



History, Science, Religion: Capturing the Public Imagination

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12 November 2008

1. Introduction: The historian's audience

Nowadays there is an enormous interest in history, science, and religion amongst the public at large. It is not a new phenomenon, however, for historians have communicated with the public for centuries. For whom did Julius Caesar write his Gallic Wars? And in more recent times, did not Lord Clarendon, Edward Gibbon, Thomas Babington Macaulay, and even A. J. P. Taylor attempt to make comprehensible to the public either their own or earlier times? For it is part of the historian's craft to link the past with the present, and to establish a coherent bridge of understanding.

I would also argue that in our own day it is the hoped-for duty and joy of university academics to take historical scholarship beyond the seminar room and tutorial to the wider public of interested non-specialists. And in this respect, television possesses a power to communicate and stimulate which is unprecedented in human experience. Yet is television innately more trivialising than, let us say, printing? One wonders how many sixteenth-century scholars bemoaned the chapbooks, astrological almanacs, crude woodcuts, joke books, and ribald tales being printed and published in Europe's burgeoning vernacular languages by 1600. Did Jack think that he was now as good as his master when it became possible for him to hear the tales of Robin Hood and his Merry Men being read out aloud in the village inn, or see scurrilous woodcuts of monks, priests, prostitutes, and princes up to their real or imagined capers? Indeed, one of the perceived dangers of the Protestant Reformation in some quarters was that it opened up religious authority to subversive popular interpretation, and allowed visionary tinkers like John Bunyan to use the English language to spell out to his readers that Christian, Christiana, Mr Valiant for Truth and the other Pilgrims did not need an ordained priest with an Oxbridge degree to guide them across the River and on to Heaven.

So did printing 'dumb down' history, religion, culture, and civilised values in general? And if not, then why should we assume that television must inevitably be worse? For to borrow Andrew Marr's original title for this lecture, must TV history necessarily be 'vivid but stupid'?

Yet where modern TV history audiences differ fundamentally from the readers of Gibbon and Macaulay is in their sheer social range. For one needed time, leisure, an already-present rich literary culture, and a level of critical acumen to wrestle with *The Decline and Fall of the Roman Empire* after its first volume appeared in 1776. And even in the 1960s, A. J. P. Taylor assumed a sense of background and cultural awareness in his viewers as they watched his extempore and word-perfect discourses on modern history delivered straight to camera. But both audiences and television technology have changed profoundly in forty years. For while our schools system may have gone to the proverbial dogs, in many ways, TV has enfranchised a vast new audience. An audience which may not know the difference between pax Romana and Paxo stuffing, and which may find it very hard to sit through a one-hour academic lecture, yet which has discovered that the past is fascinating, and worth finding out about. An audience which, when not watching the box, might spend its weekends going over old battlefields with metal detectors, helping preserve and run old railways, or making costumes for historical 're-enactments'.

For these are the children of shorter working hours, better wages, better health, wider holiday travel experience, and access to a jumble of perhaps ill-digested historical images, many of which have come from television or the cinema. And if we take 'the public understanding of history' seriously, then we must remember that they are our audience. For if we, as professional historians, cannot be bothered to influence the myriad of channels through which history can

enter the average sitting room, then we cannot complain if less well-informed and perhaps outright mercenary agencies do it for us.

On the other hand, it is not just the audiences that have changed: it is historical scholarship itself. For from classical to late Georgian times, history was about the fate of empires and the doings of great or evil men and women. But the beginnings of social history changed all that. The antiquary Joseph Strutt's *Sports and Pastimes of the People of England* (1801) opened up a new world to scholarly scrutiny: the history of leisure and fun. A world in which there were no obvious Caesars or great decisive events, so much as the fruits of meticulous scholarship on the part of Strutt as he traced from printed and manuscript sources the business of ordinary folk at play, from the middle ages onwards. English medieval domestic history then came into being with the first publication of the fifteenth-century Paston Letters in 1787, while Jacob Burckhardt's *The Civilisation of the Renaissance in Italy* (1860) showed how art, politics, dynastic power, and religious faith produced those remarkable circumstances which came henceforth to be known as 'the Renaissance'.

So since we reached the new millennium, history as a study has become so diversified in its content, audiences, and in the nature of its sources, as to demand a fundamental re-appraisal of where its remit lies. What is the relationship between the scholar and the entertainment industry? And what do we, as academic and professional historians, expect the wider population to think about the past? Especially as its perceptions are likely to have been moulded in short, vivid bursts by scriptwriters and presenters whose deeper understanding of the material in question may in some cases be little better than non-existent.

It is, however, a real challenge facing historians and one which we must face up to if our discipline is not to become sharply bifurcated between the ivory tower and the 'olde worlde' game show. And as for me personally, it is a challenge which I relish and enjoy, for in addition to the original research and publication of the historian's art, I have long been involved in trying to communicate my own branch of historical scholarship - the history of science - to the wider world. And what has never ceased to impress me is the sheer volume of serious, intelligent interest there is 'out there' from people who wish to engage with and understand the past.

2. The importance of biographical writing

One obvious historical genre that has long been a popular favourite, and which relates directly to the career and achievement of Colin Matthew himself, is biography. From the scholarly peaks of the *Gladstone Diaries* and the *New Oxford Dictionary of National Biography* (to which I had the honour to contribute eight articles) downwards, books about people's lives probably constitute one of the most widely-read classes of historical literature of the present time. And high-profile TV programmes like 'The Greatest Briton', limited as they often tend to be to the relatively recent dead, only testify to the fascination which the lives of other people - especially high achievers - have for the majority of people. What would be wonderful, however, would be to raise the public's historical awareness to a level where they could compare outstanding achievements and achievers before the longest recall of present-day living memory. Sir Winston Churchill comes top of the TV poll as the 'Greatest Briton', yet how does his achievement compare with that of William Pitt the younger, who, perhaps more than any other public figure between 1792 and 1806, galvanised British public opinion against the dictatorship of revolutionary and Bonapartist France?

Biography, I would suggest, forms a potent historical genre, and when one combines the resources of television, the National Trust, English Heritage, and other historical properties, with the National and other portrait galleries, internet search engines, and the myriad books on sale at retail outlets such as Borders and Waterstones, one gets a measure of the public's fascination with the lives of the 'interesting dead'. I believe that in my own area of historical research, the lives of scientists, when well-researched and written, can not only widen the public's interest in the past, but also help to form a bridge between the arts and the sciences. For even people who may never open a book on science, and have an instinctive fear of mathematics or abstract physical concepts, nonetheless often warm to the lives and works of scientists and ingenious inventors. This is especially so with scientists who are perceived as possessing warm or interesting personalities, such as Michael Faraday or Albert Einstein. How much these readers or viewers learn about electromagnetic induction or the General Theory of Relativity on the way is a moot point, but biographies can often be formative introductions to history - as I know from my own childhood experience.

For ultimately, biography is about the nature of human idiosyncrasy, or what I style 'the queerness of folk'. Considering, for example, the history of science, what was it in the mental and emotional architecture of one single pupil who attended Grantham Grammar School in the mid seventeenth century that subsequently led him to elucidate the Laws of Universal Gravitation? For most of Newton's contemporaries, predecessors, and successors at that

excellent educational establishment were destined to become clergymen, solicitors, local country gentlemen, and Members of Parliament. Sound local or regional worthies, I grant you, but in no way world-changers. Then, irony of ironies, what was it, 300 years later, that led another former Grantham pupil to become Great Britain's first woman Prime Minister, and a world force to be reckoned with?

These are the idiosyncrasies of personality and circumstance that people find abidingly enthralling, and constitute, I would argue, a major reason why biography is one of the readiest avenues through which the public might come to engage with and appreciate history.

3. Science and its role in history

It is, of course, impossible to overestimate the impact that science has had in the shaping of the modern world. I would argue, therefore, that we can have no adequate understanding of the history of the last 500 years unless we learn how to assess the cultural, technical, economic, and spiritual impact of science. And as I can abundantly substantiate from my own experience, when lecturing, writing, and broadcasting, there is an enormous public interest not simply in modern science, but also in its history. For as I indicated above, I believe that the history of science has enormous potential as a 'bridging' discipline between the arts and the sciences. It is all the more unfortunate, therefore, that the discipline has such a low profile in the wider communication of historical understanding, though admittedly over the last few years there have been several popular books, of varying degrees of historical quality, in the wake of Dava Sobel's *Longitude* (1995).

It has generally been the case for a long time, however, that the best and most assiduous promoters of the public understanding of scientific history have been persons coming from scientific backgrounds. Could it be that 'straight' historians fear getting involved with scientific complexities? One thinks of the late Jacob Bronowski's *Ascent of Man*, first broadcast some 30-odd years ago, as an unforgettable example of how to communicate scientific history within the wider processes of historical culture, whereas more recently Adam Hart Davis's entertaining and informative programmes have done the same. And while he does not claim to be a historian himself, the *Sky at Night* programmes of the legendary Sir Patrick Moore have, over the years, contained a great deal of astronomical history. The history of mathematics has been actively taken into the public sphere by mathematicians such as Robin Wilson - whose *'Alice in Numberland'*, based on the mathematical ideas of Lewis Carroll (Charles Lutwidge Dodgson) has made Victorian mathematics entertaining - and Oxford's new Simonyi Professor for the Public Understanding of Science, Marcus du Sautoy, who has established himself as a master of both lecture and broadcast communication as well as of the written word.

And while I disagree fundamentally with his atheistic ideology and interpretation, I nonetheless admire Richard Dawkins's tireless efforts to use the media channels of print, lectures, and TV to communicate his views on evolutionary science, and the impact of Darwinism, on the history and thought of the last 150 years.

Compared with the scientists, however, one has to search hard to find historians who match their assiduity when it comes to communicating the history of science. And oh, how one wishes that they would do so, for then many of the hoary old myths about scientific history might be finally laid to rest, and a more balanced perspective of the subject come to be absorbed and understood by the public. But to be fair, one cannot deny that the present generation of historians has produced some excellent science communicators. Who can, for instance, overestimate the impact of the late and sadly missed Roy Porter, who has done more than anyone to transform the public understanding of the history of medicine? And it is also gratifying to see scholars of the academic standing of Simon Schaffer actively taking scientific history into the public sphere, whose BBC TV programmes on the history of light a few years ago were a masterpiece.

I think that it is unfortunate, however, that in so many ways the history of science is an 'internalist' discipline, with many of its professional practitioners seeming to be more concerned with issues of methodology, sociology, and philosophy than they are not only with the art of lucid exposition but with the enterprise of taking the riches of their subject into the public arena. But perhaps this is the product of attempts in certain quarters to see the history of science as a branch of the reductionist social sciences, or else to understand it using the techniques of literary critical theory: an enterprise of which I have never been part. Perhaps my reluctance to see the history of science, or historical study in general, as a social science derives from my abovementioned fascination with human idiosyncrasy and 'the queerness of folk'. For social science, with its concern with paradigms, modelling, revolutions, and dialectic, and with its super-abundance of in-house jargon, has never furnished a lens through which I personally could see the world clearly. Indeed, quite to the contrary; and from my student days in the late 1960s onwards, I have always

entertained a profound scepticism regarding all-embracing secular ideologies and methods (especially when coming from a Marxist direction), quite simply because they are incapable of explaining the eccentric, the unexpected, or the creatively heretical. And it is this deep, persistent human propensity to break rules and do unexpected creative things that has always captured my own imagination, in both past and present generations. And while many historians may agonise over or be uncomfortable with words like 'genius', or 'greatness', what cannot be denied is that our potential audiences 'out there' are fascinated by those who strive, succeed, and triumph against all odds. And these types are to be found in all walks of life - be it Leonardo da Vinci, John Wesley, Mozart, Nelson, Florence Nightingale, or Churchill - and their lives and works provide us with natural avenues through which we can engage with the public.

Of course, the history of science has its own 'canon', albeit a canon which has been taking shape since the seventeenth century: Copernicus, Galileo, Newton, Einstein, and so on. Yet in its earlier Whig, and subsequent sociological phases, the history of science has always had a tendency to concentrate on what might be seen as members of a perceived scientific 'club', or, more fashionably expressed, an 'elite': scientists who, from a twenty-first-century perspective, are regarded as university men, or in some way 'professional' scientists - the natural ancestors of modern-day academics and scientists. They held chairs, like Galileo, Newton, or Einstein, and seemed to be professionally recognisable types to the modern scholars who studied their lives, discoveries, and social contexts.

Yet where in this scheme of professional ancestry-building does one place figures such as the eighteenth-century physicist Henry Cavendish, the late Georgian-cum-early-Victorian mathematician Mary Somerville, the Irish cosmologist Lord Rosse, or indeed Charles Darwin? For neither Cavendish, Somerville, Rosse, nor Darwin were university people, and none of them held any kind of public position except, in Rosse's case, a seat in the House of Lords. Cavendish, Rosse, and Darwin never did a day's paid work in their entire lives, being entirely privately-resourced, and Mary Somerville's non-family income came from entrepreneurial writing. Indeed, they were nobody's professional ancestors, apart from the fact that their ideas, discoveries, and writings would profoundly influence future generations.

I would say that these figures belong to a very large constituency of eighteenth- and nineteenth-century scientists who have never been studied or even properly recognised as a 'community' by modern historians of science. I have come to call them 'Grand Amateurs'. They were self-funded, independent operators whose natural milieu was not the university, but the fellowship-based learned society, the *soirée*, or private correspondence. They were from a diversity of backgrounds, and their wealth varied considerably. Some, like Cavendish, Lord Rosse, and Darwin, inherited handsome incomes. Others made substantial fortunes in business, manufacture, or the professions, owned and ran successful private schools, or else married heiresses. Others again were active or retired Army or Navy Officers who had been lucky with prize money; while there was a vast number of well-beneficed Anglican clergy. But what they all shared was an independence of circumstances which placed them beyond the need to toe lines or solicit favours. As the now elderly retired Napoleonic Wars captain astronomer, Admiral William H. Smyth, R.N., says of himself and his ilk in the 1850s, they came to science for love, not for profit; and hence were amateurs in the noblest Latinate sense of the word. And as these people addressed the cutting-edge science of their day - be it in cosmology, organic chemistry, geology, mathematics, or evolutionary biology - I have styled their vision 'Grand'.

4. The Grand Amateurs

These 'Grand Amateurs' were part of a driven, deeply patriotic, often (but not exclusively) staunchly Protestant, and libertarian culture which had grown up in the seventeenth century. The Hon. Robert Boyle, Bishop John Wilkins, Sir Christopher Wren, Dr Robert Hooke, Sir William Petty, and the early Fellows of the Royal Society laid the foundations of this very English way of doing science. Men of inherited wealth like Boyle, and to some degree Wren, and men who had made handsome fortunes, like Petty and Hooke. The Crown gave the early Royal Society a charter, a ceremonial mace, and a title - but not a penny in money or investments. The Fellows had to pay their own way. Hooke, perhaps the most dazzlingly original scientist that Great Britain has ever produced, made his £10,000-plus private fortune as Surveyor to the City of post-Fire London, combined with a lucrative sideline architectural practice. Then the new constitutional circumstances that developed after 1688 - including a monarchy with limited powers, an independent judiciary and jury system, a Parliament which controlled the public purse-strings and was to emerge as the envy of liberty-seeking Europe, and the wealth-generating engine of the City of London - helped to create a class of people who could afford to live in comfortable circumstances, kept a watchful eye on their independence, and were free to spend their money on whatsoever they liked: dogs, horses, grand tours, gambling, rake-hell debauchery, connoisseurship, church-building, or scientific research. This 'Grand Amateur' world (which also included antiquaries, collectors, bibliophiles, and social reformers like Wilberforce the slavery Abolitionist, alongside scientists) extended across a very wide social range. Indeed, it embraced pretty well every social group with any thinking space at its disposal, from George Parker P.R.S., the astronomical Second Earl of Macclesfield, to the young working potter Josiah Wedgwood, whose youthful experiments into heat and chemistry not only laid the foundations of the English

fine porcelain industry but were to bring Wedgwood into the 'Lunar Society' circle of Midlands scientific friends. And none of these 'Lunar Men' - including Priestley, Boulton, Watt, Erasmus Darwin, and Edgeworth - held any formal scientific appointment (apart from, in many cases, Fellowships of the Royal Society), but funded their researches into biology, medicine, chemistry, physics, engineering, and manufacture entirely from their own resources.

And when, in the aftermath of the Napoleonic Wars after 1815, Germany and France in particular were rebuilding their educational and scientific research systems along centralised, state-funded lines, with the German Ph.D. eventually becoming de rigueur for all aspiring scientists, the British 'Grand Amateur' community thrived as never before, and would soon establish a pattern for British science that would survive down to the closing decades of the nineteenth century. Unlike the university-based scientific institutions of continental Europe, however, British science was remarkably flexible and open to initiative and originality. A working canal surveyor, William Smith, laid the foundations of modern stratigraphic geology - and received an Trinity College, Dublin honorary DCL degree for his pains. A Liverpool brewer, William Lassell, an Irish Peer, Lord Rosse, and a Scottish-Manchester railway locomotive manufacturer, James Nasmyth, did all the preliminary work necessary for the evolution of the modern, large-aperture reflecting telescope. Between them, they transformed our knowledge of the planets of the outer solar system, discovered that 'nebulae' were distant star systems that seemed to be rotating, and realised that the moon had been formed by volcanic and gravitational tidal forces, just like the earth. William Huggins liquidated his assets in the family silk mercery business to found the science of astrophysics - from a state-of-the-art observatory in his back garden in south London - while William Perkin, while still an eighteen-year-old undergraduate student and on the strength of his father's very successful building business, discovered aniline dyestuffs in a home-made laboratory in 1856, and went on to establish the science-based artificial dye-stuffs industry and make his fortune. Academically-educated as Perkin was, the organic chemical business that he was to found provided him with the necessary resources to pursue independent research chemistry at the highest level for the rest of his life, publish major papers, and become a Fellow of the Royal Society and a Knight. And let us not forget Charles Darwin - the son and grandson of two self-made wealthy private physicians and very successful provincial businessmen, Dr Erasmus and Dr Robert Darwin. For though he was a failure at Edinburgh Medical School, and a Cambridge theology student who never reached ordination, Charles Darwin's passion for natural history was to transform the way in which we came to understand living things. And all of this on the strength of hand-outs, then an inheritance from his father, and never a day's paid work in his life!

Yet what attention do these people receive from modern-day practitioners of the history of science? I grant that the work and results of people like Darwin, Cavendish, and Perkin get discussed in seminars, and even the media, and that the world is all set to go mad celebrating Darwinian evolution in 2009, yet their circumstances, social relationships, and independent status rarely get a look-in. For are they not really proto-professors?

Not in the least! For in reality, they did not think of themselves as men who deserved, but somehow could not get, professorships. Quite the reverse: they were proud of their independent, amateur status. And perhaps nowhere was this pride in independence more succinctly expressed than in the 1848 'Address' in which Sir John Herschel, Bart., F.R.S., and President of the Royal Astronomical Society, presented the Society's Gold Medal to the Liverpool brewer William Lassell, F.R.S., in recognition of his independent researches into planetary astronomy; for as Herschel said, Lassell belonged 'to that class of observers who have created their own instrumental means, who have felt their own wants and supplied them in their own way'. Lassell's entire career, his large observatory, and the discoveries that proceeded from it, stood foursquare upon the firm financial foundation of his Liverpool brewery. Sir John Herschel was eventually persuaded to take his first paid job in 1850, at the age of 58, as Master of the Royal Mint. He only accepted because Newton had held the same post 140 years previously, and hating team work, committees, and bureaucracy, he resigned in 1855 as soon as the exigencies of the current political situation of the Crimean War would allow. The badges of recognition which these men sought, rather, were election to the Fellowship of the Royal Society and the burgeoning specialist scientific societies after 1808 - invariably filled with 'Grand Amateurs', with honorary doctorates from Oxbridge, the Scottish, Irish, or Continental universities - and election to membership of the corresponding French, German, or other great overseas academies. For the leading 'Grand Amateurs' were indisputably on an intellectual and technical par with their Continental brethren, and were recognised as such. They stayed with and entertained each other in their houses and on their respective travels on either side of the English Channel or Atlantic Ocean, honoured each other, and corresponded. Their only significant point of difference was that the British scientists were self-funded and worked on whatever interested them, whereas their Continental colleagues tended to work much more within official hierarchies and vertical systems of state patronage.

It is my suspicion that this constitutes the very reason why the British 'Grand Amateur' tradition remains invisible and unacknowledged within modern-day history of science research. For most academic science historians work within career hierarchies just like those of the nineteenth-century European scientists. Could it be that modern scholars instinctively relate to people circumstanced similar to themselves, and while recognising the intellectual originality of

figures like Darwin, Sir William Herschel, and Sir John Herschel, somehow remain oblivious to their personal circumstances and social driving forces? And could it also be that, within the management control culture of modern academia, and all the political resonances that go along with it, the culture of vigorous private independence, small government, personal initiative, and respect for individual creative idiosyncrasy, which are all part and parcel of the 'Grand Amateur' view of life, presents political difficulties for modern scholars working in increasingly centralised and vertically-managed universities?

Yet when one looks at the universities of nineteenth-century Britain, the 'Grand Amateur' ethos was the order of the day there also. The geologists William Buckland, Adam Sedgwick, and Charles Lyell, each of whom held a titled chair in geology, all came from the Grand Amateur tradition. Buckland and Sedgwick were quite independently Anglican cathedral dignitaries, while Lyell was a barrister and private gentleman. The early Victorian Oxford chemist Charles Daubeny moved sideways into his chemical and botanical chairs from medicine, while behind him stood the private means of a Bristol banking family. It is true that astronomical professors had usually received a formal training in Newtonian celestial mechanics, but not infrequently they still had extra professorial strings to their bows. Most nineteenth-century academic astronomers up to 1870 were also independently beneficed clergymen. Oxford's Savilian Professor of Astronomy, Abraham Robertson, was a former domestic servant whose kindly master had secured for him a poor man's place at Christ Church. Then off he went into Holy Orders and a chair. Imperial College, London's first Professor of Solar Physics in the 1880s, [Sir] Joseph Norman Lockyer, became, after his education at Rugby School, a Senior War Office Clerk, and was a completely self-taught astrophysicist.

Victorian academic salaries were often quite modest, and presupposed that an incumbent would have an ecclesiastical benefice or private resources to bring him up to a gentlemanly standard of living. Charles Piazzi Smyth's first contact with university life came in 1846, when he was appointed Regius Professor of Astronomy at Edinburgh. Smyth had learned his astronomy from his father - the abovementioned 'Grand Amateur' Admiral Smyth - and from working as assistant to another former Grand Amateur friend of his father, now His Majesty's Astronomer at the Cape of Good Hope, the ex-Bedford surgeon-astronomer [Sir] Thomas Maclear. As an Edinburgh professor, Smyth received £300 per annum, which was modest in the extreme. But family money and personal initiative came to the rescue. And when that living epitome of a professional scientist, [Sir] George Biddell Airy, became Astronomer Royal in 1835, he spelled out to the Admiralty (as he had spelled it out to the Cambridge University Senate some years before, upon taking up the Plumian Professorship) that he needed a hefty increase in his official salary if he were going to accept the job. For Airy, the brilliant scholarship boy, was neither a clergyman, a physician, or a barrister, and as neither he nor his wife Richarda had any private means worth speaking of, he demanded proper payment for his official services. He was, moreover, willing to give the government his entire working time as part of the deal. Indeed, a very unusual concept for a gentleman in 1835, for even Royal Navy Captains had plenty of leeway for topping up their modest salaries with wartime prize money and by private bullion transportation and various forms of quasi-legal muster book manipulation. But thoroughgoing professional as he was, Airy fully respected Grand Amateur science as far as original research, the development of instruments, and technologies were concerned, for why should Parliament squander the taxpayer's money on experimental novelties when there was a large body of Grand Amateurs out there willing to innovate out of their own pockets? Indeed, as Airy was preparing to retire in 1881, he emphasised the primacy of the Grand Amateur in the field of original research in a letter to the *English Mechanic* magazine.

And quite frankly, what I have said above only scratches the surface of British Grand Amateur research, and I would urge historical scholars to direct their attention not only to what it achieved scientifically, but to how the self-funded and self-innovating tradition related to the wider social, political, economic, and even ecclesiastical structure of eighteenth- and nineteenth-century Britain. And as far as the public understanding of history is concerned, it has colossal potential, not least from the point of view of biography and the study of human motivation.

5. The media's obsession with iconic figures

One thing which I believe a wider understanding of the Grand Amateur tradition could do is change the media's seeming obsession with iconic figures. For when the history of science does break into the popular understanding, especially on TV, it is likely that programme makers will turn to one or other of the same selection of 'big' names: Galileo the victim of the Inquisition, Newton the far-seeing mystic, Darwin the popularly-perceived Crusader against blinkered Bible-thumpers, and Einstein the Nazi hate target yet smiling genius of transcendent intellect. Yet rarely are the lives and the achievements of these truly remarkable scientific figures placed into any recognisable context - with the possible exception of assumed ecclesiastical or actual Nazi persecution.

On the other hand, I know from personal experience how difficult it is to get television to take a serious look at other

scientists, such as Aristotle, Harvey, or Robert Hooke: lives in which there is no assumed 'persecution' element. No authentic contemporary portrait of Hooke survives (I personally doubt, on good contemporary evidence, whether one was ever painted), yet when I was involved in making a BBC documentary dealing with his life and work, to be screened on the 300th anniversary of his death in early March 2003, I was horrified to discover that the BBC, in post-production, had abandoned a modern intelligent forensic reconstruction of Hooke's face, based on two very detailed seventeenth-century 'pen portraits' by two of his close friends, and commissioned what I can only call a cartoonist to conjure up a 'portrait' for Hooke, which was a cross between a Tolkienesque Hobbit and a Cornish pixie. (I got my revenge, however, when the Daily Telegraph commissioned me to write an article to be published on the day of transmission. It was accompanied by the forensic reconstruction of Hooke's face based on the two 'pen portraits', and the BBC's commissioned grotesque wholly ignored. And while I admit that Hooke was no *matinée* idol, the face in the reconstruction did capture an intelligence and an acuity that one might expect to find in a man who had received his Oxford M.A. degree without examination by personal command of Lord Clarendon, the Chancellor, and was elected Fellow of the Royal Society at 28 and Gresham Professor of Geometry at 30. But more about Hooke later.)

Yet what I find truly wearisome in television's occasional contacts with scientific history is the abiding concern with 'victimhood'. When, some years ago, and in the wake of Dava Sobel's bestseller, *Longitude* (1995), the BBC decided to make a 'docu-drama' on the life of John Harrison, the inventor of the marine chronometer, the 'us' and 'them' school of historical popularising was much in evidence. There was poor John Harrison (played by the versatile Sir Michael Gambon), in plain working clothes, accompanied by his son William, who metaphorically carried his dad's tool bag, up against the 'toffs' of the Royal Society and the Admiralty Board of Longitude. Indeed, as one present-day Fellow of the Royal Society put it to me, a day or so after the programme was broadcast in 1999, 'It made Royal Society meetings look like a brawl from *EastEnders*.'

Yet what the scriptwriters did not convey was the enormous respect in which John Harrison and his son were held by the Royal Society and by the 'Establishment'. For one thing, the Board of Longitude - which was empowered to disburse the £20,000 Longitude Prize pledged by the Act of 1714 - had already made interim grants to Harrison in excess of £10,000 before King George III and Lord North finally intervened with a special Act of Parliament to secure him the remaining £8,750 in 1772. In the mid eighteenth century, indeed, £20,000 was an enormous sum of money. What is more, had the TV script-writers bothered to check the Royal Society records, they might have spotted two things. Firstly, in 1749 the Society bestowed its prestigious Copley Medal on John Harrison - the Nobel Prize of the eighteenth century - and the then President, Dr Martin Ffolkes, delivered a glowing encomium of Harrison's genius, occupying fifteen pages of handwritten script in the 'Journal Book', or official record of Royal Society meetings. Then secondly, in 1765, William Harrison was elected F.R.S. in his own right. I called up William's Election Certificate in the Royal Society Library, and was surprised to see that not only was he warmly commended for the Fellowship, but that no less than 22 distinguished Fellows signed this Certificate, including Benjamin Franklin and the eminent society physician William Heberden. Hardly a simple lad who helped his dad!

Yet setting John and William Harrison in their proper historical light would have destroyed the essential 'victimhood' of the 'docu-drama' portrayal. Indeed, what the Harrison Longitude TV programme did was simply confirm outmoded popular stereotypes of class war and culture. And who would have thought, after watching it, that Georgian England was a place where innumerable ingenious men from 'humble' backgrounds won fame and fortune as inventors, scientists, industrialists, and 'mechanicians' like Harrison, to become not only successful members of the 'Establishment', but also to attain iconic status at the pen of Samuel Smiles?

Indeed, 'plain' Billy Harrison, F.R.S., himself did just that, and used the money inherited from his father's undoubted genius to become a leisured 'Grand Amateur' scientist in his own right. He effortlessly moved into the open elite of British science, became one of the Great and the Good, and died in his house in Guildford Street, London, at the age of 87 in 1815, and was buried in Hampstead Parish Church.

6. Anniversaries as history opportunities

It has long been recognised that significant anniversaries can play a major role in the broader understanding of history. The end of W.W. II, the 50th anniversary of H.M. Queen Elizabeth II's accession, the Battle of Trafalgar, and the 2006 bicentenary of the birth of the engineer Isambard Kingdom Brunel are cases in point. Yet let us not forget that we currently stand on the verge of three major scientific anniversaries.

Firstly, there is the 400th anniversary of the invention of the telescope, the instrument which made its official entry into the world on 2 October 1608, when the Dutch spectacle-maker Hans Lippershey applied for a reward for his invention from the States General. Then 1609 saw the first scientific use of the telescope. For it was in late November or early

December 1609 that Galileo Galilei, then of Padua, first observed the moon, Jupiter, the Pleiades cluster, and the Milky Way through his telescope, and published these early discoveries in Venice in March 1610, in *Sidereus Nuncius*: observations that were to lay the foundations for a new type of 'physical', in addition to classical 'geometrical', astronomy.

Yet it should be remembered that Galileo was not the first telescopic astronomer. No, that distinction must go to the Englishman Thomas Harriot, and soon afterwards, his Welsh friend Sir William Lower of Trarant, Carmarthenshire, for on 26 July 1609 Harriot made a drawing of the five-day-old moon, which still survives in the West Sussex Record Office, Chichester. Unlike Galileo, however, Harriot never published his early telescopic observations, and it was not until 1784, and in particular after 1832, that his achievement was made public. Harriot's achievement, though, is to be duly celebrated in 2009.

Priorities apart, however, the invention and early scientific use of the telescope is of prodigious significance in scientific history, yet the people who seem to be most active in bringing the event to public notice are astronomers, not historians. The BBC Sky at Night with Sir Patrick Moore, for instance, did a one-hour 'special' to mark the telescope's 400th anniversary, in conjunction with features and science news programmes on 14 January, while on Sunday 26 July 2009, a large meeting with a lecture will take place at Sion Park, near Kew, close to the site of Harriot's original observation. It will be sponsored by the South Downs Planetarium and the Royal Astronomical Society.

But what an opportunity the 400th anniversary presents - not just for discussing a pivotal event in scientific history, but also for introducing the public to the wider context of Renaissance English and European political, social, and cultural history, in which the invention of the telescope is embedded. For one reason why Harriot may have been reluctant to publish his findings in 1609 was that two of his best friends and patrons were currently being detained at King James's pleasure in the Tower of London: Sir Walter Raleigh, with his 1603 death sentence still hanging over him, and Henry Percy, Ninth Earl of Northumberland (the 'Wizard Earl') because of possible connections with the Gunpowder Plot. Harriot, after all, had been interrogated and had his house searched in November 1605, and one suspects that peace and prudence ranked higher for this wealthy 49-year-old bachelor than did scientific celebrity.

And then again, 2009 marks the 150th anniversary of the publication of Charles Darwin's *Origin of Species*. And as one might expect, this presents a prime opportunity for the public understanding of nineteenth- and twentieth-century history. Of course, the biological scientists are actively engaged in telling the public about the discoverer of evolution by natural selection. Yet will our TV screens and the other avenues to the wider public be dominated by the hoary old canards that historical scholarship has already relegated to the realm of scientific myth-making: the shock-horror impact of the Wilberforce-Huxley 'debate' in 1860, for instance, or the triumph of scientific rationalism in driving out religious superstition? What a wonderful opportunity the Origin anniversary presents for some sound, revisionist history, and for placing the evolutionary debate within the wider context of Victorian scientific, religious, and intellectual history! Yet are historians, and historians of science, making preparations to leave their seminar and tutorial rooms for a while to promote 'the public understanding of history' in the market-place, or are they simply letting agenda-driven biological scientists confirm old popular prejudices?

And the third anniversary coming in the near future is the Royal Society's 350th, in 2010. Indeed, the Royal Society itself is actively planning its celebration and outreach events as far as communicating science is concerned, but I am not aware that the historical community is doing likewise. Yet what a wonderful opportunity for advancing the public understanding of history presents itself in this anniversary! For in 1660, science in Britain attained a clear public status, recognised and chartered by the Crown, yet still self-financing and self-determining: providing a pattern or template, in fact, for the next c. 240 years of British science. And what is more, the published agenda of the early Royal Society emphasised experimental science, combined with the hoped-for practical application of research to 'the relief of man's estate'. Indeed, this was visionary science in so many ways, and if we exclude it from our wider historical understanding, then we fail to give proper attention to one of the key movements that helped to make the world we live in today.

Yet when it comes to using significant anniversaries as ways of developing historical awareness, we must be vigilant and maintain a balance that reflects the priorities of the historical period in question, rather than those of our own time. A salutary reminder, in regard to imposing modern agendas upon historical anniversaries, is the bicentenary of the abolition of the Slave Trade in 2007. For most of the exhibitions and events to mark the slave trade's abolition, which I saw myself or which were reported to me on good authority, either downplayed or else airbrushed out entirely

the pivotal role played by Christian Evangelicals in this great enterprise. This was conspicuously so whenever central or local government money was being spent to fund an exhibition. For in most cases, when any mention was made of Granville Sharp, Thomas Clarkson, William Wilberforce, or John Newton, along with numerous Quakers who had campaigned against slavery, it was generally in the context of their being very nice, kind men - sons of the Enlightenment, in fact! Political correctness could not permit schoolchildren to be told that what drove many thousands of late Georgian abolitionists were not Rousseau's splendidly vacuous and self-indulgent 'Rights of Man' ideas, or their modern-day cognates, but the morality of the Christian Gospels.

Yet the Abolitionist movement was indeed the very first highly successful peaceful 'mass movement' in British social history, involving as it did both men and women, and having creative linkages to press, trade goods memorabilia, and slogan markets - 'Am I not a Man and a Brother?' - with national fund and 'consciousness raising' infrastructures behind the Parliamentary lobby - and most of it rooted in churches and chapels!

So when we come to mark the scientific anniversaries of 2009-10, let us respect the motives and values of Tudor, Stuart, Georgian, and Victorian people, and not permit modern sociological or ideological agendas to usurp the presentation of the historical record.

7. Religion

One of the conspicuous features of western European, and perhaps American, intellectual life, certainly from the mid-twentieth century onwards, has been an attempt to marginalize or ridicule the role played by Christianity in the development of western civilisation. Enlightenment Rationalists, Positivists, radical Darwinists, Marxists, Freudians, Neo-Marxists, Modernists, Post-Modernists and so on, from the Baron d' Holbach to Richard Dawkins and his co-religionists, have all played and continue to play, their parts in this wider movement.

And in an ideal world of free speech, that is all right. For give and take, and vigorous debate, are the hallmarks of a free society. The danger arises, however, when the ideas of a 'liberal intelligentsia' not only become monolithic, but where the very nature of the media and that intelligentsia's control of the media make it difficult for dissenting voices to break through. Of course, this is a far bigger issue than I have space, or proper context, to discuss here, but what I do wish to address is the entrenched myth that science and religion are innately opposed. For it is here that the historian, with his or her long-term view on mankind's development, may be able to say something useful towards a wider public understanding of the past.

(a) The 'monkish' Middle Ages

In a lecture which he delivered to the Royal Society on 4 December 1689, Robert Hooke, in his bedazzlement with recent discoveries, dismissed the entire culture of medieval Europe as the 'Darknesse of those times . . . [and] . . . blacker designs of those who ruled the commonwealth of Learning', with its 'Ignorant Monks', and supposed domination by freedom-suppressing priests. And Hooke was no anti-clerical bigot by any means, being the son of an Anglican priest, a close friend of bishops, and the recipient of a Lambeth M.D. degree in 1691 from his friend Archbishop Tillotson.

But I wonder how far these attitudes had grown out of the very fabric of north European Reformation culture, which took it as axiomatic that everything that had occurred between the early Patristic period and Martin Luther was 'ignorant', 'monkish', dark, and regressive. The very 'Dark Ages' of legend, no less: an age to which politicians, media pundits, and popular writers consign everything that does not accord with the avant garde.

Yet in this mythical 'Dark Age', we bury much of the scientific and philosophical underpinning which Roman Catholic scholars built up, and which laid a foundation for the great scientific enterprise of the seventeenth century. For it was medieval figures like Robert Grosseteste, Richard of Wallingford, William of Ockham, Thomas Bradwardine, Nicholas of Cusa, Nicole d' Oresme, Guido de Chauliac, and many, many more who not only wrestled with Aristotle's physics, but also discussed the possibility of an infinite universe, pioneered the science of mechanics, established experimental and theoretical optics, developed computational mathematics, and did fundamental work in clinical medicine.

And where were those ideas pursued and developed? Not timidly in the secret closets in which popular legend says all original thinkers worked in medieval times, but in public places, such as Europe's burgeoning universities and great monasteries, and at the Papal Court at Avignon. For all of the abovementioned figures were 'public' men: Grosseteste, Bradwardine, Cusa and Oresme were Bishops, Archbishops, or Cardinals in the Roman Catholic Church; Richard of Wallingford was a great Abbot; de Chauliac was a fourteenth-century Papal physician, and Ockham was a Fellow of Balliol. And they were only the tip of the iceberg, as far as the sciences were concerned. All

were devout Christians, most were priests, and all died unpersecuted in their beds.

But old prejudices die hard. The twentieth century, it is true, has seen historical scholars of the calibre of Sir Richard Southern, Alistair Crombie, John D. North, James Weisheipl, O.P., Stanley Jaki, S.J., and others confront this myth head on, and bring out the immense richness and versatility of medieval thought. And while it is true that no reputable scholar would now speak of the 'Dark Ages', much has still to be done to securely establish the realm of medieval scientific learning within the wider and more balanced purview of the public understanding of history.

(b) Sir Francis Bacon (1561-1626)

One area where many professional historians of science are still actively distorting the work of a great religious visionary, however, is in the presentation of Sir Francis Bacon as the proponent of a secular approach to science. Without doubt, in his advocacy of taxonomic and forensic techniques to study nature, Bacon was a major formative influence upon the conscious development of an experimental approach to scientific inquiry, and upon the Royal Society after 1660. Yet any open-minded perusal of his writings, especially the 'canonical' ones such as the *Advancement of Learning* (1605), *Novum Organon* (1620), and especially the posthumously-published *New Atlantis* (1628), brings it home that Bacon saw science not only as potentially useful, but also as redemptive, conducive to salvation, and spiritually prophetic. And while the depiction in the frontispiece of *Novum Organon* of a ship sailing out through the Pillars of Hercules evokes a sense of impending new discovery, we should be careful not to miss its accompanying unascribed Latin text 'Multi pertransibunt & augebitur scientia', which comes from St Jerome's Vulgate Bible. In the Authorized Version of 1611, this same passage, Daniel 12:4, is translated 'many shall run too and fro, and knowledge shall be increased', leading some writers to see it as a proclamation of the power of the New Science. However, we must not forget that Daniel is one of the most mysterious and visionary books of the entire Old Testament, being concerned not with human physical progress, but with Armageddon. It is about the separation of the Damned from the Saved, the difference between false and true knowledge, the sealing up of true knowledge, and the coming of the reign of the Messiah.

England in Bacon's time was a country experiencing great trauma and great deliverances. The destruction of the Spanish Armada, attempts - by the perceived agents of Anti-Christ - upon the lives of Protestant Sovereigns (most notably the Gunpowder Plot of 1605, directed against King James I), and the gradual emergence of England as a serious global sea power, were all seen by many Protestants as signifiers of the dawning of a new age: an age that was not only characterised by spectacular geographical and scientific discoveries, but that also heralded the Reign of the Saints, with England as the New Jerusalem.

Several present-day scholars, such as Stephen A. McKnight and Lawrence M. Principe, have started to publish new interpretations of Bacon and the early scientific movement which incorporate this wider, prophetic, and deeply religious aspect. Of course, this runs directly counter to the Whiggish 'science equals secular progress' school of thinking. Yet no matter what personal views any individual historian may have about religious belief, what cannot be denied is that looking at pivotal figures like Sir Francis Bacon in the religious visionary as well as the scientific context enriches our broader historical and cultural understanding.

And putting such views across to the historical laity can be fascinating, as I know from personal experience.

(c) Galileo and the Church

This affair has, of course, been a popular cornerstone of the mythology of science since the eighteenth century. Here we see the frail, sickly, elderly Galileo, that martyr for truth, bravely standing his ground before his ignorant 'medieval' Inquisitors of the Roman Catholic Church. Protestant, Unitarian, and non-believing 'Enlightenment' figures had a field day with the image, not to mention historians, painters, and storytellers of the 'Romantic' age and the nineteenth century.

Yet late-twentieth-century revisionist historians have revisited the Galileo affair more objectively, working on primary documents, and trying to understand what happened between 1610 and 1633 in a clearer light. And from these modern studies, Galileo emerges less a simple martyr than a fallen courtier, a somewhat ruthless propagandist willing to use people for his own ends, who had no objection to speaking contemptuously of those who did not see things his way, and who seriously misjudged how far he could presume upon his former patron and friend, Pope Urban VIII. Indeed, one has only to look at the portrait of Galileo when he was probably in his early forties by Domenico Robusti in the National Maritime Museum, Greenwich, to realise that in his years of vigour he could have been a ruthless opponent. For the early-middle-aged Galileo was bull-necked, with piercing eyes, and a set of the mouth suggesting a man not to be trifled with. When I showed a good-quality reproduction of this beautiful example of Renaissance portraiture to one lady, she responded 'Shave off the beard, and you've got the face of an East End gangster'; another said 'I wouldn't like to meet him on a dark night!'; while another likened the face to that of a character in the 1607 play of Italian bloodshed, *The Revenger's Tragedy*.

It is not surprising, perhaps, that this picture is so little shown in reproduction, for it makes the Galileo of his early

telescopic fame look more like a 'hard case' than a victim-martyr. Not good for myth-building, in fact. Indeed, the only good reproduction of the painting that I know appears in Michael Hoskin's *The Cambridge Illustrated History of Astronomy* (C.U.P., 1997), p. 122. In this 400th anniversary of the telescope year, the picture has appeared on the internet: look under 'portraits of Galileo', the 'Nā Kilo Hōkū' page of the University of Hawaii.

Of course, none of this in any way undermines the intellectual stature of Galileo as a scientist, and as a major influence upon the growth of both observational astronomy and experimental and mathematical physics. But it does, perhaps, when used in conjunction with certain of his controversial writings, such as *The Dialogue on the Two Chief World Systems* (1632), and with specific examples of how he got his own way, explain why he made so many enemies, and why the chickens finally came home to roost before the Inquisition in 1633. For one crucial point which all media and most academic treatments of Galileo invariably duck is why, if the Copernican theory with its moving earth was so offensive to Christian doctrine, did it take the Church so long to do anything about it? For Copernicus's book had been published in 1543, and reprinted in 1566.

For the basic fact remains that Galileo's condemnation in 1633 was more about teaching as truth what he could not prove physically, and breaching a caution not to do so laid upon him in 1616. His condemnation, moreover, did not pertain to any articles of Christian doctrine, for never did Galileo criticise those beliefs central to the faith: God's creation of everything that existed; the divine Sonship of Christ, His Virgin Birth, and His Resurrection; the nature of the Sacraments; the Pope's divine Vicarage on earth; the Church hierarchy; the doctrine of Heaven and Hell, and of Christ as Saviour of the world.

It is, moreover, wholly inadmissible for writers and popularisers to compare Galileo with Giordano Bruno, who was a Copernican burnt for heresy in Rome in 1600. For Bruno was a lapsed Dominican Friar, who had effectively abandoned Christianity for a sort of world-soul pantheism in which there was no distinct God, Son, or Saviour, and in which, theologically speaking, the Church and the Papacy were an irrelevance. And in addition to this collection of alpha-class heresies, Bruno happened to be a Copernican! So what did he really get burned for, one wonders?

We should also remember that early-seventeenth-century Europe was not a place that professed intellectual freedom, and we condemn its culture unfairly when we fail to find it there. It was rather a society grounded upon a series of spiritual and secular hierarchies; and if one transgressed the boundaries, one quite simply got into trouble. But what is truly remarkable about Galileo is how many influential friends he actually had - until, that is, all went wrong in 1632: men such as Cosimo de Medici, Grand Duke of Tuscany; Niccolò Riccardi, O.P.; the Vatican Censor who licensed Galileo's book and whose career Galileo ruined; Cardinal Matteo Barberini, who became Pope Urban VIII in 1623; Asciano Piccolomini, Archbishop of Sienna; and many others, within Italy and beyond. For we often forget that Galileo's trial and condemnation were very much a product of the Inquisition, which itself was a corporation within the wider Church, and that many senior Roman Catholics were disturbed by the whole business. Indeed, we should think less in terms of 'Galileo and the Church' than 'Galileo and the Inquisition'.

But what about Galileo and the Bible? This is, of course, an area upon which countless gallons of academic and journalistic ink have been spilled, and to which many hours, of both theatrical and broadcast air time, have been devoted. Suffice it to say, however, that neither the Roman Catholic nor the burgeoning Protestant Churches of Reformation Europe were 'fundamentalist' in the way that fundamentalism has sprung up in the twentieth century, and it is a tragedy of historical understanding that so many people view the Galileo and the Church affair from an assumed fundamentalist perspective.

For in spite of allusions to an immovable earth in Joshua 10 and Psalms 93 and 104 and elsewhere in the Old Testament, the Christian Church had an old and mature tradition of Biblical interpretation, coming from the Fathers, developed in the medieval universities, and familiar to all academic theologians by 1600. That most revered Doctor of the Church, Saint Augustine (AD 354-430), had devoted much attention to it, and in his *De Genesi ad Litteram* (401-15) he explored the interpretation of the Pentateuch in the light of later Greek knowledge. For what mattered in the Creation story was that people should understand that God was the source of all creation: Genesis was a statement of God's creative majesty, and not a physics textbook. Augustine had no objection to Godly men studying nature so long as they remembered that God Himself was greater than the Creation. Indeed, Galileo had explored this familiar theme in his *Letter to the Grand Duchess Christina* (1615), where he had said that God had written two books: one was the Book of the Word, or Scripture; the other was the Book of Works, or nature. He even cited the sixteenth-century Cardinal Boronius, that the purpose of Scripture was to teach us how to go to Heaven - not to teach us how the heavens go!

One suspects that had Galileo been less abrasive, in that world of finely-tuned hierarchies, his scientific discoveries would not have become controversial, his friendship with Pope Urban VIII would have continued undisturbed, and there would never have been set-piece confrontations with the Jesuit astronomers, Dominican theologians, or the Inquisition. For what the 'orthodox' confrontational history of Galileo and the Church invariably omits is that when he published his original telescopic discoveries in 1610, they were met with almost universal acclaim, including from eminent Churchmen.

It has long been my opinion that not only was the Galileo affair not about Christian theology but about authority in a hierarchic society, but that Galileo's own personality and treatment of his contemporaries were the real triggers of the process that brought him before the Inquisition in 1633. And while people are entitled to their own views about how

one should behave in a hierarchic society, and how far the rules of courtesy and good manners should apply, we must realise that the Galileo affair was not about religion, was only in part about science, but was overwhelmingly about human behaviour in a Renaissance courtly world.

And in the forthcoming '400th International Year of Astronomy and the Telescope', in 2009, I would like to see accessible books, articles, and radio and TV programmes presenting this view, and suggesting to the historically-interested public that the story of Galileo that comes across in Berthold Brecht's powerful image-forming ahistorical play *The Trial of Galileo* (1939) is very wide of the mark.

(d) The Oxford Darwinian 'debate' of 1860

Paired, like book-ends on the mantle-piece, with Galileo in the hagiography of science versus religion is the so-called 'debate' that took place in Oxford on Saturday 30 June 1860. Here, so the hagiographic tradition says, the ignorant and verbose Bishop of Oxford, the Rt Revd Samuel Wilberforce, condemns Darwin's recently-published *Origin of Species*, only to be shot down in flames by that stalwart champion of secular truth, Prof. Thomas Henry Huxley. Supposedly, the Bishop asks Huxley whether it is from his grandfather's or grandmother's side that he claims descent from the apes. And quick as a flash, the dynamic 35-year-old David hurls his rhetorical stone at the metaphorical brow of the 55-year-old ecclesiastical Goliath with world-shattering effect, saying that, had he had the choice of being descended from an ape or a Bishop, he would have preferred the ape. The meeting then ends in chaos - ladies faint, ancestral certainties evaporate, the 'Victorian crisis of faith' begins!

I have read this narrative in, quite literally, dozens of books, of varying academic quality, from my childhood onwards. I have seen it acted out in at least two television programmes, and its general gist repeatedly re-affirmed in countless treatments of Darwinian evolution.

It is not appropriate, in the context of this lecture article, to explore the matter in depth. But suffice it to say that modern scholarly research into the 'debate' has come to draw rather different conclusions from those of the standard hagiographical line. Firstly, let it be understood that there is no authentic transcript of what was said, and what we now know comes in various garbled interpretations in private correspondence, followed by the 'canonical' version, from Francis Darwin's *The Life and Letters of Charles Darwin* (1887), and from those of T. H. Huxley (1900) and Joseph Dalton Hooker (1918), who repeat the story: hardly contemporary with the event, or impartial.

Secondly, the only contemporary printed accounts of the Wilberforce-Huxley exchange (if that is not too strong a term) that seem to have existed - Jackson's *Oxford Journal* and the *Athenaeum* magazine - give a brief, simple narrative of the 'Section D - Zoology and Botany, including Physiology' meeting of the British Association at which the two men spoke. The local *Jackson's Oxford Journal*, 7 July 1860, devoted a dozen lines of its massive coverage of the week-long British Association meeting to the Bishop's objections to Mr Darwin's theory, to which 'Professor Huxley, in a calm, dispassionate, and argumentative speech, replied to his Lordship, and was followed by Admiral Fitzroy, Dr Beale, Mr Lubbock, and Dr Hooper.' The *Athenaeum* proceeds along similar lines. So where is the furore, where is the crushed Bishop, where is Huxley triumphant? Outside, that is, deliberate long-post-facto myth-making?

Some people, however, have tried to argue that the polite, respectful reporters and newspaper editors of the Victorian age threw a veil of silence across the whole affair, to preserve the wounded Bishop's dignity. Rubbish, I say! There was no shortage of radical, anti-clerical, anti-Anglican newspapers and magazines in 1860 that would have crowed Wilberforce's ritual humiliation from the housetops had it ever taken place. *Punch* - no respecter of unjustified reputations - would have had a field day, had there been anything to have a field day with; and let us not forget that the plot of Anthony Trollope's *The Warden* (1855) hinges on the radical editor of the fictional *Jupiter* newspaper Tom Towers pillorying the ecclesiastical establishment of Barchester Cathedral because of an alleged misuse of funds. And in 1860, there was no shortage of real-life Tom Towerses or Jupiters. Indeed, one thinks of the radical *Examiner*, and even *The Times* itself; for in the 1850s 'The Thunderer' had often been loudly critical of clerical abuses, especially those of Cathedral Chapters.

Thirdly, there seems to have been no planned or actual 'debate': Wilberforce's quip and Huxley's response were quite extempore, and probably lasted only a few seconds in a response which one commentator said was scarcely audible, and in which another said no one could recall the precise words spoken. Indeed, it was a world-changing debate only in hindsight.

Fourthly, equally many, if not more, people who left surviving notes about the 'debate' thought that the Bishop's critique of Darwinian evolution was the one that really carried the day, and the physicist Balfour Stewart, F.R.S. believed that the Bishop had 'the best of it'.

Fifthly, in the excellent display dealing with the 'debate' in the Oxford University Natural History Museum, where the 1860 meeting took place, a clear attempt has been made to set the historical record straight, and separate received hagiography from the surviving historical record.

But there was another component to the 'debate' which seems to have been overlooked by scholars - perhaps because they are being too serious in their secularist zeal: fun. Let us look at the context of the supposed encounter.

This Saturday afternoon event was of course part of the annual meeting of the British Association for the Advancement of Science. These jamboree meetings of British science, which had been part of the educated person's calendar since 1831, met originally in a major British city for about one week, and the 1860 gathering happened to fall in Oxford. In addition to being a public shop-window for the latest scientific research, the Association meetings were conspicuous social events. They were a sort of Ascot for the thinking classes, and attracted not only serious men of science, but country clergy, gentry, the professional classes in holiday mood, journalists, publishers, and pundits, along with their wives and daughters. In addition to the lectures and learned sections, there were often balls, outings, soirées, dinners, tea-parties, and band concerts, for let us remember that the reputedly serious Victorians actually liked to enjoy themselves.

And very importantly, the 1860 meeting followed hard upon the end of Oxford's Trinity Term, at the height of the University's social season when - even without the British Association - examinations would be over, and parents would often 'come up', bringing their daughters, in order that they might meet eligible young gentlemen under approved social conditions. Encaenia, the University's great time of celebration (literally 'renewal', from the Greek), when honorary degrees were awarded to eminent persons, and garden parties were held, had taken place only a few days before the British Association opened on Tuesday 26 June. It was high summer holiday in Oxford. So when one adds these things together, one begins to get a grasp of the pleasureableness of the season and of the occasion. This also helps to explain why high-spirited undergraduates were around in such abundance, and why the American Professor John Draper's paper on the 'intellectual development of Europe considered with reference to the views of Mr Darwin & others' sometimes broke down in undergraduate hilarity when he spoke of the man and the 'mawnkey'!

Samuel Wilberforce, Bishop of Oxford, moreover, was a popular figure and a renowned orator and public performer, sometimes nicknamed 'Soapy Sam' (or more respectfully, 'Sapanacious Samuel'). He was also the mitred son of that national saint, William Wilberforce, the slavery abolitionist and reformer. In an age where great orators were social lions, Wilberforce was a guaranteed drawer of crowds, and we must not forget that whatever he said extempore to Huxley, it was most likely in the context of an oratorical peroration before an audience that wanted, in the best way possible, to be entertained. This is what packed in an audience estimated at 700 people to hear him, in a room intended to take half that number. An audience of scientists, ladies, undergraduates, and scientific amateurs, who had not come in any expectation of a dour debate, but to witness another of Samuel's stunning and entertaining performances.

So how correct are those historians who see the 'debate' as a set-piece encounter between an out-of-date clerical establishment and the dynamic truths of young secular science? Should we not be willing to factor into our understanding the time, the place, and the season, with Oxford University and British science in something of a holiday mood, with verbal exchanges, undergraduate japes, and scientific papers as part of a wider social round?

In the forthcoming double Darwinian anniversary year of 2009, and the 150th anniversary of the 'debate' in 2010, should not historians in the media be trying to cast wider and more colourful rays of historical light upon an incident in scientific history that has not only been blown absurdly out of proportion by secularists and anti-clerical interpreters, but which has become enshrined in a po-faced monochrome?

I would love to see a TV producer make a programme on the 'debate', complete with laughs, shouts of 'mawnkey', and a Bishop who knew how to work a crowd. It would not only help set the hyped-up hagiographic interpretation straight, but it would also help explain why popular magazines, such as Punch or Vanity Fair, had such a field day with Darwinism in general, and why so many of the middle-class patrons of those publications enjoyed jokes, cartoons, and comic songs about monkeys, grave bearded gentlemen with bald heads - and bishops!

8. The historical circumstances behind modern science

In recent decades, and most notably since the 1960s, it has become fashionable in some circles to downplay the pivotal role of the West in the development of scientific understanding. Perhaps it is part of the 'post-imperial guilt' syndrome, or an aspect of a debilitating apology culture; but either way, we are often told that pretty well everybody else on the planet got there first, and then the wicked West came along and stole all the glory.

Of course, it would be ridiculous to suggest that other cultures have not made very significant contributions to the sciences, especially in fields such as Chinese astronomical record-keeping, and Arabic taxonomies in botany and certain branches of medicine, or that these have not been absorbed - generally with full contemporary acknowledgement - into Western science. On the other hand, I would suggest that a particular set of circumstances came in to play which helped to ease Western science along a particular direction of development, and that these circumstances were portentous in framing the modern world.

(a) Greek civic culture

Much scholarly discussion has been devoted to what made the Greeks so pivotal in laying key foundation stones of Western science. And while fully acknowledging Greece's debt to Babylonian, and through the Babylonians to Indian,

mathematics, I would suggest that what was perhaps the most important circumstance for the Greeks was the creation of what might be called 'free thinking space': the product of an often turbulent, unstable, yet prosperous and freedom-valuing society. It came from the possession of enough resources to be able to spend at least part of one's time sitting around doing enjoyable things, without being bound to an overlord or having to spend one's days in backbreaking work. The kind of people, indeed, who populate the Dialogues of Plato: young gentlemen, poets, historians, philosophers, travellers, athletes, playwrights, cultured soldiers, and professional windbags like Socrates. A breed, moreover, that does not seem to have existed in Babylon or Egypt: a 'proto-middle-class' that traded, argued, wrote, or wrestled for a living, and that was sure of a big enough audience of similarly-circumstanced individuals who could provide patronage and congenial company.

For one needs a good bit of ease and prosperity in the social system to have a whole class of men (and a much smaller body of women, like Sappho) who have the time and resources to sit around all day composing poems, philosophising about 'the Good', speculating whether there is a singular Logos that transcends all the Olympian gods, discussing what the sun is made of, the eternal properties of a right-angled triangle, or the nature of that 'life force' which oversees the growth of all living things. For none of these activities are essential for human survival, yet when the Greeks began to ask these sorts of questions, in the sixth century BC, a new level of maturity and potential had been attained by human culture.

And yes, I fully admit that Greek prosperity depended upon a slave caste; yet at least slavery in antiquity was not racial in its basis, and not only does ancient history record many cases of slaves who were set free, but also many - often the unfortunate victims of wars and annexations - who were men of culture and education, and who when enslaved practised as teachers, physicians, and administrators.

So quite apart from the specific details of the Greek contribution to civilisation, I would suggest that the value which the Greeks put on 'thinking space', prosperity, and what might be styled 'civic virtue' was a key component in the rise of Western science.

(b) Christianity and paganism

The pagan cultures of Greece and Rome not only invented 'thinking space' - at least for a moderately-sized elite - which made a recognisable civic and mental life possible, but they were also transformed by their contact with the new religion of Christianity. Indeed, it is one of the wonders, or miracles, of history, that a religion which made its first entry into the world as a radical sect within Galilean Judaism became so universalised so quickly. For even within the brief two- or three-year ministry of Christ Himself in the late 20s AD, not only Jews, but 'unclean' Samaritans, Gentile Greeks, Roman army officers, and various foreigners became Christians. Then an odd assortment of men, including tax collectors, fishermen, physicians, and the converted Rabbi Paul were soon taking the faith across the Mediterranean world, and even into Arabia, Persia, and India. What is more, women were also playing key roles in the new movement: women, moreover, varying in social status from prostitutes to successful businesswomen, such as the Greek Gentile Lydia of Thyatira, a dealer in costly purple dyestuffs, who appears in the Acts of the Apostles. And by AD 100 Christianity was beginning to spread through the Roman administrative system, with words like 'diocese', not to mention the cut of liturgical garments, being borrowed from the districts and dress of Roman officials; while in the early fourth century, Constantine became the first Christian to sit on the imperial throne, the son of a Christian mother, Helena. It was, moreover, a 'hearts and minds' conversion process, and did not use war or armed force.

My view is, however, that as the moral code and spiritual values of Christianity melded with Greek ideas of freedom and Roman ways of getting things done, one began to see the origins of a new kind of society. And while early Christianity was not concerned with science per se, many great Christian thinkers, most notably St Augustine around AD 400, began to wrestle with the status and value of secular pagan knowledge, such as science. For while studying the passing, transient world may not have been as enduringly valuable as preparing for the Life Eternal, science and secular knowledge were nonetheless useful. There was nothing wrong in loving science and scholarship, provided that one loved God more. And Augustine knew this at first hand, for before his conversion in AD 387, at the age of 33, he had been a comfortably-off young intellectual about town: delighting in Plato and the great pagan philosophers, and even keeping a mistress.

For science could be so useful, at least while the world endured. Christians especially needed a good astronomical knowledge to calculate the moveable Feast of Easter, from the 'Paschal' full moon in the spring equinox. Boethius (St Severinus) produced encyclopaedic works of scholarship which contain scientific sections, while the works of Hippocrates, Galen, Pliny, Aristotle, Ptolemy, and many other pagan scientific writers were cited and paraphrased in late-classical Christian compilations.

The emerging late-classical Christian world also benefited from the intellectual techniques and principles of Roman law, often seasoned with the ethics of the Sermon on the Mount; while pagan sites were frequently used for the construction of churches, and popular festivals turned into Christian celebrations, such as Roman midwinter Saturnalia becoming the time to celebrate Christ's birth.

In short, the fusion between Christian ethics and morality and Graeco-Roman pagan intellectual ideals and efficiency

was one of the most powerful formative influences upon the West, making possible the creation of a society that, by the Middle Ages, was able to develop the financial, social, and intellectual resources that provided a crucial foundation for the rise of a scientific and technological culture.

(c) The corporate society

Ideally, at least, Greek and Roman social and political organisation depended upon mutually-agreed ground rules, and a level of transparency in public life. The concept of the state, in fact, rather than the familial tribe, or the unchallengeable autocrat; and perhaps the most trenchant statement of that ideal lies in Aristotle's *Politics*. And even when ideals went sour, emperors usurped power, or, in medieval times, Popes wielded distinctly un-Christ-like powers, the visible falling away from that ideal was plain, as was the hope of many for its restoration.

And intimately related to the above was Western society's ability, or at least its aspiration, to balance its secular and spiritual wings in a creative dynamic. Indeed, this juxtaposition of secular and spiritual is encountered time and again from late-classical times onwards. Europe's medieval universities were prime examples, whether the particular institutions were, at least formally, headed by a great churchman, such as Oxford and Paris, or were 'student'-run places, like Padua. Theology was Queen of the Sciences, yet tutors and students demanded the right to let their intellects run freely - sometimes in open conflict with the university's governors - even if most of them were either priests already, or hoped to become ordained. And in addition to the study of specifically Christian texts, no fundamental incongruity was seen in the students' also studying a myriad of pagan, Jewish, and Muslim philosophers, poets, and medical and scientific writers. One could aspire to a life of spiritual purity while also reading Cicero, Horace, or even Ovid's *Ars Amatoria*; seek God, while (after its re-discovery in a monastic library in the fifteenth century) tasting the blind atomism of the atheistical Lucretius' *De Rerum Natura*.

These paradoxes and juxtapositions run through medieval, Renaissance, and early-modern European intellectual society, and prepare the way for the handling of incongruity and for lateral thinking, which are essential pre-conditions for creative scientific research.

They also form a component of a society where the rule of Popes and Emperors is naturally counterbalanced by the power of the elected assembly. For medieval European society contained a complex network of self-governing 'corporate' bodies which assumed a high degree of independence from outside control. For just as the eleven Apostles held an election amongst themselves to replace the dead traitor Judas - electing Matthias - so peer-election was to be found in the representative governing bodies of the medieval universities; town councils, such as the Venetian Senate and the City of London; monastic and cathedral chapters; great trading companies, such as the Hanseatic League; and, very conspicuously, in the 'Fellowship' governance of Oxford and Cambridge colleges. For the Fellows, or *Socii*, were by Latin derivation members of a company of like-minded men, who ran their own affairs. And at the very highest level, this corporate way of doing things led to the election of Popes by the College of Cardinals, and the election of the Holy Roman Emperor through a corporate assembly of princes that met in a specified 'electoral' city, to which it was summoned when an Emperor died. And from very early on, the Roman Catholic Church developed a cross-European corporate mechanism for deciding upon important issues of mutual concern: the Church Council. The Council that met in the Byzantine city of Nicaea in AD 325 settled major points of Christian doctrine, while that of Constance, in the fourteenth century, not only tried to clean up some of the Church's accumulating abuses, but even deposed Popes. And last, but by no means least, let us not forget that corporate body which had such a profoundly formative role in the creation of the modern world: Parliament.

When all of these factors came together - religious, ethical, political, administrative, and social - one had the basis for a dynamic and creative society, where no single power bloc was absolute, and where counter-arguments and counter-claims could be publicly laid. And drawing heavily on its Greek philosophical roots, medieval Christendom possessed key components for what might be called an 'enterprise culture': great self-governing merchant cities like Florence or Venice, industrial and technological centres such as that 'silicon valley' of late-medieval Europe, Nuremberg (where one might obtain a clock, a gun, a printed book, or a bank loan); and great universities. And then there was that great revolution in finance, starting in Florence and Augsburg, out of which modern banking and the international credit economy was born. Self-made merchant princes might now bankrupt crowned heads with the stroke of a pen, while some successful banking dynasties, such as the former wool merchant Medici, became crowned heads, and made and unmade Popes, but were sometimes forced to flee in the face of popular revolt.

By the fifteenth century, Europe had become a powerful engine of creativity on all kinds of levels, from nurturing the seeds of the Protestant Reformation on one hand, to providing the financial and technological resources that would power the great voyages of discovery and eventually the global economy on the other. And out of this cocktail of Christianity, classical philosophy, finance, invention, and close corporate organisation came a more dynamic way of investigating and harnessing the forces of nature in what is often referred to as the 'Scientific Revolution'.

Indeed, this view of European development between c. AD 900 and 1500 is one of which the media might well take note. This would not only help to break down 'Dark Ages' stereotypes, but would also remind people where the spiritual, ethical, intellectual, and social ideas and values that have formed the modern West actually came from.

(d) Triggering innovation

I would argue that two technological innovations took place between 1470 and 1670, which were crucial to the development of the modern world, and by extension, to the development of all those parts of the world which, even when proclaiming their hatred of the West, still desire Western commodities, be they financial services, antibiotics, representative government, TV networks, computers, or machine guns.

The first great innovation was the oceanic voyages of discovery. Starting with Portuguese attempts to find the supposed Christian African kingdom of Prester John after the Ottoman Sultan Mohammed II's destruction of the Christian Byzantine Empire in 1453, and followed by Columbus's discovery of the Americas after 1492, and Magellan's circumnavigation of the globe by 1520, a whole new global geography was opening up. And while no educated person (contra the myth still actively fuelled by the media) had believed the world to be flat for nearly 2,000 years, the accumulated geographical discoveries presented undoubted challenges to traditional ways of thinking.

Remarkably, the surface of the earth was found to be covered mostly with water, and not land, as the ancients had assumed. Likewise, there were continents, oceans, peoples, animals, and substances undreamt of in the old world. Could the ancient writers have got it wrong, or had they really not known everything? Did modern-day man, on the brink of Armageddon, really know things undreamt of by Aristotle, Ptolemy, or Strabo? Indeed, one begins to see why geography so fascinated Sir Francis Bacon, and why he accompanied his visionary quotation from Daniel 12:4 with a picture of a great ship striking out into the uncharted oceans of knowledge.

But why was the ship such a potent symbol of new knowledge? Because, I would argue, the great three-masted, ocean-going square riggers of early Renaissance Europe were scientific instruments of discovery in their own right: great, complex machines of wood, iron, and cordage, financed by new banking techniques, and often built and owned by corporate bodies of venture-capital, profit-seeking businessmen and their shareholders. And what does a scientific instrument do? It conveys the human senses to places which they could not get to without the instrument.

The knowledge revealed by the new ship technology, moreover, was not only empirical, and hands-on, but was easily susceptible to independent verification. If a navigator found a new island or continent, then when his route and sailing directions became known on his returning home, anybody with access to an adequate vessel and the necessary back-up resources could go and verify the discovery for himself.

This was not only new knowledge, but public knowledge. Potentially, knowledge of the market place, dockside, or tavern, capable of being discussed in the vernacular by practical men and often sped on by the new art of printing and the copper-plate engraved map. Judging from surviving examples, sea-books clearly catered for readers of vernacular Spanish, French, Dutch, English and other languages, and only in subsequent learned compilations were they generally graced by the Latin of the schools.

I would suggest, therefore, that the voyages of discovery not only opened up geographical knowledge to an 'ordinary persons' market; they also supplied the prototype of what is referred to as 'the Scientific Method', incorporating as it does new technology, public verification of results, tests and experiments, and an increase in public awareness.

The second great innovation came in the seventeenth century, and had a clear relationship to the lessons of oceanic discovery: it was the development of scientific instruments. In the 'Preface' to his monumental *Micrographia* (1665), Robert Hooke spoke of all the wonderful new instruments that had given researchers a new and publicly verifiable 'handle' on natural knowledge in recent decades. Of course, he acknowledges the intellectual power of ships and geographical discovery, but then, in *Micrographia* and in other publications, he lists recent instruments that had transformed scientific knowledge: microscopes, telescopes, barometers, precision clocks, meteorological instruments, airpumps, various optical devices, and a range of new precision tools. He referred to them collectively as 'artificial organs' that 'strengthen the natural'. They were 'artificial' not because they were false, but because they were the product of art, or of human ingenuity. Both collectively and individually these new instruments took the human senses to places which they could not reach without them: to the surface of the moon and planets, to the cellular structures of vegetable matter, to insect anatomy, to measurable and hopefully predictive mechanisms in the weather, and to the physiology of respiration and the chemistry of combustion. Just in the same way, in fact, that a modern three-masted ship took an observer to the mountains of Peru or to Van Deiman's Land.

And just as the ship produced one geographical discovery after another, so the growing array of 'artificial organs' opened up one world after another to human perception. Indeed, once the discovery 'mechanism' had been set firmly in motion by the 1660s, it carried on relentlessly. And once discovery had been allied to practical technological innovation, which would, in Bacon's phrase, 'relieve man's estate', one had created that science-technology-innovation relationship that is a hallmark of modern civilisation.

And considering that the Royal Society after 1660 became an overt promoter of this way of understanding, and that, as was mentioned above, the Society celebrates its 350th anniversary in 2010, what a golden opportunity presents itself to the historical community. What books, magazine articles, TV documentaries, and radio talks could be presented to the public, and what an opportunity we have to inform the wider community how science - and religion - played such a leading role in creating the modern world.

9. Conclusion

This lecture, as I delivered it on 12 November 2008, was obviously much shorter than the above text. But in the printed word, especially when intended for internet publication, one has the opportunity to explore themes in more detail than is possible orally, in 60 minutes. Both the lecture itself and this expanded written version have enabled me to draw together and explore a range of ideas about the nature of history, science, and religion that I have been developing over many years. For I feel that it is one of the historian's ancient duties to try to disentangle and understand past events, as far as the sources allow, and to attempt to communicate a balanced interpretation of them to 'the public'. And as the modern world, and in particular the Western world, has been so profoundly influenced by mankind's developing capacity to analyse and interpret the structures of nature, and then to manipulate these structures to produce transformative technologies, the present-day historian is obliged to incorporate the impact of science and technology into his or her wider vision.

And while no historian can be without bias or slant, I believe that he or she must also address the way in which science itself has built up a mythology about its own origins, developments, and climacteric events that is often a gross distortion of the historical truth. And nowhere, perhaps, is this more glaringly so than in science's supposed bloody-nosed relationship with Christian belief. Irrespective of an individual's personal views on religion, the historian does have a duty to get at the truth, as far as legend can be separated from record, and interpretation from the nuances of personal conviction.

And this brings us back full circle to that angel or devil of modern mass-communication: television. Yes, it can be, in the words of Andrew Marr, 'vivid but stupid'; but let us not forget that TV programmes are only as good as the people who make them, and if we are only capable of producing ludicrous travesties of the past on the small screen, then the time has arrived to start giving out redundancy notices across the writing, directing, and producing sectors of the industry.

For there is out there a very large constituency of intelligent people who do not wish to be insulted by recycled hoary cultural myths, or have gross prejudices routinely confirmed. And in this forthcoming time of multiple anniversaries, let us hope that history programme-makers acknowledge this constituency, throw political correctness out of the window, and remember that, as in Lord Reith's vision of broadcasting, there really are millions of people out there (myself included) who wish to be further educated, improved, inspired - and delighted.

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