
Ethics, Climate, and Risks

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I guess one of the first risks being taken in this session is in inviting me to moderate it, and to prove this I will do a quick test of the nerd-level of the audience with a story: Werner Heisenberg was pulled over by a traffic cop who approached him and said, "Do you have any idea how fast you were going?" To which Heisenberg replied, "No. But I know exactly where I am."

Of course, the question is, "Where are we?" The issue that fascinates me about this session is the examination of public obligations in appraising the risks involved in moving to the radically new paradigm in production represented by bioprocessing. The question of public obligation in situations like this is an old one. The land grant universities that you represent were founded on the idea that public investment in research yields benefits that vastly outweigh the returns possible from any private investment, which is certainly true for broad economic issues. It is specifically true for rural economic issues. And it is certainly true that investments in research at land grants pay enormous benefits in the form of trained students who are not captured by any private entity.

Now, in the twenty-first century, because of these benefits, the obligations of land grants certainly continue to justify federal and state support. But a new class of public benefit, environmental improvement, is now possible through investment in some of the advanced technologies. Public interest in research in bioprocessing, in addition to economic benefits, is motivated by the potential for very significant environmental improvements simultaneously with a growing economy.

However, the risks we are undertaking are obviously very large. You do not need a PhD from a land grant university to figure out that if you double world population and you have three times the economic activity for each human

being on the planet, you have a problem that is not going to be solved by 10% fixes. We must have orders-of-magnitude improvements in the relationship between economic activity and environmental impact. The bioprocessing technologies that have been described at this conference clearly provide that opportunity.

In the federal government, we have tried to put together a portfolio of research that meets public obligations broadly in this area. Obviously, the first necessity is to make the processes more efficient. Bioproducts provide that opportunity at the industrial level. Not only are crop plants extremely efficient at producing a variety of chemicals, but they are particularly advantageous from the perspectives of the greenhouse effect and global climate change.

We have put together a budget proposal that we think is robust. We are requesting an additional \$44 million for the USDA and \$49 million for DOE, and an interagency research partnership has been forged that other speakers have described. Although, there is no guarantee that this money is actually going to appear, there is strong bipartisan support. Given the tough budget year we are in, progress will be impossible without a lot of people working together.

Senator Lugar's bill, authorizing an integrated program, was passed by the Senate. We supported that, but were unhappy to see that the specific authorization for DOE was removed. There are parallel companion bills in the House Science Committee and the House Agricultural Committee, and we hope that a bill will pass both houses and be brought to the president within a month. Again, this has strong bipartisan support, and we would welcome your participation in the deliberations.

A critical component was the issuance of an executive order that fosters integrated research. One of the key elements of that integrated research, contained in the executive order, is the consideration of potentially negative impacts resulting from much greater investment in bioproducts. There is concern about ecology, wildlife, the soil, and genetically modified organisms. We feel that these issues should not be considered as an afterthought, but should be integral to the investment we are making; the research partnerships must include people who share these concerns.

I suggest there are four unique, previously unseen, issues to face. First is the speed of development; the rate of research progress is unprecedented. We are seeing exponential growth in the development of concepts, which, although good, imposes special obligations that society has only years, not decades, to think through. Second, the speed of dispersal: ideas move around the planet, for good or for evil, with extraordinary speed. Third, the scope and subtlety of the impacts are an order of magnitude more complex than, for example, "Do you like nuclear power?"

And, finally, an issue that Bill Joy brought up and which has been attracting a lot of attention lately: the democratization of the development of technologies that have potentially worldwide impact. It is one thing to have someone create

a computer virus that spreads worldwide over a 24-hour period. It is another thing to have someone develop a real virus that could do the same thing; if you lower the cost of creating a harmful impact you greatly change the scope of the problem.

In any event, clearly we have an obligation to make public investment in biotechnology and bioprocessing in order to achieve economic advancements and to develop “no-regrets” responses to problems like climate change. Without technology, we simply cannot imagine supporting 6 to 10 billion people in anything like a prosperous world with only a moderate impact on the environment.

Technology is essential. However, in devising ways of minimizing climate change, for example, we must not incur other risks. The land grant colleges are uniquely well suited to take up this challenge, not only with their history of investment in issues of public interest but also because they embody the technical expertise and the ability to anticipate the impact of new technologies.

Kelly