

Science as Culture

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The BA Science Communication Conference, 19 May 2008

<http://www.britishtscienceassociation.org/sciencecommunicationconference>

The gap between the two great Nobel Prize winning Braggs of Science and the Bragg of fiction and broadcasting who most apprehensively sets out to address you today is wider and deeper than the Grand Canyon. Their knowledge was hard-studied, disciplined, professional. Mine is late come by, scatter-gathered and built on the shifting sands of a brief grammar school education in science which ended *before* O-levels. I can only have been invited here for contrast. We do share a Viking name & county of origin & Lady Bragg thought a distant ancestor - not a lot. I pointed this out to Sir Roland Jackson over an Athenaeum lunch – but he would not be budged, and by battery and flattery he hooked his fish. If only the word 'keynote' did not feature, then at least I might not be feeling the dread of it.

I asked for a steer and Sir Roland obliged and I shall try to navigate by it. The talk he said 'might include' addressing the notion that though science is integral to our culture it is not often viewed as such in today's society; a consideration of the purpose of science with regard to economic competitiveness; vis a vis 'pure' science and science in the media.

Science and our culture – is it not viewed as integral to our society? There are several ways to tackle this. One is simply but simplistically, I think, to dismiss it out of hand. Our current society in the west surfs on the waves of science. Computers, e-mail, websites, the internet, mobile multi-purpose phones, even old fashioned television and radio, let alone the matters of electricity, combustion engines, vaccines, and jets which to many are part of the given of the earth, as natural as mountain streams, these inventions out of science and engineering and technology are the tides on which so much of our lives are floated and sustained.

We are wired into daily science almost as much and as unconsciously as we are wired into the biology of daily existence. Science extends and enriches our memories and our reach in ways which make all of us capable of being walking libraries, personal carriers of information which students at Alexandria could only have dreamed of. Science has given each one of us the liberation of instantly available knowledge and pleasure: and yet, the worry behind the sentence proposed by Sir Roland is justified. Why does it not *seem* like that?

When Andrew Neil, the then Editor of the *Sunday Times*, had the nerve to reach for the word 'Culture', then thought of almost exclusively as European, pretentious and worrying, his bold step did not take in science. When Andy Burnham talks of introducing five hours culture a week in schools, he does not include science. When the *Culture Show* on BBC-2 presents its agenda, there is no science. When the word 'cultural' is used we know that it could include opera and ballet, even fiction and cinema, but not science. The word 'culture' has been the subject of a successful takeover bid to mean only 'The Arts'.

Yet of the three greatest books by Englishmen – by Darwin, Newton and Shakespeare – two are by scientists. And when we look at say the last three hundred years in terms of the deepening of the understanding of the condition and the possibilities of humankind, science soars away. Yes the novel was as it were invented in this period, great, though not the greatest poetry written, the cinema also invented, memorable romantic music written, popular music radically re-energised, radio and television discovered (through science) and more, and good.

But compared with the developments in physics and the bio-medical sciences, compared with the advances in chemistry and mathematics and, *crucially*, their direct impact on the quality of lives, it is difficult to see why there is this cultural snub.

Let us not claim superiority for science, though many would, but let us claim that science has a purchase on imagination, elegance and insights into the mechanics and essence of being which can

be compared to that of artists. So why, if Sir Roland's concern is to be taken up, why does it, and not only in this country, seem to have failed to be seen as a key strand in the DNA of culture? When you speak of culture and science, you have to reach for C.P. Snow, *The Two Cultures*, the Rede Lecture in May 1959, delivered, dissected, damned, but not irrelevant even in a world which has moved on so much from the Cambridge – and class – of C.P. Snow.

I do not want to become snowbound, but it is worth saying that though the system behind Snow's arguments has been eroded it still remains an observable fact that in a country where land has always 'counted', i.e. signified more than manufacturing among those who have determined the patterns of the times, and – well, we know the story, the class system is still the alphabet of our society and in this context science is and feels itself to be at the tradesman's entrance.

Does this still have an effect? In an age in which the Emeritus Professor of English at Oxford, John Carey, edits a magnificent book on science; when one of our leading novelists, Ian McEwan, is besotted by science? When Richard Dawkins, Steve Jones and Martin Rees and other scientists write books as literature? When we are all Etonian egalitarians now?

But on the whole I think that the weight of work and the dazzles of recent discoveries have left that class and inheritance argument as cut off from the mainland as any monosyllabic protuberance which lurks in the seas off Northern Scotland. And why should scientists care, anyway? They rule the way the world works – what more do they want? They feel embattled. That can be a comfort, the happy few, the righteous. They are crucial to every aspect of the future economy – the future of the planet itself. Do they also need to be included in Andrew Neil's supplement? The showing of a fine pair of heels might be the better course. The snapping of the thumb and the index finger, the cultured expression of disdain the characteristics of the elites throughout the ages.

Yet, rightly in my opinion, they do not want that. Rightly, in my opinion, some scientists see that to be outside the tent is to be in danger of not fully connecting with and therefore not fully engaging and serving those to whom their work is directed.

That to have a voice in the gossip, let us say the higher gossip, of the nation is if not crucial certainly important in enabling the transmission of their ideas. But, you could argue, is that voice not already there? What do we hear in the higher gossip or let us say the programmes and newspapers and magazines which think for England – climate change, issues about seemingly intractable illnesses, is there life on other planets – a good deal of the media matter is science based. Nor does science languish in specialist coverage.

A short selection from current television programming includes *Horizon*, *Springwatch*, *The Natural World*, *Planet Earth*, *How To Improve Your Memory*, *the Power of the Planet*, *Human Giants*, *Scrapheap Challenge*, *Brainiac*. And underestimate not Dr Who? How about an exhibition on the science behind Dr Who at the already greatly successful Science Museum. That would lift the roof. On Radio 4, the national home for science programmes, *Case Notes*, *The Material World*, *Costing the Earth* - this is just a selection from a jumble but a not unrich jumble. Several newspapers have excellent science writers and reporters. And when that critical collision occurs in the Cern Collider, provided it does not fulfil the prophecies of the apocalyptics, then we can expect the air waves to flood into action.

So science is not in broadcasting limbo. And to take the programme I started up about ten years ago, *In Our Time*. It grew out of *Start The Week* which I'd done for ten years and onto which, in brief, I had introduced scientists. Their representation went from less than one per cent to thirty-seven per cent a year. And, against all expectation the programme flourished accordingly. At first many – most? – were very reluctant to become involved in what looked suspiciously like a popular programme with access to a big audience. "I'm in my laboratory at that time of day" was a regular rebuff. Yet when finally teased on they discovered (a) they were reaching wide audiences every bit as keen as I was to learn more (b) they were very good communicators (c) when they were on the audience numbers grew. (d) They did not need to dumb down.

This has been even more emphatically proved on *In Our Time*. We've discussed Physics and Cosmology, the Multiverse, Antimatter, the Speed of Light, the Higgs Boson and with academics of the highest distinction, including Martin Rees, Frank Close, Ruth Gregory, Jocelyn Bell Burnell, Roger Penrose and Jim Al Khalili. Biology and Geology with, inter alia, Steve Jones, and Jane Frances. The History of Science with Simon Schaffer, Steven Pumphrey, Vivian Nutton. Maths with Marcus de Sautoy and Ian Stewart.

We get more contributions – tens of thousands – to the internet message board for science than for any other subject and they are often more involved, more informed and more argumentative! And over 2 million on top of our audience plus 125,000 more – usually younger listeners – listen through the internet here and abroad and on podcasts.

We now have eighty programmes in our Sound Archives – much visited. One conclusion is that perhaps a generalised lesson or two per week in school on the History and Big Ideas of Science might keep in the tent those potential young scientists who otherwise flee away in the night. The fact is that the reach, not only in the UK but now world-wide, has astonished us all. We take one subject, invite three top-rate academics and I encourage them to put a quart into a thimble and very often they do.

What does this say? For the programme also includes History, Philosophy, the Classics & World Literature. To me it says that a large number of people, like me, want to find some way to enter into the world of knowledge you know and own. And also to me it says that in this country there is a very large minority who take it for granted that the multiverse, the dissolution of the monasteries, the history of the brain, zero, Avicenna and Joseph Conrad belong to the same spectrum. Yet the worries, legitimate I think, remain. Perhaps the real blame can be laid at the door of the British Association for the Advancement of Science. An article of 1834 commented that the lack of a single term to describe 'students of the knowledge of the material world' was causing unrest. (Hard evidence rather threadbare.)

Consequently at a meeting of the British Association in the 1830s "some ingenious gentleman proposed that, by analogy with *artist* they might form *scientist*". Oh that the ingenious gentleman had never spoken. To the BA's credit, the report goes on to say that "this was not generally palatable". But the genie was out of the bottle. Alack a day.

If only the term Natural Philosopher had been retained. If only Mathematician, Physicist, Chemist and so on could have retained their singular dignity, their freestanding supremacy instead of becoming bracketed with the catch-all *scientist*. And if only, above all, *scientist* had not been intended from the start to call up the word *artist*. Artist itself is a poor holdall now become so over-used and over-elasticated that it only means what the speaker wants it to mean. "I am an artist" is the wholly unashamed mantra of a host of sincere chancers. "I am a scientist" has always something to prove. "I am an artist" is a declaration that if I say this heap of whatever is art then it is art. "I am a scientist" is a declaration of professionalism.

But the two words have come to be used in opposition with unfortunate consequences. Natural Philosophy would never have got its denominations in such a twist: nor could you have pushed it around. In 1882, Matthew Arnold in his Rede Lecture pitted Literature against Science and although he did a neat sidestep worthy of his father's Rugby and bypassed many problems by claiming the *Principia* and *On The Origin of Species* for Literature, he landed on the conclusion that the classically taught man (it was a men-only world) was the 'educated' man and so the battle continued with an intellectual compounding a class argument.

As I have said, I think the class argument has been largely eroded: weight of scientific success sank it. But the scientist *versus* (for so it has become) artist debate is still, damagingly I think, with us. And here we begin at the beginning, not on radio programmes but in schools and universities. *Engaging Science*, a Wellcome Trust publication in 2007, looked at studies in schools from three countries – Australia, Sweden and the UK – and discovered that there was dissatisfaction with the experience of science lessons as 'teacher-centred content transmission' – a perception of curriculum

content as unengaging and disconnected from students' lives and concerns; a view that science is a 'difficult' subject at which many do not feel 'good enough' to succeed. The statistics, like most statistics, seem grim.

Although science student numbers are booming in Asia, in Britain, in the Natural Philosophies, they are falling. Between 1991 and 2003, despite an overall increase in the number of A Level entries of around 7 per cent there were falls of 18.7 per cent in chemistry, 25.4 per cent in mathematics and 29.6 per cent in physics. Alarming reading for a country which has been a world leader or up among the leaders for over three hundred years. Only biology has bucked the trend. (These figures come from the Demos pamphlet published in 2005).

And the situation was not helped by what until very recently was described by Demos as "the scandal of the Blair government's record on to be found in universities". Distinguished chemistry departments have had to close down; engineering seems apparently close to melt down and so when at very last we make up our minds as inevitably we must to build nuclear plants we will have to import the vast majority of skilled workers who can do the engineering job.

And in March in celebration of Natural Science and Engineering Week, the *Times* ran an article which, in the first paragraph, announced that "long famous for the quality of its scientific research, Britain is fast becoming a nation of scientific illiterates".

Let's leave aside an examination of the quality of research behind that remark. Do fewer people know about synapses today than they did thirty, fifty years ago? Do fewer people know how the universe began than did fifty, or a hundred years ago? Is a working knowledge of the law of thermodynamics a mark of much more than a close education in the subject not dissimilar to a working knowledge of Milton's sonnets or, come to that, the lyrics of Bob Dylan?

Yet unproven and possibly unprovable declarations of gloom as to the public's ignorance litter the landscape of public scientific discourse. It's usually the government's fault.

If we too are to join in the blame game for a minute or two, perhaps I might be allowed a couple of observations. For instance, some might think it logical to begin with those who teach science both in schools and universities. Should they not shoulder some responsibility? An army is as good as its officers. A company is as good as its top executives. If the children of Albion have fallen into the black hole of failure in science – maybe they could have been better directed, led, taught?

And is the concern for numbers itself proven? The Chinese are turning out, what is it, 120,000 physicists a year. In terms of mass we have we will never compete, just as we are wholly outgunned in mass manufacturing. But between say 1660 and 1720, when world changing wonders were uncovered in London and Cambridge alone, only a few men were involved: it was their distinction, the, frequent though not 100 percent, collaborative even collegiate structure of the then constituency of knowledge which seems to have mattered. And far from specialisation coming too early – which has been widely agreed - it could also be argued that, for those few who take to the subject, specialisation is coming too late. Small clusters seem to work across all disciplines: look at how few there were in the 5th and 4th century BC in Athens; in 14th and 15th century Florence; in the mid-twentieth century Cavendish Laboratory.

One final observation. A couple of years ago, I approached a television Commissioning Editor – who had a sound scientific background – with the idea of doing an audit of twentieth century science. What had led to good, what to bad, what was still unproven. I was given short shrift: very. There could be no question that science's influence had been entirely positive. Yet I read Robert Winston in the Demos pamphlet from which I have already quoted "the application of science has undoubtedly brought huge benefit to society ... yet it has been perceived by others as a threat to human wellbeing.

Whether scientists like it or not," he continues, "technological advance is now increasingly seen as a massive threat – to mankind and to our planet. And rightly so ... people do not feel they have ownership, control or even much influence over the technologies that are exploited by their

governments and by commercial enterprises". Could this, too, be a deterrent? Could this unease with what the Big Brothers are doing be one reason why anxious and intelligent young people think they would rather not join the club?

And finally, by the adoption of the word *scientist*, the competition with *artist* is always lurking about and it is doing the natural philosophers little good at present.

This is an age – in the west – of switches, gadgets, the instant. The difficult bypassed or solved by a machine, of ease. The leisured life once the preserve of the few who had the servants, the space, the time to move through it owning it is now available to more and more of us and we want it: we want it now. And compared to science the arts are easy.

We have developed a disease of ease: of easy ideas, of dismissing the virtue which can be found in what is difficult. That started in the arts. And in the [gadgets??] Very seductive. There it is.

It is, of course, just as difficult to be a fine artist as it is to be a fine scientist. But there is no doubt at all that you can amble and scramble in the foothills of the arts quite cheerfully, acknowledged to be doing 'interesting' work, socially lubricated, while, it seems to me, scientists have it much tougher all the way, the road to the arts is broad and easy; the road to the sciences is straight and narrow. In an age where something the size of a matchbox can contain a library, what sense does it make to spend all your limited and lovely time stuffing your skull with lists? Previous generations of scientists took proper pride in the muscularity of their memory, in the weight of their information, and rightly so and were admired for it and rightly so. I'm not so sure that today's young intelligent people see that as being quite as necessary or admirable.

And there is Fashion. The vice of Fashion turning, turning all the time and the fashion now is for the arts however threadbare, intellectually bankrupt and trendy some may be. To be called an artist, even if only by yourself, is to be in the moment. Not entirely without foundation. The creative industries in this country are greater, per head of population, than anywhere else in the world; the creative industries are growing at 6 per cent a year, more than twice the national average, and they employ over two and a half million people. It's a band wagon which is rolling on.

Finally – for to talk of the recent contentious political and managerial disaster in physics, that has reduced the status of one of our greatest and longest running success stories, to point out the damaging imbalance between funding for the bio-medical sciences – Government, the Wellcome Trust and the pharmaceutical industry compared with physics – might better be addressed in questions.

I would like to step up to the plate and attempt briefly to address Sir Roland's point about competitive or commercial as it were versus 'pure' and collaborative research.

I think there is no better person to make the case to which I hold than Michael Faraday. I quote from the late John Meurig Thomas: "Look at the magnitude of his discoveries. He liquefied about twenty different gases. Refrigeration becomes possible as a result of that. "(Instance of the law of unexpected consequences at work in the area of 'pure' research)." It did not have an immediate input in that direction but his laws of electrolysis changed the nature of industry and manufacture. But the biggest impact, theoretically, which we are still feeling and which Einstein and Clark Maxwell and all the great physicists have applauded respectfully is that he worked out the notion of the field.

He argued that you have to think in terms of the natural world, not just in terms of Newtonian mechanics. This is what has given rise to electronics – the fax machine, telephone, television, the wireless, the radio, the gramophone, they all go back to Faraday's understanding that you can have this force in the ether which you can tap and harness and pull out. They all go back step by step to Faraday."

In the matter of his drive, Meurig Thomas is very clear: it was not for money – he refused to patent his discoveries – nor for more fame than he already enjoyed through his lectures; he was, Meurig Thomas says, "driven to study nature because of his religious commitment. What he was doing in looking at nature was to see the manifestation of the Almighty." Uncommercial, uncompetitive.

This is not to deny that those working for aircraft or aerospace companies or for pharmaceutical companies and so on do not turn up with groundbreaking research. It is though the clearest possible warning to any thinking intelligent government that the last three hundred years of science – inordinately well represented in this country – proves beyond doubt that ‘pure’ can turn ideas into material more precious than gold. One day Higgs is walking in the Highlands, an idea arrives – out, of course, of much previous intensive study – and now we have the monumental Cern Project and God knows where that will take us.

When the Curies worked on X-rays they had not a notion that some decades on this invention would be crucial in uncovering hitherto deeply hidden illness such as cancer. X-rays were not developed to look through flesh. If the Cavendish had copyright on Maxwell’s theories and the Double Helix they would be rich beyond the dreams of Harvard. And this is directly linked to the universities where, currently, we are the only country in the world to be high up there with the lushly endowed American universities.

And, it is our science, our natural philosophy which has got us there and it is intolerably negligent of governments to neglect this area of our intellectual life and not to realise – given the evidence of generation on generation – that it is not enough to be a copycat culture like Japan, which is now revising its policies and making more investment. But it is necessary to be aware that the British have punched and still punch way above their weight in this area because of proud traditions, because of well enough supported clusters of scholars, and because of an understanding that the lonely imagination, the lonely impulse of delight and the singular obsession of our natural philosophers can take us, literally, to new and better worlds.

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