

SOCIAL, EDUCATIONAL AND POLITICAL ASPECTS OF BIOTECHNOLOGY: AN OVERVIEW AND AN APPRAISAL OF BIOTECHNOLOGY IN A CHANGING WORLD

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Summary

This article is intended to set the scene for the 13 individual chapters that go to make up this Topic. It is not intended that this review will provide a synopsis as to what is in these chapters, for that the reader must see for themselves what is being written, but seeks to provide an overview of how biotechnology and society are impinging on one another. The pace of biotechnology has been so fast, particularly over the past 15 years since the advent of genetic engineering, that society has scarcely had time to adjust to the promises and potential benefits that biotechnology can bring. The paradigm of biotechnology has to seen in terms of 'What is possible', 'what is realisable' and most importantly, 'what is wanted'. The public have the right to be involved in the debate as to what benefits it would like to see accruing from the applications of biosciences but needs to be both informed and educated in the underlying science if the debate is to be meaningful and of lasting significance. Bioethics are now a reality and the debate as to the future directions we wish to take our own societies are now beginning. What we want from biotechnology is not certain; no one has a crystal ball but, to paraphrase the old maxim, 'biotechnology should be for the greatest good of the greatest number of people' would be an apposite one to quote in this present context.

1. Science and the Public

We are witnessing a global down-turn in the appreciation of scientific endeavour in spite of science being the major contributor to the ever-increasing standards of living of most of peoples in the world. Anti-science has almost become acceptable. The ogre of

the 'mad scientist' determined to bring about the downfall of mankind has been fostered in the minds of so many people by influential media experts (who are the only ones who really understand how to manipulate public opinion) that we, the scientists, now have a collective struggle to convince the public that science in general and biotechnology in particular are indeed the major routes to future benefit of us all.

A recent poll was conducted in the UK, which placed scientists below doctors, school teachers and judges and about equal to policemen as people whom the public could trust to tell the truth (see Table 1). Significantly, 14 per cent of the 15 to 24 year olds who were included separately in this poll considered that scientists did not tell the truth.

According to this MORI survey carried out for the British Medical Association, 2 out of 3 adults in the UK would generally trust scientists to tell the truth (see Table 1); this still leaves one person in three who must have grave doubts about scientists and whether they can be trusted.

| | Tell the truth | | | | Not tell the truth | | | |
|--------------------------------------|----------------------|-----|-----|-----|----------------------|-----|-----|-----|
| | % '97 '99 '00 '01 | | | | % '97 '99 '00 '01 | | | |
| | '97 | '99 | '00 | '01 | '97 | '99 | '00 | '01 |
| Doctors | 86 | 91 | 87 | 89 | 10 | 7 | 9 | 7 |
| Teachers | 83 | 89 | 85 | 86 | 11 | 7 | 10 | 10 |
| Television news readers | 74 | 74 | 73 | 75 | 14 | 17 | 18 | 17 |
| Professors | 70 | 79 | 76 | 78 | 12 | 10 | 11 | 10 |
| Judges | 72 | 77 | 77 | 78 | 19 | 16 | 15 | 15 |
| Priests | 71 | 80 | 78 | 78 | 20 | 14 | 16 | 15 |
| Scientists | 63 | 63 | 63 | 65 | 22 | 27 | 25 | 22 |
| The Police | 61 | 61 | 60 | 63 | 30 | 31 | 33 | 27 |
| The ordinary man/woman in the street | 56 | 60 | 52 | 52 | 28 | 28 | 34 | 34 |
| Pollsters | 55 | 49 | 46 | 46 | 28 | 35 | 35 | 34 |
| Civil Servants | 36 | 47 | 47 | 43 | 50 | 41 | 40 | 45 |
| Trade Union officials | 27 | 39 | 38 | 39 | 56 | 47 | 47 | 46 |
| Business Leaders | 29 | 28 | 28 | 27 | 60 | 60 | 60 | 61 |
| Journalists | 15 | 15 | 15 | 18 | 76 | 79 | 78 | 75 |
| Politicians | 15 | 23 | 20 | 17 | 78 | 72 | 74 | 77 |
| Government Ministers | 12 | 23 | 21 | 20 | 80 | 70 | 72 | 73 |

Table 1. MORI/British Medical Association survey of the public opinion in UK of doctors, scientists and other professionals 1997-2001 (from Corrado, 2001).

Scientists themselves must accept at least part of this blame for not being trusted by a significant proportion of the population as they have steadfastly refused, or have been unwilling, or even unable to communicate to the general public about the work that they are doing. This failure to communicate to the public is all the more worrisome as the

majority of science that is funded in our institutes and universities is, in fact, funded from the public purse. The public who then pay for the research to be in the first place would then seem to the last group of people who are to be told what their money has been spent on. No wonder there is dissatisfaction with scientists.

More specifically, the standing of science and scientists in the community at large have not been helped by the recent food and medically related scares in the UK where the reaction of the public is probably typical of what is happening, or might happen, elsewhere in the world. The first scare was that of BSE - bovine spongiform encephalopathy - (which was real), then more recently the scares surrounding the hazard posed by the introduction of genetically modified crops (which is almost wholly illusory) and now, in 2001, by a devastating outbreak of foot and mouth disease in cattle and sheep which, at the time of writing (September 2001), is still not eradicated some seven months after the initial outbreak. Understandably the public trust in scientists, who seem unable to offer coherent strategies to deal with outbreaks like foot and mouth disease, or to counter the arguments put forward by environmental activists against genetically modified foods, is in serious decline. More worrying though is how public confidence in science and scientists is to be restored if, indeed, it can ever be restored once the initial confidence has been lost.

For the outbreak of bovine spongiform encephalopathy (BSE) in cattle, regrettably, the government of the day in the UK sought to placate an unsuspecting public that good food practices were in place both on the farm and in food handling places, such as abattoirs, that it was inconceivable that the prion-caused disease of BSE could be passed on to consumers of meat. Absolute assurances were given to the public by government ministers and other politicians in the early 1990s that there were no dangers from eating beef and beef-derived products, in spite of them being given rather cautious warnings from animal scientists that all was not yet clear about the nature of this disease.

Whether or not the cause of variant CJD now arising in humans is indeed caused by eating contaminated beef is more or less besides the point. Although it is a completely devastating disease, to date (September 2001) there have only been 99 cases of mortality due to vCJD in the UK since 1996 and it is, in truth, a very rare disease. But there remains a slight chance that vCJD will prove to have originated from BSE in cattle. Not unnaturally, the public are frightened and apprehensive about the safety of the food that they buy particularly when innate fears about food safety are constantly being voiced by some scientists who appear to be more interested in self-publicity than accurate reporting. Consequently most members of the public will no longer accept that scientists can speak with authority on this topic. By implication, the public then distrust scientists to speak authoritatively on any matter. Of course it is illogical to make such a deduction but who ever said that the public were logical. The public may be always right, by definition, as it is their opinion that counts; but being 'right' is not the same as being logical.

The fact that the original assurances to the public about BSE were being made by the politicians and not by scientists has now been largely forgotten: it is scientists who have to take the blame. 'But who advocated the recycling of slaughtered animals, in the form of hoof and bone meal, as part of the diet of farm animals?' is the cry from the public.

The answer is, of course, the scientists themselves but with the proviso that the recycled animal wastes being used for animal feed should be rendered safe and free from all biologically active agents. Unfortunately, the prions that appear to be the causative agents of BSE and of vCJD are the most heat-stable of all bioactive molecules and any lapse in the heat-treatment of animal feed materials then allowed the prions to get into the food chain, from sheep into the cattle and then, by inference (but not yet proven), from cattle into humans. Had the original advice of the scientists been followed as to how recyclable wastes should be processed, it is clear that BSE would not have arisen.

So we have a real dilemma: scientists can bring about major changes for the improvement of our lives but at the same time the public is distrustful of them. The alternative to science, which is ignorance, does seem to have escaped the attention of many members of the public or maybe they feel that ignorance is an acceptable alternative to having scientists foisting unacceptable risks upon them.

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Professor of Microbiology at the University of Surrey, UK and he writes occasional scientific articles in the national press that help redress the balance between the exaggerated claims of some of the environmentalists vehemently opposed to the introduction of all GM crops in Europe. He writes with a very perceptive pen.]

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Biographical Sketch

Colin Ratledge is Professor of Microbial Biochemistry at the University of Hull, England. His areas of interest include studies on the mycobacteria and, in particular, the investigation of iron metabolism in these organisms. His current, principal area of interest though is in the lipids of microorganisms where he and his group have conducted a major investigation over many years to describe the oils and fats that microorganisms can produce and to explain, in biochemical terms, the phenomenon of lipid accumulation in certain microorganisms. The current thrust of this work is the investigation of polyunsaturated fatty acid formation in filamentous fungi and marine microorganisms. Colin has served on most of the major biotechnology committees in the UK and also on the European Federation of Biotechnology. He was also secretary of the International Committee for Environmental and Applied Microbiology. He has served as Vice-President of the Society of Chemical Industry. He currently is Editor-in-Chief of *Biotechnology Letters* and also the *World Journal of Microbiology and Biotechnology*. Recent publications include books on mycobacteria and also, with Bjorn Kristiansen, has been editor of the second edition of *Basic Biotechnology*. He has acted as a consultant to numerous industrial companies in the UK, Europe and the USA. He has participated in many international conferences giving plenary lectures in over different 30 countries. He has received awards and distinctions for his work on microbial oils from the UK and other countries.

