

Framing the Biotechnology Debate:
A Textual Analysis of Editorials and Letters to the Editor in the *St. Louis Post-Dispatch*

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Abstract

This paper examines how the subject of agricultural biotechnology is framed in editorials and letters to the editor in the *St. Louis Post-Dispatch* from 1997 to 2006. Editorials and letters to the editor were textually reviewed and coded according to a frame typology that included the following frames: Progress, Economic prospect, Ethical, Pandora's box, Runaway, Nature/nurture, Public accountability, and Globalization. The overall tone of each text was also qualitatively assessed according to whether it mentioned risks, mentioned benefits, or reported controversy. Whereas previous research has found the "progress" frame to predominate coverage of biotechnology, results suggest that the "public accountability" frame now largely organizes discourse on agricultural biotechnology, both in editorials and letters. Findings further show that both risks and benefits are commonly reported, but letters are much more likely to offer radical alternatives to applications of agricultural biotechnology than editorials. The implication of this finding is that readers are more likely than official editorial opinion to express subjectivist, non-technical solutions to the problems that biotechnology purports to solve, while editorials are more likely to maintain positivistic associations with the technology.

Depending on one's point of view, the subject of agricultural biotechnology can represent a vast array of realities. It is at once a gift to the developing world and an act of biopiracy, a technological breakthrough and a threat to biological diversity, and a way to enhance nutritional content while posing a risk to public health. Some argue that humans have been selecting plants and animals for desirable characteristics since the dawn of civilization, and biotechnology simply provides the tools that allow scientists to tailor such traits more accurately at the molecular level. Thus, for proponents, "The

objectives of food biotechnology are generally the same as previous technologies, but the process is faster and more precise” (Hoban, 1995, p. 189). Supporters feel that society can look forward to a host of economic, social, and environmental gains as a result of the technology. As Priest (1994) explains, “By manipulating a single gene or a series of them in both plants and animals, scientists seek to create tomatoes that are resistant to disease and rotting, cotton that is resistant to insect infestation, corn that grows faster and larger, [and] pigs that produce leaner meats” (p.77). Opponents, on the other hand, see food biotechnology as a biological perversion. Because genetic engineering involves the transfer of genetic information from one species to another, it represents a radical departure from traditional breeding and therefore invites concerns regarding the safety and ethics of the technology along with the regulatory capacity of the government. In this view, we as a society are carelessly playing God with unknown ramifications.

Regardless of these varying ideological perspectives, the field of agricultural biotechnology continues to grow. Last year marked the tenth anniversary of the commercialization of genetically modified (GM) or transgenic crops, which are now commonly called biotech crops. According to the independent International Service for the Acquisition of Agri-Biotech Applications (ISAAA), a not-for-profit organization, “In 2005, the billionth acre, equivalent to the 400 millionth hectare of a biotech crop, was planted by one of 8.5 million farmers, in one of 21 countries,” which is up from 17 countries in 2004 (James, 2005, p. 3). As stated in the 2005 Executive Summary of the ISAAA, “The global area of approved biotech crops in 2005 was 90 million hectares, equivalent to 222 million acres, up from 81 million hectares or 200 million acres in 2004,”(James, 2005, p. 3) and 67.7 million hectares in 2003 (United States Department of Agriculture [USDA], ¶ 20). Producing 55% of worldwide biotech crops on 49.8 million hectares in 2005, the United States by far leads global biotech production and is followed by Argentina, Brazil, Canada, and China.

The USDA itself states, “U.S. farmers have adopted genetically engineered (GE) crops widely since their introduction in 1996, notwithstanding uncertainty about consumer acceptance and economic and environmental impacts. Soybeans and cotton genetically engineered with herbicide-tolerant traits have been the most widely and rapidly adopted

GE crops in the U.S., followed by insect-resistant cotton and corn” (USDA b). In 2005, U.S. soybean production consisted of 87% GE varieties, while U.S. cotton and corn production included 79% and 52% GE varieties, respectively.

It is difficult to speculate what percentage of foods in U.S. supermarkets contain GMOs, because the United States Food and Drug Administration (USFDA) does not require mandatory labeling of GMO ingredients unless a food item is “significantly different from its traditional counterpart,” in terms of its nutritional value or potential allergens present (USFDA, 2001). When Congressman Dennis Kucinich introduced a failed GMO labeling bill in 2000, he estimated that 60-70% of all processed food in supermarkets contained GMO ingredients (Center for Food Safety).

Despite the near omnipresence of GE food in the U.S., a telephone survey of 1002 U.S. citizens indicates that 69.9% of respondents considered themselves “not very well informed” or “not informed at all” about modern biotechnology (Priest, 2000). Another ongoing survey study found “virtually no change in consumer awareness of biotechnology between 1992 and 1996. Only about one-third of U.S. consumers had heard or read a lot or something about biotechnology” (Hoban, 1998, p. 4). Such findings are disturbing, because agricultural biotechnology represents something much greater than an isolated technological advancement. Rather, it is a public policy issue with economic, political, ethical, environmental, and moral implications. Agricultural biotechnology is also a consumer rights issue that pertains to something so personal and intrinsically necessary--the food we put in our bodies to sustain ourselves. It could therefore be argued that there should be a strong deliberative public debate surrounding biotechnology and what kind of relationship we as a society would like to have with food.

Further, the subject of biotechnology has profound global implications. Corporate life science giants such as Monsanto claim to be leading a new agricultural revolution that will feed a hungry world with crops modified to survive frost, drought, pests, and plague. Global critics, meanwhile remain deeply concerned by the technology’s potential to cause cultural, environmental, and economic harm. Indian activist Vandana Shiva, for instance, accuses seed companies of engaging in biopiracy when they hunt for patentable exotic seed in undeveloped countries. For their part, the companies

themselves refer to such actions as “bioprospecting” (Pringle, 2003, p. 81). Members of the global community worry not only about the privatization of their natural resources but also about the threat to biodiversity biotechnology may pose. In the fall of 2001, researchers from the University of California at Berkeley discovered the DNA contamination of native maize grown by peasant farmers in Oaxaca, Mexico, where GM plantings were banned (Pringle, 2003, p. 159). Experts presume that farmers seeking improved crops planted imported kernels meant for human consumption. Although the Mexican government did not officially import GM corn, it did in practice because of the American grain industry’s ultimate inability to separate GM from non-GM grains. More recently, civil society organizations in both Africa and Latin America have called for the immediate rejection of two World Bank projects which aim to introduce GM crops such as maize, potatoes, cassava, rice, and cotton into five Latin American and four African countries that are the centers of origin or diversity for those and other major food crops (www.etcgroup.org). Commenting on the proposed ‘biosafety’ projects, German Velez, of the Colombian civil society organization Semillas, says, “Under the guise of ‘scientific research,’ the goal is to legitimate the contamination of seeds that are the basis of peasant economies--and ultimately create dependence on corporate seeds. Clearly, this only benefits the biotech industry” (Action Group on Erosion, Technology and Concentration [ETC], p. 1). A further, yet not final, concern for some developing countries involves the trade implications of the technology, as some exporting countries in Asia and Africa have struggled to remain GM-free to appease anti-GM sentiment in Europe.

Given the breadth of concern over agricultural biotechnology, the media, which can be thought of as the center for contemporary public debate, should foster a discussion of the full range of issues surrounding the technology. In order for citizens to engage in meaningful debate, media must provide the public with what Priest (1995) calls “information equity” (p. 41). In contrast to the current situation in which coverage of biotechnology is largely dominated by the experts of academia and industry, information equity would “involve more media attention to the views of a broader range of social groups, as well as to a wider range of relevant social and political issues” (p. 42). In

other words, information equity would involve validating non-scientific subjectivist positions coming from the cultural knowledge of non-experts.

Guided by framing theory, this paper questions how the subject of agricultural biotechnology is framed in editorials and letters to the editor in the *St. Louis Post-Dispatch* from 1997 to the present. Through textual analysis, this study seeks to find if letters to the editor are more likely than editorial opinion to express subjectivist rather than positivistic associations with the technology. In other words, is Priest's notion of information equity apparent in editorials of the *St. Louis Post-Dispatch*, and if not, are the voices of citizen readers providing that equity?

Literature Review

Theoretical Framework

Sociologist Erving Goffman (1974) is credited with introducing frame analysis. He argued that humans organize, or 'frame,' everyday life in order to understand and respond to social phenomena. From a social and psychological perspective, framing explains "how people rely on expectations to make sense of their everyday social experiences" (Reese, 2003, p. 7). More recently, however, framing has been popularly recognized as a useful tool for addressing macroscopic concerns about media and politics, including the social and political context behind dominant media frames and their potential consequences.

Entman (1993) argues that to frame is "to select some aspects of a perceived reality and make them more salient in a communicating text in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation (p. 52). But frames have a power beyond the mere inclusion or exclusion of information. Moreover, they allow journalists to actively categorize information into existing cognitive categories and to grant chaotic events meaningful structure. Indeed, Tuchman (1978) explains that "frames turn nonrecognizable happenings, or amorphous talk into a discernible event. Without the frame, they would be mere happenings of mere talk, incomprehensible sounds" (p. 192). Therefore, the

power of frames lies beyond the screening process of selection and salience, as the framing process itself generates information.

Like Tuchman, Gitlin (1980) shows that a frame's defining power is strengthened through its routine nature, which transcends individual stories and grants it persistence and resistance to change. He describes frames as "persistent patterns of cognition, interpretation, and presentation, of selection, emphasis, and exclusion, by which symbol-handlers routinely organize discourse" (p. 7). In their study of Cold War-era cartoons, Gamson and Stuart (1992) show how symbol-handlers structured frames according to their opposing principles. They identified cartoons framed according to the ideology of the military-industrial complex of governmental officials, corporations, and private groups on the one hand, and public interest groups and social movement organizations on the other. Thus, a symbolic framing contest ensued, which was "waged with metaphors, catch phrases, and other symbolic devices that mutually support an interpretive package for making sense" of an issue, which in their case was the bomb (p. 59). For Gamson and Stuart, framing provides "a highly abstract symbolic container to deal with an unfolding reality," and within that container dwells a "family of packages" that supports the core frame (p. 60).

Although frames determine whether most people notice a problem, how they understand and remember it, and how they evaluate it by highlighting aspects of reality while omitting others, it should be understood that frames do not have universal effects. Nevertheless, because people are not usually well-informed on "most matter of social or political interest, framing maintains significant influence over individuals' responses to communicated messages, especially within a hegemonic political arena (Entman, p. 55). In this way, "the frame in the news text is really the imprint of power," which can be self-reinforcing as views beyond those expressed in the dominant frame are deemed to be an unacceptable form of discourse (Entman, p. 55). Moreover, on issues related to science and technology, the general public may not have sources of expert information or interpretation beyond the mass media. It is therefore "very likely that the power of media to influence public opinion is stronger for science and technology issues than for other questions" (Priest, 2003, p. 29). Ten Eyck (2003) likewise argues, "Public knowledge of issues related to genetics and biotechnology is heavily influenced by

news coverage, as most audience members have little experiential knowledge of the research related to molecular biology and biotechnology” (p. 129). But, as previously indicated, the subject of biotechnology is more than just a technical issue. Rather, it represents a political arena of competing frames sponsored by various interests, including scientists, policy makers, industry representatives, and other political or social interests. These actors are not only engaged in a power game over control of biotechnology’s applications but over the ability to frame the issues associated with biotechnology. It is therefore important to analyze the nature of media coverage related to biotechnology and to speculate on what potential effects such coverage has on public opinion.

Media Content and Biotechnology

Several studies (Priest and Talbert, 1994; Nisbet & Lewenstein, 2002; Priest & Ten Eyck, 2003; Ten Eyck & Williment, 2003) have applied framing theory to the subject of biotechnology in their content analyses of media coverage. Many have adapted their framing typology from the nuclear power packages identified by Gamson and Modigliani (1989) in their analysis of nuclear power discourse in TV news coverage, newsmagazine accounts, editorial cartoons, and syndicated opinion columns and its relationship to public opinion. The authors argue that public opinion can only be fully understood in the context of media discourse, because the media provide interpretive packages that give meaning to an issue and become part of the public’s available tool kit used to make sense of the world.

Seeking to determine which interpretative packages were most apparent in newspaper coverage of agricultural and medical biotechnology, Priest and Talbert (1994) focused largely on which sources, or frame sponsors, most frequently “speak” through print media. Results found that industry and university sources dominated coverage of biotechnology, and university sources were almost three times as likely to present biotechnology positively in their arguments. In their exhaustive quantitative content analysis of biotechnology-related coverage appearing in the *New York Times* and *Newsweek* between 1970 and 1999, which questioned what themes, media frames, tones, and source types have been employed in media coverage of biotechnology, Nisbet and Lewenstein (2002) likewise found that biotechnology was framed

increasingly and almost exclusively as scientific progress. The authors did, however, find that in the second half of the 1990s, which represents the period of greatest diversity of biotechnology frames within the thirty years under study, ethical and public accountability frames rose considerably, as did reporting of conflict. Still, the progress frame remained most predominant. Such findings point to the need for future research to examine those features unique to the late 1990s that have continued into the new millennium.

Consistent with Nisbet and Lewenstein (2002), Ten Eyck and Williment (2003) found that more than half the coverage of genetically related topics were framed as progressive during the entire study period, while the reporting of controversy increased during the latter portion of the study period (1992-2001) in their content analysis of coverage related to genetics and genetic technology in the New York Times (1971-2001) and the Washington Post (1977-2001). Topics analyzed by the authors run a broad gamut, including genetic innovations in agriculture, medical science, and criminal investigation research. Because coverage dealing explicitly with food biotechnology represents a very small portion of the entire study sample, results reveal very little explicitly about media treatment of genetically engineered food. Findings do show that food biotechnology is rarely reported in comparison to other genetic issues, but they do not indicate specific details on how the subject is discussed when it is covered. The broad-based nature of the research points to the need for more in-depth qualitative examinations of media depictions of particular applications of genetic technology. Because Nisbet and Lewenstein (2002) likewise examined coverage of all aspects related to biotechnology, including both agricultural and medical issues, they also invite future research to apply their approach to just one dimension of biotechnology.

Finally, Priest and Ten Eyck (2003) were primarily concerned with the legitimizing effects of the media that occur through framing practices in their multinational and multiyear content analysis of elite newspaper coverage of biotechnology in the U.S. and Europe. Articles were coded into eight frame categories, which mirror the frame typology used by Nisbet and Lewenstein (2002) and closely parallel the packages employed by Gamson and Mogliani (1989). Results specific to agricultural biotechnology coverage in the U.S. found that over 50% of articles are framed as

progressive, while broader results support the previous finding that scientists are more likely than all other source types to sponsor progressive biotechnology frames (Priest & Talbert, 1994). The authors conclude that dissenting voices are delegitimized through framing techniques in mainstream U.S. media and suggest that such delegitimization occurs in ways too subtle to document in large-scale content studies. This conclusion further highlights the need for more small-scale qualitative research studies on the framing of biotechnology.

While the ostensible role of the mass media in a democratic society is to provide a diverse range of viewpoints in order to stimulate knowledge and debate among the public, generalized results of previous content analyses indicate this is not being accomplished in the arena of biotechnology. In 1994, 80% of newspaper coverage focused on economic or other benefits to biotechnology even though prior focus groups revealed a broader base of public interests and concerns, including information and awareness issues, potential dangers, and appropriate regulations associated with biotechnology (Priest & Talbert, 1994). It is therefore appropriate to question what potential effects framing techniques that deligitimize dissenting viewpoints may have on public perceptions of biotechnology.

Effects of Media Coverage of Biotechnology

Research into the media effects of coverage on biotechnology has drawn from a number of theoretical perspectives, including cultivation (Besley & Shanahan, 2005; Bauer, 2005), perceptions of accountability (Irani, Sinclair & O'Malley, 2002), schema processing (Priest, 1994), spiral of silence (Priest, Lee, & Sivakumar, 2004), and framing (Priest, 1994; Priest, 1995). Guided by framing theory, Priest (1994) conducted a series of focus group discussions exploring how newspaper coverage of biotechnology may influence the public's response to the technology. The author hypothesized that coverage would strongly structure the general character of the discussions. Results show that discussions on biotechnology were more likely to focus on costs and benefits than other issues, and Priest (1994) speculated that the limited range of discussion may be due to the narrow range of media coverage on

biotechnology. Another study, however, found that narrowed media coverage of biotechnology in Europe has not limited discussion of a broader range of issues (Gaskell & Bauer, 1999). Still, it is possible that Europeans may process media framing tactics in a different manner than Americans according to culturally specific self-schemas. At the same time, the framing effects observed by Priest (1994) were not as strong as had been expected, and concerns expressed by the lay public did extend beyond those represented in media coverage.

Using agricultural and medical biotechnology as a case for exploring media effects in a report published the following year, Priest (1995) provides an overview of research results on mass media coverage of risk and lay public responses to risk-related information. Results show that concerns expressed by nonscientists were not limited to the narrow coverage provided by the media. Despite the predominance of media frames emphasizing economic and other benefits, Priest (1995) found the persistence of robust schemas among the public. These schemas process risk in social, rather than technical, terms and are concerned with a broad range of social issues, including potential ethical and socioeconomic consequences to biotechnology development. For what Priest terms “information equity” to occur in this arena, media coverage would have to broaden the biotechnology debate beyond the frames of scientific and economic progress and give voice to a range of social and political groups with subjective yet equally legitimate concerns related to the subject of genetic engineering.

Besley and Shanahan (2005) likewise found evidence of robust schemas among certain individuals in their recent study on the media effects of biotechnology coverage. Drawing from cultivation theory, which has shown that public perceptions may reflect reality as it appears on TV more so than as it exists in the real world, the authors set out to explore the relationship between television and newspaper consumption and opinions about agricultural biotechnology. Findings show that while attention to television news, science television, and entertainment television were all significantly related to support for agricultural biotechnology, newspaper use, despite the well-documented positive nature of newspaper coverage of biotechnology, did not correlate with support or opposition to agricultural biotechnology. The authors conclude that newspaper use involves more systematic processing and should, therefore, have

effects such as knowledge gain rather than attitudinal effects. Consumers who rely on newspapers for information may be more likely to have already processed an issue such as agricultural biotechnology, and they may therefore be less susceptible to media messages as compared with their TV-watching counterparts.

Public Opinion and the Biotechnology Debate

Presenting the results from several major U.S. telephone surveys conducted to explore public perceptions of agricultural biotechnology, Hoban (1998) reported that just over 70% of American respondents supported the technology in each of three different years of research (1992, 1994, & 1998). U.S. respondents expressed individualized concerns over technology, such as nutrition, safety, taste, and cost, whereas European consumers expressed societal concerns, such as environmental, political, and social impacts. These results seem to contradict findings that members of the U.S. lay public maintain a broader range of concerns related to biotechnology, including potential social and political effects (Priest, 1994; 1995). It is possible that the discrepancy is due to Priest's focus on both medical and agricultural biotechnology, but that explanation is unlikely, because research has shown public support to be even stronger for medical applications of the technology, such as genetic testing for inherited disease (Priest, 2000).

Gaskell and Bauer (1999) present the results of survey research on public perceptions of biotechnology in Europe and the U.S. from 1996 to 1997 along with an analysis of press coverage (1984-1996) in attempt to explain the discrepancy between support for the technology in the U.S. and opposition in Europe. The authors present two popular views on the effects of press coverage: One posits that positive or negative coverage molds public perceptions in the corresponding direction, while the other is specific to technological controversies and suggests that increased coverage, no matter the tone, will lead to more negative attitudes among the public. Interestingly, results indicate support for the latter hypothesis. As coverage in Europe increased, so did the level of public concern. What's more, European press coverage of food biotechnology was even more positive than that in the U.S. This finding suggests that Europeans are not

susceptible to predominant media frames and tones but does not necessarily support Priest's (1995) conclusion that members of the U.S. lay public are likewise resistant to media framing techniques. There may be a significant cultural divide between the ways in which Europeans and Americans process press coverage of food biotechnology. Perhaps Europeans are more strongly guided by certain schemas, which, for instance, view farmland as an important environmental resource (Gaskell & Bauer, 1999), and are therefore impervious to arguments for new food technologies.

Gaskell and Bauer also found that trust in national regulatory authorities was far higher in the U.S. than in Europe, which may further explain why public concerns are greater in Europe. Findings made by Irani, Sinclair, and O'Malley (2002) supplement this observed connection between positive perceptions of biotechnology and confidence in national regulatory authorities within the U.S. Beginning with the assumption that accountability of government, industry, and the regulatory process is a likely determinant of consumer reaction to food biotechnology, the authors hypothesized that perceptions of accountability will correlate with respondents' attitudes towards applications of food technology. Results indeed show a positive relationship between trust in regulatory bodies and support for biotechnology.

The results of a telephone survey that sought to gauge U.S. perceptions of biotechnology, however, found that agreement was weakest for the idea that regulations currently in place for GM foods are sufficient (Priest, 2000). What's more, less than half the respondents indicated that the government is doing a good job in making regulatory decisions. Such findings stand in stark contrast to those put forward by Gaskell and Bauer (1999) which suggest extremely strong approval for U.S. regulatory bodies. Priest's findings also point to eroding support for biotechnology within the U.S., for while over half of the respondents indicated a positive view of biotechnological developments, 30% of respondents reported that genetic engineering will make things worse in the next twenty years. Still, results indicated that the U.S. population as a whole continues to maintain a positive view of developments in biotechnology, as 52.8% of respondents agreed that genetic engineering would "improve our way of life in the next 20 years" (p. 939).

Research Questions

Addressing the well-documented need for more qualitative examinations of coverage of particular applications of biotechnology, this study seeks to determine which frames dominate in newspaper editorials and letters to the editor discussing agricultural biotechnology in the *St. Louis Post-Dispatch* (PD) from 1997 to the present. Based on the literature, the following research questions are posed:

RQ1: What media frames are employed in editorials and letters to the editor dealing with agricultural biotechnology in the PD?

RQ2: What is the tone of coverage related to agricultural biotechnology in editorials and letters to the editor in the PD?

Methodology

The St. Louis area represents a key public forum on the subject of biotechnology, as it has been dubbed “the heart of the Bio-Belt--a world class center for plant and life sciences research, investment and business opportunity” (St. Louis BioBelt). Supporting factors include the region’s strong research base, the significant number of plant and life science companies and institutions based in the area, including Monsanto and the Donald Danforth Plant Sciences Center, and the nationally and internationally known conferences held in the region, including the BioDiscovery Symposium, the International Botanical Congress, and the World Agricultural Forum, all of which bring leaders in plant and life science to the area, making the region a center for world agricultural discussions (St. Louis BioBelt). As such, the *St. Louis Post-Dispatch*--the region’s major daily newspaper--should be expected to actively participate in public debate surrounding agricultural biotechnology.

The year 1997 was chosen as a starting point, because that was when the local World Agricultural Forum was founded with the mission “...to provide a unique, neutral, inclusive forum for the ongoing discussion and debate of crucial agricultural issues and policies, leading to solutions and better informed decision-making by global leaders in all disciplines, from academia and industry to government and advocacy,” (World Agricultural Forum). Although it is difficult to say exactly at what point St. Louis became the center of the BioBelt, the creation of the WAF in 1997 helped establish the area as a major forum for agricultural discussion.

Editorials and commentaries published on the editorial page have been selected for analysis, because they represent either the official position of the paper or examples of what the paper considers legitimate opinion worthy of public discussion. As previously indicated, news articles on biotechnology most frequently cite official sources from academia or industry (Priest, 1995). This paper, however, will largely examine the expert opinion of the newspaper itself. Letters to the editor have also been chosen for analysis in order to compare and contrast biotechnology frames employed by the paper and the public. Readers who write letters to the editor are most likely heavy readers and they may function as opinion leaders, maintaining rather fixed beliefs while simultaneously helping to guide public opinion.

Data was retrieved by performing two searches on both Lexis-Nexis and the *St. Louis Post-Dispatch* archives database. Key words included “agricultural,” “biotechnology,” and either “editorial” or “letters to the editor.” Results revealed a total population of 78 editorials and 46 letters to the editor. Editorials and letters to the editor were then separately categorized in a chronological manner. Starting with the first result, every third editorial and every other letter to the editor was selected for inclusion in the study sample. Items that were actually hard news articles were removed, leaving a total sample size of 22 editorials and 23 letters to the editor.

The sample was qualitatively reviewed, and each argument made in an editorial or letter to the editor was categorized into the following frame typology, adapted from Gamson and Modigliani (1989) and used in previous research on media coverage of biotechnology (Nisbet & Lewenstein, 2002; Priest & Eyck, 2003):

- 1) *Progress*: celebration of new development, breakthrough; direction of history; conflict between progressive/conservative-reactionary
- 2) *Economic prospect*: economic potential; prospects for investment and profits; R&D arguments

- 3) *Ethical*: call for ethical principles; thresholds; boundaries; distinctions between acceptable/unacceptable risks in discussions on known risks; dilemmas
- 4) *Pandora's box*: call for restraint in the face of the unknown risk; the opening of flood gates warning; unknown risks as anticipated threats; catastrophe warning
- 5) *Runaway*: fatalism after the innovation; having adopted the new technology/products, a price may well have to be paid in the future; no control any more after the event
- 6) *Nature/nurture*: environmental versus genetic determination; inheritance issues
- 7) *Public accountability*: call for public control, participation, public involvement; regulatory mechanisms; private versus public interests
- 8) *Globalization*: call for global perspective; national competitiveness within a global economy

Each incident of a frame was tallied and then counted in order to gauge the percentage of each frame's presence. Finally, the overall tone of each editorial or letter to the editor was qualitatively assessed according to whether it mentions risks, mentions benefits, or reports controversy.

Discussion

Frames

General findings surprisingly suggest that "public accountability" was the most commonly employed frame category in both editorials (23%) and letters to the editor (31%). In editorials, "public accountability" was followed closely by the "economic prospect" (20%), "ethical" (19%), and "progress" (17%) categories. Other frames present in editorials include "globalization" (10%), "Pandora's box" (7%), "runaway"

(3%), and “nature/nurture” (<1%). In letters to the editor, however, the second most common frame was “globalization”(19%), which was then followed by “economic progress” (17%), “ethical”(14%), and “progress” (12%) frames. All other frames, including “runaway,” “nature/nurture,” and “Pandora’s box,” were each present in less than 1% of the letters to the editor.

Public Accountability

The general sentiment behind the "public accountability" frame is that questions need to be asked on the subject of agricultural biotechnology. This frame encourages public participation on all levels of the biotechnology debate, and on the surface, its ubiquity on the editorial page indicates that the *Post-Dispatch* is at least attempting to achieve Priest's notion of information equity. After all, editorials abound with statements such as this:

"We need rational regulatory mechanisms--local, national, and global--that ensure human health and environmental safety. We need trade regulations that preserve economic stability. We need more public discussion of biotechnology in the U.N. and at the local library" ("Irresistible Force," 1999, March 1, p. D14).

Editorials call for an unbiased forum to address increasing concerns about industrial agriculture and a regulatory process that inspires confidence among the public. They stress the need for thoughtful dialogue among disinterested parties. The editorial comments, however, are often qualified by expressions of overall support for the inevitable promise of biotechnology:

"What we need is a basic scientific education to help us learn more of the brilliant promise of biotechnology" ("Irresistible Force," 1999, March 1, p. D14).

However much public involvement is encouraged, it is often presented as a foregone conclusion that genetically engineered foods hold more potential than they do risk and that their shortcomings could easily be corrected. Thus, in many cases, "public accountability" frames merged with "progress" frames in editorials. This pattern gives the impression that the *Post-Dispatch* grants extensive lip-service to the need for public involvement in the debate over biotechnology, but in the end, the major decisions have already been made: Genetically engineered foods are a beneficial inevitability, so long

as they are properly regulated. "Public accountability" frames found in letters to the editor, however, were much more overtly critical of the biotechnology industry and focused more heavily on private versus public interests:

"As a Green environmentalist, I am deeply skeptical regarding corporate claims of primary concern for the world's hungry. It seems terribly convenient, for example, that as a chemical company, Monsanto developed pesticides that adversely affected crops, and as a biotech company, engineered plants to resist those very same pesticides. Is this what they consider "sustainable" agriculture? I imagine it does help sustain profits" (Lampe, 1998, August 7, p. B6).

One reader critiqued a politician's promotion of Monsanto, noting that in a free-market economy, the government is supposed to stay out of private enterprise. The main exception to this focus on private versus public interests within the "public accountability" frame was found in letters to the editor written by representatives of Monsanto. One letter, entitled, "Monsanto pledges dialogue on biotechnology" seems to appropriate the "public accountability" frame for public relations purposes:

"I believe very strongly that the biotechnology industry, and my company, Monsanto, specifically, have an equally important role in furthering the open discussion about this technology. In November, I made a series of public commitments on behalf of Monsanto called the New Monsanto Pledge. The pledge embodies our commitment to everyone who cares about agriculture throughout the world, and includes most prominently a commitment to dialogue..." (Verfaillie, 2001, February 8, p. B6).

But if the majority of the letters to the editor are any indication, many members of the public maintain a fundamental distrust for the biotechnology industry that cannot simply be solved through appeals for public dialogue. In the face of such outward criticism for biotechnological developments, Monsanto's pledge smacks of insincerity, because it is clear that those on the other side of the ideological divide in the biotechnology debate are not welcome to participate.

Economic Prospect

"Economic prospect" represented the second most commonly used frame in editorials. Topics discussed under the frame included general economic benefits, regional impacts, and costs, especially due to international skepticism towards biotechnology.

"Economic prospect" frames highlighting benefits commonly overlapped with progress frames, as indicated by the following passage:

"If golden rice is embraced by farmers in poor countries, analysts predict it could help clear the way for wider acceptance of other bioengineered foods from which Monsanto and others could reap huge profits. If it can save lives and sight, without disrupting traditional agricultural practices and ecosystems, the promise of biotechnology will have begun to be realized" ("Golden Rule," 2000, August 8, p. B6).

Editorials focusing on regional economic impacts associated with agricultural biotechnology included discussions of Monsanto's merger with a pharmaceutical firm, the economic implications of Monsanto's "technology protection system," or "terminator technology," Monsanto's general business strategy, and competing business interests between Anheuser-Busch and Missouri's rice industry, among others. Most interestingly, however, many "economic prospect" frames overlapped with "globalization" frames and focused on the potential for economic loss in international markets. Europe in particular was often framed as a fear-mongering spoiler for American business interests:

"Europe's attitude is slowing the spread of a very useful technology, much of it developed in St. Louis. Nations elsewhere are wary of adopting GM crops for fear of harming their European markets" ("Heart Healthy," 2005, December 3, p. A45).

Letters to the editor focused far less on "economic prospect" frames than editorials. Two, however, largely did, and they highlighted regional incentives. It is worth noting that several of the letters to the editor were written by farmers or individuals who grew up on farms, and their comments consistently contradicted a claim commonly made in editorials--that agricultural biotechnology is in the farmer's economic interest. This position is apparent in editorial statements such as this:

"Cotton, long the most-sprayed crop, has been implanted with a pesticide-producing gene that enables American farmers to increase their yields and profits, while reducing their use of toxic pesticides by about two million pounds annually" (Jacobson & Jaffe, 2003, April 23, p. B7).

Contrast this perspective with that of a reader who wrote in:

"Having grown up on a potato farm, I witnessed the inexorable economic power of industrial agriculture and so can attest to the destructive pressures it brings to bear on small-scale, independent production, a pressure that will only be intensified by genetically engineered seed" (Trevelline, 1999, January 9, p. 36).

It therefore appears that without contributions from readers, nothing close to a full discussion on the economic impacts of agricultural biotechnology would occur on the editorial page of the *Post Dispatch*. Perhaps in order for Priest's notion of information equity to occur in the realm of economic prospect, *Post-Dispatch* editorials should give voice to the economic interests of individual farmers in addition to the biotech industry.

Globalization

The “globalization” frame was the second most commonly used frame in letters to the editor and was much less employed in editorials themselves. In letters to the editor, the frame was occasionally used to stress the potential of agricultural biotechnology to reduce world hunger. That sentiment is typified by the following passage:

“The institute’s main focus concerns the developing world, where as many as 150 million children, or one out of four preschool children, may be malnourished in 2020. Collectively in these countries, food production is unlikely to keep pace with increases in the demand for food by growing populations. Thus, appropriately managed and regulated genetic engineering can offer these people great hope by increasing crop yields, reducing food costs and improving nutritional quality of food” (Pinstrup-Andersen, 1999, June 6, p. B2).

More commonly, however, views expressed by readers questioned the reality of this hope for the developing world, suggesting the arrogance of seed companies and international organizations that claim to know what is best for peasant farmers:

“The present state of U.S. agriculture, dominated by industrial production, explains in large part why the rebellion against genetic seed is heard only overseas where small-scale, independent production still exists to a certain extent. Asia and Africa are well acquainted with the destructive power of high-tech agriculture” (Trevelline, 1999, January 9, p. 36).

In editorials, the “globalization” frame was applied to discussions of national competitiveness within a global economy. This occurred primarily in editorials that framed Europe as a spoiler, as previously mentioned. Other editorials highlighted biotechnology’s promise to feed a hungry world. One piece, entitled, “Golden Rule,” merged this theme with both the “progress” and the “economic prospect” frames:

“From the beginning, supporters have touted the potential of bioengineered foods to feed the world’s starving millions. With its bold announcement [to give away patent rights on genetically modified rice] last week, Monsanto took an important step toward realizing that promise...Before golden rice begins filling the bellies of starving children, governments often skeptical of Western intervention--and bioengineered foods in

particular--will have to permit its planting. It will likely be several years before the rice is in widespread cultivation. By then, several million additional children will have died and more than half million others will have been blinded by a lack of Vitamin A." (2000, August 8, p. B6).

Others, however, did present international opposition to biotechnology more legitimately by contrasting corporate claims with global perspectives:

"Monsanto and its Swiss-based rival, Novartis,...say such products hold the promise of a better future for the poor in developing countries. There, crops modified to produce higher yields could feed more hungry people on shrinking amounts of arable land...[But] developing countries don't want to be dumping grounds for foods with untested new gene traits, and they resent American pushiness" ("Irresistible Force," 1999, March 1, p. D14).

In sum, editorials only occasionally acknowledged a global critique of biotechnology. More often, they briefly stressed the need for global involvement through "international working partnerships" on agricultural change. Overall, the "globalization" frame was infrequently applied in editorials and was not used to express overt opposition to biotechnology, as occurred in letters to the editor.

Ethical Concerns

The "ethical" frame was the third most frequently applied frame in editorials and the fourth most commonly used frame in letters to the editor. The frame was typified by calls to (or questions on how to) balance the benefits and risks of biotechnology:

"Bioengineered crops have been around for years, but a bioengineered animal for human consumption? That was a new one. Not surprisingly, it raised serious questions: Is it safe to eat? What are the risks of raising them? Most vexing, how do we know?...How much fundamental uncertainty is acceptable? Purists will insist the answer is none. That's not realistic. There is uncertainty in every aspect of life, especially regulatory reviews. The real question, then, is where we draw the line" ("Brave New Fish," 2002, September 16, p. B6).

Issues relating to professional, or corporate, ethics also fell under the ethical frame and were addressed in editorials but less frequently. In some cases, professional ethics themes overlapped with "economic prospect" frames as in discussions of Monsanto's corporate responsibility to respectfully address critics' concerns:

"...Monsanto can't shrug off as mere technophobes those who decry killer corn or its soon-to-be-acquired infertile "terminator" seed technology" ("Monsanto," 1999, May 23, p. B2).

“Ethical” frames employed in letters to the editor were more likely to ask bigger questions about the overall efficacy and inevitability of agricultural biotechnology. They went beyond risk and benefit analyses of the technology to pose questions outside the parameters of debate in editorials. Letters suggested that overpopulation and overconsumption were in fact the real problems and that biotechnology development was a mere band-aid solution that would ultimately lead to further environmental degradation. Perhaps, readers insinuated, answers to major global health problems lie in basic family planning and health care and in access to safe food and water, not in a science laboratory:

“Science will always have a logical, factual explanation to dismiss the negative impact of some technological advancements. Will science have an excuse when natural and environmental disasters are out of control? Can Monsanto manufacture a brand new world out of a test tube?” (Beliz, 1999, December 12, p. B2).

Thus, letters to the editor were not only more likely to offer a scathing critique of biotechnological developments, but they also presented a broader, more radical agenda, questioning the ethical foundation of the technology.

Progress

The “progress” frame was the fourth most commonly used frame in editorials and the fifth most frequently applied in letters to the editor. As mentioned in previous sections, the frame often overlapped with complementary frames such as “economic prospect” and “globalization.” The frame was usually used in editorials concerning environmental or health benefits associated with biotechnology:

“Monsanto scientists think they are about five years away from producing soy genetically modified to contain more Omega 3 acids, which improve heart health and may have other health benefits” (“Heart Healthy,” 2005, December 3, p. A45).

Letters employed the “progress” frame far less frequently, and when they did, they expressed similar environmental and health benefits:

“By genetically altering crops to need less water and fertilizer, we could lower food costs. In Third World countries where irrigation is inadequate and there are no fertilizers, it could help their economy and also help to feed the people who are going hungry. That could

help the 850 million people who are going hungry around the world. We can reduce the amount of nutrients needed in the topsoil to grow the crops, which means that we can grow more crops without wearing out the soil as much" (Serber, 2000, February 6, p. B2).

Pandora's Box, Runaway, and Nature/Nurture

The remaining frames were infrequently used. Mild "Pandora's box" frames sometimes overlapped with "ethical" frames that included questions of "what if?" Often, the sentiment behind the "Pandora's box" frame was overtly rejected and delegitimized as based more on fear than fact, as indicated by the following editorial passage:

"...The brewery's threat to boycott Missouri's rice crop is an overreaction to a theoretical hazard. The brouhaha in the Bootheel shows the need for reasonable, science-based rules to assure safety in the new business of 'biopharming'" ("Hold Your Horses," 2005, April 15, p. C8).

Only one editorial, which was written by the "pure food" campaigner, Jeremy Rifkin, was completely structured around the "Pandora's box" frame. Rifkin states, "Critics worry that seeding farmland with transgenic food crops could spread genetic pollution and damage the biosphere. The critics are right" (1998, July 19, p. B3). He goes on to detail particular aspects of biological devastation to come. Overall, however, these concerns were largely downplayed and were more frequently brought up only briefly, presumably in attempt to present a 'balanced' picture of the biotechnology debate.

The "runaway" frame was employed even less often in both editorials and letters to the editor. The frame guided part of one editorial that reported how StarLink corn, a GM crop approved for growing for animal feed but not for human consumption, was accidentally mixed with other corn. The sentiment guiding the frame is typified by the statement, "It is possible that traces of StarLink corn from 9 million bushels that have already left farms will show up for years to come in any corn product, from cornflakes to frozen corn dogs" ("Corn Bites," 2000, October 21, p. 34). Even still, risks were downplayed--taco shells were "easily-recalled," and the risk of serious allergic reactions was "believed to be small." The "runaway" frame was likewise occasionally used in discussions regarding a study that found monarch butterfly caterpillars died after eating pollen from bioengineered corn. An organic grower wrote in and expressed the following concerns:

“We have already realized ecological damage wrought by GE. Iowa State University’s recent study on Bt and the monarch butterfly confirms Cornell researchers’ findings that Bt pollen is lethal to feeding monarch caterpillars. Controls on GE’s entry into our food supply do no work as seen in the notorious GMO taco shell fiasco. The risks of further catastrophic effects of genetic engineering are too great to permit further marketing of products that we do not need” (Renard, 2001, January 6, p. 32).

“Runaway” frames employed in coverage of the Bt study led Monsanto to then sponsor “public accountability” frames in attempt to assure a weary public. In a letter to the editor, co-president Robert T. Fraley wrote:

“...Monsanto takes the safety and performance of our products seriously. The benefits and environmental safety of Bt corn have been carefully studied and reviewed by scientists and approved by government agencies around the world...We are working with academic experts at Cornell University and Iowa State University to develop research that will determine what relevance these laboratory results may have...” (1999, June 6, p. B2).

Finally, the “nature/nurture” frame was used least frequently of all. The author presumes that this frame category proved more relevant for previous research which examined coverage of all applications of biotechnology, including debates over genetics and human cloning. Even still, a few comments, especially in letters to the editor, captured the sentiment of the frame. One reader, for instance, wrote, “...We doubt that the use of genetically modified crops will change [conventional agricultural] methods, as they are simply an extension of the engineering approach to agriculture and the philosophy that man should dominate nature” (Simonson, 2000, January 16, p. B2).

Tone

As the above discussion makes evident, the overwhelming majority of editorials did report controversy involving agricultural biotechnology. Very few failed to acknowledge both the potential risks and benefits associated with the technology. Letters to the editor, however, were more likely to address risks than benefits. What this pattern suggests is that despite the prominence of the “public accountability” frame in the editorial pages of the *Post-Dispatch*, many readers continue to feel that their perspectives are not being represented by the paper. Moreover, letters to the editor were far more likely to question the entire ideological foundation of agricultural biotechnology and to present radical alternatives to the technology. In other words,

readers thought big, whereas editorial writers thought small. An editorial reporting the potential health benefits associated with genetically engineering soy to contain more Omega 3 acids, for instance, failed to offer the rather commonsensical alternative view that perhaps we should eat more foods that are naturally high in Omega 3s rather than artificially add them to highly processed foods (“Heart Healthy,” 2005, December 3). Another editorial focused on GE rice grown to produce anti-diarrheal drugs and its potential to reduce childhood mortality rates in developing nations (“Hold Your Horses,” 2005, April 15). The writer neglected to mention the merits of securing a safe water supply worldwide. In sum, editorial writers almost consistently failed to recognize that many global problems perhaps have nontechnical solutions. Readers, however, were more likely to imagine that “another world is possible.” They made broader connections, questioning the link between biotechnology and overpopulation, and were more likely to defend the alternative use of small-scale organic farming methods.

Conclusion

General findings show that the “public accountability” frame predominates in discussions of agricultural biotechnology on the editorial pages of the *Post-Dispatch*. Controversy is frequently reported, but radical alternatives are rarely addressed in editorials themselves. The onus is largely on readers to bring a full range of issues and perspectives to light via their letters. These results indicate that the *Post-Dispatch* is attempting to achieve Priest’s definition of information equity. Calls for public accountability commonly address the need to include the voices of disinterested nonscientists in the biotechnology debate. But calling for a broader range of discourse is not the same as actually including it. The voice of the average citizenry remains relatively restricted to letters to the editor and therefore may not be perceived as equally legitimate and credible opinion. Thus, achieving information equity within the letters to the editor section does not discount the need for greater information equity in editorials themselves.

Clearly, though, a broader range of issues related to biotechnology are being discussed now than have been in the past. This study adds to the literature, because it shows that the once dominant “progress” frame has greatly diminished, while it supports previous findings that members of the lay public bring a wider set of concerns to discussions of

biotechnology than is found in general print media. Further, whereas previous research has employed quantitative methods to the task of researching media coverage of all applications of biotechnology, this study uses qualitative methods to look only at discourse on agricultural biotechnology on the editorial pages of the *St. Louis Post-Dispatch*. This research, therefore, provides a much-needed in-depth look at the context and nuance associated with framing the biotechnology debate in print media.

The main limitation of this study is equal to its strength. While textual analysis allows the researcher to pick up on subtle details within the text, it is a subjective approach that sacrifices accuracy. It is therefore quite possible that another researcher could review the exact same sample and come to a different conclusion than that stated here. Future research should use quantitative methods to examine Post-Dispatch coverage of agricultural biotechnology. In addition, sampling errors tainted the accuracy of the systematic sampling method. A few items turned out to be news articles rather than editorials and were therefore removed from the sample, thus detracting from the overall generalizability of the results. Future qualitative research on agricultural biotechnology should focus on fewer texts that center around a moment of critical discourse, such as the StarLink recall, the Bt study, or the debate over Monsanto's "terminator technology." Finally, this study did not consider the role and influence of gatekeeping in the media. Gatekeeper studies suggest that what consumers of the media ultimately digest is the final product of a filtering process by which gatekeepers determine what news to print and what news to omit. Thus, the range of opinion found in published editorials and letters to the editor may not in fact reflect the full scope of perspectives among editorial and letter writers themselves.

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