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TITLE: ACADEMIC FREEDOM: IS IT DYING OUT?

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Science originates from our natural curiosity to find out about the world and ourselves. To be truly free, it must be pursued objectively and dispassionately, and must not be driven by thoughts of profit, glory or material gain. This may seem common sense, but increasingly, today, science is being compromised by commercial interests, as I personally discovered to my cost in 1998.

I had worked at the Rowett Research Institute in Aberdeen, Scotland, for 35 years, first as a Principal Scientific Officer, then a Senior Research Fellow. In June 1998, I was asked to appear on the television programme World In Action, to talk about my research into GM foodstuffs. I wanted to highlight the need for a case-by-case programme of biological testing of all genetically modified (GM) foodstuffs, particularly because our group at the Institute had done some pioneering studies on novel methods of biological testing.

My appearance on the programme was recorded in late June with the consent of Professor WTP James, the Director of the Rowett Institute, and in the presence of the Institute's PR officer. Everything seemed to go as planned. I kept to an agreement made beforehand with the Institute, and only talked about the necessity of biological testing of GM foodstuffs before they were accepted into the human food chain. I released no confidential experimental details, or even identified the gene we used in our work. I believed then — and I thought the Rowett agreed with me — that our nutritional and immunological work on two distinct lines of GM potatoes expressing the GNA gene could have been a good starting point for a biological testing programme for GM foods.

The interview went well, and the Rowett seemed happy with the publicity. The director even phoned my wife after the broadcast to congratulate me on how well I handled the interview. Rowett press releases on 10 and 11 August, and another by the Rowett Governing Body chairman, were full of praise for our work 'of strategic importance to our country and European Union consumers... A range of carefully controlled studies underlie the basis of Dr Pusztai's concerns,' they stated, supporting me and my work clearly and publicly.

Then, rapidly, everything began to change. To begin with, the Rowett made what I consider to be two unfortunate mistakes. To begin with, it did not keep to our pre-agreed line of not releasing scientific details to the media and, furthermore, did not check with me about the accuracy of some crucial press releases of 10 August. Second, once the programme had been aired and the press releases sent out, the Rowett decided that, from 10 August, all enquiries about my interview and my work be dealt with not by me but by the Rowett's director, who was unfamiliar with the details of my research. From the combination of these events, major scientific mistakes were made, with the director giving unintentionally misleading statements to the media about the details of my work.

Perhaps the director realised the error late in the afternoon of 11 August, because he then tried to extricate himself from the responsibility for telling the media about experiments which had never been done by laying the blame on me, claiming that I got 'muddled' in my interview. He even suggested that I had never conducted any GM-potato experiments at all, but had just supplemented ordinary potato diets with the poisonous chemical Concanavalin A — a blatant factual error.

Whatever his precise motivation, the Rowett's director swung round, in a matter of hours, from publicly supporting my work to publicly attacking my very integrity. For me, this was a great shock. No one had ever maligned me or my work in this way before — least of all my own employer. At the time I had no idea what was happening.

It is worth remembering at this point that I have never claimed that all GM foods are unsafe, or that biotechnology per se is dangerous. All I have said is that my work suggested GM foods may pose dangers to human health, and that more work needs to be done on this subject, particularly as GM foodstuffs already accepted have never been tested by methods similar to those used in our GM potato studies.

Perhaps, however, even these comments were too much for the sensitive biotechnology industry, for at this point, events took a Kafkaesque turn. James started to use the official restrictive rules under which all scientists have to work in our academic system. First he suspended me, then, by instituting an audit, he gagged me on 12 August. All my data was confiscated. My phone was redirected to his office and my emails were intercepted. The director then wrote me a series of letters in which he explicitly threatened me with legal action if I spoke to anyone in or outside the Rowett about our work. He also warned Rowett staff of the dire consequences if anyone spoke to me.

I discovered later that the director had no right to set up the audit because I was not accused of scientific fraud by the Rowett — the only legitimate scientific reason for an audit. Drawing erroneous conclusions from our GM-potato work — the offence of which I was wrongly accused — was not a serious enough offence to warrant an audit. To my mind, the entire point of the audit was to create a 'show trial'. None of the many nutritionists at the Rowett were appointed to the audit committee set up to judge my work, no proper statistical analyses of my findings were carried out by the committee, and I was given no opportunity to explain my work and the director's mistakes. The whole audit was over in less than 10 hours. Needless to say, it decided against me.

I was then suspended from all GM-related work, which in reality meant I was cut off from all research. The whole GM programme was stopped, our group was dispersed and none of its members were allowed to carry out further work on GM or related projects. Our results, my three PhD students and all our funding were summarily taken from me by the Rowett. I was left to my own devices in my office to fill out the remaining four months of my contract.

THE WITCH-HUNT CONTINUES

Astonishingly, this was not the end of the matter. It was apparently felt that I had not been slandered and discredited enough by the scientific and political establishment. The House of Commons Science and Technology Committee, Royal Society (RS), Committee on Toxicology, Advisory Committee on Novel Food Processes (ACNFP), and the Nuffield Foundation Bioethics Committee all produced virtually identical, and equally damning, reports on my work within the space of a few days in May 1999, allowing Jack Cunningham to stand up in parliament a couple of days later and decree that there was 'no credible scientific evidence' to show that GM food was harmful. None of these reports included any direct input from me — indeed, except for the Science and Technology Committee, none of these institutions even asked me about my work when preparing them. Furthermore, the results of independent multivariate statistical analysis of my data, peer-reviewed by a group of independent scientists who praised my work, were conspicuously absent from any of these reports. Most tellingly, none of these institutions would disclose whether they, or those preparing the reports, had any links with the biotechnology industry.

Despite all these public attempts to discredit me and my work, I received some crucial support from other independent scientists. Dr Stanley Ewen at Aberdeen University, who had carried on with my work after I was suspended from the Rowett, submitted, with me, a paper to the medical journal *The Lancet* at the end of 1998. The draft paper had gone through three separate bouts of refereeing by a total of six referees and was finally accepted and published on 15 October 1999.(FN1) According to the editor of *The Lancet*, five of the referees were in favour of publication and one was against. Despite this, the one referee who was against publication broke a 200-year-old rule of not discussing referees' comments, by going to the media and attacking my paper. These comments were then picked up and distorted, to further discredit my work, and muddy the waters on the GM issue.

LESSONS WE MUST LEARN

What does my experience say about science in Britain today? For a start it tells us to ask serious questions about the future of independent science. What example is shown to young scientists when they see an independent senior scientist, such as myself, who belongs to no pressure group, has no financial interests for or against GM and who has an unblemished track record of scientific achievement, attacked in this way? Which young scientist is likely to start working on GM-related topics that may come to critical conclusions? And what does it tell the world about academic freedom when an editor of a respected scientific journal is attacked and pilloried by a senior Fellow of the Royal Society for publishing a peer-reviewed scientific paper approved by the vast majority of its reviewers?

Today, the industrial scientist's situation is straightforward: he/she is not a free agent but is hired for a particular job which is restricted in scope and objectives and carried out under close supervision. Data obtained becomes the property of the company that pays for the research. In most instances, the scientist has no rights to discuss or publish the results without the permission of the company and the company may withhold publication for five years, particularly if the results are patentable. Even university or government research scientists are not in a much better situation. When hired, they are required to sign a contract which places them under the rulebook of the BBSRC (Biotechnology and Biology Science Research Council) or the MRC (Medical Research Council). Even if the actual contract is not signed, by accepting his/her salary, the scientist tacitly agrees to the terms and rules of the contract, which greatly restrict his or her work and hand his or her director ultimate sanction over results, publication and interpretation.

It seems that, in the eyes of many senior scientists today, the future of science lies with industry. When scientists who apparently have no obvious financial connection with the biotech industry defend GM crops so blindly, and attack even the mildest critics, slandering their work and abilities in the process, we must ask ourselves what motivates them. And one possible motivation is that, with the rapid disappearance of the State patronage of science, many of these people are genuinely worried about the future funding of scientific research.

Perhaps they feel that the only chance for the survival of research in the 21st century is to set up an alliance with industry. So they may have to embrace this new creed wholeheartedly, warts and all, and throw their whole weight behind genetic manipulation, regardless of what they may individually think about its merits.

UNDER THE YOKE?

But this is a very dangerous attitude. By accepting money from an industry which has aggressively set out to dominate many aspects of life and society, science and scientists are becoming servants of multinational concerns whose motives are at best

questionable and at worst positively detrimental. The alternative seems to me to be clear: we must help the public to understand that if they want independent scientific advice in today's complex world, they will have to pay for it, somehow, from the public purse. This will then release scientists from their servitude to 'big business'. Furthermore, scientists must be, and be seen to be, transparent. They must publicly declare all financial or other interests, just as MPs are obliged to do. Only in this way can we begin to win back the public trust we have often deservedly lost. The time has come to remind our peers and politicians that any democratic society which suppresses academic freedom and the inventiveness of the individual is, ultimately, stifling its own development.

ADDED MATERIAL

Arpad Pusztai, born in Hungary, came to Britain as a political refugee in 1956. After obtaining a BSc in Physiology and PhD in Biochemistry at the University of London, he joined the Rowett Research Institute, where he worked until 1998. He has published eight books and 280 scientific papers.

BRIDGEMAN ART LIBRARY

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The interview went well, and the Rowett seemed happy with the publicity. The director even phoned to congratulate my wife. **WORLD IN ACTION, GRANADA TV**

FOOTNOTE

1 Ewen SWB, Pusztai A, Effects of diets containing genetically modified potatoes expressing *Galanthus nivalis* lectin on rat small intestine. *The Lancet* 1999; 354: 1353-1354.

SCIENTIFIC TRUTH: THE HOT POTATO

DR PUSZTAI PUTS HIS EXPERIENCE IN CONTEXT

In modern times, it was perhaps the 'gentleman scientists' of the nineteenth century who came closest to a genuinely objective form of scientific research. These privileged amateurs enjoyed a financial independence which many scientists today would kill for, and which enabled them to satisfy their scientific curiosity without the need to please patrons.

With the almost exponential growth of scientific research, and the emergence of the professional scientist after the Second World War, science has become an expensive occupation. Many scientists today look back upon the 1960s as a Golden Age of modern-day science, when research was mainly funded by the taxpayer, and scientific enquiry was seen by governments to be part of the public good; something worth paying for.

Today, the situation is very different. 'Academic freedom' is now often little more than an illusion for most scientists working at universities or in publicly-funded research institutes, and is often so compromised by the interests of the corporate world that it can hardly be called science, in the true meaning of the word.

How to explain this development? Why has science moved from the relative freedoms of the past to its present-day form — a regimented, money-driven, compartmentalised, dogmatic and narrowly focused science 'industry'?

COMMERCE TAKES OVER

No doubt the model of scientific enquiry followed from the 1940s to the 1960s was very expensive, and governments seeking to reduce the overall financial burden on the state saw scientific research as an obvious candidate for cost-cutting. The Thatcher government took its axe to publicly-funded research by invoking dogmatic principles to select which research topics were 'useful' and thus entitled to receive state support.

First, Mrs Thatcher's government introduced the 'Rothschild Principles' (named after one of her favourite scientific advisers) at the beginning of the 1980s, according to which only research which produced a 'useful' end-product — essentially one that would be financially promising, or could be patented for the benefit of British industry — should be financed. Anything else was regarded as frivolous, and not entitled to state support. A decade later, a new law was introduced, according to which any 'near-market' research (research likely to lead to commercial end-products) should either be entirely financed by industry or, if public funds were to be used, should be spent in 'strategic alliance' with business.

This was a key turning point in the move towards the profit-driven science that increasingly dominates today. The Thatcher government's cost-cutting actions led scientists into the open arms of industry, where so many of them remain. With the state increasingly unwilling to fund novel or important research, and with the costs of that research growing as science advances, it is increasingly difficult to see how scientists can maintain — or regain — the independence they so vitally need if they are to do their jobs properly.

THE BIOTECHNOLOGY REVOLUTION

It is these developments which underlie the beginnings of the 'biotechnology revolution' we are now seeing, in which large, often transnational, pharmaceutical, agricultural and food corporations increasingly extract support from governments in exchange for taking over the financing of scientific research, most of it based on gene manipulation.

Biotechnology research is rapidly becoming almost a quasi-religious crusade for many governments. Advised by 'experts', most of them directly or indirectly funded by the industry, ministers have been issuing constant reassurances that this new 'safe' technology will be the salvation of mankind in the 21st century, stopping deforestation, increasing food production, feeding the starving and making the rest of us rich. Anyone standing in the way of biotechnology, or even questioning some of its more shaky tenets, is instantly declared a 'Luddite', trying to reverse scientific progress.

Such apparent unanimity of purpose between scientists, politicians and industry should ring alarm bells with those concerned to maintain the independence of science. Research grants which slavishly reflect the government obsession with biotechnology have caused a great deal of confusion in the scientific community, and increasingly it is only those who can quickly adapt their research to the new guidelines — mainly embracing gene technologies — who have any real chance of obtaining funding from the research councils. Without at least a component of some DNA-oriented research in the overall work package, chances of getting money are slim. Meanwhile, grants to promote studies on the health, nutritional or environmental consequences of gene manipulation have for some time been conspicuous by their absence.

The biotechnology industry's stranglehold over gene research goes a long way to explaining why, in the past 17 years, there has been only one peer-reviewed scientific paper published on the possible nutritional effects of a GM crop — 'Roundup-Ready' soya, in 1996(FN1). This single example says an enormous amount about the sort of research which gets done in this age of commercially-driven science.

It is explained partly by the fact that research topics which the biotech industry is willing to support are based on genetic manipulation, usually with relatively narrow and highly applied remits, which, in most instances, are not suitable for publication in top journals. But the lack of published research on the safety aspects of biotechnology is also explained by the fact that the results of such research, when paid for by biotech companies, are regarded as the property of the industry, and publication can thus be

postponed or even prevented if the industry doesn't like what it hears. Such conditions have been anything but conducive to novel, imaginative and fundamental research. It would not be an exaggeration to say that, under such conditions, academic freedom is little more than an illusion.

JOHN JONIK

FOOTNOTE

1. Hammond BG, Vicini JL, Hartnell GF, et al, The feeding value of soybeans fed to rats, chickens, catfish and dairy cattle is not altered by genetic incorporation of glyphosate-tolerance, J Nutr 1996; 126: 717-727.