



RECOLLECTION

Margaret Thatcher's influence on British science

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In September 1986 I took leave of absence from the board of Consolidated Gold Fields, where I was responsible for business development in Australia and America, having been invited to join the Prime Minister's Policy Unit. My brief was to advise on business and industrial issues such as the privatization of the motor industry, shipbuilding and electricity, as well as the reforms of the financial services of the City. There was no initial intention that I would advise on Science Policy. However, this changed shortly after my arrival at No. 10.

I found that Margaret Thatcher (MT) was at odds with the mood in Whitehall, that expenditure on scientific research should be targeted on utilitarian goals, and that she held a strong personal belief in basic curiosity-driven research. However, she had few allies among ministers or officials. When she discovered that I had read physics at Oxford, held a research degree and maintained a strong interest in basic science, she asked me to review all the science material sent to her and advise. This was both exciting and daunting, as she was no mean scientist herself.¹

RESEARCH COUNCILS AND THE ALLOCATION OF FUNDS

MT frequently argued that individuals, not structures, achieve. She therefore took some convincing that research expenditure by Government was in an unholy mess largely because the Harold Wilson mentality about 'the white heat of technology' had grown deep roots, especially in the Department of Trade and Industry (DTI) and the Research Councils. The chairman of the Advisory Council on Science and Technology (ACOST), Francis Tombs, was also chairman of Rolls-Royce plc, and the Government's Chief Scientist was John Fairclough from IBM. Moreover, Arnold Weinstock of GEC was always lobbying for ever more spending on the likes of Nimrod, the air defence system he was building despite the availability of AWAC, an 'off-the-shelf' system from America.

No senior civil servant had any science education beyond O-level and those Government officials with a scientific background were corralled into 'the scientific Civil Service' under a departmental chief scientist who generally lobbied for the interests of his department. In any case, his comments in Cabinet papers were often relegated to the tenth appendix or beyond, even when the issue was of critical national scientific importance such as the membership of CERN (see below) or participation in other joint international science programmes.

During the early 1980s there was a general Whitehall attitude that too many crazy people were building radio telescopes or atom smashers and that a Thatcherite administration should focus research on utilitarian goals. This is exactly the recently declared policy of the

Canadian Government and the opposite of MT's personal view, which was instinctively suspicious of industry-oriented programmes.

Against the very vociferous lobbying of industry, especially manufacturing and defence, she became convinced that top industrial management rarely values research for which it has not paid. I showed her examples such as Dunlop seeking research funds for carbon-fibre golf club shafts and one instance in which an academic had convinced the DTI that it should support his research into better adhesives for the soles of shoes. We compared the sorry state of our electronics and aerospace industries, which had gorged state funds since the war, with the pharmaceutical and chemical industries, which had not and yet had flourished.

I helped her tackle this issue during 1987 with some very detailed analysis that demonstrated that industry was siphoning off funds from the total tax-funded research budget and that, although the overall spend was comparable with other leading economies, basic research was being increasingly starved. Particularly helpful was a paper by John Kay and Chris Llewellyn Smith that contained many examples of the vast benefits derived from research in basic science.²

She acted decisively and took over the chairmanship of a Cabinet committee previously chaired by the Chancellor of the Exchequer and renamed it to make its remit crystal clear: the Committee for Science and Technology. Its first meeting took place on 1 July 1987.

MEMBERSHIP OF CERN

At MT's behest I visited CERN near Geneva in May 1987, the first of many visits over the years. She was concerned that various independent reports had indicated excessive cost overruns and poor financial controls. There were even some voices suggesting that the whole enterprise was a colossal waste of money because no economic benefit would ever come out of it. (Get thee to Ottawa!)

I reported my overall impression that great work was being done in a field where Britain had excelled over the years and that a great number of very impressive British scientists were at work there, both in the theory division (for example John Ellis) and on accelerator design (John Bell; also renowned for work on fundamental quantum theory). The then Director General was Herwig Schopper, later succeeded by Carlo Rubbia, who in 1984 had won the Nobel Prize in Physics for identifying the W and Z bosons predicted a decade earlier by Abdus Salam (see below) and others.

Schopper was acutely aware that the administrative system and financial controls were inadequate and explained that the CERN management was very restricted in what it could change without the agreement of all the then membership of 14 different countries. When CERN had been set up in the 1950s, powerful ministers had sat on the council, but over the years the administration had become increasingly fossilized, forcing the management to grind on with antiquated procedures.

My essential advice to MT was that Britain should definitely not leave CERN but that it should increasingly force improved administration. She took the argument that CERN's weak administration should not force Britain out of a field—particle physics—that it had led for centuries.

Over the next year, the UK's position largely prevailed, thanks, *inter alia*, to Chris Llewellyn Smith at Oxford, later to become Director General of CERN, who devised a mechanism for recalculating the British sterling contribution. In addition, Carlo Rubbia realized that he

would have to implement stringent cost control if he wanted to free himself for proper scientific planning and management. The Large Electron–Positron Collider tunnel was well advanced and the Large Hadron Collider was already a gleam in his eye!

At this time it was MT's belief that the USA would never abandon the Texas-based 87 km Superconducting Super Collider and join CERN instead. She died owing me a £10 bet!

I rejoice that MT's view about CERN prevailed over those of some of her myopic colleagues. It would have been invidious not to be a member of the collaboration that has so recently validated the Kibble–Higgs mechanism, an event that will adorn the history of science.

CLIMATE CHANGE AND THE ROYAL SOCIETY SPEECH OF 27 SEPTEMBER 1988

In July 1988 MT told me that she was planning to give a speech to the Royal Society, of which she had been elected a Fellow, and asked me to help her write it. My initial idea was to trumpet the basic shift in Government funding from applied to basic science, and indeed this remains a key ingredient of the final work.³

However, she was advised by Charles Powell, Crispin Tickell, James Goldsmith and others that this represented a key opportunity to express concern at what might be happening to global climate, a matter that had not hitherto seemed to concern MT unduly. The wily politician realized that this matter was brewing in the depths of the UN, where Tickell was the UK representative. So far the only head of government to have shown concern with her advocacy of a policy of 'sustainable development' was Gro Brundtland, the socialist PM of Sweden. MT, through both genuine concern and political opportunism, decided to trump her.

The major theme of the Royal Society speech, certainly the one on which the worldwide press focused, was that 'we may have unwittingly begun a massive experiment with the system of this planet itself'. Every major morning headline carried variations on 'The Maggon goes Green'. MT had shot Brundtland's fox!

For the rest of her administration, the green theme continued. However, MT was worried that the subsequent hysteria would lead to over-prescriptive actions against industry before the science was adequately understood. Her own position, as I continually advised, was to make adequate funding available so that governments could establish what exactly was going on. For this reason she did support the establishment of the Intergovernmental Panel on Climate Change and wanted to see it adequately funded.

On ozone depletion, and the reduced use of chlorofluorocarbons in refrigeration and aerosols, she was a great champion and willingly signed up to the Montreal Protocol in 1988.

On global warming, then called the greenhouse effect, she was much more cautious, fearing that the self-infliction of economic damage on prosperous economies would encourage the anti-industrial Left, then licking its wounds from the worldwide implosion of Communism. She fully recognized that this was a field in which opinion far outweighed knowledge. She never argued for inaction but called for more data collection and computer modelling, especially on the behaviour of the oceans and sea-level rises. John Houghton of the Meteorological Office was particularly helpful.

Economic solutions, such as James Goldsmith's proposal that a market be created in which Third World debt could be traded, used to advantage the fact that a majority of threatened rainforests were in Third World countries with debt problems. There were also similar proposals that international aid would be dependent on forestry conservation. Although MT supported much of this and held conferences to further such ideas, the

Foreign Office was implacably opposed to linking foreign aid with the host governments' environmental behaviour. Unfortunately, she was swept from office before the nonsense of not putting conditions on aid money could be demolished.

COMMERCIAL EXPLOITATION OF BRITISH INNOVATION

MT was very critical of Britain's failure to exploit discoveries made here, only to see foreign companies reap great commercial benefit. Her favourite examples were the failure to patent liquid crystal displays, initially developed by GEC under a Ministry of Defence contract, and the failure of the Laboratory for Molecular Biology (LMB) at Cambridge to capitalize on the large-scale production mechanism for monoclonal antibodies that had won César Milstein the Nobel Prize in Physiology or Medicine in 1984. Her argument was that Britain might lead the world in science but our scientists were woefully naive in failing to foresee the commercial benefits.

I decided to investigate this argument, which was also prevalent at the DTI, with their endless 'innovation' and 'enabling technology' programmes that were frequently a disguise for taxpayer funding of near-market research. I visited the LMB and met Aaron Klug, its then director, César Milstein and Francis Crick, who was visiting from the USA, all landmark figures in breakthrough science. These were certainly not commercially naive people. Indeed, Milstein reminded me of the wily steel dealers I had encountered in America, of whom it was said 'They could make money in a phone booth.'

What had actually happened in the Milstein case was that he was very well aware of the enormous commercial benefit that his process could bring and wanted the LMB to take out a patent. However, the Treasury would not allow this because 'it had not been budgeted'. Milstein offered to take out a patent at his own expense but was told that he could not do so because the intellectual property was not his: it had been funded by Her Majesty's Government (HMG). Meanwhile, time was running out because he could be pipped at the post for the Nobel prize if he did not publish soon. In the event he did, received the Nobel prize and watched as the pharmaceutical industry in the USA made billions of dollars from his work.

The story at GEC was similar. Cyril Hilsom, the then research director, told me that GEC had begged the Ministry of Defence to take out a commercial patent on the liquid crystal technology that it had developed under a secret HMG contract for cockpit displays in fighter aircraft. This was refused, and GEC had the frustrating experience of watching the Japanese rediscover liquid crystal displays and install them in millions of wristwatches throughout the 1970s and 1980s.

MT was appalled and herself pointed out that Nimrod might have been a successful air defence system if the Treasury had not insisted that it be developed using spare Comet aircraft that were due to be scrapped and were anyway too small to accommodate conveniently the extensive electronic equipment that Nimrod required.

Edicts issued forth from No. 10 that henceforth organizations such as the LMB, which were administered by the Research Councils, should be encouraged to exploit their research and reinvest a large part of the proceeds. In this way, the scanning tunnelling microscope, then under development at the LMB, has led to commercial exploitation, greatly to that organization's benefit.

Sometimes it was the other way around. In the late 1980s, Alec Jeffreys at ICI developed a DNA probe that could identify microscopic human samples with almost 100% accuracy. This rightly interested the Home Office, which was in negotiation with ICI for a

royalty-based licence to use the probe. However, ICI was playing tough on price so the Home Office tried to get MT's support for sequestering the device by using a process known as Crown Right. The argument was that this was in the national interest because serial killers and rapists could be identified quickly before they could do further harm.

No. 10 was sympathetic to the enforced use of the probe in urgent cases involving life or death, as indeed was ICI. However, the Home Office wanted to have their cake and eat it, and tried to sequester the general use of the probe, for example, in identifying relatives of immigrants. No, said MT: for that they would have to pay ICI a commercially negotiated price.

The use of the DNA probe is a political hot potato today, with Jeffreys and the Government trying to scale back the storage of data by a recalcitrant police force.

DEPARTMENTAL RESEARCH PROGRAMMES

The exception to MT's broad policy of taxpayer funding of basic work, where the science was not understood, while leaving applied work intended to generate profit to the private shareholder, was the research and development work that enabled Government departments to fulfil their own remit.

In these fields, as everywhere else, there was endemic confusion between value for money, return on capital, and the boundaries between research, development and procurement. Of course, vested industrial interests exploited this to get as much from the taxpayer as possible.

Defence

The Policy Unit did not brief on defence *per se* but did become involved with defence procurement, on projects including the European Fighter Aircraft, the next generation of tanks (Abrams versus Challenger) and, as mentioned previously, the choice between Nimrod and AWAC airborne defence. There was always a marked proclivity towards developing a British or European system, if necessary from scratch, rather than acquiring American equipment off the shelf. This often leads to a misstatement of defence research costs versus procurement because the prototype equipment on which large research funds have been spent normally itself goes into service.

The self-sufficiency argument is understandable but it did, and still does, lead to enormous waste and bloated overrunning budgets. It sometimes leads to major political spats, with very long-term consequences, such as the 1986 resignation of Michael Heseltine from the Cabinet. MT decided to support the American company Sikorsky's purchase of the British Westland Helicopter Company, as advocated by the Westland board, rather than back a costly and uncertain European rescue as favoured by Heseltine.

British National Space Centre

One of the DTI's pet projects was the British National Space Centre (BNSC), which, when reduced to its elements, was a national strategy for 'keeping up with the Joneses', as MT put it. British Aerospace was keen to retain the *status quo*, which enabled it to siphon off taxpayer funds for projects that would give 'economic competitive advantage to the UK'. Apart from wanting more money, up to £30 million per annum from 1990, there was a suggestion that the BNSC should be a free-standing cost centre within Whitehall but outside the DTI. This would have set it up, like the UK Atomic Energy Authority

(UKAEA), to become one of Government's big spenders. Fortunately, MT nipped the idea in the bud: 'They are attempting to build a pulpit for industrial lobbyists!'

MT's belief was that space investment should not be part of the science budget at all, because the means for establishing equipment in space were well understood and the future should therefore be technological effort driven by commercial rationale. It was only after these financial runaway proposals were rejected by HMG that industry was pushed into directly financing space activity. BNSC, and its associated industry pressure groups, had been completely captivated by French arguments for grandiose 'Man in space' projects rather than bolstering successful achievements such as communications satellites and remote sensing.

These arguments prevailed and by mid 1989 BNSC had ceased to embarrass the Government by lobbying for huge expenditure and had settled into an interdepartmental coordinating role. It was pushing for greater industrial funding of space applications and, as Britain's representative at the European Space Agency, had efficiently renegotiated our participation in the Polar Platform project—a surveillance system that orbited the Earth from north to south and therefore covered the entire Earth's surface every 24 hours.

The next generation of nuclear reactors

The Energy Department was heavily engaged in developing the next generation of nuclear reactors.

The Prototype Fast Breeder Reactor (PFBR) had been operating on the north Scottish coast at Dounreay for several years, and by the middle of 1988 it was producing 250 MW of electricity into the Scottish grid. This was a tiny amount, more nuisance value than commercial value, despite the taxpayer's having contributed £3.5 billion up to then. Annual operating costs in 1988 were more than £100 million compared with the £12 million received for the electricity generated!

The rationale for developing the PFBR programme in the 1960s was that the price of enriched uranium was predicted to soar. So a device that made its own fuel, by generating plutonium from natural uranium, seemed like a winner. However, it became a massive commercial failure capable of operating only with vast taxpayer subsidy and, as MT pointed out, a classical example of Government folly in trying to pick winners by using very long-term economic criteria. A similar mistake is being made today with the wind turbine programme.

The UKAEA tried to argue that the PFBR was not a commercial project and that research should continue on fuel reprocessing as well as the overall fuel cycle. When all else failed, the prospect of unemployment in Caithness was advanced. To my surprise, MT was remarkably sympathetic to this case. She had visited Dounreay, liked the community, but recognized that the breeder reactor operation had to terminate.

She asked about the possibility of continuing research on the fuel cycle under commercial contracts or equity participation from countries that still favoured a breeder reactor programme such as France or Japan. This had clearly never been considered by the UKAEA, which had operated as a hopelessly uncommercial arm of the Energy Department with an unfortunately large measure of independence. Indeed, it was the Government's electricity privatization programme, with its emphasis on profitability, that heralded the death knell of the UKAEA.

The other great civil nuclear research project was a huge European collaboration, the Joint European Torus (JET) being constructed at Culham near Oxford. This was absurdly long-term:

in 1990 a commercial fusion reactor was promised by the year 2060, and it was a classic example of the top-down, finance-driven approach that often fails to solve practical problems.

Nevertheless, I argued that it represented a very different situation from the PFBR. Whatever the economic follies of the past, the decision of the Wilson Government to act as host for JET had left Culham with the most sophisticated magnetic torus machine in the world. It had been a great scientific success in finding out how plasmas behave at very high energy and that even the most intractable problem of the plasma's interaction with the vessel's wall was beginning to be solved.

We did not therefore support the Treasury's proposal to terminate JET before its research programme had been completed. The scientific case for extending the programme until 1996 was good but so was the economic case, because the torus had already been built. The most productive fusion reaction for energy generation is that between the two heavy isotopes of hydrogen: deuterium and tritium. All the work hitherto had been leading to the introduction of tritium into the reactor chamber and this was proposed within two years, in 1990.

To stop the project before introducing tritium would have been akin to abandoning a bridge when it was within reach of the other side of the river. MT was taken with this argument but also agreed that the funding arrangements on the British side had been naive to the point of farce. We were paying a 10% 'host country premium'. Decommissioning costs, as always, had spiralled and the economic case for a fusion reactor, as for a fast breeder, had weakened.

It was therefore agreed to complete the research programme at JET, provided that Britain ceased to pay any host country premium after 1990 and that the European partners be pressed to help with decommissioning. It was also argued that Britain should not participate in the Next European Torus (NET), instead favouring an extended international project, involving the USA, Japan and Russia (the International Thermonuclear Experimental Reactor).

Agriculture

By 1986 agriculture was absorbing annually more than £120 million, namely 13% of all research spending by civil departments, and this excluded the £50 million spent by the Agricultural and Food Research Council.

The industry had, and still has, an overall return on capital well below the national cost of capital, and Government was expected to make good the balance. It was therefore no wonder that taxpayer-funded R&D spending had so mushroomed! A vicious circle existed whereby more research led to more overproduction, leading to more subsidies. Curbing this was difficult because of Britain's membership of the European Common Agricultural Policy, with the French Government, as ever, in the pockets of its farmers.

Nevertheless, MT was determined to try to prune the Government-financed research budget of this prima donna among industries.

The principal argument from the Ministry of Agriculture, Fisheries and Food (MAFF) was that agriculture, and particularly horticulture, is composed of a large number of small firms who cannot afford a research programme. The starting premise was that someone *must* fund near-market research; otherwise, British farmers and horticulturalists would be unable to compete, especially with European producers receiving massive government grants. The logic then went on to support the imposition of blanket levies on producers that funded joint R&D for the industry. Any shortfall was inevitably picked up by HMG.

The Agricultural Development and Advisory Service (ADAS), the organization within MAFF that conducted this work, employed half of the latter's staff. MT's attitude was to

privatize any successful parts of ADAS and close down the rest: 'This Government was not elected to grow flowers!' ADAS subsequently became an executive agency of MAFF and was eventually privatized in 1997.

We never felt that the curtailment of MAFF's near-market research programmes had been as successful as in other fields, largely because European Commission programmes and protocols had largely usurped Britain's ability to act independently. The Common Agricultural and Fisheries Policy continues to bedevil British interests today.

The Department of Transport

The Department of Transport had a relatively small annual research budget, at £25 million, and spent much time trying to reconcile the European Commission's vehicle emission limits with lean-burn technology and the use of three-way catalysts as (unsurprisingly) advocated by Johnson Matthey, which made them. No. 10 had very little involvement with the transport research budget, which was under reasonably tight control throughout the Thatcher period.

In the spring of 1989, departments were asked for initiatives about global climate leading up to a broadly based conference at No. 10 that MT had agreed to chair. The contribution from the Department of Transport was utterly defeatist, seeking to capitalize on the perceived problem of CO₂ emissions in order to excuse their own failing transport policies. Their basic solution was vast increases in taxation on private transport to fund massive subsidies on public transport. This went right against the Thatcherite principles of consumer choice and dissemination of central control. 'Doesn't sound much of a vote catcher', said she!

NOBEL PRIZE WINNERS' LUNCH AND VISIT OF ABDUS SALAM

To emphasize her support for basic science, MT held a lunch at No. 10 in April 1989 for UK scientific Nobel prize winners, including foreign citizens who had conducted their work in Britain. Invitees included César Milstein (Argentina) and Abdus Salam (Pakistan), neither of whom would take British citizenship because it would remove a Third World Nobel laureate. This meant that Abdus Salam could not use his knighthood in the UK. Furthermore, ill health prevented him from attending the lunch (but see below).

The guests included Aaron Klug (1982, for development of electron microscopy), Godfrey Hounsfield (1979, for computer-assisted tomography), Anthony Hewish (1974, for the discovery of pulsars), Frederick Sanger (1958, for the structure of insulin), Max Perutz (1962, for the structure of other proteins), Dorothy Hodgkin, MT's former tutor at Oxford (1964, for the development of protein crystallography), George Porter (1967, for work on free radicals), Nevill Mott (1977, for the electronic structure of disordered systems), Brian Josephson (1973, for predicting macroscopic quantum phenomena), Andrew Huxley (1963, for excitation of the nerve cell membrane), César Milstein (1984, for monoclonal antibody production; see above), James Black (1988, for beta-blockers), Geoffrey Wilkinson (1973, for the discovery of organometallic compounds), Peter Mitchell (1978, for ionization in biological systems) and John Vane (1982, for work on prostaglandins). Most of these laureates held titles, either national or academic, which have not been included above.

Because the majority of attendees, which included Kenneth Baker (then Secretary for Education and Science), John Fairclough (the Government Chief Scientist) and myself,

were from outside Government, we were able to lay on a lavish lunch. MT sat alongside Dorothy Hodgkin, who suffered from severe arthritis, and helped her cut up her food. I never saw MT behave so deferentially to anyone as she did that day to her former tutor.

The lunch was deemed a great success and went a long way towards re-establishing MT's credentials among scientists, Oxford having refused her an honorary doctorate several years previously. Nevertheless, as we went up the staircase to her study afterwards, she commented to me, 'So much brain power concentrated in one room and all they wanted to talk about was money!'

I have mentioned that Abdus Salam had not been able to join us that day, but we were able to arrange for him to visit MT in May; I had the great privilege of both briefing her for his visit and attending the meeting, at which only the three of us were present. The meeting lasted at least an hour and began with a present from him in the form of a magnificent silken rug, woven in Pakistan. MT immediately rolled up and threw out the moth-eaten one in front of her mantelpiece and replaced it with Abdus Salam's present!

The conversation was wide-ranging, from spontaneous symmetry breaking and the electroweak interaction to ideas about the development of research in the Third World of which Abdus Salam was a champion. He told us about his Institute for Theoretical Physics in Trieste, which he invited me to visit, and I did later that summer.

Towards the end of the meeting, he mentioned that he was seeing Benazir Bhutto, then Prime Minister of Pakistan, later that week. Our scientific conversation immediately ceased and was replaced by a set of instructions on how that country should be run! As so often happened with MT, the political opportunity was never missed.

NOTES

- 1 MT's paper on saponification, in which she verified the Arrhenius equation for the reaction kinetics of molecular monolayers: H. H. G. Jellinek and M. H. Roberts, 'The saponification of α -monostearin in a monolayer', *J. Sci. Food Agric.* **2**, 391–394 (1951).
- 2 J. A. Kay and C. H. Llewellyn Smith, 'Science policy and public spending', *Fiscal Stud.* **6** (3), 14–23 (1985).
- 3 Speech by MT to the Royal Society in September 1988, in which she stated her championship of basic science and proposed major research into global environment (<http://www.margaretthatcher.org/document/107346>).