
Module II Panel Discussion and Q&A Session

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PANEL DISCUSSION

William Boggess (Oregon State University, Corvallis, OR): Fred, you indicated that, philosophically, you often see the “question behind the question.” You also mentioned that, in the next 47 years, there will be another 3.2 billion people in the world to feed and most in the rural, underdeveloped areas of the world that face many agricultural challenges. My question behind the question is: do you actually anticipate feeding these people or at least attempting to feed them, or do you see this as not being a possibility?

Frederick Kirschenmann: Whether or not that population increase occurs will depend on whether or not current circumstances stay in place. There’s the question of infectious diseases and what role they will play. It will depend also on what kinds of intervention we use. We know that education of women has been one of the most effective tools for stabilizing population, for example. But, assuming that the increase will occur, simply producing more food is not going to solve the problem because we will run into water shortages before we run into food shortages. Also, we will run into the problem of ecological impact; how long we will continue to insist on consuming will be a part of the equation. Many challenges face us, and simply developing technologies to produce more food will not solve the problem. Having said that, there are some examples of how we can, in fact, increase productivity without increasing yields, by developing multi-species systems that actually produce more from the same acreage. My favorite example of that is a farmer in southern Japan, Takao

Furuno, who, instead of just producing rice as he did up until 1987, also produces duck meat, fish meat, duck eggs, and fruit from the same acreage. This multi-species system has created synergies such that he no longer needs to buy pesticides, he no longer needs to buy fertilizer, and his rice yields have increased. So my question is: why aren't we devoting at least some of our research money to understanding such systems? What's the ecological equivalent for Washington State? What's the ecological equivalent for Iowa? For Africa? I'm convinced that, with such complex highly productive systems in place, farmers would no longer be on the technology treadmill and would, in fact, increase the production and diversity of food so we wouldn't have the problem of nutrient deficiencies because we're concentrating on increasing the yields of particular crops, namely rice or wheat. We need to explore some of those options.

Boggess: Kay, do you think that this emphasis on risk assessment, which is being taken as a portion of the ARS and USDA mission, is actually addressing profound hazards or is this part of seeking a risk-free world and environment as part of our society?

Kay Walker Simmons: We are addressing biosafety research needs identified by scientists under the aegis of the National Academy of Sciences as well as other scientific forums. At the same time, we are mindful of concerns expressed by consumers about the need to assess the long-term impact of crop biotechnology on the environment and plant genetic diversity.

Boggess: In light of that, I was wondering—I think the numbers are correct here—do you have any information that would support that \$3 million is enough to support 2- to 3-year studies on resistance management and effects on non-targets or gene flow?

Simmons: That amount funds competitive grants on an annual basis in each of the priority areas identified as biosafety research needs. These grants are awarded by the USDA CSREES Biotechnology Risk Assessment Research Grants Program. Additionally, there is the new Biotechnology Risk Assessment and Mitigation Initiative within USDA-ARS that supports long-term biosafety research projects. ARS funding increases in 2002 and 2003 (\$5.4 million total) support this long-term research on effects on non-target organisms, risk to the environment, and assessment and mitigation of the effects of transgenes on global gene expression.

Boggess: John, do you see Monsanto and other industry leaders in the development of biotechnology, as utilizing a systems approach, or will it be primarily a single, one-dimensional approach?

John Anderson: In day-to-day activities at Monsanto, we are organized in teams. There's a corn team, a wheat team, a cotton team. Within that process sometimes we focus on individual products. The challenge that we've undertaken, and are very capable of addressing, is how to look at the portfolio of products in a more holistic way, and how to address growers' needs—some people call them solutions—on a landscape scale. So, the good news in my opinion, having come from academia where we were organized by disciplines, is that, at Monsanto, there are entomologists, agronomists, because our products cross so many commodities and other enterprises—biofuels and those kinds of things—the expertise is there to look at things in a holistic way. But, you have to make an effort to point out that it's needed and the issues that you have to address require holistic solutions. I apologize for the Monsanto commercial, but, since we are team-based, if I need Eric Sachs or Harvey Glick to add expertise to a team to address something that is holistic, we have the empowerment being a flat organization to put that team together. I understand it sounds self-serving, but that's the way it is.

Bogges: Thank you.

Brewster Kneen (The Ram's Horn, Sorrento, BC): After 15 years or so of looking at the issues of biotechnology, I find myself having to look further and further upstream to ask, "What is the real problem here? Is what we identify as the problem really the problem or is it somewhere else further upstream?" In good reductionist tradition, we want to reduce the discussion to issues that we think we can address with pragmatic and technological or technical solutions. That approach may not address the problem at all, but we have that proclivity. We do this because, if we cast the problems as technical questions in a society that says technology and science are neutral, then we can avoid dealing with the ethical, moral, and social questions of where we stand personally and are we prepared to make life changes to actually address the problems? The problems always come in language such as, "How are we going to feed the world?" And I agree with Fred—I don't think we are going to feed the world. That's the white man's burden. I think it's high time we gave that one up and said, "Why don't we let people feed themselves?" So, I have a problem with some of the language. Of course, it becomes personal. "Am I prepared to make changes in my life to decrease the demands that keep the system of exploitation going and for which biotech is supposed to be an answer?" So I have to back up again. Let me just suggest that I see genetic engineering, biotechnology, as a cultural project, or product if you will, of a particular culture. And I am very aware that, in listening to the discussion, this is very, very North-American centered, as if it's the only culture in the world and everything is resolvable and can be dealt with in this context. I suggest that that is problem number one. Three more points: as Fred stated, production is not the issue. The issue is justice, and justice

means distribution. But that's a social question that we don't want to deal with because then we have to ask ourselves about our demands, what we expect for our livelihood, and what we think we can expropriate out of the pot. If you look at medical biotech, you see that it's a very elitist practice for a very, very small number of people to benefit by extremely expensive processes, which raises a lot of serious moral questions to me. The second point, which Fred has alluded to, is that the environment is not out there. It is not a resources for us to use. It is the world in which we live. It is the context of our lives from the gene up. The context is constantly expanding and we are part of that. We are not some separate thing that is in a position to control it. My point is that sustainability must exclude growth. Now that may sound radical. But, we assume that the problem of poverty is economic growth, not distribution. And we assume that we have to feed people with industrial agriculture, not allowing them to feed themselves with a diverse sustainable subsistent system, which is in fact the way most people feed themselves. So I guess I would ask John Anderson first, if progress isn't in fact what's killing us?

Anderson: I would answer your long question in a very direct way: I don't get up in the morning feeling guilty for consuming something, and I'm not so naïve as to think I or my employer can feed the world. But I do like to think that I can see out in front of me. Many things are going to have to change to feed those people. Wars may be fought over food and water. We have the ability and the intelligence to adapt and manage those situations in a way that is good for a lot of people. And so, if I ask myself the ethical question, "If I'm working in the biotechnology industry, am I doing something immoral or unethical?" I would say no, because traditionally people have tried to improve their quality of life by using the resources at hand and applying their knowledge to create what you could call technology to solve the problems of importance to them. So no, I don't feel guilty working in this industry. The other thing is that we have a lot of opportunity in front of us and that opportunity, whether you're an organic grower or a traditional grower, is based on markets. I'm a supply-and-demand kind of guy. If there's a need, and a compelling need, then somebody will respond to it. If they can profit from it, I don't have a problem with that, but no one has a monopoly on ethics, and if you move forward and do the right thing you can use technology and accomplish the goals at hand. I don't feel there is anything in front of us that we can't manage or that there is anything that really is terribly negative about the way we are approaching it.

Kneen: Kay, I was struck by the fact that you had one slide in which I think the text was, "As agriculture itself creates risks with conventional crops, this should be the standard of comparison." Doesn't this illustrate the point I was making, that we take industrial agriculture as normative, and is that a reasonable starting point?

Simmons: My point was that any type of plant breeding or crop improvement introduces some risk. *Any* new plant variety should be carefully compared with previously developed varieties that have performed well. For example, effects of new biotech crop varieties on non-target species should be tested in the field and compared with other commonly used varieties. Amounts of pesticides used and effects on non-target organisms should be compared. Those comparisons should be done with current farming practices, which can also include alternative farming methods.

Kneen: Fred, do you feel that the term “technology”—which you’ve used as well as everyone else in referring to life processes and characteristics of organisms—demeans life and reduces organisms to objects that are then fair game for our manipulation?

Kirschenmann: It depends on how this turns out. I’m trying to redeem the term “technology” so that we don’t limit it to hardware or control systems. In fact, a lot of technologies, which we could access, are available in nature. Aldo Leopold has been mentioned several times today, and one of the things that we often forget about his view of the world—and it really is the underlying principle of his land ethic—is that *Homo sapiens* is not the conqueror of the land community but a plain member and citizen of it. In other words, we are not in control of the world, we are not in charge, we are each simply one citizen of the community and the other citizens comprise everything from bacteria to earthworms to every other organism. So, what technologies, what mechanisms, are available to us if we recognize ourselves as plain citizens of the community and we can access all those other resources by relating to them to make the system as a whole more productive? He also said that the objective is not to preserve the community in its present state, because it’s always changing, because nature is always evolving. Nor is it to “squeeze the maximum productivity out of it.” The objective should be to enhance the capacity of the biotic community to *renew* itself. Think about that for a minute. We should, in fact, be engaged in using every technology at our disposal to meet that objective, because the future—the sustainability of the whole system—depends on that one issue. I invite all of you to keep that fundamental philosophical position clearly in mind, because that’s what Leopold was talking about.

Kurt Volker (Syngenta Crop Protection, Yakima, WA): Fred, the thesis I got from your paper was that not just biotech research but probably most agriculture research is not focused on the right things. It’s reductionist rather than holistic. It’s “single component” rather than “systems.” What I didn’t hear though was whether you see any unique opportunities on one hand or any unique challenges on the other that biotech may bring to your solution. Does biotech open up avenues that traditional research doesn’t to better understand systems,

or does it have some characteristics that make it even less likely that we will make the shift?

Kirschenmann: I'm sorry if you missed where I tried to emphasize that, particularly in referencing Evelyn Fox Keller's work *The Century of the Gene*. One of the things that she points out, based on her research of the evolution of gene technology and gene research over the last century, is that its real value lies in the enormous capacity for better understanding how systems function. In that case, it's a knowledge-based enterprise rather than a technology-based enterprise, using the word "technology" in the traditional sense. And if we can begin to recognize that there is some real value to the knowledge that we can extract from genetic research, in terms of better understanding how systems work—on my farm, for example—I want that information because that can then help me to understand how I can manage it better to access its inherent strengths. This is important for me as a farmer, because there have been a lot of other references in the last day and a half about the benefits that farmers get from this technology when applied to a single crop to provide farmers with X number of additional dollars per acre. Yet, when you put the whole system together, farmers are not surviving economically because they are constantly on a treadmill because these technologies don't address the fundamental sources of the problem. By introducing crop rotations many of my problems disappeared. And by changing the management system of our animal agriculture, the disease problems essentially disappeared. We no longer use veterinarians on our farm. So, there is information from genetic research that could be enormously beneficial to me, and I want that information. Information will be the driving force, not specific technologies that I have to buy, which, by definition, are going to have short-term solutions because we haven't addressed the source of the problem. We've only addressed how to fix the problem and that's the point of Joe Lewis's whole analysis.

Volker: John, I am thinking back on your eight principles, one being time/value/money or the fact that a dollar is worth more today than it will be a year from now. Considering how people respond to incentives and the role of capital, which you pointed out, and that it costs \$80 million to bring a technology online, explains why we've seen private companies focus on commodity crops—corn, soybeans, wheat, cotton—that have a large market size with which sufficient benefits can be captured from producers' willingness to pay for a particular interventionist-type technology. What incentives are there for Monsanto and other large companies to take on research that might lead to longer-term, sustainable systems, particularly if it means that it would be difficult to capture benefits in the marketplace? Or do you see being restricted to products from which benefits may be captured in the marketplace?

Anderson: You use the term “interventionist,” I would prefer “innovation,” because markets are harsh judges. The private sector takes shareholders’ resources and puts them at risk, and can spend \$80-plus million to commercialize a product—but it doesn’t mean that people are going to buy it. You assume that you have interpreted the business landscape correctly enough to create value with that innovation. People put their scarce resources where there is the highest return, whether it’s on Fred’s farm or whether it’s in the private sector. He’s looking at how to best use his resources to accomplish his goals. The goal at Monsanto is to make money. We don’t apologize for that. Because of the expertise we’ve assembled, we have the opportunity to address modern agriculture. Because we have entomologists, agronomists and molecular biologists, we have the opportunity to look at things in a broader holistic way. We support projects with the Nature Conservancy, with Audubon, and with other entities that espouse the need to think holistically in an ecologically sound way. I would argue that conservation tillage in tandem with biotech cotton or corn, with other ecologically sound approaches that growers might adopt, can create holistic solutions to economic problems. In a global commodity business, which farming is today, the low-cost producer always wins. We must use this technology to broaden the number of opportunities available to growers. The dynamic I talked about—people moving out of town back onto the landscape—is a huge opportunity for what the Audubon people would call community-based agriculture, and I sense that’s what Fred’s describing. He’s shaking his head no. I’m sorry—didn’t mean to intrude, Fred. That’s what I thought he said. In any case, there’s an opportunity here to find ways to add value and get off the commodity treadmill rather than the technology treadmill.

Volker: Kay, your last slide ended your presentation on an optimistic note: high safety standards and safeguards are in place, and will be even higher in the future. I was surprised that you seemed sure that there is no need for concern over development of resistance, unintended effects on non-target organisms, or gene flow that might have irreversible effects.

Simmons: New funding for USDA biosafety research will increase monitoring and evaluation activities to detect any development of resistance or unanticipated effects on non-target organisms or the environment. Results of this research will be openly provided to the public and be used by federal agencies to review regulatory practices for biotechnology crops.

Q&A

Craig Winters (The Campaign to Label Genetically Engineered Foods, Shoreline, WA): I want to know how the US Department of Agriculture can justify

allowing genetically engineered corn to be grown when it's apparent that it is contaminating organic corn. It's interesting to hear the Secretary of Agriculture Veneman say that if people want products that are labeled they can just buy organic, when we know that organic crops are being contaminated by genetically engineered crops. Another incredible thing is the proposal to allow drugs to be produced in crops that will be within 1 mile of food crops when we know that corn pollen travels far more than a mile. How can the USDA justify allowing organics to be contaminated and pharmaceuticals to be produced in food crops?

Simmons: The USDA Animal and Plant Health Inspection Service (APHIS) regulates the introduction of transgenic crops, including those containing pharmaceutical and industrial compounds. That agency has recently developed more stringent protocols for field testing of these types of transgenic crops.

Alan McHughen (University of California, Riverside, CA): Kay, I appreciate the work that you were describing from the USDA-ARS. The allergy-reduced soybean is a tremendous project. We all know that eventually insects will acquire resistance to *Bt*, and it's important to do that type of work and put it in the public domain. I applaud those efforts. But, \$3 million simply is not enough, so I would encourage more funding for those types of projects. You referred several times to National Academy of Sciences reports and it seems to me that on those several occasions when they've offered comments they said that the risks associated with biotech are no different in kind from those associated with conventional and indeed organic production. Yet all of these studies were aimed at biotech products, and I question the wisdom of perpetuating the myth that there is something special and something inherently risky about biotechnology. Are we addressing perceived risks from society or are we addressing real risks? If we continue to work on perceived risks associated with biotechnology might we ignore real risks with conventional and organic products?

Simmons: As Fred Kirschenmann noted, the significant benefit of biotechnology has been the tremendous advance in new information at the gene level. Biotechnology is enabling us to understand the effects of altering individual genes. Much of our new USDA-ARS biosafety research will be assessing the long-term effects of introducing new pest- and disease-resistance transgenes. While these ARS projects will focus on transgenic strategies, the research results will also provide new knowledge and tools for conventional plant breeders. New information about the most effective genes, unanticipated effects from altering specific genes, and methods to minimize environmental impact and effects on non-target insects can be used by all plant breeders.

Carolina Reyes (Western Washington University, Bellingham, WA): My question is most directed to Mr. Anderson as well as Ms. Simmons. Speaking of whole-systems approaches, it has become very clear that an environmental benefit of biotech is reduced pesticide use. On the other hand, it could be said that large-scale pesticide use is made necessary by large-scale agriculture—by monoculture farming. Using potatoes as an example, is it not true to say that Monsanto has construed the problem as being the potato beetle rather than potato monoculture. This is to say, existing systems of agricultural production are left intact while the root causes of unsustainability are left untouched. Are we addressing symptoms and not the causes of our problems?

Anderson: I think you are asking, “Could crop rotations replace pesticides?” Fred spoke to that earlier. There are examples where those systems work. There are examples where insect problems break out in those systems. But, if you look at the global demand for feed grains, global demand for oil seeds, the agricultural sector has chosen to meet those demands, and be rewarded accordingly, with efficient, highly productive systems. Now, remember my comment that complicity breeds expense. Support to do that kind of work came from the 1985 Farm Bill—a lot of that effort faded away because the people working in those systems were never able to demonstrate widespread economic benefits. And so, complexity breeds expense. It’s a knowledge-intensive, more difficult way—in my opinion—to farm, and it’s not one that meets the demands of large markets. Over hundreds of years, not just the last 20 years, a system has emerged whereby people use the technology they have at hand to address a problem most efficiently and most effectively. That is traditionally how agriculture has approached issues. I am not saying the approach you are talking about doesn’t work. I’m just saying it’s hard to generate large economic benefits to large numbers of people with that kind of approach.

Phillip Schwab (USDA Cooperative State Research Education and Extension Service, Washington, DC): I appreciate Dr. Anderson’s comment about definitions, and my question derives from the definition of biotechnology that we are talking about here today, which seems to be mostly focused on transgenics. From my perspective as a federal science policy person, our major investment on the federal level is in genomics and, Dr. Anderson, you referenced that in terms of encouraging your daughter to go into proteomics. As we learn more about the genomics of crop and animal species, learn more about the proteomics, the inner workings of the genetics in each of these species, won’t we be able to make better intra-species crosses—better plant breeding, better animal breeding—versus reliance on interspecies transgenics. How will that affect the biotechnology debate and what do you think the relative contributions will be of genomics information *vis-à-vis* intraspecies transformation?

Anderson: If you go back to Thomas Friedman—I like him because he understands that the late 1800s was an era of innovation based on the rapidly declining cost of transportation—the seventh largest company in this country was Central Leather. I would defy anyone in this room to tell me what Central Leather did. What we are seeing today, as I suspect you already know, is an era of biological innovation based on the rapidly declining cost of biology. Monsanto has a huge investment in genomics, as do many of the people in this room. I think the greatest benefits from genomics will come from improvements in plant breeding—molecular breeding if you want to call it that—because I can assure you that the current rates of improvement in crop productivity are nothing compared to what you will see in the very near future, maybe 10 years out. If it's not transgenic that's good news, because you circumvent the risk and the cost associated with transgenic approaches. I'm agreeing with you that the real improvements in crop productivity are going to come from molecular breeding and other things that young people understand but I don't. There's a whole language around proteomics that I'm trying to learn.

Simmons: Consider the promise of genotyping. Genomics is going to allow us to use genotyping to mine crop germplasm collections and identify genes for valuable agriculture traits for pest resistance and weather tolerance. Crop diversity will be enhanced. USDA-ARS is developing regional wheat and barley genotyping laboratories to deploy new gene discoveries for use by public plant-breeders in partnership with land-grant universities.

Steven Garrett (Washington State University Cooperative Extension, Takoma, WA): Dr. Anderson, a criticism that industry and academics producing genetically engineered crops have had to sustain is the perception of arrogance—that scientists think they know best. In fact 2 or 3 years ago, when Monsanto had a change in CEOs, the new fellow—I can't remember his name—publicly apologized for just such attitudes that had been exhibited by scientists at Monsanto and in academia. Given that public recognition that attitudes need to change in order to promote the new technologies, I was a bit dismayed to hear you talking about others within this forum having bad science, bad economics, and the general theme that you know the way things are. I think the criticism comes mostly from people who don't like to be patronized—also science is not necessarily neutral, as has been pointed out. As Fred said, there is always a question behind the question. For example, in your slide on Bollgard® cotton, you had asked the farmers if it had improved the wildlife on their farms. But, first you said that we have found that Bollgard® improves wildlife habitats on farms and then you asked if it improves it on their farms. No social scientist would load the question before asking it, basically telling them the answer.

Anderson: I understand your comments about arrogance. I don't recall the details of the apology you described, but initially at Monsanto we thought this technology was so good and the benefits would be so obvious that people would understand it. You could say we were taken aback by the fact that people didn't see the same things we did. Call that arrogance if you will, but we have no monopoly on that either. I'm a little taken aback by the fact that you say I demean people. I just pointed out that the person yesterday talking about finance needed to explore some more detail because, conceptually, it was wrong and I don't think I called him by name and I don't think I called it demeaning. But what you are really speaking to is the ability of a corporation, organization, a university to listen to your clientele and respond to their needs. I think we are past the point of arrogance in this industry in the sense that you are judged by your actions. Now, relative to the survey question I think I said before that we argued about how to ask the question. We all know that how you ask the question is important. I can take you to the growers who can give you that information. I can give you their names and addresses and show you their pictures and they'll be glad to talk to you. I have a lot of confidence that I'm correct. I've lost the end of your question, please follow up.

Garrett: I actually thought you had compelling evidence there.

Anderson: I think it's very compelling.

Garrett: In terms of Bollgard®, and I was just pointing to that particular question as to say—

Anderson: Yeah, and I pointed that out before I said it.

Garrett: —we cannot say that we scientists always do things correctly or that science is never neutral. That question was like push polling in politics. That kind of question would engender a response, so, to me, it took away the compelling evidence that you had in terms of wildlife habitat because of Bollgard®, which I have no doubt would definitely improve the habitat.

Anderson: I acknowledged before I put the slide up that the question might not be perfect. I think I said that. "Push polling" is not quite appropriate there. The key thing is that there's a body of evidence that says that biotechnology can generate wildlife benefits, particularly if they are looked at holistically on an agricultural landscape. In the wildlife conservation community—they still believe in good science and they're still very close to agriculture, and if you look at the demographics I described, they are going to be a lot closer in the future.

Gabrielle Roesch (Western Washington University, Bellingham, WA): Michael Taylor, FDA's deputy commissioner who wrote the FDA's rBGH-labeling guidelines formerly worked for Monsanto, and Margaret Miller, deputy director of FDA's Office of New Animal Drugs, was formerly a Monsanto research scientist who worked on Monsanto's rBGH-safety studies until 1989, and Susan Setchen, the primary reviewer for rBGH in the Office of New Animal Drugs between 1988 and 1990 was involved in research under Monsanto-funded rBGH studies at Cornell University. Considering those connections between our regulatory frameworks and private interest, I'm curious what problems that represents to you all about the objective nature of our regulatory system.

Anderson: I suggest that it's naïve to think that Monsanto controls the FDA.

Roesch: That wasn't what I was saying, though.

Anderson: No no, but I'm going to finish. The regulatory system in this country requires tremendous amounts of research, evidence, and documentation. As was indicated in our session yesterday by the gentleman from the EPA, they brought in outside experts who didn't work with Monsanto—haven't taken Monsanto's dollars—and they listened to those people. They also have public-comment periods where you are entitled to comment, just like I am. So there's a misconception that the regulatory system in this country is broken and it's naïve to think that because someone used to work somewhere that they are still advocating a particular point of view. You can buy someone's time, but you can't buy their integrity, at least that's the way it's supposed to be. My point is, the regulatory system works; if you look around the globe there's not one that's better. If you look at the risk assessment, it is huge. Risk is assessed, and that is getting better. Transparency needs to be improved, in the sense that it is very difficult for someone who doesn't deal with it—regulatory science is a science in itself—to actually understand how it functions, and I can tell you from the discussion in our group yesterday that few people in that room understand how you take a product through the regulatory process. That's not demeaning, that's just fact.

Roesch: Does anyone else have a response to that question?

Trudy Bialic (PCC Natural Markets, Seattle, WA): I'm from a consumer-owned retailer of natural foods here in the Puget Sound area. I want to speak on the behalf of consumers, who often are overlooked in this debate, and to follow up on a couple of the comments just made. It would be a gross tactical error on the part of the biotech industry to underestimate the depth of passion that consumers have about genetically engineered foods. To suggest that we have a transparent process when we have more than two dozen examples of industry

people occupying the highest levels of the regulatory commissions, I think that would be a tactical error. I'm here primarily to encourage you to use your vast resources to transfer your skills and scientific endeavors into more medical applications and out of the food-crop industries. The advent of bio-farms is extremely disturbing to consumers. We have secret trials all around the country. Consumers know about them. We've been told that GE foods are not different enough to be labeled, but they are different enough to be patented. And I do think that it would be very valuable to heed the advice of the INVESCO report, the investment firm that reported that investments in biotech foods is a very bad risk right now—you can find that INVESCO report online—primarily because of the credibility gap between what the industry is trying to get consumers to believe and what consumers are perceiving. Essentially it comes down to an argument again for labeling. We're the only country in the world that allows rBGH milk. We stand alone. No other country in the world allows it. To think that we have that situation because we have a transparent process is fueling the organic industry at 20 to 25% a year.

Lomax: Do you have a question?

Bialic: I have a question. How do you reconcile between having foods different enough to be patented, but not different enough to be labeled so consumers can choose?

Anderson: I think there are people in the room who know far more about labeling than I, but the key to labeling, is that the label has to mean something and agreement on what that label means—when a lot of people have a lot of different opinions—is very difficult to come by. A patent is granted because someone had the insight to create something that is valuable, and the patent means you have 20 years or so to capitalize upon your discovery. It's a kind of government-approved monopoly, granted because you had creative insight. Transgenic plants are very different, in terms of the innovation it took to create them. They differ by a single gene or a single protein. They are substantially the same; a soybean is a soybean. So I don't have any problem resolving that issue. When we get to the point of having novel foods, then the discussion becomes very different and much more complex. Today we have a soybean that is very much like any other soybean except it has a single trait that allows a farmer to improve his business or his livelihood. Let me give you an example, and I hope I'm not getting into deep water. My wife works in the medical industry. She manages clinical trials for HIV. If you look at the current lack of capacity to produce pharmaceutical proteins that will improve people's quality of life, then I don't have any problem resolving the pharmaceuticals-in-plants debate. The new APHIS regulations are good, so that is almost an ethical question that I can live with. I don't see the big risk that you speak to. It comes down to being

awarded a patent or opportunity to capitalize on your creative insight and the pharmaceutical piece is basically a quality-of-life issue to me. People look forward to having therapeutic proteins available that are rationed because you can't produce enough of them. We come from very different perspectives. I don't have the risk concerns that you do, but I agree with you wholeheartedly that in this global economy, consumers have all the power. They make a market that is a very harsh judge of anything a company like ours does. They have all the power and so, if we make a mistake, the people whom we represent, the shareholders, understand those mistakes. From an ethical perspective I have no problem with pharmaceuticals in plants, from a risk perspective I have no problem. I have no problem with patents, but I think you are right in representing consumers because, in the end, you are going to decide what happens.

Kirschenmann: I'd like to add that there has been a lot of conversation around two aspects—one that was just raised about the consumer. It seems incredible to me that we are indicating that we don't have the aggregate intelligence to come up with a label to tell consumers what they want to know. I just find that difficult to believe, so I don't think that's the problem. I think there are other agendas at work here. The other thing is the notion that we are going to be able somehow—with sufficient regulatory systems and control—to isolate a living organism within the environment and keep it from becoming mixed with other organisms. Everything I know from ecology and evolutionary biology tells me that that's a pipedream. Nature is designed to disperse its seed and it's going to find one way or another to do that. The notion that we're going to somehow isolate one organism from another is totally unrealistic.