, as it did in 1970. If viewers of the 1964 Parade’s End stayed tuned in, they could have seen an instalment of The Brothers Karamazov the same evening. If that makes it sound like Great Books television, the example of Sartre makes it clear that it wasn’t the costume drama heritage industry it has since become, with its endless recycling of Jane Austen and Dickens. Marxism and Existentialism were very much in fashion, and the programmers wanted to get people excited about big questions and radical ideas.

Ford might not seem the obvious figurehead to choose for such a vision. Too much of the criticism about him is fixated on his attraction to the idea of Toryism, and to the figure of the English gentleman. Yes, Parade’s End has as its central character an example of the Edwardian landed gentry, Tietjens of Groby, already beginning to look rather old-fashioned and nostalgic. But he is also someone who sees through the hypocrisies and stupidities of that world. Someone continually offering scandalous analyses of society, and continually behaving in ways that shock the...
conventional. Incidentally, his class positioning has little to do with Ford's own circumstances, derived from English bohemian painters on his mother's side, and with a German intellectual and musicologist for a father. What the 1964 version gives us is a picture of the English establishment on the eve of the First World War – the civil service that the protagonist, Christopher Tietjens and his brother both work for; county families; a General; vicars; bankers; a cabinet minister and so on. But it presents them as caricatures: exaggerated, mannered, idiosyncratic to the point of insanity, and in some cases beyond that point.

The other co-ordinates the creators of this 1964 series seem to have had in mind were more radical still. Only the previous year, Joan Littlewood’s Theatre Workshop production *Oh What a Lovely War* had been so successful at the Theatre Royal, Stratford East, it had transferred to the West End. It may seem too big a stretch to claim any similarities of technique or politics between Littlewood and Ford. Certainly, Ford's overall view of the war isn't reducible to the formula of ‘lions led by donkeys’, as in Alan Clark's book *The Donkeys* that provided one of Littlewood's sources. But what there is plenty of in the Ford, is a version of the Absurd which has much in common with the critique of European political insanity in *Oh What a Lovely War*. The golf club thrown into turmoil by the Suffragette protest; the lavish breakfast scene interrupted by the obscenities of the insane vicar; Tietjens getting his shell-shocked fellow officer McKechnie to play a game in which he composes sonnets for McKechnie to translate into Latin; the arrival of Tietjens’ wife at the base camp in France, and the ensuing brawl with a drunken general trying to get into her bedroom: these are all as strange, subtle and dark as the theatrical juxtapositions in *Oh What a Lovely War* of sentimental propagandistic song and projections of chilling casualty statistics. They draw us into a destructive irrationality that is not only in war, but latent in pre-war society too. Such a critique of the insanity and absurdity of the political status quo had returned writ larger in the 1960s, with the Cold War, and the threat of nuclear holocaust.

Where this reading of the work comes across most clearly is in the Brechtian anti-naturalism of the title-sequence, a two-dimensional collage, done on a shoestring but no less powerful for that, involving suffragette placards, and surreal transitions, such as when a soldier’s trench periscope shows us not the dead of no man’s land, but a high society group portrait photograph, with an expressionist skull superimposed on a woman’s head. There is also more than a hint of Kurt Weill in the jaunty dissonance of the accompanying march-like sound-track. If this is the Edwardian Tory mentality, it’s seen through the eyes of modernism: Eisenstein; Brecht; Murnau. To set the series up in this way is to offer the novels too as major works of modernism; which they are – just as pervasively composed in terms of dislocations of time, and space, and narrator, as anything in these fellow modernists.

Fast-forward nearly half a century. The 2012 version, again for the BBC, but this time in partnership with HBO, stars Benedict Cumberbatch and Rebecca Hall, and was adapted by Sir Tom Stoppard, who was reported in the *Guardian* as being ‘hopeful that the BBC2 drama will restore Ford's reputation, placing him alongside authors like DH Lawrence and Evelyn Waugh in the pantheon of early 20th century greats.’ This version also used a visually experimental title sequence to suggest modernist affinities: a triangulated pattern of mirrors reflecting the credits and moving as they changed. Here the allusion is more direct: to the photographic experiments by the American photographer Alvin Langdon Coburn, who was a friend of Ezra Pound, and who, when Pound was talking about Vorticism with Wyndham Lewis, started experimenting with a set of triangularly placed mirrors to fragment the picture surface. He called them vortographs, and he took several of Pound, from 1917:

The director of the 2012 version, Susanna White, said she was thinking about how the idioms of the visual arts were changing in the period the work is set. The vortograph device also suggests something about point of view, and how that is deployed in the novels. And it also conveys the central feature of the plot: the love triangle.

Visually this version is brilliantly imagined. And that imagination often also works by intensifying realism to the point where it turns into something else: a work of visual art, in which the lavish costumes and elaborate sets are composed like a Pre-Raphaelite painting or an Edwardian ‘Grand Manner’ portrait. This visual intensity can lend a transcendent, poetic quality to the images, which goes beyond the Edwardian costume drama mode of say *Downton Abbey*, with which...
Parade’s End was inevitably compared. Susanna White manages to get this quality out of very different kinds of scene: the social encounters; battle scenes; scenes of passion.

The screenplay, by Sir Tom Stoppard, is perhaps more in tune with this second method – achieving psychological depth through the intensity of visual and verbal surfaces – than with the formal fracturing exemplified by Vorticist art. Parade’s End represents a massive challenge to an adapter. Its mix of free indirect style and interior monologue tell us much about what is happening inside the characters’ heads that their dialogue doesn’t tell us. And sometimes an omniscient voice tells us more about the characters than they might know themselves. To have managed to convey as much of this as the 2012 version does is a considerable achievement. But Ford’s text presents a further kind of difficulty in the narrative ‘time-shifts’ he was proud of having pioneered through his collaboration with Conrad, and perfected in The Good Soldier. Parade’s End, too, does extraordinary things with time. It moves back and forth through time at several different levels: not only within a character’s thoughts, but in the narrative structure itself. There too the movement occurs on different levels. The shuttling of the narrative present back and forth even within a chapter, as happens in the first few chapters of Some Do Not . . ., produces a fractured and disorientating text that alienates a lot of today’s readers, never mind what it would do to today’s television audiences if followed faithfully. The time also shifts between the parts of the novels. The first half of Some Do Not . . . is set around 1912; the second, around 1917. In between, the war has broken out; Tietjens has served in France, and been shell-shocked. Very little of that experience is narrated; only the fragments he can recover – the novel’s structure brilliantly capturing the amnesia he is battling against. Or the third novel, A Man Could Stand Up –, is structured as a triptych. The shorter, outer sections, take place on Armistice Day; the opening as Valentine, who is teaching in a girls’ school, is called to the ‘phone to be told that Tietjens has returned; the conclusion describing their reunion. In between, the narrative flashes back to the Western Front, and the German Spring Offensive of 1918, months before, and recounts his near-death which makes clear the precariousness of that reunion.

Stoppard had to rewrite the text extensively to produce his version. As an interview with Victoria Glendinning makes clear, it was the architecture of the novel and the series that had caused most difficulty in the adaptation process:

Set before and during the First World War, in which Ford had served, “Parade’s End” is a whirlwind of a work, four novels put together as one, and stylistically a challenge, with a “baffling structure”, Stoppard says. “The difficulty in writing a series, as opposed to a film, is that each episode has to come to something.” He had trouble with the third episode, “I really got it completely wrong.”

Stoppard’s solution was to rearrange the modernist, time-shifted architecture of the tetralogy into a much less challenging chronological order; with the effect of making the series a more realist work than the one Ford wrote.

Glendinning seems not to realise the last volume is all set quite a bit after the war as well. And that’s crucial. Because one reason Parade’s End seems to lend itself to such commemorative projects on the national television station is precisely its panoramic sweep: in space, from London to the South East to Germany to Yorkshire to France and Belgium and back to England;

One major shift in our way of thinking about WW1 is that it’s now approached from a post-Holocaust perspective, and in terms of trauma studies. The 2012 version of \textit{Parade’s End} is inflected by this contemporary agenda, more concerned with what’s repressed than what can be uttered. It’s a version for viewers who have read their Pat Barker (or at least seen the film of Regeneration), and know about Craiglockhart mental hospital and the work of W. H. R. Rivers.

But there’s another major difference. \textit{Parade’s End} is a work profoundly concerned with memory. Tietjens’ memory is prodigious – before the war he goes around tabulating the errors in the latest edition of the \textit{Encyclopaedia Britannica} in his head. But, like Ford, when caught in a shell blast he suffers from amnesia. The story is not just about his personal mental regeneration, but also about how the war will be remembered. The title of the second volume, \textit{No More Parades}, alludes to a discussion about how the Kitchener Battalions of volunteers were to be disbanded after the war; just as the title of the fourth, \textit{Last Post}, focuses on how the dead are commemorated. It was evident we were entering into a new phase of relationship to the First World War when Harry Patch, the last surviving veteran, died seven years ago in 2009. There is a sense in which the war itself has passed into amnesia, now there are no living witnesses who actually remember it. All we have is cultural memory. So it’s not surprising that our historians and critics have become increasing preoccupied with the cultural memory of the war: From Paul Fussell’s \textit{The Great War and Modern Memory} to Jay Winter’s \textit{Sites of Mourning, Sites of Memory}.

The 2012 version of \textit{Parade’s End} is a product of this commemorative paradigm. In 1964 there were enough survivors for the BBC to interview for its Great War series. 1914 seemed long enough ago to need commemoration, but was recent enough to seem part of the same world. And modernism still seemed modern. By 2014 the Edwardian past seems truly a foreign country, and modernism itself feels like a historical phenomenon, especially to those born postmodern or born digital. In 1964 it was still possible to see \textit{Parade’s End} as making criticisms relevant to the contemporary status quo. Alec Douglas Home, the Conservative prime minister who had just been defeated by Harold Wilson in October 1964, would not have seemed out of place in the clubs and drawing rooms of \textit{Parade’s End}. But for a 21\textsuperscript{st} century audience, the creators of the 2012 version appear to have assumed that it can only be a period piece. But then ‘Period’s End’ was probably a suggestion hovering around somewhere in Ford’s extraordinarily fertile imagination.

\begin{enumerate}
\item Victoria Glendinning interview ‘Versions of Stoppard’, From \textit{Intelligent Life} magazine, September/October 2012; accessed 23 December 2015: \url{http://www.intelligentlifemagazine.com/content/arts/versions-stoppard}.
\item See Paul Skinner’s introduction to \textit{Last Post} (Manchester: Carcanet 2011) for a definitive discussion of the temporal positioning of the final novel.
\end{enumerate}
In 1815 the English canal surveyor and land drainer William Smith (1769–1839) produced the first geological map of England and Wales, arguably the first of any country in the world, based on principles of the regularity of the sequence of strata and on the identification of strata by the fossils they contain, principles which he himself conceived while working in the area around Bath. Although today the map is regarded as an icon of geology, its production was far from straightforward and sales were disappointing.

William Smith was born in the Oxfordshire village of Churchill, the son of a blacksmith, on 23 March 1769 (Figure 1). He received a village school education, but showed an aptitude for reading, arithmetic and measurement. At the age of eighteen he was taken on as an assistant to Edward Webb (1751–1828), a land surveyor from the nearby town of Stow-on-the-Wold. In 1791 Webb sent Smith to survey coal mines on an estate in Somerset to the southwest of Bath, and in 1794 he was appointed to survey the route of the proposed Somerset Coal Canal which would link to the Kennet and Avon Canal and thus open up a route to London for coal from the Somerset mines. During his time working for the canal company, Smith realised that the sequence of the rock strata in each of the two planned parallel branches of the proposed route of the canal was identical, with the same rocks, in the same order and with a gentle tilt towards the southeast. He also noticed that each stratum contained distinctive fossils which could be used to identify its position in the rock sequence. Travelling around England, Smith saw that his observations in Somerset applied more widely across the country (Torrens, 2004, 2016).

In 1799 Smith lost his job with the canal company and set up in business as a land drainer and surveyor, based in premises at Trim Bridge in Bath. By 1801 Smith had drawn up a simple geological map of the area around Bath and had prepared a small map of the geology of England and Wales, showing the outcrop distribution of his strata across the country to the north and east. Encouraged by his friends Benjamin Richardson (1758–1832) and Joseph Townsend (1739–1816) to publish his discoveries on the sequence of strata and their contained fossils, Smith issued a prospectus for a work on the strata of England and Wales in 1801. John Debrett (1753–1822), who had agreed to publish it, was declared bankrupt that year and it was to be over ten years before Smith found another publisher, the cartographer John Cary (1755–1835), although...
he had been in contact with Cary about maps for his Somerset Coal Canal work. During the first decade of the new century, Smith travelled extensively on drainage and surveying commissions and took every opportunity to record the rocks and fossils he saw. Soon after Debrett’s bankruptcy, Smith changed his ideas on what his work on the strata might be and settled upon the idea of a large scale map with an accompanying explanatory memoir (Sharpe & Torrens 2015). During this period, Smith regularly attended agricultural gatherings organised by the Duke of Bedford at Woburn and Thomas Coke of Holkham Hall in Norfolk, seeking subscribers to his project, and expounding upon his ideas of strata and the value of fossils to those present. It was at this time that he earned the nickname, “Strata Smith”. His map, he reckoned, would be of value to agriculturalists as it would show the underlying bedrock and be indicative of soil types and drainage, and to landowners seeking minerals such as coal, limestone and iron, the bedrock of the Industrial Revolution then underway in England.

With Cary as his publisher, Smith was able to use perhaps the best available topographic base map for his geological map, Cary’s New Map of England and Wales, with Part of Scotland of 1794, but with much of the detail specially simplified to prevent it masking the geological lines. On a scale of five miles to one inch and comprising fifteen separate sheets which came together to make a complete map measuring 2535 by 1770 mm to the engraved margin, it took nearly three years to prepare the fifteen copper plates for printing. The sheets were hand coloured by a small team of specialist colourists employed by Cary, although once production increased in late 1815, Cary took on additional colourists whose work was not up to Smith’s exacting standards and which resulted in a quarrel between Smith and Cary or one of Cary’s sons.

Although carrying a date of 1 August 1815, A Delineation of the Strata of England and Wales, with Part of Scotland and its accompanying Memoir were not published until early September 1815 (Figure 2). Both were dedicated to Sir Joseph Banks, President of the Royal Society, who was Smith’s leading sponsor, having met him at an agricultural meeting in 1804 and been much taken with Smith’s ideas. Banks and the Duke of Bedford were amongst the first to receive copies of Smith’s map. About twenty copies were distributed in September and October 1815, but the main issue of the map was from 2 November 1815 when Smith decided to begin signing and numbering his maps (Sharpe 2016).

The Memoir lists 410 subscribers to the map, but few of these had paid in advance, and when the map was finally published, some refused to take their copies, and at least ten named on the list had died during the map’s ten-year long gestation (Figure 3). The map was on sale at prices from five guineas to twelve pounds, depending on format, prices that were not inconsiderable, especially following the end of the war with France at Waterloo in June 1815, the aftermath of which plunged England into a deep economic recession which hit agriculture, the potential purchasers of the map, particularly badly (Sharpe & Torrens 2015). Recent research shows that perhaps only about 330–350 copies (of which, perhaps 130–150 survive today) were produced, so not all of those named on Smith’s subscribers list got copies, and some copies went to people not on the list. Those who did purchase a copy were not all sold the same map; in addition to complaining to Cary....
about the variable quality of some of the colouring, Smith continually revised and altered the map, which can be seen clearly in changes to the representation of the geology of the Isle of Wight (Figure 4). These revisions which must have been a source of irritation to Cary. Despite this, however, Cary continued to support Smith’s publishing of his later cross sections, reduced map of England and Wales, and county maps into the 1820s. The variants of Smith’s map were first catalogued by Eyles & Eyles (1938) and his publications, including the later sections and maps, listed in a bibliography by Eyles (1969).

Although publication of a rival map of the geology of England and Wales by the Geological Society in 1820 must have impacted upon the sales of Smith’s map, it did not bring about its demise, and nor did it sell well. Sheets of Smith’s map were still being printed in the 1820s and it is now known that several maps were produced as late as 1836, just a few years before Smith’s death in 1839. The existence of several annotated copies of the Memoir in the Smith Archive in Oxford shows that in 1834 he was planning to issue a revised edition, and it may be that the copies of the map known to have been produced then are either an issued second edition or at least proofs thereof. These may reflect a new-found confidence in his work following his belated recognition in 1831 by the Geological Society as “being a great and original discoverer in English Geology & especially for his having been the first to discover & to teach the identification of strata, & their succession, by means of their embedded fossils.” and his christening by Adam Sedgwick, President of the Society as the “Father of English Geology”.

Smith’s map was not the first to show the distribution of strata, but it was arguably the first to represent the strata on a map in such a way that it was possible to predict the extension of the rocks below ground, an invaluable aid to finding horizons of economic value. He did this by shading the base of each stratum in a darker tone, fading to white towards the top, so that a viewer can visualise how the beds are dipping and their relative order (Figure 5). This technique was expensive and time-consuming to do well (hence the argument with Cary) and was used almost exclusively by Smith.

Today geological maps use symbols to indicate the orientation of the strata. His use of an index of colours
arranged with the oldest at the bottom and younger towards the top, standard on today's geological maps, provides an easy visual indication of the order of the strata (Figure 6). In a comparison with the modern geological map of England and Wales issued by the British Geological Survey, Smith's map stands up well, especially in the straightforward southeasterly-dipping Mesozoic sequence of southern and eastern England. Not only are the boundaries of his major rock units accurate, but many of the colours used by Smith are those still seen on today's maps (Wigley et al. 2015). It is an icon of the science (Sharpe 2015).

**Figure 5.** Detail (part of Dorset) of Smith's map showing the graded shading of the individual strata, the darker tone at the base, fading to a lighter tone to indicate beds dipping towards the south and east.

**Figure 6.** Key to Smith's 1815 map, with the beds arranged in stratigraphical order

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**References**


FROM TEST TUBE TO TURNER – THE ROLE OF THE CHEMISTRY IN ART

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Summary by Professor J. H. Holloway.

Introduction.

Most galleries arrange their collections in chronological order and to the average viewer it is often the changes in style, fashion or subject matter that is indicative of the passage of time. Far less noted is the change in the nature of the paint with time, but the evolution of chemical techniques and new chemical discoveries can be mapped on to the development of new pigments and their use in artworks. Human beings have long felt the need to try to interpret what they see and feel by drawing and painting. Paint as we know it, consists of four elements; pigment, binder, additives and solvent. The ideal paint needs a pure pigment, even particle size which is uniformly distributed, a transparent binder and the correct flow and drying characteristics.

Pigments.

There are numerous comprehensive reviews which chart the chronological development of pigments and new pigments have been seized by artists to help express themselves using a variety of media. White light can be split into a range of colours (red, orange, yellow, green, blue, indigo and violet) and the colour we see in substances arises because some substances absorb some of these colours, and we see a blend of the remaining colours or they reflect some of the colours and we see a blend of them. Pigments fall into two categories some, known as inorganic substances, are metal based while others, called organic substances, consist of chains of mainly carbon atoms inter-dispersed with a few other elements, mostly hydrogen, oxygen, and nitrogen. In inorganic compounds the colour arises from the way in which the outer electrons of the metal interact with the electrons of the attached molecules. In organic species, alternating double and single bonds between the atoms in the chains (conjugation) allows delocalisation of electrons between different electronic orbitals which affect the wavelength of light absorbed.

The first ‘synthetic pigment’, it could be argued, was carbon black or bone black obtained by burning wood or bones. These absorb all wavelengths of light because the material is highly conjugated. Cave paintings dating back to 40,000BC were produced using three pigments; carbon black, red ochre (Fe₂O₃) and yellow ochre (Fe₂O₃·H₂O). These were applied to walls using natural binders/solvents such as spit, wax, animal fat, plant sap or resin. Initially, pigments were not used for decorative purposes but rather as symbolic representations, particularly for death. In early Chinese and Egyptian civilisations pottery and wooden artefacts were used to adorn burial sites and these were often brightly coloured. The pigments used were often ground minerals and included chalk or bone (both white) and complex aluminosilicate clays would have provides dull reds and greens. Travel broadened the palette to brightly coloured minerals including Cinnabar, HgS (red), Orpiment As₂S₃ (yellow), Malachite (Cu₂Co₃(OH)₃) (green) and the most prized of all, Lapis Lazuli CaNa₇Al₆Si₆O₂₄S₃SO₄ (blue). Minerals consist of mixtures of crystallites and the intensity of colour relies on separating out the different crystalline phases and grinding and washing could then be used to intensify the colour density.

Among the first synthetic techniques would have been thermal methods such as calcining (the decomposition of a hydrate or carbonate by heating), roasting (reaction
with a gas-phase reagent) and smelting (thermal reactions with one phase being molten). It was also known from pre-history that transmutation of materials could occur by heating. For example galena (PbS) could be converted to lead by roasting in air (PbS + O₂ ---- Pb + CO₂). A more common method of obtaining pure metals and alloys was the use of smelting by the reduction of metal oxides and carbonates using carbon in the form of coke or charcoal. By the time of the Romans it was possible to produce fairly pure gold, silver, copper, lead, mercury and tin. Having pure metal reagents meant that some pure pigments could then be produced. One of the first was vermilion (HgS), the synthetic version of Cinnabar. Others include the oxides PbO (yellow) and Pb₃O₄ (red). Red lead is still used today particularly as a primer and an anti-corrosion additive. The development of higher-temperature furnaces (850–950°C) as far back as 2500 BC resulted in the production of Egyptian Blue (CaCuSi₄O₁₀) by heating together Malachite, sand and limestone (Cu₂CO₃(OH)₂ + SiO₂ + CaCO₃ --- “CaCuSi₄O₁₀ + CO₂ + H₂”). Independently, the Chinese also created blue and purple pigments, traces of which have been found on the terracotta warriors, by a similar route. Much early synthetic pigment manufacture originated from dissolution of metals and precipitation of insoluble compounds. This required acids and bases. Acetic acid, which can dissolve metals such as lead and copper, was the first acidic medium and was produced by the oxidation of alcohols. Bases were present in the form of ammonia from dung fermentation, and wood ash or slaked lime. The synthesis of white lead (PbCO₃·Pb(OH)₂) is one of the first documented liquid phase syntheses of a pigment, Pliny describing its extraction from the dissolution of lead in vinegar. A similar method was used for extracting the blue-green of verdigris from copper. The common stronger acids used today were not developed until later. Hydrochloric acid was not recorded much before 800 AD and aqua regia (one part nitric acid to three to four parts hydrochloric acid) was not documented until the 13th Century. The purification of materials by distillation, sublimation, filtration and recrystallization are over 2000 years old and has its origins in Alchemy. These techniques have been important in the preparation or extraction of pigments from plant and animal materials. Organic chromophores are a variety of complex conjugated compounds such as Alizarin and Purpurin from Red Madder (Tubia tinctorum), Indigo from Blue Woad (Isatis tinctoria) and Carminic acid from the red cochineal beetle. The preparations were complicated. For example, to obtain Indigo the young leaves of Isatis tinctoria would have been chopped and dried and then ground and moistened to allow fermentation. Potash and urine were added and fermented further for three days before the liquid was suitable for use as a dye or absorbed on to a reflective substrate such as chalk before being made into paint.

**Painting Methods and Influences.**

Traditionally, natural binders such as waxes, plant resins and, most commonly, egg lecithin have been used to bind pigment gains. The Romans and Greeks used a technique known as ‘encaustic’ in which pigment was suspended in warm beeswax and applied to the surface using a knife-like tool. This was viscous and fairly impermeable to water and, hence, was quite stable. An alternative water miscible binder was gum Arabic, which is a mixture of polysaccharides (linked chains of starch, inulin or cellulose molecules) and glycoproteins (conjugated proteins containing small amounts of carbohydrates) which interact with the pigment particles to produce a stabilised colloidal dispersion which can be applied with a brush. The use of proteinaceous binders such as egg yolk, milk or animal glues was probably developed in central-southern Mesopotamia and later adapted by the Egyptians. Egg yolk mixed with vinegar was the most common and forms a colloidal dispersion with added pigment powder. The aqueous phase evaporates rapidly leaving a smooth matt layer. The layer cracks easily and so thin layers of paint have to be applied.
This technique is known as Tempera painting. The thin layers also necessitate a white background and so a primer of chalk or gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) in animal glue (Gesso) was used on wooden surfaces. On walls it was also necessary to fix the pigment on to reflective white surface and the development of furnaces enabled the manufacture of plaster which involved roasting chalk ($\text{CaCO}_3$) to give quicklime ($\text{CaO}$) which reacts with water to produce an alkaline slurry of slaked lime ($\text{Ca(OH)}_2$) which, after trowelling on to walls, slowly absorbed $\text{CO}_2$ from the atmosphere to make a hard, smooth surface. This technique, known as Fresco, was favoured by the Egyptians, Greeks and the Romans. Since the pigment was introduced into the slaked lime it had to be stable to the strong base. When a pigment was not stable to the alkaline environment a coat of Gesso was applied.

The use of plant oils such as linseed, groundnut, walnut, flax and poppy seed, as binders for pigments is assumed to have occurred during the Renaissance and they are still used, but there is evidence that they were sometimes used as additives for Tempera paintings even in Greek and Roman times and in the 5th century drying oils were used for varnishes for works in Tempera. Because hardening oils are slow to dry the artist has more time to apply the paint and because the flow characteristics are superior to those of Tempera the paint can be applied in fine strokes. Artists could also paint wet on wet and layer the pigments in new ways or lay down thick pastes or apply the paint with a stiff brush, palette knife or their fingers. Comparing Fra Angelico's ‘The Annunciation’ (1432) and Jan van Eyck's 'The Betrothal of the Arnolfini' (1434), the latter contains far greater detail and more luminous colours. This was not only because Van Eyck used a different binder, but also his clever incorporation of reflective materials such as ground glass and calcined bone. Different studios used different ingredients in their paints and developed recipes for accelerating drying. Since drying oils are immiscible with water, in order to accomplish finer paintwork soluble diluents was required and turpentine became the solvent of choice. It is derived by distillation of pine tree resins. Distillation was first practiced by the Greeks and Romans for alcohol and was developed further in the 12th Century for the production of Brandy and more sophisticated steam distillation was made possible through the development of complex glass and pottery equipment. The use of oils also led to the use of canvas as a substrate. This reduced cracking and allowed thick layers of paint to be applied. The Renaissance is characterised by a new style of painting focused on capturing reality in paint and influenced by the dominance of the church; but scientific intrigue was suppressed and the range of pigments did not significantly change. The Papal Schism in the Catholic Church around 1400 combined with social issues such as the plagues which ravaged Europe in the 15th and
16th Centuries reduced the importance of iconography and artists turned to portraits and landscapes. The Reformation led directly to the development of what is considered ‘scientific methodology’. The use of chemicals and minerals to ease medical conditions by Paracelsus and developments in ore purification, particularly by Georgius Agricola, set in place a framework for advances in mining and furnace technology and the discovery and isolation of many of the metallic elements in the 16th, 17th and 18th Centuries. The building blocks of matter were rapidly identified and between 1790 and 1848, 29 elements were discovered.

The Chemistry of Blue, the New Pigments and J M W Turner.

A substance appears blue when it absorbs light in the orange part of the spectrum. This is quite difficult to achieve. The only true blue paint, ultramarine, was made from the mineral lapis lazuli which is as rare as diamond and only found in significant quantities in the mountains of Afghanistan. The colour originates from the sulphur radical anion, $S_3^-$, trapped in the aluminosilicate mineral. Its value meant that it was reserved for painting only important items such as the Madonna’s veil in Christian iconography. Some synthetic blues were produced in Antiquity but these were pale and the first synthetic true blue, $\text{Fe}_3[\text{Fe(CN)}_6]_3$, was produced by Johann Diesbach in Berlin in 1706. This was instantly adopted for colouring fabrics (notably, Prussian Army uniforms) and was first used by Pieter van der Werff in 1709 in the painting the ‘Entombment of Christ’. A fraction of the cost of ultramarine, Prussian Blue was extensively used in Europe within 10 years and became a favourite of noted artists such as Gainsborough, Constable, Monet, Van Gogh, and Picasso. The first synthetic ultramarine was produced in the 18th Century by a French inventor, Guimet, who refused to publish his method and so Gmelin is credited with its first synthesis. Various recipes exist but, basically, iron-free kaolin clay, sodium sulphate, sodium carbonate, sulphur and charcoal are calcined, ground and washed. Chemically, this ‘French Ultramarine’ is the same as lapis lazuli but the crystal form is slightly different.

At the end of the 18th Century the artist’s palette was missing greens and vibrant yellows, but the discovery and extraction of new elements such as cadmium, chromium and cobalt and the development of their chemistry added a range of new pigments to the artist’s palette (Table 1). These certainly impacted on the Baroque and Neoclassical styles and, later, on romanticism, realism and impressionism. In the Neoclassical and Romantic periods the way art was viewed changed, as did the way in which paints were prepared. Art and its underpinning science became disconnected. The gradual production of pigments on an industrial scale changed the way art was taught and the way it was viewed. Art had been a trade; a potential apprentice would join a studio and study sketching and the production of paints under a master. The study of art and art history became an academic subject and art schools taught styles of art rather than the technical aspects of pigment preparation.

J M W Turner was trained in the classical way, serving an apprenticeship making architectural drawings and colouring engravings. There is evidence that he prepared his own watercolour blocks and experimented with the ingredients used to formulate paint, but he was greatly influenced by new pigments,
adopting them soon after their introduction. He also worked with manufacturers such as Rowney and Windsor and Newton. Cobalt blue has been found in his watercolours of 1810 and chrome yellow appeared in works around 1815. In depth analysis of his palettes and painted works indicate not only a broader range of pigments than earlier artists but also changes in colours throughout his career. He also developed his own pigments such as lead yellow (Turner’s yellow) which, although suitable in both oil and watercolours, had a tendency to blacken. Indeed, the stability of many paints developed at that time is an issue for conservators; it was a period of experimentation and permanency was not the most important concern. Turner’s drive to push the boundaries of painting set his work apart from that of his competitors but this was with scant regard for the stability. His use of differing pigments is evident in his oil paintings of the ‘Battle of Trafalgar’ in 1806 and 1824 and ‘Slave Ship’ in 1840, and his watercolours of ‘The Thames and Kew Bridge’ in 1805, ‘Scarborough’ in 1825 and ‘Venice; Looking across the Lagoon at Sunset’ in 1840.

The Industrial Revolution and the rise of Organic Chemistry.

One might imagine that the Industrial Revolution would have little impact on the world of painting but it had the most profound effect of all. At the end of the 18th Century commercially produced oil paints were sold in bladders. Once opened they had to be used quickly so that ‘painting in the field’ was difficult; most work was derived from sketches or watercolours and carried out in the studio. However, the Industrial Revolution made the extraction of metal routine and a chemical industry began to flourish. The discovery by Davy and Faraday that metals could be extracted from solutions of metal salts by electrolysis also increased the range of metals available. In 1841 John Rand patented the collapsible metal tube (in lead, tin and eventually aluminium) with a screw cap which allowed paint to be stored out of contact with the air. Rapidly adopted by Windsor and Newton, they sold their first tubes in 1842. The development of photography from the 1860s freed the quest for realistic representation and artists were able to pursue new types of image. The incompatibility between some pigments were overcome by the chemists so that a simple palette of perhaps only six or seven paints close to the primary colours could be carried, The new vibrant colours and the commercially available tubes of paint opened the path to working ‘in plein-air’ and the Impressionist movement was born. The painting ‘Boating on the Seine’ 1879–80 by Pierre-August Renoir was painted in only seven colours, most of which were newly discovered; cobalt blue

![The Battle of Trafalgar (1824)](image1)

![Scarborough (c.1825)](image2)

![Slave Ship (1840)](image3)
(1802), viridian(1838), chrome yellow (c.a.1800), lemon yellow (1830s) and chrome orange (c.a.1800). These developments also put paints into the hands of amateurs and led to naïve forms of painting.

Prior to the beginning of the 19th Century, organic chemistry had revolved around the extraction of natural products which consisted of a limited range of main building blocks such as polysaccharides and proteins. The Industrial Revolution brought large-scale coal usage and the identification of a range of hydrocarbon building blocks. The carbonisation of coal produced coke, ‘town gas’ and coal tar, which contains predominantly phenols, polyaromatic hydrocarbons, and heterocyclic compounds. Phenols were found to be good antiseptics and were the basis of coal-tar soap. From the point of view of the colour chemist the isolation of pure aniline (C₆H₅NH₂) by Wilhelm von Hofmann, which is the primary building block that gave rise to the synthetic aniline dye industry and the genesis of the colourful world we enjoy today. The first synthetic organic pigment was made by one of Hofmann’s students in 1856. In an attempt to make quinine he mixed aniline with the oxidising agent potassium dichromate which, when washed, gave a purple dye called Mauvine which became a popular colour in the late Victorian period. Aniline proved to be the starting point for a number of other important dyes which were synthetic analogues of already important pigments. Carmine and Indigo were synthesised by German chemists in the 1860s and 70s and another related class of so called azo dyes were derived from the reaction of aniline and nitric acid followed by coupling with an aromatic moiety. The first azo dye sold as an artist’s pigment was aniline yellow (Field’s yellow). Some of these azo dyes, however, exhibited poor light fastness but others are still in use.

**Learning From Nature.**

Two of the most important pigments in nature are the green chlorophyll in plants and the red haemoglobin in blood. Their structural relationship, they consist of a metal ion bonded into the centre of a large, flat, cyclic array of carbon, nitrogen, hydrogen and oxygen atoms, was only ascertained in the mid 20th Century. In chlorophyll the metal atom at the centre is Mg²⁺ in heme it is Fe⁺⁺. Similar synthetic compounds can be derived from the reaction of other metals with phthalic anhydride [C₄H₄(CO)₂O] to give a class of compounds called phthalocyanines. These are stable with good colour density and covering power and now constitute approximately one quarter of industrial pigments.

**The Advent of Plastic Paints and Electronic Media.**

The first synthetic polymer was polyethylene made in 1933. Although acrylic polymers were first produced in 1936 it was not until 1946 that Bocour and Golden discovered that an emulsion of polymer, solvent and pigment could be made into paint. Also, acrylic polymers are unsaturated and are therefore unreactive and without colour. Sold under the trade name Magna, the clarity of the polymer binder yielded vivid colours and the rapid drying promoted a change in style – a dynamic application of paint. By 1953 Rohm and Haas had developed aqueous based emulsions that could be applied to any surface, were fast drying, flexible and did not crack. They do not appear to colour with age, both matt and gloss finishes are possible, and it is possible to apply other media over the top such as ink, chalk or even screen prints which is not possible with oil-based paints. They can also be applied in highly diluted thin layers like watercolour or as thick pastes like oil paint. Their immediacy made them popular in the Pop Art movement with artists such as Warhol and Lichtenstein. And so the possibilities for artistic expression move on. Photoluminescent, electroluminescent, chemiluminescent and even radioluminescent materials have been used and the use of electronic media employing new chemistries in the form of, for example, liquid crystalline materials and light-emitting diodes (LEDs) have appeared. Our ability to create visual images is easier and the current dominance of digital imagery may have changed our perception of what art is. The majority of children are taught formally how to create art and the cost and quality of artistic materials is such that most people, certainly in the developed world, can express themselves through artistic means. The future of art is limited only by the human imagination and artists will continue to experiment with everything available to express their personal perceptions of the world.
Migration is a regular return movement that birds make each year between their breeding areas and their wintering areas. It occurs not just in our climate, with warm summers and cold winters, but also in the tropics with regular wet and dry seasons. In fact, migration of this type occurs in any seasonal environment in which bird food supplies change predictably from abundant to scarce during the course of each year.

Living as we do in mid latitudes, we in Britain are familiar with the fact that we have several different categories of birds, with respect to migration. We have resident species that are present here year round, such as the House Sparrow, Wren and Blue Tit. We have summer visitors that come here to breed, such as the Barn Swallow, Reed Warbler and Cuckoo. We have winter visitors that spend their non-breeding season here, such as like the Redwing, Fieldfare and Brent Goose. And we also have passage migrants that we see here each spring or autumn as they travel between breeding areas to the north of Britain and wintering areas to the south – birds such as the Little Stint and Grey Phalarope. But we also have partial migrants, the biggest category of all. This term is applied to species in which part of the population stays here year round and another part migrates away for the winter and returns the following spring. Species such as Song Thrush, Linnet and Kestrel are in this category.

Migration is assumed to occur whenever birds benefit from leaving their breeding areas for a period rather than staying there year round. The usual reason that breeding areas become unsuitable for part of the year is lack of food. Plant growth stops for part of each year and many prey animals either die off or hibernate or become inaccessible under snow or ice. In the case of the Whooper Swan that breeds in Iceland and winters in Britain, the lakes in breeding areas freeze over for the winter; and in the case of the Swallow that breeds in Britain and winters in Africa, the aerial insects on which it depends become unavailable in the northern winter. Also, day-lengths shorten to such an extent in winter that many diurnal birds would be unable to get enough food even if food were available. So the reasons why many birds move south in the autumn to lower latitudes is fairly obvious. A much more difficult question is why they bother to return in spring, because many of them winter in the Mediterranean region or in Africa, in areas that seem perfectly capable of supporting those birds year round. However, by returning north in spring birds can exploit the seasonable abundance of food that develops each summer at higher latitudes as well as the longer summer days, and probably raise more young than if they stayed in their lower latitude wintering areas and competed with the birds that are resident there. So whereas the advantage of autumn migration to lower latitudes can be seen as improved winter survival, the advantage of spring migration to higher latitudes can be seen as improved breeding success. We can suppose that migration occurs whenever the net benefit to a bird of travelling both ways outweighs the cost of staying in its breeding areas year round.

These are just plausible ideas. They are practically impossible to test experimentally, but there is considerable circumstantial evidence in support. For example, in Western Europe the proportion of migrants among local breeding birds rises with increasing latitude as the winters get more severe. Even in the mild climate of Morocco in the south, 29% of all the breeding bird species are completely migratory; and that proportion increases with latitude to reach 83% in the far north in Svalbard. A geographical trend thus occurs in bird migration that corresponds to the severity of winters. Similar trends occur throughout the northern hemisphere, and also in the southern hemisphere, with migration increasing towards the poles.

Whether particular species leave particular latitudes in winter seems to depend on their diets and whether the foods that they eat remain available there through the winter. Only if winter food is predictably available do many individuals stay there year-round.
How do we study bird migration and what do the different methods tell us? At the start of the 20th century, ringing represented a huge technological break-through in the study of bird movements. Each metal ring bears a characteristic number, so once a ring is on a bird’s leg, that bird remains for the rest of its life as an identifiable individual. The ring also bears an address so that anyone who finds that ring can report the fact, giving date and location. Taking all the recoveries of a large number of individuals of each species, we can calculate their respective life spans and figure out their movement patterns. Most of what we know about the migratory routes of birds stems largely or entirely from ringing. However there are three problems with ringing as a method of studying bird migration. First, for each bird we only have two pieces of geographical information, where the bird was ringed and where it was recovered, with no idea what it did or where it went in the interim. The second problem is that, in practice, it is difficult or impossible to get bird ring recoveries from certain parts of the world, even though British-ringed birds may have been there. Through much of the 20th century, there were few or no recoveries reported from tropical Africa, from much of the Arab world or from the former Soviet Union. In addition, many land- and seabirds migrate over oceans where the chances of getting ring recoveries are very small, except for seabird species which get caught in fishing gear. A third difficulty is that, because of their habitat or behaviour, some birds give very few ring recoveries.

Another common method of studying bird migration is by observation. Many people like to sit on sea coasts, offshore islands or hilltops at migration times to count and identify the birds flying overhead. However, when watching bird migration with the naked eye we can only detect birds within the limits of our own visual acuity or within the limits of our binoculars. As we now know, most bird migration occurs beyond our visual range, and also at night when we could not see it anyway. Radar gets round these problems, as it enables us to detect flying birds at all altitudes, in all weathers, day or night. The main problem is that species cannot usually be distinguished from one another, although slow-flying small birds can usually be separated from bigger faster-flying birds like ducks and waders.

Over the years, radar has increasingly confirmed that birds prefer to migrate under clear skies with a following wind. The clear skies enable the birds to see the sun or the stars which they use (along with the earth’s magnetic field) for navigation, and the following wind helps to blow them on their way, and thereby saves energy. The wind often changes in strength and direction at different altitudes, so birds often fly at altitudes where at the time the wind is most favourable. On long flights over the sea, land-birds have been found by radar to fly at up to 6 km above the waves, and over Himalayas occasional species have been found at over 8 km above sea level (asl). However, these high altitude flights are exceptional, and probably most bird migration occurs at altitudes less than 3 km, as recorded by radar. With increasing altitude, the air becomes thinner and colder, which can bring other problems for birds. Wind directions also influence bird migration routes, and many long-distance species travel by somewhat different routes on the outward and return journeys.

For many years the only information we had on bird movements came from observations or ringing, but in recent years other breakthroughs have occurred, enabling us to follow individual birds on their journeys. One method involves the tracking of radio-tagged birds by satellites as they circle the earth. A radio (strictly a Platform Transmitter terminal, PTT) fitted to the bird sends signals which are detected by satellites which in turn transmits the date, time and location to a ground-based receiving station, and then on to the researcher. Repeated readings allow each bird to be tracked on migration, wherever on earth it may go. Another method of tracking migrants involves the use of geolocators which can be attached to the bird, regularly recording and storing information on its position. When the bird is re-caught, perhaps the following year when it returns to the same nest-site, the accumulated data can then be retrieved, and the bird’s movements reconstructed retrospectively.

Using these methods, some remarkable migrations have been recorded: for example, the Bar-tailed Godwits that breed in eastern Siberia and Alaska migrate non-stop over the Pacific to winter in New Zealand. This journey takes more than 200 hours of continuous flight, without rest, food or water. Before take-off these birds more than double their weight by accumulating fat, which (as in many other birds) fuels the journey. Some Arctic-nesting Gyr Falcons have been found to spend their winters at sea, presumably resting on ice bergs and hunting sea-birds. This could
not have been discovered by ringing. Overall, modern technology has revealed that birds perform feats on migration that are almost unimaginable in terms of the distances they travel by non-stop flying, the altitudes at which they can fly, the precision of their navigation, and the way in which they store and use energy. By any standards, they are remarkable creatures.

Living as we do in mid latitudes, we in Britain are familiar with the fact that we have several different categories of birds, with respect to migration. We have resident species that are present here year round, such as the House Sparrow, Wren and Blue Tit. We have summer visitors that come here to breed, such as the Barn Swallow, Reed Warbler and Cuckoo. We have winter visitors that spend their non-breeding season here, such as like the Redwing, Fieldfare and Brent Goose. And we also have passage migrants that we see here each spring or autumn as they travel between breeding areas to the north of Britain and wintering areas to the south – birds such as the Little Stint and Grey Phalarope. But we also have partial migrants, the biggest category of all. This term is applied to species in which part of the population stays here year round and another part migrates away for the winter and returns the following spring. Species such as Song Thrush, Linnet and Kestrel are in this category.

**Altitudes of flight**

The altitudes at which birds fly can be studied by radar, and at any one locality usually show a wide range of variation. One example (a) is from the central European lowlands in spring, where birds were detected flying at up to about 3 km, but averaging around one km above sea level. The second example (b) is from south Sweden in spring, referring to birds that have crossed the Baltic Sea, and are on their way to breeding areas further north. These birds were flying at up to nearly 4 km, but averaged around 2 km above sea level. The third example (c) was from Antigua in the Caribbean, detecting birds overhead that were passing south. It was assumed that these birds had taken off from north-east North America, perhaps from Newfoundland or Nova Scotia, and had struck out over the Atlantic heading for South America, where they would hit the northern coast of Brazil. On this long oversea journey, the birds were travelling at up to 6 kilometres above sea level, averaging around 4 km. Needless to say, most of these birds would have been invisible to ground-based observers with binoculars.

Even higher altitudes have been recorded for birds migrating over the Himalayas, where some reached 8 km above sea level.

Now why do the birds travel at such high altitudes, particularly over lowland areas where there seems no need? This question was addressed in south-eastern North America by Gauthreaux (1991) who studied migration in birds that were travelling mostly between North and South America. For each night, he worked out the altitude with the maximum density of migrating birds, and plotted these altitudes in relation to the altitude that had the most favourable winds, that is with the winds blowing strongly in the right direction. There was a clear linear relationship between the two values; in other words, birds were choosing to fly each night at whatever altitude the wind was most favourable to them. This was the most energy efficient altitude for them to fly. They preferred lower altitudes and flew higher only when necessary.

There are of course constraints on birds flying at high altitude. With increase in elevation, air becomes thinner, oxygen less available, and temperature falls. For every kilometre a bird climbs, the ambient temperature drops by 7°C. So a typical night temperature in autumn in southern England might be +5°C. If a bird rose to just one kilometre above ground, the temperature would drop to –2°C. If the bird rose to two kilometres it becomes –9°C, and if it goes up to 5 kilometres it becomes minus–30°C. So the heat loss for birds flying at high altitude can be great, although it may be compensated to some extent by the heat the bird generates in its own body by flapping its wings. Nevertheless, at the high altitudes at which some birds fly, they must burn energy in order to keep warm. So in effect migrating birds could face a trade-off. They have to balance the energy gained from flying in a favourable wind at high altitude against the cost of heat reduction and reduced oxygen availability.

Huge advances have been made in recent years. Technology has continually provided us with new tools and pushed forward our understanding of what birds are capable of, including some of the remarkable journeys they undertake. However, the method is expensive, costing around £3,000 per bird to buy the tag and to process the information. Also, most of the tags that have so far been used on birds have been battery powered. The battery adds weight, limiting
the size of bird that can carry the equipment, and the length of time that transmissions can occur. However, in the last 10 years or so, tags fitted with small solar panels have come into use, creating the power needed to generate signals and operating over much longer periods, often over more than one journey.

One of the first birds tracked along the whole of its migration route was a Short-toed Eagle which was tagged in its breeding area in France and then followed on migration south through France and Spain and on to its wintering area in Niger (Meyburg et al. 1998). The bird flew only during daytime, and the signals revealed the position of the bird every day, where it spent each night, the route the bird took, the time taken over each stage of the journey, the major stopovers, and the altitude of flight. Moreover, the pattern of migration could be examined in relation to weather maps to see how the journey had been affected. Using Google Earth, it was possible to find in what sort of habitat the bird spent each night. The daily flight distances of this eagle varied between 17 and 467 km (mean 234 km), and the whole 4,685 journey took 20 days. Such information constitutes an enormous advance on that provided by ring recoveries, but can now be gained as routine. Tracking by satellite also reveals much about the hazards that birds face on their journeys. Many Ospreys have been tagged in Scotland by Roy Dennis who tracked them to their wintering areas in West Africa. Some of those birds died on route, and most of the deaths occurred in two places: either over the Atlantic (where some birds were blown by westerly cross-winds) or in the Sahara Desert, the most hostile part of their route. Moreover, almost all the mortality was of juveniles on their first long journey. The more experienced adults almost always got through successfully. These findings were perhaps not surprising, but radio-tagging not only confirmed our expectations, but it enabled us to quantify the mortality, which had not previously been possible for any species. It was pleasing to find that few, if any, of these Ospreys were shot on their way south, but birds that take migration routes further east, through Malta or Cyprus, may not be so lucky. Similar information from Honey Buzzards tracked from Sweden and from northern Scotland has revealed they too die mainly in the Atlantic (after westerly drift) or in the Sahara. For some bird species, radio-tracking has also revealed previously unknown wintering areas, thereby extending the known geographical range.

The remarkable Bar-tailed Godwit

Some particularly remarkable results have been obtained for Bar-tailed Godwits, not those wintering in Britain, but others that breed in Alaska and migrate to spend the winter in New Zealand (Gill et al. 2009, 2014). At least 24 of these birds have been tagged and tracked on their non-stop journey over the Pacific. One female, whose migration was shown on the web, took nine and a half days and nights over her 11,500 km southward journey, enduring 228 hours of continuous flapping flight, with no rest, food or drink. She averaged 56 kilometres per hour. After wintering in New Zealand, the bird took a different route back to suit the wind conditions at that time of year. On the first leg of her return journey, she flew 10,200 km from New Zealand to the Yellow Sea on the Chinese-Korean border, taking about 7 days at an average speed of 38 km per hour, slower than on the outward journey. After refuelling on the Yellow Sea coast for about a month, the bird then flew another 6,500 km back to the breeding area in Alaska. These are the longest non-stop flights ever recorded from a land-bird, and many thousands of godwits undertake this journey every year, though presumably not all manage to complete it.

Before setting off, these godwits more than double their normal weight, so that about 55% of their total body mass consists of fat that acts as fuel on the journey. In order to carry that amount of fat, just before they take off the birds shrink all their body tissues that are not concerned with flight, including the gut, and convert them into flight muscle and fat. In fact, the fat tissue and flight muscle expand, while most other body organs shrink, reducing unnecessary weight to a minimum (Piersma & Gill 1998). Evidently, long-distance migratory waders are not like aeroplanes; they do not simply land, refuel and take off again. Fuelling in a godwit entails some reconstruction of internal organs in order to give the maximum weight of fuel with the minimum other body tissue. The shrunken gut must be partly reconstructed after landing before the bird can feed effectively again.

Geolocators

A second, and much cheaper, way of tracking migratory routes is by use of geolocators. By this method, information is stored in a data logger attached to the bird, usually to the bird’s leg. A geolocator does not transmit this information, so the bird has to be
re-caught, and the accumulated data downloaded to a computer. Seabirds are ideal subjects because they are big and strong, and also because many return to the same nest sites each year. So if the bird survives, it can be re-captured, and its precious cargo of data retrieved. This method has been used extensively on Manx Shearwaters nesting on the Island of Skomer, off southwest Wales (Guilford et al. 2009). The geolocator measures the times of light and dark, dawn and dusk, every day the tag is on the bird. If you know those times in relation to time on the breeding areas, you can work out retrospectively where in the world the bird was on particular dates. You know the longitude from the time shift and the latitude from the date. But these estimates are only rough, and in particular latitude is difficult to judge at the equinoxes when days throughout the world are the same 12 hours long. Data from many different shearwaters show that on leaving Skomer, the birds travel down the east side of the Atlantic, past West Africa. They cross the Atlantic in the southern hemisphere and then spend the northern winter off the coast of Argentina and Brazil. All this we also knew from earlier ring recoveries, but what ringing had not shown is that the birds took a different route back, travelling up the west side of the Atlantic to cross the ocean in the northern hemisphere on their return to Skomer. This particular route makes sense in terms of wind directions. In the northern hemisphere the wind travels clockwise round a circle, but in the southern hemisphere the wind flows anti-clockwise. In taking the outward and return routes that they do, Manx Shearwaters gain the advantage of following winds on both migrations, as they use opposite sides of the Atlantic at the two seasons and also cross the ocean from east to west in the southern hemisphere, but from west to east in the northern hemisphere. Equipment is improving all the time, and geolocators have now got so small that they can be fitted to songbirds, as exemplified by the research on Nightingales by the British Trust for Ornithology.

**GPS recorders**

Other studies of birds on migration have used satellite tags in conjunction with GPS recorders to give more exact locations for the bird. This can be exemplified by the work of my student, Kurt Burnham, who worked on Gyrfalcons in northwest Greenland (Burnham & Newton 2011). Little was known about migration of this falcon, except that it nests across the High Arctic and appears further south in winter, including occasionally in the British Isles. The use of satellite tags revealed that birds from northwest Greenland migrated up to about 4,500 km from their nesting areas. The main surprise was that some of the tagged birds wintered at sea without coming to land for several months. We assume that they were sitting on icebergs and hunting seabirds, such as auks or ducks. Most of those that were tagged behaved in this way, wintering either in the North Atlantic between Greenland and Iceland or in the Davis Strait between Greenland and Canada. These birds ranged widely over the sea, and from October to March, their home ranges covered an average area of 160,000 km². Some other Gyrfalcons wintered on the land, in Canada, and their home ranges were smaller, but still surprisingly large, averaging 48,000 km². Now a similar sized raptor in southern England, such as the Common Buzzard, might have a winter range of 2 to 3 km².

For the Gyrfalcons that wintered over the sea, the home range shifted south during the course of the winter, following the pattern of ice formation, as the sea froze from the north southward. We assumed that this progressive southward spread of the ice sheet pushed the seabirds ahead of it, and the Gyrfalcons moved south along with their prey. Soon after the ice reached its maximum southward extent, Gyrfalcons set off on spring migration, heading north over the ice to reach their breeding areas. Their rapid spring journey occurred weeks before the seabirds also moved north, and the only prey available to Gyrfalcons at this time of year in northwest Greenland was Ptarmigan. It was little wonder that the breeding success of Gyrfalcons over much of their range varies from year to year, along with the abundance of Ptarmigan. By the time Gyrfalcons hatch their eggs, seabirds and then other land-birds have begun to return to the far north, so near the coast a great abundance of food is once more available to the falcons. None of this was known before we were able to track individual Gyrfalcons from satellites, so this is another example of how technology is changing our understanding of what birds do.

**Volunteers can help with studying bird migration**

So to conclude, I hope I have convinced you what remarkable creatures birds are. They perform feats on migration that are almost unimaginable in terms
of the distances they travel by non-stop flying, the altitudes at which they fly, and the way they store and use energy. Huge advances have been made in recent years. Technology has continually provided us with new tools and pushed forward our understanding of what birds are capable of, including some of the remarkable journeys they undertake. Most of the information that I have presented in this talk was collected by amateur volunteers, including some of the radio-tracking. It is amateur ringers that have provided most of our information on bird migration routes. So there is a lot of scope for ordinary folk to get involved in bird migration studies in one way or another. These are indeed exciting times for research into bird migration.

References

TED HUGHES—THE UNAUTHORISED LIFE
Professor Sir Jonathan Bate CBE FBA FRSL
Lecture delivered on 8th February 2016

This talk told the story of the creation of an unauthorized biography of the late Poet Laureate Ted Hughes (1930–1998). It began with an account of Ted Hughes’s manuscripts. He sold a huge archive of his poetic drafts to Emory University in Atlanta a couple of years before his death. This provides a valuable resource for scholars, since he was a compulsive writer and an inveterate reviser of his work. Some poems exist in ten or more drafts. But there are gaps in the archives. For example, some of the notebooks have pages ripped out of them. The reason for this was revealed ten years after Hughes’s death, when it was revealed that his widow had sold a second archive to the British Library in London, for half a million pounds. It turned out that Hughes had told Emory that he was retaining some things he was still working on. What he was working on, though, was Birthday Letters, his poetic account of his marriage to the American poet Sylvia Plath, the breakdown of their marriage and her suicide. What he had therefore retained was everything to do with that project, which he had in fact been developing for nearly thirty years. The second archive included a wealth of intimate unpublished journal writings and notes. The ripped out pages from the notebooks were found! Unlike Sylvia, who kept neatly bound journals, Ted mingled autobiographical notes and thoughts in with poetry and prose drafts. His desire to withhold personal material accounted for his editing of the first archive.

There was a reading from a passage of the biography, describing an attack by a bear on the picnic food of Ted and Sylvia at a camp site in Yellowstone National Park, during their American road trip in the late
1950s, one of the happiest times of their life together. The lecture showed how a continuous biographical narrative can be woven out of different sources (the two poets’ respective journals and letters home, a short story by Sylvia called ‘The 59th Bear’ and a Birthday Letters poem of the same title by Ted), but also revealed differences in memory and emphasis. The biographical problem that different members of a family remember the same events in the past differently was discussed.

Ted Hughes: The Unauthorised Life began as a project written with the co-operation of the poet’s Estate (viz. his widow), but this support was withdrawn when, due to the sheer size of the two archives, draft chapters were not ready in time for approval by a specified date. The book was thus reconfigured with a new publisher and with the elimination of the kind of extensive quotation that would have required permission from the Estate. The lecture reflected on the pros and cons of paraphrase, and on an inward weaving of the words of a biographical subject, as opposed to a quotation-based discussion.

The lecture then told the story of the recent opening of another archive: the papers held at Smith College, Massachusetts (Plath’s alma mater), pertaining to an extraordinary incident in Ted Hughes’s life when in the 1980s he found himself among the defendants in a six-million-dollar defamation lawsuit regarding a character in a movie based on Sylvia’s novel The Bell Jar (Ted, as Sylvia’s literary executor, had sold the film rights to Hollywood). Among the papers, which were sealed until the recent death of the plaintiff, Jane Anderson, was a remarkable 150-page deposition in which Hughes was interrogated over his relationship with Plath and the content of the novel. The lecture explained how, as an American court document, this was not subject to the same copyright regime as Hughes’s poetry, so quotation could be more extensive, allowing Hughes’s voice to be heard at the beginning of the biography. It was also explained that in the course of the deposition, Hughes reflected on the relationship between a writer’s life and their work, a matter of central interest to the biographer. The deposition thus became an opportunity to reflect on the art of literary biography itself.

There was then a discussion of another new archive deposit: that of the great theatre director Peter Brook, in the Victoria and Albert Museum’s theatre collection. Hughes worked with Brook on several extraordinary projects, and the lecture discussed one of them – with a further reading from the biography. This was a play called Orghast written by Ted in an invented language and performed in the Iranian desert in an arts festival not long before the overthrow of the Shah. The lecture took the opportunity to link it to Hughes’s interest in myth, folktale and the archetypal stories of ancient cultures.

The lecture stressed the diversity of Hughes’s achievement – as an environmental campaigner, a dramatist, a critic, a children’s writer, the author of radio plays for the BBC, and more. But the main focus was on his poetry and in particular his long battle to release a personal or ‘elegiac’ voice, which finally came with Birthday Letters. A closing reading came from a beautiful letter, written shortly before his death, in which Ted Hughes was visited by the tender memory of Sylvia Plath as both bee-keeper and writer, bending over his shoulder like a guardian angel of forgiveness.
TELLING LOCAL STORIES IN A HANDHELD WORLD

Ms Jane Hill
Editor BBC Radio Leicester
Delivered 22\textsuperscript{nd} February 2016
Sponsored by Leicester Mercury

Telling stories is one of the oldest of all human activities. Our earliest ancestors told local stories – details of their surroundings, their food sources, the dangers that lurked nearby. But new technology has the power to put the whole world into something we can hold in our hands.

So where does that leave traditional media? How do we tell local stories in the handheld world?

When I was younger, I was woken by an alarm clock radio. We would listen to the radio over the breakfast table, the whole family together: usually Terry Wogan. If the weather were bad, it would tune one of our local radio stations. Later the local paper arrived on the doormat. We read it at the tea table. Then there was the early evening television news followed by Nationwide and the regional news and another TV bulletin later on.

There was no internet, no constant updates. If you wanted your say on the news, you’d write to the local newspaper or phone up the radio station.

We use our smartphones as an alarm clock nowadays. You pick up your phone and see a newsflash on the screen. I’m sure I’m not the only person who then goes straight to social media – checking Facebook and Twitter, sometimes even before I’m out of bed. I do look at news sites but social media comes first. That’s because it’s a community. I see the news that my friends, colleagues and acquaintances are talking about. Sometimes a link will take me direct to the news source – BBC, the Guardian, the Daily Mail, maybe one of the internet sites like Buzzfeed that specialise in what’s become known as clickbait.

I’ll also turn BBC Radio Leicester on – on my phone. I use the BBC iPlayer Radio app because I can tuck my phone in the pocket of my dressing gown and take it around with me. Downstairs the kitchen radio will be tuned to Five Live as my partner listens. Even while BBC Radio Leicester is playing on my phone, I scroll through social media and news sites, gathering a broad idea of what’s happening, digging deeper into stories that interest me. During the day, I check in on social media again and also get news flashes on my phone. I’m never disconnected.

We all remember where we are when a celebrity dies. It can also help us trace the changing face of news. I heard about the death of John Lennon from Terry Wogan on Radio 2. When the Princess of Wales died, I was on holiday with no mobile phone – imagine that. I eventually heard the news and had to rush home from holiday to supervise our coverage. Michael Jackson’s death was the first time I realised the power of Twitter, which is where the news broke. Oddly I read the news in a tweet from the tennis player Andy Roddick, whom I follow. I heard about David Bowie’s death in an old school way, on the radio as I drove to work. But Twitter and Facebook became the place to mourn, to share music and stories: a community of likeminded people.

Newsgathering has changed, too. I started working in local radio thirty years ago. We had typewriters. And phone books. There was no internet. If you wanted to find something out you had to find the right person to phone or go and knock on doors. Today’s journalists literally can’t imagine what it was like without the Internet.

We had huge tape recorders called Uhers. We developed a hunched way of walking because they were so heavy. After recording an interview we’d have to rush back to the office to find sticky tape and a razor blade to edit the tape. If you wanted to change the order of a voxpop you would hang bits of tape around your neck to cut in later.

Actually, editing hasn’t changed that much. Now it’s done on a computer screen, but the process is the same: making sure you remember which bit is which, sticking them together so you can’t hear the join.
During the last General Election I covered the Hinckley count entirely on my iPhone. I used software called Luci Lite on a 3G signal. I didn't even need wifi. With headphones and microphone plugged into my phone, I did live reports and recorded interviews. I could edit the interviews then email them to the radio station, play them live or upload them online.

During the count there was an arson attack on a police car, which exploded. Not only was I able to do a live report, but using the same piece of equipment I also could take photos and videos. Within seconds, I tweeted a photo which was retweeted many times. It was used by the Daily Mail, the Metro and the Hinckley paper.

That excites me.

What worries me – or challenges me – is: how do you get and keep people’s attention when there’s so much other stuff out there?

Remember the famous dress that was either blue and black or white and gold? It started with a woman sending a photo of the dress to her daughter. The daughter tweeted the picture, and within hours the world was talking about it. I woke up to a Facebook & Twitter feed full of opinions. As I jokingly tweeted at 7am, “my partner’s been up for a whole hour and he still hasn’t told me what colour he thinks the dress is.”

It was fun, scary and would have been unbelievable a few years ago. It also presents a challenge for those of us who work in local media. Many people don’t listen to local radio or read a local newspaper – and yet they’re glued to social media. How do we get their attention? How do we make our local stories – our news, our sport, our weather and travel news – work in this new world? Here are some of the techniques we are using.

First, we keep doing what we’re doing as well as we can. Radio offers something that no other medium can: the sense of personal friendship. The late Terry Wogan said that he only had one listener. It’s a conversation between the listener and the presenter.

The BBC and local papers like the Leicester Mercury do “traditional” online journalism. But now we tweet links to stories or put them on Facebook, to spread them as widely as possible.

We also use Twitter to great effect as another news platform. A radio station offering live coverage of council meetings would lose listeners. But BBC Radio Leicester’s political reporter Tim Parker “live tweets” the meetings so that the coverage is there for those who want it.

Local Live is a BBC initiative that is a stream of what’s happening locally each day; curated content from radio, online, TV, social media and local newspapers. It’s flexible and chatty, and you can keep the page open on your computer as you work.

Not only can you listen live to all BBC radio via the iPlayer on your computer or your phone, but you can listen to past programmes and selected clips from programmes. If we interview celebrities, we get their fans to retweet the link. Our history programme interviewed actor Richard Armitage about his interest in Richard III. We realised via Twitter that we had fans of his listening as far afield as the USA.

Sport suits the new handheld world. Our sports team tweet commentary updates during City and Tigers matches. There is support around the world for Leicester City and for Tigers. Our commentary deal doesn’t allow us to broadcast full football commentary online because the club retains the rights to do that but we can tweet regular updates throughout the match.

Video and great pictures work well on line. Our news team not only cover stories for radio but they’ll also use smartphones to gather photos and videos to post on Local Live or Facebook. Facebook allows people to comment on the story. If there’s a big planning decision and we have a video of the new design, people can take a look on Facebook, see what they think, and then comment.

Weather is the most British of all obsessions. BBC Weather Watchers is a new initiative to get people involved in building up a picture of the weather across the country. You add details of what the weather is like in your area. We use that information on the radio, online and on TV. A freak weather event – like the multi-coloured cloud that was seen across Leicestershire – creates more chat and interaction than almost anything other than sport.

The more things change, the more they stay the same. Bins, potholes, dogs, football, weather – all these will generate views on social media will spread the word of Leicestershire and the BBC, and make people feel involved and part of a community, even in a world where it seems we are all glued to our phone.
When Harry met Alfred in Leicester

The morpho is a brilliant blue butterfly of the Amazonian rainforest, named after one of the epithets of the Greek goddess Aphrodite. Its short life is lived miles away from Leicester and miles away from the home of the *Oxford English Dictionary* in Oxford. And yet this little insect brings together Henry Walter Bates, the Leicester-born natural historian, his scientific friend Alfred Russel Wallace, and the *OED*. I am unlikely to have recognised this connection before the twenty volumes of the dictionary were digitised and rendered computer-searchable. The digital *OED* tells us that Alfred Wallace can lay claim to introducing some seventy-nine words and meanings into the English language, including the butterfly name *morpho* (in his *Narrative of travels on the Amazon and Rio Negro* of 1853), and that his colleague Henry Bates can lay claim to around fifty first uses. One of Henry Bates’s usages of *morpho* (from his *Naturalist on the River Amazons* [sic], 1863) is cited alongside Wallace in the *OED’s* entry.

A short history of the *OED*

The *OED* is the dictionary of record for the English language from Anglo-Saxon times up to the present day, and will remain so (I would hope) for many years to come. The dictionary’s scope is the English language wherever it is spoken in the world, and it includes the whole range of usage from formal to slang. All of its 650,000 entries for current and obsolete terms attempt to create miniature word biographies. For any meaning of any word in English, the *OED* is the place where you should be able to find authoritative information of its first recorded use, its origin and its meanings. We are lucky that in English we have such a richly documented formal and informal literature stretching back hundreds of years, which made it feasible to contemplate such a Herculean objective such as this.
These are big questions, and as yet not all such questions can be satisfactorily answered. But the Victorian obsession with collection and classification has given us a reliable groundwork upon which to build.

The work of collecting information about words and then compiling a large-scale dictionary on the basis of this information proved too ambitious a task for the Philological Society, and eventually a publisher (Oxford University Press) and an editor (James – later Sir James – Murray) were found to take the enormous project forward. James Murray was appointed editor of the dictionary in 1879, and he and his staff published the first instalment of what became known as the *Oxford English Dictionary* in 1884. That first instalment just contained the words A to ant, but in such incredible detail that its readers and reviewers realised that they had on their hands the makings of the lexicographical masterpiece, which promised in due course to place the English language at the centre of a cabinet of the wonders of the English-speaking world.

After years of excitement, toil, and adversity, the Oxford English Dictionary was completed in 1928. In order to get it finished, Murray had to work with three other Editors and their numerous assistants. His daughters helped to file away alphabetically the index cards sent in by “readers” in Britain and around the world who had volunteered – in a form of early crowdsourcing – to read books and newspapers in search of words which would be of interest to editors compiling the dictionary. Famous authors such as Thomas Hardy and Charlotte Yonge contributed by reading texts or answering questions from the editors on their own particular vocabulary; educated “readers” with some leisure time, and even some unlikely “readers”, such as Dr William Minor (injured in the American Civil War and latterly residing in Broadmoor after murdering a man on the streets of London) supplied evidence to the editors of the dictionary through their reading of historical sources. The dictionary, completed in ten volumes in 1928, was a crowning glory and one of the “jewels in the crown” of both Oxford University Press and the English-speaking world.

A one-volume supplement was published in 1933, sweeping up early twentieth-century vocabulary which had come to prominence after the relevant alphabetical volume of the original dictionary had been published. This was replaced by a new, four-volume supplement, published between 1972 and 1986. The whole text was republished, with the supplement text interwoven into the main edition, in 1989.

**Searching the dictionary online**

The Second Edition of the *OED* was most important for the fact that, although it was published as a set of books, the text was printed from a version of the dictionary held on computer. Having the text on computer changed everything for the future of the dictionary. This “computerisation” was the result of a pioneering venture in the 1980s by the University Press in Oxford, working with IBM (who supplied software and hardware), International Computaprint Corporation of Philadelphia (who had the 67 million characters of complex dictionary keyed to computer), and the University of Waterloo (who masterminded database design and search-and-display software). With the dictionary on computer, we could at last plan to update it efficiently and re-edit it for a new generation of scholars.
But as time passed, we came to realise that the dictionary’s circle of users and fans could be widened from the rarefied academic spheres it had occupied previously. By the mid 1990s the possibilities of the Internet were becoming apparent. We set about refocusing the OED as an online resource, and our prototype online OED became one of the first five hundred sites on the Internet. Editorial work also began on a massive project to review and update every aspect of the old dictionary, not just adding new words, but re-investigating all of those old words and meanings that had lain untouched since the nineteenth century. In 2000 the OED formally went online, with intelligent search functionality, and the new edition began its slow progress. By now the big editorial revision is some 40% complete, and a new version of the dictionary’s website has been launched, with even further improved searchability.

For Henry Bates and Alfred Wallace, the current editing means that their words are receiving an up-to-date, modern re-assessment, and the complex search routines allow us to see how their language has influenced the vocabulary of their specialist areas. And of course these are not the only authors to whom thus has happened. Asking questions of the dictionary has introduced us to a new level of knowledge about the language. Did we know before that some 1,000 words are first recorded in the English language during the short reign of King Richard III? The major foreign language from which these words came was Post-Conquest French, and – as we move out of the Middle Ages with the invention of printing and links with the early continental Renaissance – the new French (and the new Italian, and the new Latin) of Renaissance scholarship. We can now – with our new, three-dimensional view of language facilitated by the online dictionary – start to plot the social and cultural influences which cause our vocabulary to change: new trading patterns bring in new words; the new self-confidence of English as a language of literature in the Elizabethan and Jacobean period; and many other factors of the socio-cultural environment in which language thrives.

Now, for the first time, we can see which texts have contributed most to the OED’s picture of the language in any one year, how compound words (cupboard, card table, Geiger counter) may be formed differently in different eras, where the different -ology words come from (first borrowed whole from other languages, then made with an initial Greek element, then much more loosely with English words such as Egyptology). And we haven’t found all the questions yet, let alone all the answers.

And what comes next? At the moment more or less anyone in the UK can access the OED without charge – and remotely, from their home – through their public library service website. There is a wiki-style website for people who want to share their knowledge of esoteric (or popular) science fiction vocabulary with others and with the OED. “User engagement” can be a cliche, but the more people who are motivated to look at the OED online, the more people will contribute to the dictionary, and the better it will become. It’s something to think about, if there’s nothing much on telly tonight.

I am grateful to the Secretary to the Delegates, Oxford University Press, for kind permission to reproduce two images from the OED Online web site and the image of Sir James Murray from the University Press’s Archives.
Bruno Pontecorvo was born in Pisa in 1913, the same year as the nuclear atom. In 1932, the year that the neutron was discovered, Bruno was a student at university in Rome. Here he worked with the great physicist Enrico Fermi and, using neutrons as his tool, discovered the key to nuclear power. In short: if a beam of neutrons is first slowed before it hits a lump of uranium, it becomes extremely effective in stimulating nuclear fission, thereby releasing energy from uranium. Later this would become key to the development of nuclear power and in the explosive release of energy in an “atomic bomb”. It would also enable the conversion of some of the uranium into the element plutonium, which would be the seed of the atomic blast over Nagasaki and of modern atomic science. In summary: Bruno was midwife to the “atomic age”.

Bruno’s family had Jewish roots, at least in the opinion of Mussolini’s fascists. He left Italy in 1936 and moved to Paris, where he continued his work with neutrons in the research the of foundations of nuclear physics with Nobel Laureates Frederick and Irene Joliot-Curie. In 1939 he joined the communist party.

The field of nuclear physics was still small. The five major laboratories were in Rome, which he had just left, Paris, where he now was based, Cambridge, Berkeley and Moscow. In Moscow Igor Kurchatov took note of Bruno’s work. Kurchatov and Pontecorvo both acknowledged one another professionally in their research papers. Kurchatov would later, in 1943, be charged by Stalin to develop an atomic bomb for the USSR. From KGB archives we now know that Kurchatov gave the instruction that Soviet agents should find out what work was going on in this area in the West, basically: at which laboratories, and who works there? This led to infiltration of the Manhattan project by established spies, such as Klaus Fuchs, and others, not all of who have been identified even today.

So what was Bruno doing by then?

When the Nazis invaded France in June 1940, Bruno, accompanied by his wife Marianne and their baby son Gil, escaped. Marianne and Gil fled to Toulouse by train, and Bruno followed by bicycle! His adventure is a factual analogue of the fictional accounts in the novel Suite Francaise. I tell his story in more detail in my own book Half Life. For this brief account, let’s move on to what happened next. The Pontecorvos fled via Portugal to the USA. Here, from 1940 to 1942 he became an oil prospector.

This might seem an odd choice for a nuclear physicist! However, Pontecorvo now introduced nuclear physics as a tool for the oil industry.

The basic idea was to lower a radioactive source of neutrons down a borehole. This irradiated the rocks, which become themselves radioactive. The nature and spectrum of radiation emitted by these rocks is like a bar-code, which can be read to deduce the nature of the strata. This enabled oil-bearing shales to be identified.

His former teacher, Fermi, was by 1942 based in Chicago. Here he was building the first experimental nuclear reactor, which in turn led to the Manhattan project to develop an atomic bomb. Pontecorvo’s experience with identifying rocks turned out to be central to the practical development of a reactor, where a multitude of materials are irradiated in addition to the uranium fuel. Fermi’s intervention brought Pontecorvo into the project. He worked at Chalk River in Canada, as part of the British-Canadian teams who designed one of the first nuclear reactors. This became a key plank in the broader Manhattan project. It also involved at least one spy.

One of Pontecorvo’s colleagues in Canada was Alan Nunn May. May was arrested in 1946 and jailed for...
nine years for having passed classified information to the Soviets. A death-bed statement, which I obtained through his stepson, establishes that these included reports of work on the nuclear reactor. I discovered copies of these reports in the National Archives. They include the names of scientists to whom these were circulated. The names include Pontecorvo.

Thus it is clear that through sight of these documents in Moscow, Kurchatov would have been aware that Pontecorvo – whose work and reputation he already knew – was working at Chalk River. It would have been natural that Kurchatov’s instruction to his agents to find out what was happening in North American laboratories would lead to contact with Pontecorvo, who had also enrolled as a communist party member in France. What Pontecorvo’s response was we might never know.

My conjecture is that Kurchatov could have asked for seemingly innocent help, along these lines: “I want to improve the quality of life for Soviet citizens by building a nuclear power station to produce energy. Can you help?” From two scientists, now aged, who were working in the USSR in 1950 on the nuclear programme, I learned that “blueprints of the Canadian reactor” had found their way to Moscow at some point. These could not have come from Nunn May as the plans did not exist until after 1946, by which time May was in jail. If not from Pontecorvo, then a “Dr X” remains to be identified.

In 1948 Pontecorvo moved to England, to Harwell, where the first nuclear reactor in Western Europe was being designed. Here, by unfortunate coincidence, Pontecorvo was a colleague of Klaus Fuchs. When Fuchs was arrested in February 1950, the Harwell security re-examined the political affiliations of its staff, in an attempt to shut the stable door after the horse had bolted, in the hope of avoiding further disaster. Pontecorvo voluntarily informed the security chief, Henry Arnold, that he had “communist relatives”, but denied that he himself was a fellow traveller.

Having managed to have Pontecorvo’s file of that time released by MI5, I established that they had no evidence that he had violated the official secrets act, or done any misdemeanour. There was much gossip about communist leanings, but no more. To play safe, the authorities decided that he should leave Harwell and move to the University of Liverpool. Liverpool was building a nuclear accelerator, and so Pontecorov’s expertise could continue to be available without him being privy to classified documents.

The move was to take place at the end of 1950. He had accumulated six weeks annual leave and so, with his wife and their three sons – Gil by now 12 years old and a student at Abingdon School – they left for a camping holiday in Europe. They visited his parents in Milan and were accompanied by his sister Anna (who returned to England three days before the end of the holiday). He then spent time near Rome with his brother and another sister. On August 31, instead of returning to see his parents en route back to England, he vanished. Five years later he was produced by the Soviets as a propaganda ploy prior to the Atoms For Peace conference. For sixty years the mystery of why he took this precipitate action has been unresolved.

When the file on Pontecorvo of activities prior to his defection was released, I discovered that the final entry was a letter from the British Embassy in Washington, to the Head of MI5 in London, concerning Bruno Pontecorvo. It was received in London just five days before Pontecorvo departed for Europe, never to return.

The letter revealed that the FBI was interested in Pontecorvo as a nuclear physicist who, they believed, had “communist associations”. What these consisted
of was not mentioned, but the FBI asked if MI5 had any information. The writer was Geoffrey Patterson, MI5’s man in the Embassy. How could Pontecorvo have become aware of this?

The letter contains a remark that Patterson has discussed this with the “SIS representative” (MI6’s) in the Embassy. In July 1950 this was none other than the infamous traitor Kim Philby.

I gave this presentation to a select group, which included Lord Jonathan Evans, former head of MI5, and Baroness Pauline Neville-Jones, former chair of the Joint Intelligence Committee. At the moment when I revealed this letter, there was an audible sigh as if the light had just dawned!

Philby’s modus operandi at that time was to liase with fellow traitor Guy Burgess, who was in London. Burgess would then contact the Soviet Embassy in London, and they would have to pass this news on to Moscow. By the time it arrived there, Pontecorvo was already on a camping holiday in Europe. Only when he arrived in Rome, in late August, and had contact with his cousin Emilio Sereni – a communist member of the Italian government and leading member of Comintern – was contact finally achieved. Within three days, the Pontecorvos were en route to Moscow.

Why was Philby so exercised by the sight of Patterson’s letter and the FBI’s interest? In part it is a black comedy of errors, not least associated with his duplicity.

Philby was one of a handful that knew the biggest secret of the time: the Americans had broken the Soviet diplomatic codes, known as the VENONA project. Decrypts arrived in fragmentary form, and Philby was continuously monitoring them to see if there was any mention of him or his fellow double agents, Guy Burgess and Donald MacLean. He was aware that three atomic spies had been identified, but only by their Soviet codenames. These were CHARLZ, MLAD and QUANTUM. CHARLZ was identified as Klaus Fuchs in September 1949, a fact that Philby passed on to Moscow, but too late to alert Fuchs. The identities of MLAD and QUANTUM remained unknown, however, in 1950. Today we know these were Boris Podolsky, working at Oak Ridge, and Theodore Hall, at Los Alamos. In subsequent decades, before these identities were established, several have speculated whether one or other was Pontecorvo. Philby would certainly have recognised the possibility that Pontecorvo was one of these atomic spies, hence the FBI interest, and done his job: alert Moscow.

So today we can be certain as to why Pontecorvo jumped ship so suddenly: a tip off which originated with Kim Philby. Why he was so concerned, only he ever knew. In Half Life I assess this, along with his remarkable career as one of the great scientists of the twentieth century. The second half of his life was spent in the USSR, and was not a happy one for his wife, at least. Late in life he admitted that he had been “a cretin”.

Was he perhaps the most successful atomic spy of all, in that the ones we know of, such as Klaus Fuchs, were exposed and hence ultimately failed. Fuchs and Nunn May each spent about a decade in jail for their crimes. Pontecorvo spent four decades in the USSR, where his career was often frustrated, his wife suffered mental breakdown, and his travel was restricted. It is moot who was punished the most.

Frank Close’s biography of Bruno Pontecorvo – “Half Life” – is published by OneWorld.
CHARLOTTE BRONTË AND THE AUTHOR PORTRAIT

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Lecture delivered on 17th November 2014

Sponsored by the University of Leicester

Charlotte Brontë lived at a time when authors were first beginning to become publicly visible on a grand scale through the mass dissemination of visual and verbal portraits. She has always been seen as a writer who was shy of publicity and wanted to ‘walk invisible’, but the evidence suggests that Brontë thought carefully about how her reputation might be shaped through portraits. This becomes clear when we map her career in portraiture by looking at one of her own, fantasy author portraits, drawn in the 1830s when she was a teenager; at her attitude towards the now-famous portrait by George Richmond (1850); and at her response to a request for a daguerreotype portrait.

During the early Victorian period portraits of authors began to be widely available in print media as a result of the expansion of the publishing industry and technological advances such as steel plate engraving and photography. There was also a thriving genre of verbal portraiture: detailed eye-witness descriptions of authors in biographical sketches. The scrutiny of writers’ appearances could be cruel. The expectation was that beauty would accompany genius – and this was especially true for female writers whose work was sometimes reduced to comments on their looks. Charlotte Brontë grew up reading the journals and biographies in which these author portraits were published and later she found fame in a world where to be an author entailed public visibility. But what was her attitude to this burgeoning culture of the author portrait?

The usual story has been that she did everything she could to avoid it. No visual image of Charlotte Brontë was published or publicly displayed in her lifetime. She famously wrote under a pseudonym that masked her identity – and even her gender. Until July 1848, when she went to visit her publishers in London, they had no idea who she was. The truth of her identity slowly seeped out, but was only fully revealed to the public after her death in Elizabeth’s Gaskell’s biography (1857). All in all Brontë has seemed to be an author who shunned the public eye – who wanted to disappear – as she wrote in one of her letters: ‘What author would be without the advantage of being able to walk invisible?’ (letter to W. S. Williams, 4 January 1848).

This is the usual story, but the evidence suggests that the truth wasn’t quite so simple. By calling Jane Eyre, an autobiography edited by Currer Bell, Brontë actively provoked the controversy of who she was and whether or not she could be identified with her heroine. In a novel which makes constant reference to physiognomy, phrenology and portraiture, we might even argue that Brontë was teasing her readership – inviting them to speculate, not just about who she was, but about what she looked like. From an early age, she understood her readers’ desire to see the face of their favourite authors. Her juvenilia includes a short story called ‘A Peep into a Picture Book’ (1834) where she describes leafing through a print gallery of portraits in terms which make it a seductive and even an erotic experience. The volumes of this imaginary portrait gallery:

‘…lie on a sideboard; their green watered-silk quarto covers and gilt backs are tempting, and I will make an effort to gain possession of them. Softly, softly…With zephyr-like step and bosomed breath I glide onward to the sideboard….I will raise first from the shadow of gossamer paper, waving as I turn it like a web of woven air, the spirit…that animates its frontispiece’

Brontë clearly knew that portraits excited readers. For all the dangers they presented to a female author, they also offered advantages in a competitive marketplace. Portraits brought fame and recognition and collections of portraits like the Fraser’s Magazine ‘Gallery of Illustrious Literary Characters’ (1830-38) promoted female writers alongside their male competitors. The evidence suggests that Brontë was conscious of this from an early age, and that throughout her career she flirted with the culture of the author portrait to a greater extent than has previously been recognised.
A little-known early sketch by Brontë of one of her fictional heroines, Zenobia, Marchioness Ellrington (fig. 1), gives us some insight into the teenaged Charlotte’s idea of how a female author might look and might present herself to the public.

There has been some mystery around this image, drawn on October 15th 1833. The character of Zenobia is compared to Madame De Stael in Brontë’s stories, but the portrait bears no resemblance to engravings of that writer. Christine Alexander has suggested Lady Blessington as a model, but again none of the engravings are in the least like Brontë’s image. In fact, as I’ve discovered, the portrait of Zenobia was partly copied from an engraving of Mrs Siddons in the character of Lady Macbeth, from the *Literary Souvenir* (fig. 2).

Brontë also seems to have been influenced by a portrait of Lady Julia Peel by Sir Thomas Lawrence (1827), which she probably saw as an engraving in *The Keepsake* for 1829. Brontë adapted her sources by adding symbols of authorship: a scroll and a pile of books. These sources give us insight into Brontë’s thinking as she formed her ideas about female authorship and the problems of public image. We can see, for example, how influenced she was by the idea that the female author should be beautiful and aristocratic. But we can also see that she was interested in the dangerous associations of Lady Macbeth (Zenobia is a violent character) and in the theatrical pose of Mrs Siddons. Her own portrait of Zenobia, the female author, is equally theatrical and shows her understanding of the need for a woman to present a carefully stage-managed image in order to face her public. What happened to this confident fantasy of public portraiture once Charlotte Brontë became a famous, published author and sat for a portrait herself?
We know that the idea for the George Richmond portrait of Brontë (fig. 3) came from her publisher – George Smith. It has generally been argued that she was a reluctant sitter, persuaded into posing only on the grounds that this would be a strictly private portrait – a gift from Smith to her father. But Charlotte Brontë was well aware that Smith would sooner or later have it engraved and published. It seems that she allowed him to keep a copy and, as she knew, Smith liked to put author portraits in his publications. Brontë left some brief comments on the portrait in her letters, showing that she thought it admirable as a work of art, but, if we want to find out more about her view of the significance of this portrait, it may be more revealing to look at how she displayed it at home in Haworth. The portrait arrived at the parsonage in August 1850, together with another gift from George Smith – a portrait of the Brontës’ hero: the Duke of Wellington. The two pictures were hung up together. In February 1853, a third portrait arrived from Smith – this time of Charlotte’s literary hero: Thackeray, taken from a chalk drawing of Thackeray by Samuel Laurence, commissioned by Smith in 1852. A letter survives in which Charlotte discusses her decisions in hanging the portraits. She placed Thackeray to the right of the Richmond portrait of herself so that she was either on the left of the row, or sandwiched in between the Duke and Thackeray:

I hung him [Thackeray] in state this morning. He looks superb in his beautiful, tasteful gilded gibbet. For companion he has the Duke of Wellington; (do you remember giving me that picture?) and for
contrast and foil – Richmond’s portrait of an unworthy individual who – in such Society – must be nameless. Thackeray looks away from this latter character with a grand scorn edifying to witness.’ (letter to George Smith 26 February 1853)

What are we to make of this? Her tone is of course humorous and self-deprecating, but the hanging itself is interestingly ambitious. She places herself alongside two men – one, in her view, the greatest military and political hero of the age, the other, the greatest male author. Her hanging seems to be a domestic version of a public gallery of heroes – acting out, or even rehearsing, in the safety of her own home, a fantasy of public visibility on a grand scale.

It seems to me that both this episode and the sketch of Zenobia show Bronte thinking actively and strategically about a time when her image will be released to the public, and this is also true of my final example, which concerns her response to a request for a daguerreotype portrait.

In the last 30 years or so, there’s been much interest focused on the question of whether or not Charlotte Brontë ever sat for a daguerreotype portrait, and, if so, whether the image survives. Several candidates have been put forward, but none has been firmly authenticated.iii Is it likely that she consented to such a portrait? I have a small, but new piece of evidence to add to the mix. On the very same day that she went for her first sitting to Richmond, she wrote a letter to the Edinburgh publisher, James Hogg, editor of Hogg’s Weekly Instructor, refusing his request for a portrait:

‘I decline to sanction the publication of any portrait of myself for the present’ (letter to James Hogg, 13 June 1850).

Hogg’s letter does not survive, but the editor of Brontë’s letters, Margaret Smith, speculates that ‘Hogg may have wished to publish a ‘literary portrait’ – that is, a biographical sketch.iv In fact, the evidence suggests that the request was not for a literary portrait, it was for a daguerreotype portrait - to be engraved and published in Hogg’s Instructor. Thomas De Quincey and Thomas Carlyle were both also, soon afterwards, contacted by Hogg, to have their daguerreotypes taken for this purpose. Both of these authors, reluctantly, accepted and went along to photographic studios – De Quincey in July 1850 and Carlyle in 1851.

It may be that Hogg’s letter did not make it clear to Charlotte Brontë that it was a daguerreotype he wanted, but he was up front to Carlyle about it from the start a year later, so I think there is reason to believe he would have been to Brontë. If it was made clear to her, she might have refused it simply because she was already sitting for Richmond. But an additional reason may have been because Hogg was suggesting photography as the portrait medium. Her letters elsewhere use the word ‘daguerreotype’ in such a way as to make it clear she thought the medium was both literal and superficial. Photography wouldn’t flatter her (as the Richmond portrait had done) but it would also fail to show the inner woman. Whether or not this was her reason for refusing Hogg’s request, we cannot be sure, but what this episode does show us is, firstly, the pressure she was under to become part of Victorian celebrity culture in its most up-to date form and, secondly, her ability to make strategic decisions and manage her own public image in her lifetime. This episode shows us a refusal to be publicly depicted, but for Charlotte Brontë it wasn’t simply a matter of wanting to disappear from public view – to ‘walk invisible’ - but to appear as she wanted, choosing her moment and her medium, for public visibility.

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iii In 1984 a glass negative was discovered in the National Portrait Gallery archives, labelled in the studio index of the photographer Sir Emery Walker (1851-1933) as ‘from a carte de visite of Charlotte Brontë, taken within a year of her death’. The following year a sepia tinted photograph taken from this negative and also labelled ‘Within a year of CB’s death’ turned up at the parsonage in Haworth. The theory is that it may be a photograph of Brontë taken on her honeymoon (July 1854) since a photograph of her husband exists that may also be from this date. In 1995 a BBC Bookmark programme publicised the possibility that two further photographs of Brontë had been discovered at Haworth – by Audrey Hall, Chair of the Brontë Society Membership Committee. The so-called ‘Hall’ photo and the so-called ‘parsonage’ photo. These provoked much debate in the pages of the Brontë Society Transactions.

BENNETT FUND RESIDUE FOR MUSEUM SEISMOGRAPHS
Launched by the Minister of Education,
The Rt Hon Nicky Morgan, MP
at New Walk Museum on Friday Feb 12 2016 at 5pm

by
Emeritus Professor Aftab Khan¹, Dr Stewart Fishwick², Paul Denton³,
Mark Evans⁴, and Lorraine Cornwell⁵

For many years the interest from the small residue of the Bennett fund has been used to support research projects for which applications were invited each year. However in these times of low interest rates the amounts available were too small to be useful. The Lit and Phil Council therefore decided to use the residue for a single landmark project consistent with the objectives set when it was formed over 180 years ago i.e. for the promotion of education in literature, science and art. Its priority then was at the Tertiary level – the formation of a museum, a library, and later a University. Today, the society and its two Sections in Geology and Natural History, retain strong links with both the Leicester Universities and the Museum. Formal education programmes are now managed by the state but there are extra-curricular L&P activities at which town and gown meet, for example in 3 Lit and Phil lecture programmes in the winter at the Museum and the Universities; field trips in the summer; and joint events like the Peach and Bennett Lectures which are published in the Society's Transactions. It also sponsors lectures for schools involving the Universities and the National Space Centre. The proposal to install seismographs at the museums in New Walk and Oakham filled the objectives and budget admirably and also provides a link with another major National

Scientific Institution, the British Geological Survey.

The installation of the seismographs is a great advance. In the half a millennium since Galileo used telescopes to study the heavens, amateur astronomers of all ages have become interested in science through observing the stars. But it is only today, thanks to the availability of cheap computers and the internet, that they have been able to do the opposite, and make seismographs suitable for schools to study what is beneath our feet using the methods of seismology, the science of earthquakes.

Most of what we know about the about the Earth’s interior, from the near surface down to the centre, and how it works, comes from seismology. The Lit and Phil, is delighted that it has now been able to provide seismographs (Figs 1 and 2) – based on the design of that great British seismologist of the last century, John Milne – at both the Museum here in Leicester, and also at Oakham in nearby Rutland where there have been small earthquakes recently. The two Museums and the University, in collaboration with the British Geological Survey which has its HQ at Keyworth, half an hour from the Museum, and which organises and looks after the UK National Seismic Network, as well as the recently developed School Seismic network, are running them. One of their UK stations is sited on the ancient Precambrian rocks of Charnwood Forest, which was first used by the university for this purpose in the 1970’s. The Schools’ Seismology project, is a highly successful outreach programme, was developed and managed by Paul Denton formerly of the Department of Geology at the University of Leicester where it started. Earlier this year he received the prestigious RH Worth prize of the Geological Society of London for his pioneering outreach work on this subject. He is now driving the programme from the BGS at
Keyworth, which has resulted in the installation of seismographs in over 400 secondary schools in the country. Their data are sent on-line to an international data centre and then shared with schools in many countries that have similar programmes, many under the UNESCO umbrella. It may seem a small step to have our own four prestigious institutions enable the installation of just two seismographs, one in each of these two County Museums, but we believe it will be a giant step in stimulating more bright young people – together of course with their parents – to become interested in doing science and mathematics, and so go a little way to help to fill the vacant UK university places in physical science and engineering required to meet the national shortage of manpower in these areas. Earthquakes and their aftermath make dramatic television. News of them and their sometimes devastating effects are now being distributed instantly via social media. They catch the attention of young people immediately, perhaps a little more than does laboratory physics!

The science of Seismology goes further than this. Our understanding and monitoring of hazards (earthquakes, tsunamis, volcanoes, landslides), the exploration for and management of raw materials (oil, gas, water, minerals, industrial and building materials) which mankind needs for its development, use seismology in many, many ways. The modern seismograph has been in use and developed for over a 100 years on Earth, and now excitingly, is deployed on the Moon, with plans for a further deployment on Mars – and who knows when – perhaps beyond? The instrument we have here in the Museum, although simple in its design, in particular because it is primarily an educational tool, is fundamentally the same as those sophisticated instruments used in such far-flung environments. Indeed it has become a very sophisticated science, the complex data processing and interpretation techniques also developing and in use in sciences well beyond that of study of the Earth. For example, they are applied at very small scale to examination of the human body; I am sure there are a number of readers who have had CT scans for whatever medical reason, and so have been subject to the same procedures as those developed by seismologists on a different scale for examining the deep interior of our planet. In April and May 2016 students from the University of Leicester made use of the New Walk Museum seismograph together with a similar instrument to which the Lit and Phil contributed, located in Hazel Community Primary school in the city centre to monitor crowd induced vibrations generated at the King Power stadium as
Leicester City Football club’s premiership winning season reached its climax. This outreach project (dubbed the @vardyquake project after Leicester’s star striker) caught the imagination not only of school students in Leicester but also the world’s press and ended up as a “good news” story syndicated globally and published in over 375 different news articles in dozens of countries (e.g. Figs 5 and 6).

The seismographs in the New Walk and Oakham Museums will bring this science that much closer to those in Leicestershire and Rutland, known for the fairly regular small subterranean earth movements at present occurring occasionally in the vicinity of Oakham, but also in the past around Charnwood Forest, as well as in the north of the county. In the short time since the two instruments have been on test, they have made some splendid records of earthquakes from the Pacific, South America and the Mediterranean. Two examples are shown on Fig 4.

On Feb 11 2016 the Society’s President, Mrs Joan Beeson, handed over the seismograph at Oakham to the Museum there and on Feb 12 she invited the Minister to inaugurate our own instrument at the New Walk Museum in the City of Leicester (Fig 3).

Fig 4 Records made at the New Walk Museum in April 2016 of 2 large Earthquakes in Japan and Ecuador, both c.9000km away.

Fig 6 Records made at Hazel Community Primary School of 4 goals scored by Leicester City against Swansea on their way to the Premier League championship.

References and Links
Seattle Seahawks football-quakes measured by PNSN https://www.pnsn.org/seahawks
Useful links:
http://www.bgs.ac.uk/ssp
http://www2.le.ac.uk/hosted/litandphil/seismographs
http://www.bbc.co.uk/news/uk-england-leicestershire-36243016
I have pleasure in presenting my report for 2015/16. Like last season, this too has been a very busy year with projects previously planned and reported on at the last AGM coming to fruition, giving us a higher profile in Leicester, Leicestershire and Rutland.

The Rugby World Cup Exhibition “Leicester Rugby-Leicester People” was launched on the Thursday September 17th 2015 in Newarke Houses Museum under Mrs Ann Fuchs’s Presidency as a joint project with Leicester City Council Museum Service when several Lit & Phil Council Members were among the guests. Many members took advantage of visiting the exhibition on the special open evening on 23rd November. We are greatly indebted to Mr Michael Kirk for the major contribution he made.

Also mentioned in last year’s report was the Seismograph Project which used the Bennett Fund to provide seismographs for the New Walk Museum and for the Rutland County Museum in Oakham.

It is however the lectures that are our raison d’etre and this year’s programme can only be described as outstanding in its range of topics and in the excellence of the speakers. We are greatly indebted to our programme secretaries, Geoffrey and Hilary Lewis, for all the time and effort they devote to this.

In October we heard Alexander Waugh speaking of his grandfather’s house at Combe Florey where the orderly formal rooms contrasted markedly with the informal chaos elsewhere. Professor Max Saunders followed this speaking on “Ford Madox Ford, Parade’s End and the First World War”; this novel is becoming increasingly regarded as the greatest British fiction of the First World War. Professor Grayling told us of the Greek philosophers and encouraged us to undertake many different activities to make time appear to last longer as this is all there is. “Who would have thought making maps could be so enthralling” was a comment made to me after Tom Sharpe’s lecture on Mr Smith’s remarkable maps, our joint lecture with the Geology Section. Professor Andy Abbott’s talk on the development of chemicals resulting in new colours being produced for painting pictures was equally fascinating. Sir Mark Walport, the Government’s Chief Economic Adviser spoke on “How will we power the UK in the future?” resulting in a lengthy discussion only curtailed by the constraints of time allowed to us at the Museum. We were invited to host this as one of a series of 7 lectures that Sir Mark was delivering in different parts of the UK and was additional to our programme of 11 lectures. Who will ever forget the Godwit flying from Alaska to New Zealand and back via China for a few days rest? This was one of the many facts we learned from the joint Natural History lecture given by Prof. Ian Newton on bird migration. Prof. Jonathan Bate told us of writing “Ted Hughes - The Unauthorised Life” and included ways of avoiding copyright problems by using court material already in the public domain. From using bulky tape recording equipment to smart phones for recording news items and involving listeners by Face book, Twitter and online were discussed entertainingly by Ms Jane Hill, editor of BBC Radio Leicester in the Leicester Mercury sponsored Lecture. Similarly, Dr John Simpson explained changes in technology in the editing of the OED from individuals sending in postcards to work being done on line. Those of us who were concerned that we would find Prof. Frank Close’s lecture on Neutrinos a challenge had nothing to fear. The lecture was the intriguing story of Bruno Pontecorvo an eminent physicist who disappeared in 1950 from Italy and reappeared in Moscow in 1955. It was a fitting end to this season.

Some of our lectures have been supported by outside bodies, the University of Leicester, De Montfort University, The Royal Society of Chemistry, the British Association of Science and the Leicester Mercury. The Geology and the Natural History Sections both made contributions to the cost of the joint lectures. Thank you to them all, the Society is very grateful for their continued interest. In addition I am pleased to tell you that the Vice Chancellor of Loughborough University has offered sponsorship for a lecture next season. Thank you also to Leicester City Council Museum Services and to all the staff here for all their help at our lectures. Our Publicity Officers, Diana Thurston and Ann Fuchs contact special interest groups and produce press releases for the Leicester Mercury and together with Craig Vear our website editor ensure that details of lectures are made known outside the
Society consequently 145 visitors have been to our meetings this year. Thank you to them all.

This year our Schools Lecture was held in Lutterworth College in February when Prof. Mike Branney and Dr Stewart Fishwick of the University of Leicester Department of Geology spoke on “Largest Natural Disasters: super eruptions and great earthquakes”. This was well received by the students as well as by Ann and Peter Fuchs and David and me who represented the Society.

In case you think that our outreach veers towards science I would just mention our English Prizes which are awarded to final year students at each of our 3 universities. These are awarded in the summer term and details will be published in the Transactions.

There are therefore many and varied ways in which the Society is drawn to the notice of the public at large.

I cannot end this report without thanking the Council for their support and thanking everybody who has helped the Society to run so smoothly this year.

Some I have already mentioned but I want to thank John Heard our efficient secretary, to David Beeson our membership secretary for keeping the records and welcoming people at the door and to Jeremy Prescott and Peter Fuchs who have assisted him in my absence. Also thank you to Hilary Lewis, Dot Barnard and Joanne Warren for serving the refreshments, an important way of ending the meetings giving an added opportunity for members to chat to each other and to speak to the lecturer more informally.

I must say a special thank you to the Society for inviting me to be the President this year, it is a great honour. It has been an experience which I never expected to have but it has been enlightening, interesting and enjoyable although I look forward to being back on the reception desk next season.

My final very pleasant duty is to tell you that the President for next year will be Professor Alison Yarrington. She will take over the mantle on 3rd October at our first meeting of our 2016/17 season.

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LEICESTER LITERARY AND PHILOSOPHICAL SOCIETY
LECTURE PROGRAMME 2015 2106

5th October 2015
DEEDS NOT WORDS
President’s Address
Open Meeting to be followed by a social gathering
The Lord Mayor of Leicester will be present

19th October 2015
A PLAIN HOUSE ON A HILL –EVELYN WAUGH’S LAST HOME –COMBE FLOREY
Mr Alexander Waugh
General Editor of OUP The Complete Works of Evelyn Waugh
Honorary Research Fellow University of Leicester
Sponsored by The University of Leicester

2nd November 2015
FORD MADOX FORD, PARADE’S END AND THE FIRST WORLD WAR
Professor Max Saunders
Director Arts and Humanities Research Institute
King’s College London
Sponsored by De Montfort University

16th November 2015
DEATH, DIGNITY AND THE MEANING OF LIFE
Professor A C Grayling FRSL FRSA
Philosopher and Master of the New College of Humanities

30th November 2015
Mr SMITH’S REMARKABLE MAPS
Mr Tom Sharpe FGS
Geologist Lyme Regis Museum and Cardiff University
Joint lecture with the Geology Section
Seasonal refreshments will be served after the lecture

11th January 2016
FROM TEST TUBE TO TURNER –THE ROLE OF THE CHEMIST IN ART
Professor Andy Abbott
Department of Chemistry University of Leicester
Lecture Sponsored by The Royal Society of Chemistry
18th January 2016

HOW WILL WE POWER THE UK IN THE FUTURE?
Sir Mark Walport FRS FMedSci
Government’s Chief Scientific Adviser

25th January 2016

BIRD MIGRATION
Professor Ian Newton OBE FRS FRSE
Ornithologist
Joint lecture with the Natural History Section

8th February 2016

TED HUGHES - THE UNAUTHORISED LIFE
Professor Sir Jonathan Bate CBE FBA FRSL
Biographer Novelist and Provost of Worcester College Oxford

22nd February 2016

LEICESTER MERCURY MEDIA LECTURE
TELLING LOCAL STORIES IN A HAND-HELD WORLD
Ms Jane Hill
Editor BBC Radio Leicester
Sponsored by Leicester Mercury

7th March 2016

DECODING THE LANGUAGE: THE OED’S WAY
Dr John Simpson OBE
Formerly Chief Editor Oxford English Dictionary

21st March 2016

PONTECORVO “MR NEUTRINO” THE FATHER OF NEUTRINO ASTRONOMY
Professor Frank Close OBE
Professor of Physics University of Oxford
Sponsored by the British Science Association

25th April 2016

ANNUAL GENERAL MEETING (NB 6.45PM)
FOLLOWED BY A RECITAL BY MUSICIANS FROM THE UNIVERSITY OF LEICESTER
Led by Dr Paul Jenkins
Wine will be served in the interval

EXCEPT WHERE INDICATED ALL MEETINGS ARE HELD AT NEW WALK MUSEUM AT 7.30 PM

GEOLoGY SECTION ANNUAL REPORT 2015-2016
Chairman’s Report 2015-2016
Annual General Meeting March 23rd 2016
by Dr Mark Evans

Officers and Committee 2015-2016

Life President: Dr Trevor Ford OBE
Life Vice President: Dr Roy Clements
Chairman: Dr Mark Evans
Vice Chairman: Dr Albert Benghiat
Secretary: Fiona Barnaby
Treasurer: Roger Latham
Field Secretary: Robert Tripp
“Charnia” Editor: John Martin
Publicity Officer: Dr Albert Benghiat
Webmaster: Rob Tripp
Student Representative: Sam Taylor
Committee: Dennis Gamble,
Dr Tom Harvey,
David Haywood,
Dr Joanne E. Norris
Co-opted:
Dr Carys Bennett,
Gillian Graham
Tim Johnson
This year our President Dr Trevor Ford was awarded with an Honorary Doctorate by the University of Derby for his outstanding contribution to the understanding of the geology of Derbyshire and the Peak District. Unfortunately he has not been able to attend any meetings this year, but we wish him well and look forward to reading more of his missives in our newsletter Charnia. The Section's total membership of 111 is slightly down on that of last year, and we were saddened to hear of the death of member John Ingall in February.

We had an early start to our supposedly summer programme in late March with a visit to the Sedgwick Museum of Earth Sciences at the University of Cambridge to view an exhibition on enigmatic Ediacaran fossils. The Section were conducted around a newly opened level at the Milldam Mine, Derbyshire, where fluorite ore is extracted from its host rock of Carboniferous limestone, and the neighbouring processing plant at Cavendish Mill, where it is purified. We also made return visits to quarries at Ketton, Rutland, and Much Wenlock, Shropshire. Ecton Mine in Staffordshire was once the location of a large deposit of high-grade copper ore, the only one known in the Peak District, and we are grateful to Drs Jill and Albert Benghiat for facilitating our visit there. The weekend trip to Anglesey encompassed an extremely wide window of geological time. The Section examined rocks ranging from the most recent, Devensian, ice age (ending about 11,000 years ago) to the remains of a vanished, subducted, ocean from the Ediacaran (some 550 million years ago) by way of the Carboniferous and Devonian. Our thanks to Professor Charlie Bendall for his leadership. Our last meeting of the summer examined the coming together of the bio- and geospheres in the churchyard at Lyddington, Rutland, where Dr Tony Fletcher described the great variety of lichens that could be found on the equally varied gravestones. The average attendance for field meetings was 12, and my thanks go to Field Secretary Robert Tripp for arranging the programme and his tireless pursuit of the necessary permissions.

The winter programme of lectures was well attended, the average of 49 being slightly up compared to last year. Our high-point was an audience of 67 for Dr Marc Reichow’s talk on Yellowstone volcanics in January. Professor Mark Williams started us off with assessment of the human influence on our planet, for which we were grateful as he stood in at relatively short notice. Our joint lecture with the Parent Body was well attended, with an almost capacity crowd of 148. Tom Sharpe of Lyme Regis Museum and Cardiff University gave us a fascinating insight into the creation of William Smith’s 1815 geological map in its bicentenary year. Another anniversary was commemorated when Dr Michael Simms reported on the latest research into the Barwell Meteorite 50 years after its fall on Christmas Eve, 1965. Our Members’ Evening was well supported, with talks by Tim Johnson, Frank Ince, Paul Stevenson, Geoffrey Warrington, and Graham Cheeseman. We also heard about decaying fish, the vertebrate invasion of land, a unique collection where art and petrology collide, an alternative view of the volcanic sequence of Skye, geological medical doctors, evidence for water-borne sediments on Mars and more marine reptiles. My thanks to Vice Chairman Albert Benghiat and Treasurer Roger Latham for acting as chair for some lecture meetings where I was unable to attend.

Our annual Saturday Seminar, Planet of the Plants, was a success with an attendance of 62 and 6 speakers. Each talk contributed towards a fascinating insight into the geological history of plants and other photosynthetic organisms. Our final talk by Prof David Beerling concerned a controversial proposal to recruit plants to help mitigate climate change through enhanced rock weathering. My thanks are due to my co-convenors, Dr Tom Harvey, Dr Albert Benghiat and John Martin, for their help in organising the programme, and Treasurer Roger Latham for financial management. Carys Bennett and Dennis Gamble also provided valuable assistance.

Finally, I now have come to the end of this 2 year period as Chairman of the Geology Section, and we are healthy in terms of our membership and attendances. However, we have problems recruiting to key committee posts such as Chairman and Secretary. Despite creating a new committee post of Lecture Programme Secretary to organise the meetings, we have not been able to fill the newly-streamlined post of Chairman. While we can carry on with a system of acting chairs, it is not a long-term solution. Likewise, our Secretary Fiona Barnaby, despite initially stepping down, has graciously offered to carry on in her role for another year. I urge our members to get more involved in the running of the Section.
Geology Section Programme 2015-2016

Friday March 27th
   Sedgwick Museum, University of Cambridge
   Host: Nicola Skipper

Tuesday April 14th
   Ketton Quarry, Rutland
   Hosts: Hanson Cement

Tuesday May 19th
   Milldam Mine, Derbyshire
   Hosts: British Fluorspar Ltd

Friday 19th to Sunday 21st June
   Weekend Excursion to Anglesey
   Leader: Prof Charlie Bendall

Saturday July 25th
   Ecton Mine, Staffordshire
   Leader: Drs Albert and Jill Benghiat

Saturday August 8th
   Lea Quarry, Shropshire
   Leader: Mike Allen

Saturday September 5th
   Lyddington, Rutland
   Leader: Dr Tony Fletcher

Winter Programme 2015-2016

All held at 7.30pm in Lecture Theatre 3, Ken Edwards Building, University of Leicester, except where stated.

Wednesday October 7th
   ‘Raiders of the last park’ or, how humans came to dominate the biosphere.
   Prof Mark Williams (University of Leicester).

Wednesday October 21st Lecture Theatre 1, Ken Edwards Building
   A geological smorgasbord.
   Dr Sarah Gabbott (University of Leicester).

Wednesday November 4th
   The Corsi Collection of decorative stones: where geology meets the arts.
   Dr Monica Price (Oxford University Museum of Natural History).

Wednesday November 18th
   A re-appraisal of the volcanic evolution of the Isle of Skye, N.W Scotland, hot stuff, big bangs and meteorites!
   Dr Simon Drake (Birkbeck, University of London).

Monday November 30th
   Parent Body Lecture, New Walk Museum, Leicester
   Tom Sharpe (Lyme Regis Museum & Cardiff University). Mr Smith’s remarkable maps.

Wednesday December 2nd Lecture Theatre 2, Ken Edwards Building
   To Here From Eternity: The extraordinary 4.5 billion year story of the Barwell meteorite.
   Dr Michael Simms (National Museums Northern Ireland).

Wednesday December 16th Christmas Meeting, New Walk Museum, Leicester.
   Explosive super-eruptions: The story of the Yellowstone volcanic track.
   Dr Marc Reichow (University of Leicester).

Wednesday January 27th
   Doctors and Geology.
   Dr Albert Benghiat (Vice Chairman, Geology Section, LLPS).

Wednesday February 10th
   Members’ Evening, New Walk Museum, Leicester.

Wednesday February 24th Lecture Theatre 2, Ken Edwards Building
   Models of morphological evolution during vertebrate terrestrialisation.
   Dr Marcello Ruta (University of Lincoln).

Wednesday March 9th
   Exploring Mars.
   Prof John Bridges (University of Leicester).

Saturday March 12th
   Annual Saturday Seminar, University of Leicester.
   Planet of the Plants.

Wednesday March 23rd
   Annual General Meeting and Chairman’s Address by Dr Mark Evans (New Walk Museum, Leicester).
57TH ANNUAL BENNETT LECTURE

THE SIXTH ELEMENT

Professor Andy Saunders

Bennett Professor Department of Geology University of Leicester

Delivered on 7th March 2016 in Bennett Lecture Theatre 1 University of Leicester

Carbon is intrinsic to all life on Earth; it is the 4th most abundant element in the galaxy, and the 15th most abundant in the Earth's crust. Within the Earth, most carbon (90%) has long been sequestered in the metallic core – probably when the Earth and its core were formed 4.5 billion years ago. The remaining carbon resides in the mantle, crust and at the surface in biomass, oceans and atmosphere. The exquisitely complex pattern of carbon exchange between these reservoirs is known as the carbon cycle, a topic of study for well over a century, not least because of the global impact of anthropogenic carbon release (e.g., Arrhenius 1896).

Global mass extinctions are associated with major perturbations in the carbon cycle (Saunders, 2016 and references therein). There is both indirect and direct evidence for this. Indirect evidence includes: increases in surface temperature (recorded in proxies such as oxygen isotopes); changes in global ocean composition (especially redox and alkalinity); and changes in carbon dioxide content of the atmosphere as recorded in ancient soil horizons and changes in the density of fossil leaf stomata. Direct evidence includes changes to the biosphere – the mass extinction event itself must be linked to the changes to the carbon cycle, either as a cause or an effect. Strong evidence for change to the cycle is also shown by changes to the ratio between $^{12}\text{C}$ and $^{13}\text{C}$, the two main isotopes of carbon (see below).

The carbon cycle operates on several timescales, ranging from hours (the diurnal photosynthetic/respiration processes) to multi-millenial (burial and sequestration of carbon in sedimentary rocks, and their subsequent release through exhumation, volcanism and metamorphism). It transpires, however, that three events have triggered anomalous, rapid and massive release of carbon into the surface environment: meteorite impacts, large-scale flood volcanism, and the development of human civilization and extraction of fossil fuels. The first two, at least, are associated with mass extinctions.

For the last few millennia, and before the Industrial Revolution, CO$_2$ concentrations in the atmosphere ranged between about 285 and 265 ppmv (parts per million by volume), based on analysis of gas trapped in Antarctic ice cores (Bereiter et al 1998). Natural fluctuations in CO$_2$, possibly related to volcanism and/or sunspot activity, occur throughout this period, and may be related to the Medieval Warm Period (950 to 1250 AD), the Little Ice Age (1250 to 1850? AD), and the Maunder Sunspot Minimum (1645 to 1715 AD). As the Industrial Revolution developed, CO$_2$ release accelerated, and the atmospheric CO$_2$ content currently (2016) stands at 400 ppmv.

Further back in time, before approximately 17 ky before present (b.p.), atmospheric CO$_2$ levels were as low as 180 ppmv. This was the time of the latest of several major glacial episodes, and data from ice cores extending back to more than 800 ky show natural oscillations of CO$_2$ between 180 and 290 ppmv (Luthi et al., 2008; Bereiter et al., 2015). The onset of each of the glacial periods (themselves probably triggered by variations in the distance of the Earth from the Sun and the degree of axial tilt of the Earth) is characterized by a slow decline in CO$_2$ (over ~50 ky), and each interglacial period by a rapid increase (over ~10 ky). Notwithstanding that each datum point from the ice cores is not a simple annual record, the average rate of increase in CO$_2$ marking the transition from glacial to interglacial period is far less, by a factor as much as 300, than the current rate of CO$_2$ increase: approximately 0.013 ppmv/year as opposed to the current 2.5 to 3 ppmv/year.

The ice core data extend to about 800 ky b.p. Prior to this, the atmospheric CO$_2$ data are sketchy and rely on a range of proxy methods, some of which were mentioned earlier, and global geochemical models (e.g., Berner, 2006). For much of the Phanerozoic, CO$_2$ concentrations exceeded 1000 ppmv, which is consistent with an Earth free of major polar ice
caps. Exceptions include the Permo-Carboniferous glaciations, when CO₂ probably dropped to less than 500 ppmv (note that in the Permian, solar output was approximately 6% less than today). In the opposite sense, the Palaeocene-Eocene Thermal Maximum (PETM), and times of mass extinctions, appear to correlate with transient large increases in atmospheric CO₂ and attendant global warming.

Accompanying several mass extinctions (e.g., the Permo-Triassic extinction 251 m.y. ago), hyperthermals such as the PETM, and oceanic anoxic events, are rapid changes in the relative abundances of the carbon isotopes ¹²C and ¹³C found in carbonates and organic shales (e.g., Kennett & Stott, 1991; Korte & Kozur, 2010). The ratio of these two isotopes, reported as the deviation from the values measured in a standard, is given by the notation d¹³C (in parts per thousand). Ocean water has a d¹³C value of approximately zero (because the reference standard, a natural carbonate, formed from ocean water). Volcanic gas is about -5 per thousand. Organic material is typically much lighter (-20 to -30) and methane less than -60 per thousand. The shifts in d¹³C at the time of the mass extinctions are not large – of the order of 4 to 8 parts per thousand. But, because the atmosphere, ocean and biomass contain large masses of carbon (of the order of 50,000 Gt² C), to effect this magnitude of change requires the injection (or removal) of thousands of gigatonnes of carbon with a different isotopic composition. Where does this carbon come from?

As large as it is, there is insufficient C in the biomass if that is the sole source of the additional C (~2000 Gt). Rather, the C must be extracted from a geological source, and on geologically rapid timescales. The end-Cretaceous meteorite arguably excavated large masses of carbon at the carbonate-rich Chicxulub impact site and this, accompanied by deterioration of the surface environment and decomposition of large swaths of life, probably led to increased CO₂ output in a very short period time (few years) (Schulte et al., 2010). Evidence for meteorite or cometary impacts at other mass extinction events and other transient hyperthermals is missing, however.

A likely source is flood basalt magmatism. It is well established that most mass extinctions, several global oceanic anoxic events, and the PETM are coincident with flood basalts (White and Saunders, 2005). The volcanic output in these provinces is vast – several eruptives (lavas, pyroclastics, etc); (ii) intrusions such a sills and large bodies of underplated magma deep in the crust; and (iii) from C-bearing sedimentary rocks (coal, organic-rich shales, limestones) ‘cooked’ by igneous intrusions. Given the uncertainties in estimating the original igneous volume of a province (how much lost due to erosion, for example; how much magma was stored in the crust?), and its effects on the country rock, it is unsurprising that the estimates of CO₂ production are also hazy. However, in the case of the Siberian Traps, the lower estimate is 70,000 Gt CO₂, and the upper estimate is in excess of 330,000 Gt of CO₂ (Saunders, 2016). These estimates do not include the secondary release of carbon-bearing gases from cooking of country rocks, nor release of methane hydrates from the seabed and permafrost, triggered by warming of the surface environment. To put these figures into context, the present-day ocean-atmosphere system contains approximately 50,000 Gt C, equivalent to ~180,000 Gt CO₂.

The masses of C released from flood basalt provinces far exceed the upper bound of predictions of anthropogenic release, even assuming that we burn all available oil, gas and coal (likely ~5000 Gt C; max ~15000 Gt C: Lenton & Britton, 2006 and references therein). However, the key issue is the rate of release. If the volcanic gas is released over millions of years, then burial in rock is able to remove the excess from the surface. For example, if the Siberian Traps were erupted over one million years, this would equate to an average flux of between 74 Mt and 300 Mt CO₂ per year (we are currently releasing ~30 Gt CO₂ each year).

Do we know how rapidly the Siberian Traps were erupted? The short answer to this, no, not at the precision required. Latest U/Pb and ⁴⁰Ar/³⁹Ar dates indicate that the eruptions were contemporaneous with the P-Tr C isotope excursion and the mass extinction just before the P-Tr boundary, and rapid (Reichow et al., 2014; Burgess & Bowring, 2015), but the data do not, yet, provide a precise figure for the duration of the activity, and how rapid it was. It may be more useful to consider the duration of the development of the carbon isotope excursion and the mass extinction event. Recent high-precision dates from the Meishan, China, section show that the extinction interval and
carbon isotope excursion developed very rapidly, over an interval between 20,000 years and 130,000 years (Burgess et al., 2014). This provides a crude estimate of how rapidly the Trap volcanism may have released CO$_2$. The lowest Trap volume and lowest release rates (70,000 Gt of CO$_2$ over 130,000 years) would give an average flux of 0.538 Gt CO$_2$/year (approximately 50 times less than the current anthropogenic release rate, or 6.5 times more than the average rate of increase of atmospheric CO$_2$ increase rate during the onset of an interglacial period). The highest Trap volumes and greatest release rates (350,000 Gt CO$_2$ over 20,000 years) would equate to an average flux of 17.5 Gt CO$_2$/year, similar in magnitude to recent anthropogenic CO$_2$ emissions.

It is necessary to be circumspect when comparing the consequences of anthropogenic and flood basalt CO$_2$ emissions. Flood basalts have additional impacts: not only are the total masses much higher than anything that humankind can emulate, but the basalts also emit large masses of SO$_2$. These can cause rapid, short-term global cooling and consequent severe effects on the biosphere (Self et al., 2008). Halogens may affect the ozone layer (Beerling et al., 2007). Nonetheless, it is important to fully understand the role of flood basalts in the Earth’s major mass extinctions, and to evaluate whether the rate of CO$_2$ emissions, rather than the total volume, was an important factor. Our existence may depend on it.

1 The two isotopes occur in all natural systems (plants, water, air, rock). Most (99%) carbon is the lighter isotope $^{12}$C; the remainder, about 1%, is $^{13}$C (there is also a miniscule amount of $^{14}$C which we needn’t be concerned with here).

2 1 Gt (gigatonne) = 1000 Mt (megaton) = 10$^9$ tonnes.


De Montfort University Prize is awarded to the best overall graduating students in English and is divided this year between Sarah Davies and Megan Minard.

Analysing the representations of the movement and/or stasis of the characters in *The Red Flag* (1907-08) and *Shameless, Series 1, Episodes 1-7* (2004).

Sarah Davies

**ESSAY EXTRACT**

Space can be said to be produced through a combination of the natural landscape, manufactured structures such as buildings, and the way in which the space is occupied. The French philosopher, Henri Lefebvre, argues that the production of space within literature is different because it is the deliberate and conscious creation of the author…[1]

…While the characters in Paul Abbott’s television series *Shameless* are also trapped by poverty, in contrast to *The Red Flag* they rarely venture beyond the environs of the Chatsworth Estate. Instead, they are effectively contained by the legacy of the Housing Act 1980, introduced by Margaret Thatcher’s Conservative government, which gave council house tenants a legal right to purchase their homes. The purchase price was heavily discounted when compared with the market value of the properties, encouraging many tenants to enact their so-called ‘Right to Buy’. However, residents of certain estates or parts thereof simply could not afford to buy their houses. Not only did local authorities have fewer properties in which to place tenants, they struggled adequately to maintain those properties that were still their responsibility, due to imposed spending restrictions. As a result those with the greatest social needs became trapped in small communities like the Chatsworth Estate, alienated and isolated from wider society…

…Lefebvre argues that architects and planners believe themselves to be ‘doctors’ of space, able to make ailing neighbourhoods better.[2] The Chatsworth Estate is a fictional representation of the repeated failure of inner-city planners to recognise the needs of the working class.


**Extract from a Research Report exploring the relationship between modernist literature and popular culture: The Fashionable High-brow in Harper’s Bazaar (1930).**

Megan Minard

First launched in the United Kingdom in 1929, *Harper’s Bazaar* became ‘a direct competitor to *Vogue*’ as a mass-market fashion magazine, primarily illustrating and advocating the cutting edge of contemporary fashion from a global stance.[1]…*Harper’s Bazaar* was maintained and marketed towards a niche audience […] its main aim was generally considered to be to ‘satisfy the aspirations of the upper classes’.[2]

…Leslie A. Fiedler condemned the appearance of fiction in periodicals, expressing the opinion that publishing in such magazines as *Harper’s Bazaar* deemed it to be trivial, and less likely to be appreciated by the magazine’s readership…

…When considering their similarities, fashion and modernist literature are not entirely dissimilar in their aims. T. S. Eliot commented in his essay ‘Tradition and the Individual Talent’ (1919) that ‘no artist has his complete meaning alone’, and must be mindful of past literary traditions.[1] In a similar manner, fashion is often concerned with past trends and ‘different orders of time – the past, the eternal, the present, and the future’.[4] Fashion also advocated ‘the introduction of “new modes” and changing trends’, and a movement away from the past, just as Pound implored writers to ‘Make It New’.[5] Paul Poiret commented in 1914 in a *United States* publication of *Harper’s Bazaar* that ‘the very word, fashion, means something new. Fashions should always develop in an unexpected direction and proceed towards the unknown’.[5] In this sense, fashion and modernist literature both endeavour to create something original and aim towards niche audiences.


2 Peter Scott, p.121: Stam and Scott, p.21.
Leicester University Prize is awarded for the best final year essay in The School of English and went this year to Ross Willett.

World of the News

A Critical Reflection

Ross Willett

Leicester University

My essay is a critical reflection on my short screenplay, World of the News, which follows a paranoid couple who have locked themselves in a home packed with monolithic stacks of newspapers and hoarded cans of food. Inside this extreme environment, the couple's fear of the world outside intensifies, leading them to take drastic actions to ensure the security of their isolation. I wrote World of the News and its accompanying critical reflection essay as part of Dr Harry Whitehead's fascinating module Understanding Screenplays (EN3175).

The critical reflection of World of the News examines the writing process behind the screenplay, outlines its initial inspiration (the true story of Homer and Langley Collyer) and explains how this idea evolved into my final screenplay draft which deals with more contemporary issues such as dangers existing in reality versus dangers presented in the media. It reflects on the details of the screenwriting skills I acquired during the course of the module, and how these were applied when writing the screenplay. I demonstrate how I considered the World of News theories of creative writing scholars, Robert McKee and Lagos Egri, which involve the power of symbolism on screen, minimalism and various concepts regarding building plot and tension. I also introduced the short films and feature films that aided my inspiration and described how I used rather ordinary settings and characters to create the extraordinary situation to which it is easier to relate and is more powerful for the audience.

I was delighted that my screenplay won the John Coleman Creative Writing Prize for the highest mark on a creative writing module, and that subsequent essay won the Leicester Literary and Philosophical Society Prize for the best final year special subject essay.

Loughborough University Prize is awarded for the best final year dissertation and this year is divided between Taryn Marsh and Nicola Williams.

An investigation into the effect that educational mobile technology has on the acquisition of reading skills in an informal learning setting.

Taryn Marsh

Loughborough University

Abstract:

In such an economically competitive country, it is perhaps surprising to some that literacy standards in the United Kingdom are dramatically below international competitors. Research into the reading development of young children has continually proved that the relationship between children's reading acquisition and their phonological awareness skills is undeniably strong. It is therefore unsurprising that the focus of many reading acquisition programmes is to nurture children's knowledge of the connection between the written and spoken forms of a language.

In order to assist the development of literacy skills, research has focused on the many different forms of literacy intervention implemented at a young age. In recent years there has been a shift in focus of this intervention to schools as a result of the growing popularity and affordability of mobile technology. This dissertation identifies that there is a need for evaluation of the influence of mobile technology on reading acquisition in informal situations such as at home. The main aim of this dissertation was to identify the effectiveness of a particular phonics mobile application called 'Jolly Phonics: Letter Sounds' on children's reading development. As children are exposed to constantly increasing mobile technology, it is an opportune moment to establish the effectiveness of this constantly growing market. This dissertation notes the importance of developing research in this area.
Performing "non replies" in a political interview: A study of the effectiveness of strategies in political interviews.

Nicola Williams

Loughborough University

Summary of Dissertation

This dissertation reports on a study I have conducted that closely analyses the strategies used to enact power in the context of televised political interviews. After carrying out an evaluation of the different theories of power, this dissertation asks a question based on claims that Joanna Thornborrow (2002) makes about the relationship between power and language. She believes that power can be constructed either structurally or interactionally.

This dissertation aims to investigate whether ‘where there is evidence of both structural and interactional strategies being used in a political interview to put a particular version of events on record, is there evidence that any strategies are more effective than others in achieving that goal?’ I use conversation analysis to decide how power is enacted structurally. I use this, with Brown and Levinson’s politeness theory, to decide how power can be constructed interactionally by looking at the occurrences of face threatening acts during televised political interviews in the UK General Election of 2015. Using elements of Bull and Mayer’s (1993) methodology, I analyse David Cameron’s and Ed Miliband’s performances of what are called ‘non-replies’ in replies to the questions of interviewers. It is possible to discern distinctive forms of equivocation unique to each politician and demonstrate that there are more effective ways of delivering non-replies that are less likely to be challenged.

My dissertation shows how politicians can resist an interviewer’s attempt to put a particular version of events ‘on record’.

GEOLOGY SECTION (C)

ANNUAL SATURDAY SEMINAR 2016

PLANET of the PLANTS

Presented by the Geology Section of Leicester Literary and Philosophical Society.

Saturday 12th March 2016

Ken Edwards Building University of Leicester

Phototroph diversity: a tale of kidnapping and enslavement

Dr R.J. Gornall

School of Botany University of Leicester

The current view of the phylogeny of living things is reviewed and the many lineages containing photosynthetic members are highlighted. The different types of plastid are described and an outline of their relationships and those of their hosts is given in the context of the timeline of life. The roles of kleptoplasty and endosymbiosis are emphasised and the evolutionary significance of these phenomena is made clear. In conclusion, the question of what view taxonomists might take regarding the rank of kingdom is addressed.
The early diversification of land plants; clues from the Lower Devonian mesofossils.

**Dr. Jennifer Morris**  
*School of Earth Sciences, University of Bristol, Life Sciences Building, Tyndall Avenue, Bristol, BS8 1TQ*

The origination of land plants (embryophytes) during the Mid-Ordovician period (~480 Myrs ago) was a major landmark in the evolution of life. They transformed landscapes, providing new habitats and energy for emerging terrestrial ecosystems. It is thought that the embryophyte lineage, which including liverworts, hornworts, mosses (collectively referred to as bryophytes) and the vascular plants (tracheophytes), emerged from a green algal ancestor. Through a series of innovations (e.g. fundamental changes to their life cycle, cuticles, stomata, vascular tissues) plants were able to adapt to life on land.

The key to understanding the transition from aquatic algae to terrestrial vascular plants is to understand the evolutionary relationships between the main lineages within the embryophytes, in particular between the bryophytes and tracheophytes. One approach is via the creation of phylogenetic trees from two main data sources: molecular and morphological data on living taxa and/or the morphological data of plant fossils i.e. extinct taxa. However, these analyses have yet to be successful in achieving a unifying consensus. This is in part due to the relative lack of data from the fossil record.

The plant fossil record comprises of body fossils and a separate record of their spores that have been dispersed and subsequently preserved within the matrices of sedimentary rocks. The earliest unequivocal body fossil is that of Cooksonia, a simple vascular plant of leafless stems that are branched with equal division and terminate with spore-bearing organs (sporangia), found in rocks of Silurian age (~425 Myrs ago). However, this record is highly biased towards plants that contain recalcitrant tissues (e.g. lignin). In contrast, the spore record is much older, in part because their walls are coated with decay-resistant sporopollenin. Trilete spores appear around ~450 Myrs ago (Upper Ordovician) while the more elusive cryptospores (dyads and tetrads) go back to ~470 Myrs ago. There is some debate over the affinity of the cryptospores, but it is noted that the wall ultrastructure of some cryptospore taxa bear resemble to those of extant liverworts. However the earliest unequivocal record of liverworts is not until ~385 Myrs ago.

Much of our understanding of the anatomy of the earliest land plants comes from the study of exceptionally well preserved, minute charcoalified fossils from the Lower Devonian, termed mesofossils. Despite representing only a facet of early land vegetation, recent studies with Prof. Dianne Edwards at Cardiff University indicate that they continue to make significant contributions to the understanding of morphological and anatomical diversity, giving clues to the evolution of key characters. Some fossils possess a combination of characters that are not known in plants today and may represent stem group embryophytes. Thus it is hoped that with this data the relationships between bryophytes and the early tracheophytes may be elucidated.

**Rooted in Earth History: The Devonian Transition to a forested planet**

**Dr Christopher M Berry**  
*University of Cardiff*

Modern forests lie at the centre of a web of interactions from which influence spreads far beyond the terrestrial realm into the wider Earth System, including atmospheric composition and marine geochemistry. The ‘transition to a forested planet’ during the Mid and early Late Devonian (393–372 Ma) must therefore have been a time of profound global change, the predicted effects of plant growth and plant-enhanced weathering being incorporated into, for example, models of atmospheric CO2 through time. Supporting knowledge of vegetation during this interval has, however, been very sketchy until recently. This talk will highlight the recent dramatic changes in concepts of the morphology, anatomy and growth of tree-sized plants which appeared and evolved during this time (aneurophytaleans, archaeopteridaleans, pseudosporochnaleans, lycopsids) with an emphasis on leaves, roots and wood. Definitive and spectacular evidence of plant community structure and ecology is available from the study of in situ tree bases, roots and rhizomes from New York and Svalbard, and allows interpretation of macrofossil assemblages further afield. Study of in situ and dispersed spore assemblages allows better sampling and stratigraphic resolution of the global migration of tree groups. Total evidence will allow better understanding and modelling of the environmental impact of early forests.
The amber world
Dr Leyla Seyfulla
University of Birmingham

Amber is famous for the thousands of fossils found preserved inside it, often in spectacular detail. These fossils inside amber are referred to as biological inclusions, and other types of inclusions and ‘pseudoinclusions’ can also occur. So what does, and does not, get preserved in amber? The key factors will be explored. Amber is fossilized plant resin and depends on the interplay of biological, ecological, geographical and geological factors to produce and preserve it. It was thought to be extremely rare and only occurring in very small quantities (except for the Baltic amber deposit) in the rock record; but recent new discoveries show that is not true, and there appear to be specific times in earth history when amber is far more abundant. We are only just starting to try to understand why this might be, and how this is linked with plant evolution. Amber can be thought of as not just a fossil-preserving medium, but is itself a chemofossil, as it contains information about the parent plant that produced it and the environment at the time of the resin exudation, and maturation of the resin to amber during burial does not appear to significantly alter some signals. Unlocking these signals contained within amber and resins, as well as continuing the search for the parent plants of ambers, and understanding how the deposits are formed are part of the future of amber research, as of course is the outstanding fossil potential.

Unveiling biotic change in Antarctica during the Late Cretaceous and Paleogene
Vanessa Bowman
British Antarctic Survey, High Cross, Madingley Road, Cambridge, CB3 0ET

The Late Cretaceous and early Paleogene was a critical time interval for understanding biotic change prior to, and recovery from, mass extinction in high palaeolatitudes. Global climate was warmer than today and atmospheric carbon dioxide levels may have been up to four times higher. Unique, shallow marine sediments from Seymour Island (Antarctic Peninsula) provide key reference material from this important interval. Following meticulous fieldwork, high-resolution sampling has revealed an exceptionally preserved fossil palynoflora (organic-walled microfossils). These palynomorphs, derived from both the land (spores and pollen) and the sea (dinoflagellate cysts), refine the dating of the sequence and help reconstruct the palaeoecology of the Antarctic margin during this interval. Results from a continuous sedimentary section suggest an age ranging from the early Maastrichtian (~70 Ma, latest Cretaceous) to the late Thanetian (~59 Ma, Late Paleocene). By comparing the fossil palynomorphs with those of modern flora (Nearest Living Relative Analysis) we can extrapolate environmental and climatic information back into the geological past (Bioclimatic Analysis). These techniques have allowed an understanding of the synchronicity of palaeoenvironmental events in Antarctica and put them in a global context. The palynomorphs have revealed evidence for possible ice sheets in the Antarctic interior during the latest Cretaceous, which changes the traditional view of ice free poles in a greenhouse world.

Enhanced rock weathering strategies for cooling the planet and saving coral reefs by 2100.
Prof David Beerling,
University of Sheffield

Artificial enhancement of the chemical weathering sink for CO2 via distribution of pulverized silicate rocks across terrestrial landscapes is a proposed macro-engineering strategy for offsetting anthropogenic C-emissions. However, its effectiveness and response to future global change are poorly understood. I will describe recent global carbon cycle modelling work that helps define the capacity of the system to sequester CO2 and reverse anthropogenic ocean acidification, with some consideration for the potential deployment of agroecosystems in this context.
LEICESTER LITERARY & PHILOSOPHICAL SOCIETY

NATURAL HISTORY SECTION

Annual Report 2015

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The AGM was held at New Walk Museum on March 18th. It was noted that there had been a slight increase in subscriptions this year, offsetting a small increase in printing costs due to the different format of the Newsletter. There was little change in other outgoings and so it was felt that once again there was no need to raise subscription charges.

Jan Dawson agreed to continue as President of the Section and was thanked by Ivan for her sterling work in continuing to produce such wonderful summer and winter programmes that have delighted our members. Ivan Pedley and John Tinning also agreed to continue with sharing the Chairman’s duties, and all other officers agreed to remain in post. Special thanks were given to Pouran Khodabakhsh for her hard work in creating a reformulated Newsletter. Peter Thompson remains as our representative on the Parent Body Council. The officers and committee were thanked for their hard work over the year. Ann Pinnock was also thanked for continuing to provide refreshments at Winter meetings.

The Spring Committee meeting was held on 4th March. The main item for discussion was the Winter programme. A wide range of speakers and topics was discussed. Time was also spent in discussing the new format of the Newsletter and everyone agreed that it was a huge step forward.

The Autumn Committee meeting was held on 18th November. It was felt that the new format of the Newsletter was a success and further suggestions were made in improving it further. The main item for discussion was the Summer programme. A variety of venues and leaders was suggested.

Winter meetings were held at fortnightly intervals to hear the following speakers. The average attendance was 30 members and 3 guests, with a number of new members joining the section.

January 7th
“Tales of an Urban Botanist”
Brian Laney, B.S.B.I.

January 21st
“What’s up? – in Scotland.”
Carl Baggott, L.R.O.S.

February 4th
“British Amphibians and Reptiles.”
Jan Clemens, Herptiles Recorder for Warwickshire

February 18th
“Dragonfly Recording in VC55.”
Ian Merrill, County Odonata Recorder

March 9th
“Flying in the Face of Adversity”
Joint Meeting with the Parent Body
Dr. Erica McAlister, Nat. History Museum

March 18th
A.G.M. Quiz and Social Evening

The Summer Programme of field meetings was as follows. All the meetings were well attended.

April 11th
Brandon Marsh, Warwickshire
Peter Thompson

April 25th
Swithland Wood
Steve Woodward & Helen Ikin
May 9th
Lady Hay Wood, Groby
Ivan Pedley

May 19th
Charnwood Water & Loughborough Cemetery
Peter Gamble, Loughborough Nats.

June 7th
Croft Hill, Huncote
Sue Walton

June 20th
Coombs Meadow, Stathern
Andy Lear, LRWRT

July 4th
Ketton Quarry
Jenny Harris, LRWT

July 18th
Burbage Common
John and Shelagh Tinning

August 1st
Evington Arboretum
Russell Parry

August 15th
Cossington Meadows
Chris Hill, LRWT

September 5th
Ashby Canal
Jan Dawson

September 20th
Priors Coppice – fungus foray
Richard Iliffe, L.F.S.G.
(Joint meeting with the Leics. Fungi Study Group)

Winter meetings began on September 30th with a Members’ Exhibition & Photography Evening followed by:-

October 14th
“The Plight of the Bumblebee.”
Dr. Richard Commont, Bumblebee Conservation Trust

October 28th
“Pushing up the Daisies – Churchyard wildlife In VC55”
Steve Woodward

November 11th
“Pan-species Listing – recording across the orders.”
Mark Skevington

November 25th
“The World of Fungi – some questions and answers.”
Richard Iliffe
42nd Sowter Memorial Lecture
Chairman, Leics. Fungi Study Group

December 9th
“Wildlife Images from Home and Abroad.”
John Tinning
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