

by Bernard Dixon

PURE SCIENCE IN DISREPUTE



Whether they recognize it or not, today's scientists have an urgent interest in the quality and content of school science teaching. This was not the dominant impression I expected to gain from a recent, five-day Dahlem Workshop on biotechnology. Returning home from Berlin, however, I reflected that the need for much more effective science education had lurked, almost

unmentioned, as an issue beneath much of the previous week's brainstorming. Mediocrity and irrelevance in the classroom *are* matters for serious concern, because they are already responsible for inhibiting progress between the twin arms of the conference—promise and performance in biotechnology—and threaten to create far greater barriers in future.

Take the issue of social debate over ethical dilemmas and environmental hazards associated with gene and cell manipulation. There, coralled together in Berlin for five days, were 50 biologists working in some of the fastest-growing and most contentious of today's specialities. Peculiarly knowledgeable, the majority of them were also conspicuously eager to open up for wider public assessment not only their enthusiasms but also their apprehensions about imminent uses and misuses of biotechnology. Other than in the vaguest terms, however, they did not do so. Although well-intentioned, uniquely well-informed, and with an acute sense of social responsibility, they were nevertheless highly reluctant to ventilate specific concerns. Why?

The answer, surely, is that a research worker today who openly questions potentially unwise or dangerous applications of new technology faces considerable risks of either being pounced upon as an ally in the struggle against evil or on the other hand villified as its living embodiment for even raising such matters. He or she will at least be misunderstood. And the reason for this is that public clamour over a vast range of topics, from nuclear power to rDNA maneuvers, has moved far ahead of scientific literacy in the population at large. Most people believe that radioactivity, for example, is something created by feckless physicists, rather than part of the natural world. They *know* that it could and should be totally abolished. They *know* that animal experimentation ought to be banned outright (a bill to that effect looks likely to pass successfully through the Swiss parliament shortly). They are equally certain that "genetic engineering" is thoroughly suspect, even though many would have considerable difficulty in explaining the difference between a gene, an enzyme, an atom, and a molecule.

Only one of Dahlem's four study groups highlighted the need for educational measures. Its report discussed the environmental impact of recombinant organisms against the background of man's long history of using endogenous wild-type strains and more recent experience in exploiting exogenous microorganisms for insect control and metal leaching. Lack of awareness of microbial pro-

cesses in nature, the group suggested, was at the root of current controversies over controlled release. Faced with such ignorance, some experts are understandably uneasy about exposing their own uncertainties in a wider forum whose members simply do not possess the conceptual framework required to appreciate the relevant scientific facts and ideas.

Consider, for instance, the position of a virologist who favours release of organisms for economic and environmental benefit but who (perhaps on both humanitarian and biological grounds) actually welcomes the probability that today's regulatory bodies would not permit the deliberate spreading of myxomatosis among rabbits. He or she will not find it easy to confess such disquiet. In a climate combining profound ignorance with campaigning fervour, frankness of this sort will almost certainly be seized upon as a further brick to be hurled back in the direction of the scientific community and its perceived malevolence.

But societal reaction to novel technology was not the only issue discussed in Berlin which underlines the pressing need for far greater scientific literacy among the population at large—including its politicians. Every one of the four discussion groups found itself reflecting upon the vital importance of research support from governments, particularly for the "untargetted" work upon which rewarding applications ultimately rest. The plant group, for example, concluded that while the more dramatic financial returns from biotechnology might come less quickly in agriculture than in pharmaceuticals, such investment would undoubtedly be repaid—but only if the science base were sustained.

Even participants from European countries with substantial biotechnology programs were concerned about the comparative neglect of basic research. Greater anxiety still was expressed by those working in countries such as Britain where governments applaud the entrepreneurial spirit but link their applause with barely concealed contempt for the "intellectual" world. Pure science has become disreputable. And the case for what in hard economic times appears as a luxury is not easy to make in a society whose ignorance of science extends to the very top in politics.

Moves to improve vastly the scientific education *all* citizens receive would not provide a universal solvent for all of the problems facing biotechnologists. They certainly would not spawn overnight answers. But by helping people to understand scientific ideas (and be critical towards misinformation) such efforts would transform the quality of public debate about the applications of science. And that is what all scientists, through their societies and political connections, should be encouraging—otherwise the future looks bleak indeed.

The Dahlem Workshop on Biotechnology: Potentials and Limitations was held in Berlin on 24-29 March. The results will be published by Springer-Verlag, Berlin/New York/Heidelberg/Tokyo.

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