Frames for Public Discourse on Biotechnology

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In the past five years, science-based food-safety issues have been a staple of daily news in the United States as well as in other parts of the world. Developing news on mad cow and foot-and-mouth diseases from Europe, furor over golden rice in Southeast Asia, and the continuing coverage of the risks and benefits of agricultural biotechnology have vigorously put science and the scientist in the public arena. As the lenses of the public are trained increasingly on science and the scientist, it becomes inevitable, then, for the scientist to also have the public very much in mind.

In the evolving interaction involving the public, the mass media, and scientists, it is reasonable to expect some convergence in the discourse on biotechnology. However, what we have witnessed so far seems to show increasing divergence. Although public-opinion studies in the United States do not exhibit the anti-biotechnology phenomenon that we hear about, the movement against biotechnology has certainly gained momentum in other parts of the world. This is particularly true in Europe and parts of Asia, where public opinion about biotechnology has been unfavorable and public suspicions of GMOs and institutional regulatory agencies and industry have remained unabated.

Indeed, we would not be here today if it were not for the intriguing question as to why agricultural biotechnology has become a lightning rod for conflicting public discourses. Although I am not a scientist and can comment only from within the limits of my training and scholarly reflections, I would like to proffer some insights that relate to the communication dimension of this phenomenon. In reexamining the divergent opinions expressed in public discourses over biotechnology, I thought it best to go back to the basic question: Who are the actors and from what contextual frames do they see agricultural biotechnology as they further their agendas in the public sphere?

Clearly the actors involved are scientists, the mass media, and involved publics. It also is obvious that each of these actors brings to the discourse a way of knowing and presenting truth and knowledge, a peculiar rhetorical and epistemological style, and a set of values and meanings that cannot be removed from history and immediate experiences. Whether or not they are, in our view, protagonists or antagonists in the biotech debate would also depend on the frame that we ourselves use in examining the unfolding events of agricultural biotechnology.

The Scientific Frame and the Transformation of Scientific Discourse

In order to understand the manner of scientific discourse or talk, a look back in history might help. As we all know, the Scientific Revolution was characterized by a denunciation of scholasticism and the use of rhetoric in investigating nature. In order to dissociate itself from the moralizing and personalizing types of discourse, science had to seek other ways of presenting information. The imperative to have a distinctive discourse for science was particularly underscored in Thomas Sprat's History of the Royal Society, which admonished its members to separate the knowledge of Nature from the colors of rhetoric, the devices of fancy, or the delightful deceit of fables. Robert Hooke, in his draft preamble to the original statutes of the Royal Society of London, specifically argued that scientists should have nothing to do with "Rhetoric." During a scientific congress in Italy in 1839, Grand Duke Leopold II even remarked that one of the forbidden topics would be "eloquence." These admonitions reflected the need to have a scientific discourse that was characterized by logic and analysis, the direct evidence of the phenomena, the results of observations, stripped of all charms of fancy. In this context, scientists were conduits through which nature spoke directly, across the great divide between the independent, outer world of phenomena and the subjective, inner world of the observer (Gross, 1990; Fahnestock, 1998).

These distinctive marks of scientific discourse continue to be evident in contemporary science. Then, as now, the imperative has always been for a close, clinical, naked, natural way of speaking, almost mathematical plainness. It reflects both the values and social structure of science, which is entrenched in the tradition of peer review and careful evaluation and scrutiny (Martin and Veel, 1998; Priest, 1999). It implies a degree of separation between science and society, with the former as the fountainhead of all new empirical knowledge. The autonomy of science was seldom contested. Knowledge, per se, is devoid of ethical content or moral value. It is the society, at large, that deems as good or bad (or both) the uses of knowledge and understanding, and even pure information, depending on the social, historical, and cultural contexts, and on the prevailing human and social values of the times (Brown, 1998).

Thus, when modern scientists communicate, we note cautious attempts to

establish the validity of the observations they report, emphasis on methodology, and importance given to tables, figures, photographs, and all other representations that can solidify the claim for the physical evidence generated. It is a type of discourse that can be characterized as "forensic" or "empiricist" in that it is largely based from observable characteristics of the natural world, aided by actuarial, toxicological, epidemiological, or probabilistic risk analyses and risk assessment. Using this rhetorical style, scientists simply restate the results of scientific research and suggest that risk can be calculated with precision. To deviate from this process is to negate the epistemological underpinnings and moorings of the scientific enterprise. When scientists communicate with their peers through papers, reports, or conferences, they reaffirm this built-in ethos of empiricism and try to hold back from any celebratory discussion of the significance or relevance of the work. The audience is left to infer and spell out the relevance of the study for a particular context (Sera and Shea, 1991; Priest, 1999).

But what happens when scientists shift to another type of discourse? The problem, I believe, begins when the scientific discourse slides from the forensic or empiricist style to what I would call the "celebratory" style. Communicating scientific reports and findings in ways that would make sense to the larger, non-scientific (lay) audience requires that the scientific information be adjusted to meet the lay audience's already held values and assumptions. This celebratory scientific discourse veers towards explicating the value and significance of scientific discoveries for lay audiences. It focuses on the breakthroughs, advances, contributions, applications, and benefits of scientific discoveries. It tries to contextualize science. The increasing importance of "context" shifts the discourse of science from the more traditional, established scientific search for truth to the more pragmatic discourse of "science that works." Indeed, there is a change from a discourse of methods and processes to a discourse that gives a final answer (Fahnestock, 1999).

In the case of agricultural biotechnology, celebratory scientific discourses may extrapolate, for example, the social benefits of biotechnology in terms of

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solving world hunger and even poverty in developing countries. The term "golden rice" for the genetically modified rice grain that contains beta-carotene is an example of a celebratory connotation for science. One scientific organization is even more effusive by referring to the so-called "golden rice" as the "grain of hope." It can be argued that, in the era of three-second sound bytes and diminishing attention span of media audiences, such creative catch-phrases that herald scientific accomplishments and potential social benefits may just be the proper counterpoint to other equally mind-grabbing sound bytes such as "frankenfood" and "terminator genes." Perhaps, scientists should fight fire with fire. While this strategy may be convenient, what the public gets at the end of the day, however, is simply a clash of sound bytes and more confusion.

Ironically, in an effort to make scientific discoveries relevant and appealing to the lay audience, celebratory scientific discourse all but foregoes some of the exacting standards of empiricism that have gained respect for science and entrenched its institutional role in society. Thus, it has been noted that celebratory scientific discourses tend to pay less attention to caveats, contradictory evidence, and qualifications that are highlighted in forensic or empiricist discourses. By downplaying scientific uncertainty, it alludes to greater certainty of scientific results for public consumption (Brown, 1998).

However, as it inevitably moves closer towards the arena of debate over what constitutes the common good and what is socially beneficial, it opens itself up also to a wide range of questions engendered by a different set of frames of public discourse for which science may not have the answer.

The Lay Audience's Frame: Moral and Societal Meanings and the Demands for Certainty

In my opinion, the lay audience's contention over biotechnology is neither about the science *per se* nor the content of forensic-empiricist discourses on biotechnology. For how then can we explain continuing public expectations for definitive answers or their needs for certainty, from science, even if these are rather unrealistic demands? These expectations could only suggest that, in the eyes of the public, science is still a repository of answers to many of the problems that beset the human condition. I would like to offer an analogy, despite its obvious limitation. This relationship between scientists and the public is almost akin to the principle of the separation between church and state. The church is respected as a purveyor of profound reflections on matters of morality, ethics, and conscience. The public expects that. But it is altogether a different discourse if the church dictates to the state as to what is moral and ethical. It weakens the state.

Hence, in the public discourse of biotechnology, conflict arises when science begins to be perceived as precluding public judgments and playing a decisive role in setting directions, policies, and regulations on food production and

food-safety standards. There is evidence that negative public reaction to agricultural biotechnology is driven to some extent by uneasiness over regulatory and risk-management policies that are solely based on technical risk analyses and risk assessment. This process is seen as disenfranchising other discourses that embody particular values and meanings *vis-à-vis* biotechnology. In the eyes of the public, it weakens the democratic nature of the public sphere that is supposed to engage a wide spectrum of participants and discourses. The conflict may very well be about the process of envisioning the common good and the best way to attain it (Gilbert and Mulkay, 1984; Webber, 1990; Gregory and Miller, 1998).

Scientific assertions evidently have a rightful niche in the public sphere. Celebratory scientific discourses on the wonders and socio-economic benefits of biotechnology have, in fact, been used as a rhetorical tool in several marketing or public information campaigns. In a functioning public sphere, however, these scientific claims must be evaluated side by side with other assertions, each carrying a frame of meanings, priorities, and values. This may be the reason why we do not see a blanket rejection of biotechnology. There is, in fact, disparity in public choices and levels of support for biotechnology. Public-opinion surveys indicate more support for the use of biotechnology for medical or pharmaceutical purposes than for the use of biotechnology in the production of food.

What, then, are these frames of meanings and values that inform non-scientific or lay discourses of biotechnology? These frames pertain to (a) ethics and morality, (b) control, (c) fairness, (d) familiarity, and (e) trust in institutions that regulate biotechnology. These frames are essentially reflective of Professor Peter Sandman's categorization of the more than twenty factors that influence public perceptions and opinions about risk-related issues. Using some of these categories, let me outline the typical arguments that characterize lay discourses of biotechnology (Juanillo, 2001).

Ethics and Morality Lay discourses tend to liberally equate “ethics” with “moral concerns.” Hence, if the application of a technology and related instances is unethical, it is also consequently considered morally wrong.

Public support for a technology is largely contingent on its perceived moral acceptability. Studies indicate that moral acceptability is a strong predictor of support for biotechnology and that moral concerns outweigh questions of risk and utility. The emphasis on ethics has even swayed institutional structures. In France, forums on ethics in biotechnology have been institutionalized with the creation of National Consultative Ethics Committee (de Cheveigné *et al*., 1999).

In general, lay discourses about the ethics and morality of biotechnology are informed by naturalistic or ecocentric worldviews, which see humans as only a part of nature. They manifest deeply held existential ideas about humankind and our relationship with nature. Fundamental to the ethical-moral question of

biotechnology is the guiding principle among many that nature is pure, and "all that is natural is valuable and good in itself." Thus, an action is right "when it tends to preserve the integrity, stability, and beauty of the biotic community (and) … wrong when it tends otherwise (MacLean, 1995). Hence, biotechnology is intrinsically wrong because it is seen as tampering with nature and as contrary to the very essence of humanity and its position in nature.

This particular discourse on biotechnology becomes even more complex when framed in a religious perspective. "Playing God" has been a familiar accusation against biotechnology and a basis for not a few impassioned public objections.

Interestingly, however, nationwide surveys conducted in Austria, the United Kingdom, Australia, Germany, Japan, and the Netherlands generally show less ethical opposition to genetic engineering for medical, pharmaceutical, or therapeutic applications than to applications in food production and agriculture. Genetic testing and medicines are deemed useful, morally acceptable, and to be encouraged, but genetic manipulation of food crops and animals is considered morally unacceptable.

Control Perceived loss of control over the effects of biotechnology on human health and the environment has been a recurring theme. For example, biotechnology opponents cite the threat to the independence of small farmers and the consumers' right to know and choose. People ask how broad public interests can be served in light of the growing concentration of ownership of food resources in a handful of multinational companies, particularly their control over key aspects of food growth, production, and marketing. There are concerns over the move toward agricultural research being predominantly influenced and funded by the very companies that stand to benefit most from genetically modified crop technology.

There is widespread perception that the genetic engineering industry seeks to industrialize agriculture even further and to intensify farmers' dependence upon industrial inputs abetted by a system of intellectual property rights, which legally inhibits the rights of farmers to reproduce, share, and replant seeds (Altieri, 1999).

Opponents also express fears about similar effects of agricultural biotechnology in developing countries, opening up the debate once more on the dependency that technology creates on the research and manufacturing capacities of developed economies. They believe that agricultural biotechnology will exacerbate the marginalization of small and resource-poor farmers since the technology is under corporate control, protected by patents, expensive, and inappropriate to the needs and circumstances of indigenous people. There is a perceived threat of total "corporatization" of farming, of unfairly burdening the farmers of developing countries who would become dependent on corporate genetically engineered seeds, despite being unable to afford them (Altieri, 1999).

Fairness Public debates over genetically modified foods have also centered on the technology's role in exacerbating social inequities. Concerned groups both in developed and in developing societies, for example, see current intellectual property rights as devices for perpetuating, rather than alleviating, entrenched discrepancies between rich and poor countries (Jasanoff, 1999).

Non-government organizations also have decried the limited flow of information and resulting lack of transparency as a result of the patent system in developed countries. Existing patent systems allow biotechnology industries to protect the product as well as the process, and therefore to limit the flow of technical information. Procedures and policies have yet to be established in order to promote access to these technologies. As a consequence, the public perceives that the whole biotechnology business is shrouded in secrecy, conjuring up images of technology as an instrument of social control.

Stringent regulations in developed countries on the release of genetically modified organisms or their products also are seen as making developing countries particularly vulnerable to uncontained on-site applications of biotechnology as these countries do not yet have the necessary regulatory policies. Current guidelines governing the release of genetically modified organisms do not include provisions governing the testing and application of organisms in other countries, particularly in the developing world. This situation provides opportunity for the biotechnology industry to test new products or locate their production facilities in developing countries that are ill-prepared to respond due to the lack of national safety policies, effective regulatory mechanisms, technical know-how, and institutional accountability.

The perception that developing countries are being “exploited” by companies who profit from the use of indigenous biological resources has triggered anti-biopiracy awareness campaigns by non-government organizations worldwide. There are serious concerns that these companies are being granted patents for products and technologies that make use of these indigenous genetic materials, plants, and other biological resources (Altieri, 1999).

Voluntariness An exposure to risk that is perceived as involuntary is regarded as more threatening than when an individual has a choice over personal exposure (Frewer *et al*., 1997). Consumer food choices are informed by the general feeling of well-being and satisfaction associated with products that have been chosen voluntarily, guided in part by an array of cultural, ethnic, and religious motivations.

The negative attitude of consumers towards biotechnology products appears to emanate from the perception that food and dietary risks are personal choices and ought not to be imposed on them by corporations. Much of the opposition revolves around upholding the consumer's autonomy and right to be informed through mandatory labeling and disclosure of any salient nutritional differences or new production methods in foods. In the United States, public-opinion surveys continue to demonstrate that consumers want labeling. A Gallup poll

conducted in September, 1999, showed that even though a bare majority of Americans believe that biotech foods are safe, most are willing to pay more to have labels that distinguish between gene-altered food and conventional produce. Sixty-eight percent of the respondents said they would pay more for labeled foods whereas 29% would not.

Moreover, as a reaction to this perceived threat, Europe and a growing number of developing countries have proposed a Biosafety Protocol that would require exporters of "living modified organisms" to notify the importing nation in advance, giving that nation a chance to reject the shipment. Agricultural commodities would be included because they contain seeds that can be presumably planted or can escape into the environment.

Familiarity and Tradition Agriculture has been closely associated with land-based farming where small communities have cultivated crops and domesticated animals for consumption and commerce. In the United States, powerful images of agriculture and the virtues of harmonious agrarian life persist even as the modern farm has lost much of its folk character. The village and the countryside are still perceived as the stronghold of primal American values: a sense of human values, neighborliness, respect for family, moral stewardship of the land, and a bastion of democracy and religion.

Opposition to the application of biotechnology in food production and agriculture emanates partly from the belief that it destabilizes the firmly rooted cultural archetypes and the deep symbolism associated with agrarian culture. Many environmental and sustainable agriculture groups view transgenic food as a symbol of the assault on traditional sources of food. Decreasing familiarity with their food and its origin and composition engenders such anxiety. The benefits of using biotechnology on food and crops seem far-fetched and superfluous, bear no immediate impact on individual well-being, and lack personal relevance.

Trust and Credibility Central to the public discourse on the risks and benefits of biotechnology is the issue of trust and perceived credibility of societal institutions such as regulatory agencies, life-science companies, and private research organizations. Communication between the public and proponents of biotechnology breaks down, perhaps irreparably, when the public perceives that the proponents are not telling the truth about the risks of biotechnology or are not sufficiently prepared to handle the potential risks of the technology. Public expectations about the competence of societal institutions involved in biotechnology are often based on the institutional track record or on the basis of how these institutions have handled food-related crises in the past.

The level of public trust in institutions and sources of information and how the public perceives risk work in tandem. This ongoing public suspicion of self-interest mars the relationship between the public and the governmental regulatory agencies and private food companies in debates over the risks and benefits of biotechnology. As public trust in institutions declines, the public

perceives the hazards of biotechnology to be greater, and public trust in advocacy groups increases.

The Eurobarometer surveys conducted by the European Commission in 1996 on public perceptions of biotechnology show that public authorities, administrative institutions, and industry are least trusted to tell the truth about biotechnology, and are perceived to be least reliable to regulate biotechnology. Non-government entities such as consumer organizations and environmental groups are most widely trusted, followed by school- and university-based experts. Trust, however, is issue-specific. Those in the medical profession, for example, are most widely trusted for introducing genes into animals to produce organs for human transplants. There also is more trust in the providers of biotechnologies for medicinal or therapeutic use than in those involved in biotechnologies for food production (Durant *et al.*, 1998).

A study I conducted in Southeast Asia (the Philippines, Singapore, and Thailand) on public perceptions of food safety manifests similar trends. Results of the survey show that life-science and food companies and government regulatory agencies rank lowest as trusted sources of information on food-related risks including biotechnology. University scientists rank first in all three countries, followed closely by non-government organizations such as consumer-advocacy and environmental groups and the mass media. Life-science and food companies and government regulatory agencies are perceived as being most biased in releasing information and most likely to withhold information on food-related risks. Moreover, the public perceives university scientists to be much more concerned about public health and safety with regard to biotechnology issues than are government agencies or life-science and food companies.

The Mass Media Discourse: Focusing on the Frames that Sell

Turning now to the mediator of scientific and lay discourses on biotechnology, I believe that there is no doubt about the critical role of the mass media. Studies have pointed out the possible role of the mass media as influencing the rise and fall of social issues in the public agenda. Whether rejected, accepted, or modified, the comments by definers of scientific issues in news accounts have become points of departure for personal conversations. The lay public's understanding of science and technology issues and its evaluation of technological risks stem more from a reliance on a broader, more popular vocabulary of risks and benefits provided by the mass media than on the traditional risk analysis and assessments given by experts. Risks do not just emerge as issues for the public according to their intrinsic importance, but rather in interaction with social processes such as the manner by which the mass media frame, construct, or define risks. Media effects are manifested especially in issues that lie outside the individual's personal experience, and for which the mass media are the only frames of reference.

Do reports in the popular media reflect scientific discourses or lay discourses? Tentative findings from my content analysis of the *New York Times* for the period 1998 through 2000 show that nearly 30% of the content is devoted to scientific discourses, in both celebratory and forensic styles. Evidently, much of the coverage focused on social dimensions of agricultural biotechnology, particularly on issues pertaining to control and fairness, trust and credibility, and voluntariness. Lesser coverage was devoted to issues of tradition and familiarity and ethics and morals.

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Q: Should scientists change their mode of address and move to a more celebratory style when dealing with the public?

A: Some communications research is being conducted by the Environmental Protection Agency (EPA) on the merits and demerits of using narrative discourses over more empirical, or more forensic, discourses. But the real challenge will be implementing the EPA findings in outreach programs or seeing them in action through information campaigns, and that has yet to be evaluated.

Q: Recently when I gave an introductory talk on genetically modified foods, one of the audience members asked me the question: “If you were to be offered only genetically modified foods for one year, would you accept it or not?” In terms of your framework—celebratory versus forensic—as an academician, what answer should I have given to that question?

A: As an academician, I don't have answers to very practical questions such as this. I think I work best as an observer. The real challenge is in evaluating communications strategies applied in outreach and extension programs. As of now, I have not seen any solid evaluations or findings of which strategies work best. Suffice it to say that certainly we know that when scientists try to celebrate, to take pride in, their own work, and to allot meaning to their discoveries, something else happens. It is a totally different framework—one of values and meanings—in which it is fair game for everyone to accuse you of something else. I think the public expects the scientist simply to talk about findings as empirically as possible, which is the reason that there is solid recognition for the role of scientists in society. It is something else when the scientist steps into the arena of value and meanings.

Q: Several surveys have shown that people trust in those with academic and scientific knowledge, but they get most of their frontline information from the media. I think it would be to the benefit of the consumer to hear from scientists, because they do respect the empirical point of view. On the other hand, we really do have to think about putting things into terms that the consumer can understand and hear what the consumer is really asking, fundamentally: is the food safe? That's what the consumer wants to know.

A: Albert Gunther, at the University of Wisconsin, has stated the following in response to the strategy question of what should be said to the consumer: when interviewed, the scientist usually begins in an empiricist mode, but then switches to a celebratory mode, which is when the mass media interprets and reinterprets and puts new meaning into what the scientist has said. It is a complex communication dynamic, and I don't think you can fault the scientist for not answering the question—certainly the mediators of the information from the scientist to the consumer play an important role. We still have to come up with an examination of how the mass media tinker with information from scientists. Who knows, rather than being actually celebratory, added meaning may be injected by the mediator to cloud the fundamental issue: is the food safe?

Q: The issue of celebratory science and communication is interesting. We are seeing increasingly more of this, particularly in the genomics area in which the identification of genes for specific diseases is leading to expectations for cures. As funders of the scientific enterprise, we are increasingly being called upon to be accountable. Do you see this as an increasing problem likely to erode the public's confidence in scientists? And do we as members of the scientific community need to exercise control to decide what is a biologically significant correlation—is it 20%, is it 80%? Do we need to set some thresholds for press releases?

A: I think this is a trend. Once you start celebrating science, it is difficult to change course. We must recognize that at some point the discourse will be empiricist and it will eventually slide to celebratory. I think the challenge for the scientist is, how best can you come up with communication strategies—remember when you engage in celebratory discourse you subject yourself to social criticism, which is an arena of public meanings, values and priorities that you put into your communication. Whereas, with an empiricist approach, you control the discourse. Therefore, I think that your concern about scientists exercising more control of the information that they release, whether celebratory or empirical, has to be seriously considered particularly by science communicators and educators. Inasmuch as there are checks and balances in empiricist discourse—through peer reviews and conferences—the same should happen in celebratory discourses. And we have to be careful about whether or not we are educating the public appropriately. If you choose to call golden rice the “grain of hope” you open yourself up to criticism—you enter a discourse that is not totally yours. It calls for a different way of thinking. However, henceforth it will be impossible to concentrate on empiricist discourses; some scientists will fight fire with fire. When Michael Jacobson asked what is the best way to herald some of the benefits of agricultural biotechnology, he was asking what is the best way of celebrating it.