Panelist's Remarks

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Few technological changes have caused as much debate as the recent changes in biotechnology (Bt). Unfortunately, much of this debate has been dominated by the sensational and the visceral, and little coverage in the media has been truly deliberative, rigorous, or based on scientific evidence in framing the issues.

Defining the Problem

I would like to define the scope of the topic first by limiting it to agricultural biotechnology, that is, the bioengineering of crops, especially food crops, and livestock, fish and trees. These activities are distinct from the bioengineering of medicines for human health. Medical bioengineering does not seem to elicit the same criticism as agricultural bioengineering. Critics of biotechnology do not seem to address their critiques to medical research, on the grounds that the resulting medicines or treatments would help people in distress.

Nevertheless, it is important to remember that most people who do not object to medical uses of biotechnology, while objecting to its use in agriculture, take that position because they place a value on reducing human suffering and prolonging human life, which is held to be intrinsically worthwhile. This argument, which I believe emanates from a correct system of values (that is, one in which minimizing human suffering and prolonging human life is held to be positive), is important to retain as we move to the domain that we will discuss here, namely, agriculture, especially in developing countries. It is relevant to hold that thought because the issue of better food production in the developing world involves many of the same arguments, even though the debate in the North is largely among people whose most likely nutritional problem is obesity, not hunger. The hungry in the Northern industrial societies are largely the marginalized, and they do not participate in the debate to ban or not to ban genetically modified organisms (GMOs)!

The second delineation of the problem relates to what we mean by biotechnology. Biotechnology is a continuum of tools that has only recently evolved into the part that bothers critics: the transformation of the genetic makeup of organisms by recombinant techniques, especially when we introduce the genes of other species into the target species—for example, introducing the Bt gene from a bacterium into a plant.

Transforming the genetic makeup of a variety of plant through genetic transfer from another variety of the same species should not pose much of an ethical problem. In fact it would simply be an accelerated way of achieving by biotechnological means that which we could achieve through conventional breeding programs and therefore should not pose ethical or safety problems for anyone not opposed to the latter.

We might arguably extend this acceptance to the bioengineered product of a genetic transfer between closely related plants, such as wheat and barley. Here we are already tinkering with

nature, but the boundary with the conventional "natural" breeding system is so close that, for many, that also would be acceptable. The result of such a gene transfer is unlikely to significantly modify or denature the plant. Triticale is such an interesting cross.

Beyond that we get on the slippery slope leading to the design of new plant types, based on the assemblage of desirable traits from individual plant species or even from other organisms. Are we now "playing God," with the likely results of the "sorcerer's apprentice"? That is part of this discussion.

The other, related problem that people have is with the idea of cloning, or the forced asexual reproduction of an organism that naturally reproduces sexually. This qualification is necessary because the critics of biotechnology generally, and of cloning specifically, obviously have no difficulty with the reproduction of plants through cuttings, a practice as old as civilization.

With the domain of the discussion delineated in this manner, the issues can be usefully grouped into ethical issues relating to:

- Tinkering with the natural order of things
- The likely risks associated with the new technology, which may well far transcend the actual users of the products of that technology
- The patenting of life forms.

Against this set of issues we must address the potential benefits that would be forgone if we do not use biotechnology to address the problems of the world today. This moral calculus must be undertaken if we are to chart an ethical course on this complex set of issues.

Tinkering with Nature

There is a profound distrust about people taking it upon themselves to change the natural order of things. One can argue, rightly, that by our very presence on this planet we are changing the natural order of things, and that our increasing numbers, ever-more powerful technology, and insatiable appetites for consumption and pollution are indeed affecting nature, mostly in negative and potentially dangerous ways. Witness global warming and biodiversity loss.

Yet, against this general proposition we must set the welfare of the human species. Any moral argument must include human welfare, regardless of whether one assumes that human beings are a privileged species or not. There is no reason to argue for the welfare of animals if one is not going to extend the same argument to human beings. Indeed, it is instructive that the first legislation to protect children against the abuses of child labor was sponsored by the Society for the Prevention of Cruelty to Animals!

It is difficult to argue that hunter-and-gatherer societies living "in harmony with nature" should be encouraged to stay as they are, even if that means enormous infant mortality rates and short life expectancies. Humane treatment would mean improving diet, education, and health. The resulting reduction in infant mortality and increases in consumption are likely to put pressure on the natural system. The questions then become how to handle that pressure, how to ensure that the patterns of development that are adopted are sustainable. Even arguing from a human-centric point of view, surely it does not make sense to undermine the ecosystems on which our long-term survival depends.

Biotechnology fits into the class of tools that humans are mastering for the potential benefit of humanity, and that holds both promise and perils that should be weighed intelligently, on the basis of the best available evidence, to determine whether, when, and how it should be used. Viewed thus, the matter becomes a simple calculus of the potential benefits and potential risks associated with the new technology.

However, let me add some qualifiers to the argument. We must recognize that the ethical issue of purposively changing the natural order of things is qualitatively different from trying to survive as best we can in this world in which we find ourselves. A course of action that tinkers with the natural order of things is equivalent if and only if it can be demonstrated that there is no alternative to pursuing that course, and that it has enough unique benefits in improved living conditions for human beings to outweigh the moral questions it raises.

Stated thus, the issues become propositions that can be elucidated by the best available scientific evidence about the issues of agriculture, poverty, food security, sustainable development, and the potential of alternative means to

reach the goals of food security for all in an ecologically sustainable world system. Here the evidence is mixed: the challenge of ensuring food security is profound, and the likelihood of meeting it without recourse to the bioengineering of crops is remote. Indeed, some authors, ranging from Henry Kendall and David Pimentel to Lester Brown and Hal Kane, have cast doubt on the world's ability to feed its growing population in a sustainable fashion under any scenario.

However, I do not take that view and would argue that we do have the chance to develop and intensify agriculture to meet that challenge. I would not argue that enhancing food security is possible if the potential use of biotechnology in this enterprise is prohibited. Remember that if we fail to reach the goal of sustainable agriculture for food security in the developing countries, it implies enormous misery for an enormous number of human beings. That distributive and income policies are equally important in ensuring food security does not in any way diminish the need to have the production side in hand. The production side is necessary but not sufficient to meet the challenge of hunger. Its absence makes discussion of income or redistributive policies largely academic.

If this position is defensible, then the question becomes one of managing the safety and other aspects of the technology, not proscribing it a priori. On the other hand, if the goal of sustainable agriculture for food security in developing countries can be achieved by other means, then the ethical argument against tinkering with nature remains intact for those who support it.

We must always remember that not all that is technologically feasible is ethically desirable.

Ethical Issues of Safety

In the case of biotechnology that would lead to releasing genetically modified organisms into nature, the issues of safety acquire a different level of concern. Is there a risk that we would affect the very ecosystems on which we all depend? What if these scientific efforts produce "super weeds" or "super viruses" that have a broad impact on many? Again the question is one of evaluating the scientific evidence and assessing to the best of our ability the likely risks.

Clearly, it is not possible to entirely exclude certain classes of risk, any more than one would be able to exclude the risk of an asteroid hitting the earth or of being struck by lightning. Yet these risks are considered so remote that one goes through life ignoring them. I am not saying that the potential risks of releasing genetically modified organisms into the environment are in the same class of probability as asteroids or lightning. However, the discussion should not start with the premise that any potential risk, no matter how remote, would automatically veto the potential application of a technology. After all, in a case much closer to everyday life, we could ask whether people would be willing to accept a technology that contributes to global warming, kills about 50,000 people a year and maims another 500,000 in the United States alone, and adds nothing vital to our lifestyles except the convenience of personalized fast travel. Yet no one would be able to persuade the average person to agree to ban the automobile.

So we come back to assess the real risks of biotechnology in terms of how to ensure its safe use so that its benefits can accrue safely to the many who need it. This is the topic of a two-day symposium, entitled "Biotechnology and Biosafety," starting tomorrow in which a large number of distinguished authorities will participate (Serageldin and Collins 1998).

Patenting of Life Forms and Other Issues of Patenting

The third broad area of ethical issues involved in biotechnology is that of patenting. One of the ethical questions raised is whether the patenting of life forms is acceptable. There is no direct answer, but the ownership of animals and plants, as well as the right to own a particular breed, is recognized. It could be argued that allowing ownership rights to other life forms is a matter of degree. After all, the varieties of flowers or livestock are themselves owned and sold, and breeding of horses and other show animals is recognized. So what is more offensive in patenting, that is, establishing an ownership claim on, a gene or gene sequence, than in asserting ownership of a whole plant or animal or a variety thereof?

The difference lies in the idea of owning a "building block of life" rather than the living creature itself. The assumption is that the building block can then be part of many other living things. This is an issue that I still struggle with and cannot easily define to my satisfaction.

Nevertheless, the issue is one that affects many people, and we should strive to understand their qualms and to accommodate them. No legislature can function if it does not have the broad support of the majority of the population, and the views of the minority today could well be those of the majority tomorrow. However, such a transformation is best achieved by education and scientific evidence, not by assertive preemptive action by a vocal minority.

Why do I say this? Because the lessons of history teach us so. A comparison between the United States' experience of its failed banning of alcohol (prohibition) and its effective quasi banning of smoking is instructive. Efforts to reduce smoking benefited from a protracted education campaign that resulted in a significant shift in popular attitudes; the banning of alcohol did not. The substance of that education campaign was scientific evidence increasingly linking smoking to a plethora of health issues.

In the same spirit should we not marshal the resources of science to assess the substantive claims of the contrarian view, be it for or against the patenting of life forms, to explain the difference between that and outright ownership of animals and plants?

There is another side to the patenting story. It raises another set of ethical issues that I would like to put before this assembly. These include the progressive monopolization of knowledge and the increasing marginalization of the majority of the world's population. Concomitantly, selective focusing research and applications of new biotechnologies skew their benefits to the potential markets of the rich and exclude the concerns of the poor.

The issues operate at two levels:

- Privatization of the scientific research enterprise and the meaning of proprietary science in the coming century
- Proprietary aspects of biotechnology in terms of both process and product.

On the first, I am concerned by a growing gap in knowledge between the North and South, which is exacerbated by the privatization of the knowledge enterprise. Elsewhere, I have called this an emerging *scientific apartheid.*

But the problems posed by the new environment of proprietary knowledge are different. They lead to the hoarding of information, and they are changing the character of the scientific research enterprise, especially in the universities, with their claim of promoting the advance of knowledge and its diffusion. The race to publish is being replaced by the race to patent.

Increasingly, the proprietary climate that governs research on genome mapping and the patenting of genes and gene sequences has recreated the world of the mapmakers of the 15th and 17th centuries, eloquently evoked by Daniel Boorstin:

> Geographic knowledge, a product of discovery, was a precious international currency, coveted by everyone, easily stolen, and valuable to hoard. Anybody's new bit of information about an easy passage or a treacherous shore could be added to anybody else's in the race for gold and glory....
>
> In this grand universal enterprise of discovery, all scientists, explorers, and navigators were collaborating willy-nilly, intentionally or unintentionally. Collaboration, while necessary, was both desired and feared. All realized that they were working toward the same end, a more accurate map of the earth. And their efforts bore fruit. (1994, 20–23)

In both examples the issue is not that the research efforts do not bear fruit, but that the climate of that research becomes more like the competitive and secretive climate of military research, and less like the open and participatory climate of the research university that we have come to know in this century. This proprietary research culture threatens the open partnerships of science that were established from the 18th century onward.

The emergence and rapid dominance of this proprietary science pose difficult issues for institutions of higher learning in countries such as

the United States. Here the need to maintain a not-for-profit status and retain the 501c(3) tax deduction is at odds with the pursuit of lucrative and interesting research with the giants of the private sector. They also pose questions about ensuring the ready accessibility of knowledge, surely a function of the university.

Equally powerful is the claim of the private sector that if it is to mobilize and invest large sums in research, it must be able to recoup its investment. To do so, the protection of intellectual property rights (IPR) is the key. From the view of the investor simple justice would demand that intellectual property rights be respected.

So we have an ethical dilemma posed by the conflict between two desirable ends—two competing claims to a just and fair treatment. The way out of this dilemma is to recognize the domains of the claims more precisely. Public goods should be left to the public, and *the private goods that aid in achieving these public goods should be treated differently* than the private goods produced by the private sector directly for the end user.

This is a subtle argument, but an important one. In the past institutions such as the International Agricultural Research Centers (IARCs) supported by the Consultative Group for International Agricultural Research had access to the basic science and could apply it to the problems of the poor. The results were available to all for free, a public good. Today, this is no longer possible because the patenting of both process and product continue unabated.

I would not mind if private companies patented the products that they choose to sell. However, I do mind if their patents prevent the IARCs from using the same basic scientific processes to make products of interest to the poor—products that the private sector patenters are not going to make precisely because of their public goods nature. Surely, there is an ethical question here, not just a legal one.

Of course, this does not argue for abolishing patenting or nationalizing private research. It argues for an imaginative approach that recognizes the interests of the vast majority of the poor in the world today.

This is not a hypothetical question. Look at pharmaceuticals, an areas in which the private sector has dominated research for a long time and patenting is increasingly enforced around the world through the trade-related intellectual property (TRIPs) agreements under the World Trade Organization (WTO) rules. What do we find?

Malaria today affects some 200–400 million human beings, severely affects some 10 million persons, and kills about a million people annually. Yet, there is no significant private sector research for a malaria vaccine. Why? Because malaria is not a disease of the industrial countries, and because the millions of people affected are poor and live in very remote areas, making them an unattractive market. Compare this to the research being done on AIDS. It is plentiful and, it is hoped, is leading to a real cure for this devastating disease. But the cure will cost at best between US$5,000 and US$10,000 per patient. With enormous luck the cost could be brought down to US$1,000 per patient. This is an enormous advance, but one that will leave the vast majority of very poor AIDS victims in such countries as India, Rwanda, and Uganda with no accessible treatment.

I do not say this to fault the private sector companies. They are doing what they are supposed to do. I fault the public bodies that use the enormous presence of the private sector in medical research to justify a retreat from the pursuit of what are essentially public goods in the classical economic definition of the term. Biotechnology in agricultural research poses many of the same problems. We should recognize the importance of public goods research to accompany and complement the massive private sector research. In this context we must reassess the ethical aspects of preemptive patents and the patenting of process as well as product. New ways of collaborating with the private sector while respecting its right to intellectual property rights protection must be found to access the process side of the biotechnology work for public goods research.

Envoi

I have argued for defining more narrowly the scope of the discussion, limiting it to the issues of biotechnology in agricultural research. I have tried, wherever possible, to isolate the issues that could be framed as scientific questions,

allowing us to assess the evidence and make informed decisions based on a cost-benefit or risk assessment, from the issues where the problems are inherently normative and the arguments are based on values. The difference between these approaches is the same as that between an argument against surrogate motherhood based on religious or other ethical values and one based on the safety of the procedure for the mother or the fetus. The safety argument is one that can be resolved in scientific terms, subject to another set of decisions about how much risk is acceptable. The ethical is not debatable in the same terms. So it is with some of these questions of biotechnology and patenting.

Whatever the difficulties, the ethical debate is one that we must all join in seriousness and in depth. There are few technologies on the market today that are more transformative. There are few that pose as many serious questions for our consciences and our minds, even when we circumscribe the debate as narrowly as I have tried to do here.

So let us go forth into these new domains with open minds and sensitive hearts, combining skeptism with concern and compassion. Let us be firm in the determination to do good and to remember our responsibilities toward the poor and the marginalized and the future generations of human beings as well as other species. And let us adopt an inquisitive posture that will also remember that issues such as these are never settled, but must be constantly reviewed and weighed in the light of new developments and new evidence. Only in this way will we be able to tackle our problems and, perhaps, also fashion the wise constraints that will set us all free in the truest and most profound sense of the word.

Reference

Boorstin, Daniel J. 1994. *Cleopatra's Nose: Essays on the Unexpected.* New York: Vintage Books.

Serageldin, I., and W. Collins. 1998. *Biotechnology and Biosafety.* Proceedings of an Associated Event of the Fifth Annual World Bank Conference on Environmentally and Socially Sustainable Development, "Partnerships for Global Ecosystem Management: Science, Economics and Law." Washington, D.C.: World Bank.