BIOTECHNOLOGY AND SOCIAL PERCEPTION

Particular aspects of the socio-economic integration of biotechnology
in the context of activities of the Commission of the European Communities

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ABSTRACT

The view is explained that the ongoing conflict between Industry, public authorities and other interested groups on the evaluation of risks and benefits of biotechnology can not be reduced only to a matter of missing factual scientific, legal or economic information. Analyses conducted inside and outside Commission services suggest that there is not the clear correlation between knowledge and attitude towards biotechnology assumed by classical PI concepts. The effect of information and knowledge depends mainly on how they are interpreted or selected by pre-existing attitudes, rather than on the factual content itself. Recent opinion surveys and other analysis work launched by the CEC have shown that this phenomenon is strongly cultural dependent and, therefore will vary from country to country. The question arises as to what extent scientific information can influence existing attitudes. This means that a public, industrial or R&D PI policy aiming at a better mutual relation has to put emphasis on both aspects improving existing attitudes, and efforts for improving factual knowledge.

INTRODUCTION

Everybody knows the fairy-tale "Beauty and the Beast" of the innocent maiden and the ugly and horrible beast which turned out to be something honest and trustworthy after being treated with goodwill and trust rather than with fear and repulsion. Intuitively one may think that this is a somewhat optimistic but nevertheless appropriate metaphor to describe the complex and tense relation between the public and biotechnology. But, unfortunately, there is no evidence for who is the beauty and who the beast. Is it the innocent and trusting public which is confronted with a pullulating science threatening human life, the environment and the integrity of God`s creation? Or is it a pure and beneficial science promising progress in nearly all human problems which is rejected by an ignorant and distrustful public?

The Commission of the European Communities which (like many public authorities) has an explicit mandate (or decided explicitly) to promote the social welfare and the economic prosperity of the public as well as to protect the environment and the diversity of terrestrial life, to develop research and science and to foster the competitiveness of European industry, can hardly define priorities between these goals as those usually do who have to represent mainly one single position. Environmental groups for example may say that a functioning environment is the prerequisite of any life on earth and therefore requires first priority. Industrial associations will argue (1) that "Biotechnologies promise new opportunities for

economic growth, new job creation, industrial renewal, environmental management and revitalised strength in the agricultural merket place. Future European competitiveness on a par with the U.S. and Japan in the many industries which will depend on biotechnology must therefore become the principal objective of Community policy". Science considers itself as the very producer of any progress and, therefore, must be the focus of all public policy. Ethical positions, last but not least, take by definition precedence over any other kind of arguing. So the environmentalist may tend to load an economic burden upon society which the social politician will hardly agree to pay. Or the scientist who wants to remain in the favour of public appreciation would try to tell himself and others that most of the concerns expressed are mainly due to a lack of scientific knowledge and understanding. The very problem is that all these groups have good and even moral reasons to defend their various positions as top priority. None of them can be called an egoist in the proper sense. Even the profit-oriented industrialist can argue that his success will contribute considerably to the general welfare - not to speak of the good arguments the scientist can present. It is the delicate task of public authorities, and so of the Commission, to take generally acceptable course between all these conflicting requirements.

THE SCENE OF CONFLICT

What is missing is a form of interaction between the quarters concerned which will lead to a balanced and uncontested co-existence of the various positions. Most of the groups involved would see each other either as competitors in the market of public favour or as threats to their own goals and ideals. The tendency towards thinking and acting in terms of antagonism will be the higher between groups the more they are professionally organised and claim to represent certain public interests. The conflict between these groups is sometimes even higher than the contrast between those whose interests are represented by the groups concerned. The increasing politicisation of public interest groups (IG) brings an additional element into the debate. IGs are a kind of interface between the public and those who act politically or economically in biotechnology. They contribute considerably to the formation of public opinion in a way similar to that of political parties in other fields, and in many of the political discussions on debatable matters in biotechnology public IGs are the very opponents (or partners) of political decision makers rather than the public itself. Interest groups can be considered as highly specialised political parties; and, like these, they would hardly retire from their business when their goals proclaimed have been achieved. Public interest groups vary considerably in character, ranging from a strong and fundamental opposition against nearly any research into gene-technology or its application, to the rather moderate and flexible position of many consumer groups.

The scene in biotechnology can be considered to be divided in mainly three parts: 1. Those who have a commercial interest in biotechnology and its applications (Industry, agriculture etc. and most of the R&D concerned), 2. those who deal with biotechnology for political and social reasons (comprising public authorities as well as public interest groups) and 3. the general public as consumer of the beneficial biotech goods and services as well as "consumer" of the risks and the more general socio-economic consequences involved.

The complexity of the biotech scene is based on the complex interplay between these groups. One possible interplay is the exchange of scientific, technological, economic and other relevant factual data, information and arguments with a view to the elimination of

misunderstandings and the possible rationalisation of conflicts. It is widespread understanding rooted in old democtratic traditions that this is the main, if not the only way to come to stable and reasonable forms of co-existence and compromises. Particularly the English culture thinks and acts in terms of a consensus which has to be found for all controversies and will be found if there is sufficient room for informed discussions. This is the very root of the idea of public information: the more people are informed the more successful will be their decisions - or as Mark Cantley (2) said: "If there is `ignorant democracy`, control without understanding, there is danger not only to science and technology, but ultimately to the society itself". A similar thought was expressed by Sir Walter Bodmer (3) in his famous UK Royal Society report `The public understanding of science`: "in the absence of widespread understanding we will shy at kittens, and cuddle tigers", i.e., we will be unable to manage benefits and risks of science appropriately. A third statement of that kind comes from Jon D. Miller (4), director of the US Public Opinion Laboratory: "Throughout the world, the importance of a scientifically literate workforce is recognised by political and economic leaders, and an increasing number of leaders in democratic societies have recognised the essential role of scientific literacy in the performance of citizenship responsibilities. Most governments of major industrial nations have strong commitments to improving or sustaining the quality of their programmes in science and mathematical education. Many nations are seeking to expand adult informal science education to maintain the levels of scientific literacy attained through the common schooling experiment". The view that people should be informed as much as possible about everything concerning themselves and the society they live in, is implicitly based on two ideas:

1. An improving level of the layman's scientific knowledge will improve the quality of his judgement on the political decisions to be taken in science and related political matters.

2. What we have (or what we therefore should have as many people say) is a participatory democracy rather than a representative one, i.e. a society where the citizen who is expected to be as emancipated as responsible will evaluate matters of public interest on the basis of his own knowledge and experience and then is involved, directly or indirectly in political decision or control processes, instead of leaving publicly important decisions to the legislative and executive bodies he has elected just for doing this. As to science: science itself has brought about the idea of its incorporation in general education, and is by this confronted now with the problem that the public more and more would claim participation in the definition of what research should be permitted and what forbidden.

Both ideas are more or less generally agreed. It is evident that people should take any opportunity to qualify democratic decision procedures by means of their own knowledge and that to improve this knowledge is their first and foremost task. But it has to be seen as well that factual scientific knowledge is just one of the factors determining people's attitude towards science. It might be plausible particularly for those who are used to think in scientific terms and who are proud of their scientifically trained intellectual self-control, that knowledge of science and attitudes towards science are positively correlated, i.e. that people would appreciate science and its applications the better, the more they know about it and the more they understand the mechanisms involved. This is rooted in the traditional idea that science per se is the most distinguished tool to achieve improved living conditions for all men. I do not contest that science indeed is the most powerful (and in many cases the only)

instrument to solve certain human problems -particularly those the application of science has brought about itself. But this does not determine the view on the desirability of specific developments in biotechnology - neither with the public in general nor with scientists. Even fully expert academic biotechnologists who hardly suffer from a lack of knowledge can have diametrical views on the social risks and benefits of certain matters in their own field, as demonstrated impressively by the experts hired by the various groups. How, then, can we expect the view of even well-educated laymen to converge towards a reasonable and general consensus?

THE SOCIAL DIMENSION

All this underlines that the existing conflicts between the producer and the consumer of risks and benefits of biotechnology can hardly be solved by just teaching the scientifically uninformed. It is not sufficient to tell people that biotechnology is probably the only instrument to fight successfully cancer, or to explain why the fear that biotechnological research may result in dangerous genetic monsters is unfounded, or why the deliberate release of genetically modified organisms is hardly the kind of threat to the environmment that many people believe. Independent from whether this were correct or not - all this is not sufficient if the actual comprehensions, after all, are immunized against special scientific or otherwise factual information in the sense that people do not trust the information source concerned, i.e. if people do not believe in what is being told to them, or if the opposition against certain aspects of biotechnology is based upon culturally acquired ethical positions which are widely resistant against all non-ethical arguments. Particularly here it is evident that factual information would hardly dissolve objections, and that efforts to improve trust in the reliability of informational sources or regulatory measures would be of little help.

Let me explain the non-scientific character of the relation between science and the public in some more detail. It is comprised in the definition af any individuum that it has to cope with its environment. This applies to the most primitive animals paddling around in their pond as well as to men. In the beginning, the problems to be mastered were first of all physical problems: to identify and maintain food, energy or other life resources, to protect oneself against cold and other inconveniences of nature, to fight diseases and, where men are concerned, to improve the limited physical capabilities of our species by means of machines, computers and science at all. This became the very paradigm of occidental science: to understand nature in order to master it, where nature was understood as the physical environment of individuals.

But if we look around nowadays at the environment we have to cope with we will find out that the relevant aspect is shifting more and more from the physical to the social dimension. If we look at a usual day's course we will see that about just one or two percent would concern really physical problems and their solution. The major part will pertain tasks we have to accomplish in the context of a social rather than of a physical environment. Most of our daily efforts will not be honoured by nature, i.e. they would not help us to survive in deserts or rain forests. They rather have to be appreciated by our society which, in turn, will provide us with the goods and services we need for living.

Even if we deal as natural scientists explicitly with the problems given by nature, we usually do not do it in order to survive better in the physical world but to survive better in the

academic quarters of our society (5). The selection forces we are subject to are social in character, not physical. The world we live in is first of all a social world. This applies even to those problems which are obviously physical in character such as the environment to be protected. What does that mean? In all nature one can find what could be called the phenomenon of risk homeostasis. Species, individuals or societies which have developped a new technique to solve a special problem in order to reduce the risks related to it, usually exploit the new possibility in a way that the total risk they are confronted with will rise again, after a certain time, to the previous level; the ruthless exploitation of strategic resources, so to say. A typical example is the car driver who uses the anti-lock brake not in order to reduce the risk of driving but to drive faster and more riskily. Insurance companies have reported that ABS drivers have sometimes an even higher accident rate than ordinary drivers. This, unfortunately, would hold even if an ingenious invention would allow us to cut in half the total environmental output of all production. After a while, I am afraid, we would take that opportunity to double our production. Another dreadful and very delicate example is the food and agricultural help for the most starving overpopulated regions in our world, if this aid will be used to produce new starvation in the form of new children. This, again, is a social and not a physical problem. The only real relief would be to break the circle of risk homeostasis, i.e. to redefine the priorities of our life strategies from short- to long-term aspects. This is why I called environmental risks a social problem. A longterm solution can be found only on the basis of social arrangements rather than by means of new technical development. Of course, this does not mean that the scientific environmental research such as presented here in such impressive quantity will lose its legitimation. Too many of today's environmental demages can be repaired only by means of special hightech mesures. But we should take care that, in the long term, the environment will profit from it and not the satisfaction of other individual or social short-term demands.

If we go into schools and teach children in science and particularly in biotechnology we should tell them at the same time that science is not only the never-ending source of beneficial goods and services provided we succeed in managing the technical risks related to it. Science has to be seen in the greater context of, and in competition with, the other instruments we use to manoeuvre our society. This view must not be confused with critical positions on science based mainly upon the apprehension that there are physical and technical risks and dangers related to it and which we cannot keep under sufficient control, and that the best way to escape these risks is to refrain from the special research in question. We must not discuss here the actual risks concerning genetic monsters and the deliberate release of genetically modified organisms (GMO) and to what extent the arguments used are scientifically or otherwise reasonable. These are technical problems, as technical as the benefits are scientists and industrialists speak about. I believe that control, self-control and the many regulatory measures we have or we can develop are well suitable to a successful risk management. So the balanced account of science is or will be by far positive. The danger I see in science is that it may monopolise our thinking in the sense that we consider science as a more or less omnipotent tool which would relieve us from the need to reflect on other tools. Our social responsability does not end at providing society with a well-running science. We rather have to define the reference system of values according to which we will respond to the possibilities of science. Or in other words: We have to think in long-term categories in order to escape the circle of risk homoestasis, and this is more than just organising the development of scientific solutions for technical problems.

The widespread (though now diminishing) belief in the overwhelmingly positive potential of science is rooted in our general belief in the power of rational thinking. I am not going to say that there is any reason to resign rational approaches in problem solving; but we have to be aware, that the high prestige of rationality is mainly due to co-evolution of rational capabilities and their applications, i.e. due to the fact that we favour just those goods and values which can be realised only by rational and scientific efforts, which, in turn, will increase our dependency on the further development of these capabilities. Cultures where the achievement of a good relationship with God ranks above the acquisition of material goods and technological achievements, may less depend on the extension of rational skills. It is a general phenomenon in both organic and cultural evolution that capabilities and skills (and therefore organs implementing these capabilities) can be evaluated only in the context of a certain application (6). Whether a small or a big bill is better for a bird cannot be said without knowing what is the bill for: picking grains, cracking nuts, climbing trees or fighting. Nor do rational or even scientific capabilities represent intrinsic merit. They can be weighed only with respect to their (potential, intended or actual) application. Particularly it cannot be said that species with rational competences will represent an a-priori higher fitness than others. In view of the high number of crucial human problems based on a lack of social coeherence, it may well be possible that societies where unconscious and therefore irrational problem solving capabilities would dominate, will master their future better than we are able to do.

KNOWLEDGE AND ATTITUDES

The need to think in longterm categories, comprising both scientific and social aspects, is also the reason why the CEC calls its efforts towards a better relation between the various quarters involved in biotechnology, the "Socio-economic Integration of Biotechnology" rather than just "Public Information". This reflects the view that the ongoing conflict between research, industry and wider parts of the public on particular biotechnological issues cannot be reduced to a kind of misunderstanding of science which could be healed just by more and better information - as, unfortunately, too many people still believe.

One tool to proceed in this matter is a extended communication between all involved. "Extended" means that not only scientific and technical data are exchanged but also data on the economic implications, the legal and regulatory background and on the social and safety aspects. This requires us to provide platforms for dialogues in their various forms. The Commission has held several workshops with experts concerned and in collaboration with consumer organisations from Europe as well as from the U.S. But it requires also the elaboration and evaluation of the methods to be applied, based on our own research and analyses.

For this the Commission feels the need to have more detailed knowledge on better methods and strategies for improving the relation between the various quarters in the biotech scene. To deal with methodological questions and to try to improve the methods concerned is not only a matter of more or less effectiveness of public information. Methodological considerations can be of high qualitative importance insofar they can inform on whether a special measure is likely to be productive or counterproductive. This, for example, concerns the relation between knowledge and attitudes. Is it true, as many people believe - particularly from the side of the natural sciences - that scientific knowledge will determine more or less the attitude

towards the science in question? If this were true, we could, of course, confine ourselves to public information in the usual sense and through the usual channels such as the media. But as we can learn from the social psychologists, in some cases the relation between knowledge and attitude can be just the reverse. Then attitudes are the primary variables, which will select the eventually circulating information.

It is wide-spread understanding that the key notion to describe the relation between science and the public is the knowledge about benefits and risks related to science and its applications. Identifying benefits and risks of biotechnology objectively and informing the public accordingly is expected to minimise public concerns and objections. Controversial opinions which scientists would call "irrational" are assumed to be mostly due to the lack of appropriate factual information on both the scientific and the legal (regulatory) aspects which will eventually and in the long run determine public attitudes. The relation between information and attitudes is assumed to be that of cause and effect. This is the basis of many, if not of most measures and campaigns to improve the relation between biotechnology and the public. The term "Public Information" (PI) which has come to stay as the general label for all these activities would suggest by itself the causal link between information and attitude.

This approach, however, neglects that the effect of messages, data or other kind of information depends on both their content and their interpretation by those perceiving them rather than on the content alone. Even more, the relation between information and attitude can be just opposite: People will select or reinterpret the information available according to their existing attitudes so that eventually only those pieces of information will be publicly discussed (and therefore disseminated) which fit into (or reinforce) current attitudes and prejudices.

This is underlined by what Dorothy Nelkin has written (7): "Many scientists still believe that the media are responsible for negative public attitudes towards science, that the tension between science and society reflects the poor public understanding of science, and that an adequately informed public would share the enthusiasm of scientists semselves. Thus, they try through public relations to convince journalists to project a more favourable public image. But this belief oversimplifies the complexities of public attitudes towards science, and underestimates the importance of pre-existing attitudes in shaping readers' interpretation of media images". This is also confirmed by Brian Wynne, University of Lancaster, when writing(8): ". . . But biotechnological understanding has been conventionally seen as a natural good - like any other form of knowledge. Our research has shown that lay people respond to scientific information not at all in a purely intellectual way. That is, even people capable of assimilating an offered level of technical knowledge may resist it, because they sense in that knowledge, not a morally or socially neutral and detached `free good`, but a trojan horse of associations, with technological, social or moral visions and future trajectories that cause anxieties. Of course the associations may also be positive. But the frequent lack of articulation of these `deep structures` underlaying `neutral` packages of knowledge confuses and perhaps exacerbates negative public reactions. Thus even liberal information programmes may backfire if these tacit dimensions are foreclosed".

In order to put these and similar views on a more systematic basis we organised a workshop on "Knowledge, Attitudes and Behaviour towards Biotechnology" (Brussels, Sept. 10, 1990) with experts from the various fields involved.

The workshop came to the following conclusions:

1. One of the basic problems is the lack of trust in science, scientists and application by industry rather than the lack of scientific or technological knowledge. It is important to tell people that science is not something which presents ready-made solutions but that scientists have similar problems and concerns to those of the man in the street. What confuses people is the claim of absolute competence of science. What is needed, therefore, is communication rather than information. People have to be convinced that the biotech actors not only act and speak but also listen. Information should not only concern science and technology and their applications but also economic, legal and regulatory aspects to increase trust.

2. Communication activities have to consider that the effect of information is strongly source dependent. Dissemination of knowledge, therefore, has to apply appropriate mediators (non-governmental and non-industrial organisations such as universities and museums). Appropriate funding procedures for independent communicators have to be identified which will not lead to a loss of public credibility.

3. Scientists who have sometimes a rather vague idea of what the effect of their communication could be, have to be trained in communication sciences and they have to be aware that public communication is part of their success as much as finding public money is. Scientific communication activities aiming at the public have to be professionalised in the sense of PR, in co-operation with social scientists and psychologists (anecdotal approach, approach via actual problems to be solved by biotechnology). A particular point is targeting and segmenting: different strategies have to be developed according to the various target groups as well as to the various subjects in question.

4. Concerning the high importance of cultural differences, the state of the art in public knowledge and attitudes in the various countries have to be analysed. It was stated that the role of consensus and the awareness of need to find it, is rather different in the various Community countries. This may be one of the reasons why public debates in public groups on biotechnology and its implications generally came to peaceful conclusions in England whereas they did not lead to comparable results in Germany.

So we know that knowledge and attitudes are not necessarily positively correlated. But we do not know in what case there is a negative correlation or no correlation at all. This question is crucial as we mentioned above the assumption that the effect of information mainly depends on the interpreting pre-existing attitudes. If this is correct, we cannot expect any correlation - except the case that the attitudes expressed themselves are the result of previous scientific information. For the politician or the industrial PR manager it does not make a difference whether a negative attitude towards biotechnology is due to a previously perceived information which was scientifically wrong and insufficient or due to experiences concerning trust, credibility and related topics. What is important is only whether existing attitudes can be influenced better by scientific or otherwise factual information or better by contextual mesures dealing with trust etc.

In order to get the empirical evidence needed the Commission organised April 1991 an opinion survey on "Public Perception of Biotechnology" on the basic of 12.500 interviews in the Member States of the Community (9). The result confirms that there is an additional positive correlation between knowledge and attitude towards biotechnology if other parameters indicate positive attitudes as well. Further to this, however, there seems to be a complex and cultur depending cross-correlation between the various variables. In Denmark, for example, people regard biotechnology as a highly risky matter. Nevertheless, the support of further research is recommended. This is coherent only if people would trust in the public authorities controling risks and potential misuse of biotechnology. This, indeed, is confirmed by the survey. There is no other country where people believe so much in the reliability of information released by public authorities. The German population as well is afraid of biotechnological risks, and as well trusts public information sources far above the European mean value - but is strongly against further backing of research in the field. These and other open points are subject of ongoing Commission analyses particularly on cultural differences.

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I started with the metaphor of Beauty and the Beast in order to characterise the various conflicts we are confronted with. I hope enough evidence was presented that there is neither a beauty nor a beast, i.e. that the conflict is not of the kind that each of us can unambiguously say how beautiful or beastly he is. Science, as Niklas Luhmann has shown, and particularly biotechnology, is not a subsystem of our society in the sense that it could be regarded separately from other subsystems. This insight, of course, is not a surprise and it may not provide us with any particular means to improve the relations between the various quarters of the biotech scene. But understanding that this is as it is may help us to identify and eliminate approaches which, at least in some cases, are counterproductive rather than helpful.

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