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Applying the theories of agenda building and frame building and previous work related to the shared negotiations between sources and journalists in constructing news dramas, this article examines the role of the mass media in the evolution of the stem cell controversy. How does a scientific issue gain, maintain, or lose political and media attention? What forces combine to emphasize certain dimensions of an issue over others? Using data from a content analysis of stem cell–related articles appearing between 1975 and 2001 in the *New York Times* and the *Washington Post*, the authors analyze patterns of media attention, media framing, and media sourcing across stages of scientific, political, and policy development.

Keywords: *agenda building; agenda setting; framing; news narratives; news dramas; news coverage; science writing; science journalism; biotechnology; stem cell; cloning*

For more than four decades, scientists have focused on a unique set of human cells called *stem cells*, utility and repair units of the body that play a key role in the maintenance and regeneration of organs and bodily tissues throughout life. Since the 1960s, research has predominantly used stem cells taken from adult tissue, notably from bone marrow and later umbilical cord blood. In 1998, when stem cells from human embryos were isolated for the first time, scientists, medical advocates, and press accounts were quick to speculate about the possibility of advances in the treatment of damaged tissues caused by injuries and life-threatening diseases such as cancer, diabetes, Alzheimer's disease, and Parkinson's disease. Despite the great promise of human embryonic stem cells, the

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emerging biotechnology research was also greeted with considerable social resistance from pro-life interests and some policy makers, with the issue rising to the top of the U.S. political agenda during the summer of 2001.

In this article, we outline the dimensions of the scientific and moral controversy surrounding the stem cell debate and examine the sometimes overlooked but central role of the mass media. How does a scientific issue gain, maintain, or lose political and media attention? What forces combine to emphasize certain dimensions of an issue and controversy over others? Why did stem cell research rise to the top of the U.S. political and media agenda, yet other scientific controversies have never attained similar levels of attention? In seeking answers to these questions, we apply the theories of agenda building and frame building along with previous work related to the shared negotiations between sources and journalists in constructing news dramas.

Scientific, Political, and Policy Background

Before discussing and analyzing the role of the mass media in the stem cell controversy, it is first necessary to outline the scientific, political, and policy background of the issue. The stem cell controversy follows closely cycles of policy development that Maynard-Moody (1992, 1995) has previously identified in relation to the 1980s debates over fetal transplantation research. Historically, deliberations over biomedical research protocols have been contained within administrative policy arenas such as the National Institutes of Health (NIH), the Department of Health and Human Services (DHHS), and the Food and Drug Administration (FDA). These administrative policy arenas afford special privilege to the "expertise" of the scientific community, enabling mostly insular decision making by administrators, scientists, and independently constituted scientific advisory boards, often to the exclusion of the general public or other interests (Maynard-Moody 1992, 1995).

In contrast, the overtly political arenas of Congress and the White House are open to a greater diversity of interest group involvement. In these institutions, the scientific community holds less influence, and arguments based on morality often win out over instrumental or rational values. Debates that occur within the context of these overtly political institutions receive considerably greater attention from the media and the general public. The exclusion of certain moral values within the debates taking place in administrative settings combined with the dominance of the scientific community often forces opponents of scientific research to attempt to move debate to more overtly political arenas. After some deliberation, however, Congress and/or the presidency ultimately prove inadequate for handling certain technical decisions, and policy is delegated back to the administrative context (Maynard-Moody 1992, 1995).

This cycling of contestation across administrative and overtly political arenas offers a framework for understanding the evolution of the stem cell controversy. In Table 1, we outline and describe four stages of development relevant to stem cell research as a background for understanding our discussion and analysis related to media coverage.

Media Coverage and the Stem Cell Controversy

The mass media have played an integral, interactive role within scientific controversies generally and the stem cell debate specifically. As mentioned at the outset of this article, the importance of media coverage in relation to science and technology controversy can be understood from a theoretical understanding of the forces that shape media coverage and how media coverage then interacts with the policy process.

Agenda Building and Frame Building

The mass media comprise the principal arena within which scientific controversies and issues come to the attention of decision makers, interest groups, and the public. Not only do the media influence the attention of competing political actors and the public but the media also powerfully shape how policy issues related to science and technology controversy are defined, symbolized, and ultimately resolved.

In a "mediated democracy," the events that take place in the policy sphere and the groups that compete in the political system are not only mirrored (or covered) in the media but also shaped by the media (Bennett and Entman 2001). The mass media is itself a political institution, having direct contact with policymakers, selecting and sampling from a range of possible news items and sources, often leading political actors toward actions that are in anticipation of the agenda and nature of news (Cook 1998). In an "age of press/politics," there is rarely a political decision that is made that does not have the media in mind (Kalb 1992).

The stakes are high in relation to the media strategy of various competing interests. If an interest can control media attention to an issue, then it has succeeded in controlling the media and public agenda. Moreover, when an issue does appear in the media, if interests can define their stand as well as the alternatives available for discussion, then they have "framed" the situation in more winnable terms, delimiting the arguments the opposition can make and screening them off from participation (Berkowitz 1992). The concept of a frame refers to a central organizing idea or story line to a controversy that provides meaning to an

Table 1
Stages of scientific, policy, and political development

Stage	Circa	Dominant Policy Arena	Events
Bone marrow and gene therapy research	1961 to 1993	Administrative	Scientists and doctors begin work with stem cells derived from bone marrow in 1961. In the 1980s, umbilical cord blood is introduced as a new adult stem cell source. Applications include treatment of cancer and gene therapy. Scientists remain uncertain about many aspects of the research. Work on animal embryos during the 1980s and early 1990s leads to the popular belief among scientists that embryonic stem cells may hold greater potential for research and applications than adult stem cells. Existing guidelines related to fetal tissue, however, shroud human embryo research in legal ambiguity. In 1993, immediately after taking office, President Clinton instructs DHHS to lift a ban on fetal tissue research. NIH convenes the Human Embryo Research Panel (HERP) to examine funding of human embryo research (Johnson 2001).
Ban on human embryo research	1994 to 1997	Administrative	In 1994, the HERP recommends that it would be ethical to create embryos for research purposes. Preempting the report, President Clinton declares that federal funding cannot be used to support the creation of human embryos for research purposes. In response, NIH determines that it can fund research that uses "surplus" embryos. Before implementation, however, Congress passes a rider that bans funding of any research that destroys human embryos, regardless of their surplus nature. In 1995, President Clinton establishes the National Bioethics Advisory Commission to provide broad, nonbinding recommendations related to the ethical conduct of biomedical research (Johnson 2001).

(continued)

Table 1 (continued)

Stage	Circa	Dominant Policy Arena	Events
Embryonic stem cell discovery, regulatory debate intensifies	1998 to 2000	Administrative shifting toward overtly political	In February of 1998, two teams of privately funded university scientists successfully isolate stem cells from human embryos and human fetuses. In January of 1999, the DHHS releases a legal opinion that current law prohibiting the use of HHS for human embryo or fetal research would not apply to human stem cell research. In response, 70 members of Congress send a public letter to the DHHS opposing the legal ruling. Despite political opposition, in December of 1999, the NIH publishes guidelines for stem cell–related research, and an estimated fifty thousand comments are delivered during the public comment period. In Congress, opposition to the DHHS' actions threatens to hold up passage of FY 2000 appropriations, as GOP conservatives propose amendments to the funding bill that would restrict stem cell research that are eventually dropped. In August of 2000, during the heat of the presidential race, the NIH releases finalized guidelines, and the NIH begins accepting funding applications for research immediately upon publication. Bush announces his opposition to funding guidelines (Johnson 2001).
Presidential controversy	2001	Overtly political	*Spring.* Upon entering office, Bush is presented with an agenda from pro-life organizations that includes a ban on funding for embryonic stem cell research.[a] In March, Bush nominates Gov. Tommy Thompson to head DHHS, and Thompson states in confirmation hearings that he supports stem cell funding. Several prominent pro-life GOP members of Congress announce their support for funding.[b] Lobbying intensifies on both sides of the debate, with the National Conference of Bishops and pro-life groups on one side and pro-research advocacy groups and celebrities on the other. Pending additional directives from the White House, the NIH postpones its April 15 review of funding applications.[c]

Table 1 (continued)

Stage	Circa	Dominant Policy Arena	Events
Presidential controversy	2001	Overtly political	*Summer.* The administration is depicted by Thompson as deeply divided on the issue, with Bush advisor Karl Rove advocating a ban as a way to court Catholic voters.[d] Pro-life groups dispute the need for embryonic research, claiming that adult stem cells hold equal potential. In July, GOP Senator Bill Frist announces his support for research and releases a plan that is ultimately credited with influencing Bush's decision.[e] The House passes legislation banning both reproductive and therapeutic cloning.[f] The same month, in a Bush visit to the Vatican, the pope voices his opposition to stem cell research.[g] Also in July, the Jones Reproductive Institute announces the derivation of stem cells from human embryos created and destroyed specifically for research purposes.[h] On August 9, in a nationally televised speech, Bush announces that federal funds will be used to support research on human embryonic stem cells but would be limited to sixty existing stem cell lines, delegating the specifics of funding to the NIH and appointing bioethicist Leon Kass to head a bioethics advisory commission to consult on the issue.[i] Scientists, members of Congress, the media, and research advocates dispute Bush's claim that sixty stem cell lines are available and adequate for research. Uncertainty also exists over patent and access issues to the stem cell lines.[j] *Fall.* A September 11 scheduled hearing is postponed due to the World Trade Center and Pentagon attacks. In November, Advance Cell Technology's announcement that its scientists had successfully cloned human "embryo-like" cells for purposes of stem cell extractions draws renewed attention to proposed Senate legislation related to cloning.[k]

Note: "Administrative" refers to funding and regulatory agencies, independent scientific advisory panels, and ethics panels. "Overtly political" refers to Congress and/or the presidency. The "dominant" policy arena was determined by a qualitative assessment of the central locus of deliberation and decision making. In

(continued)

Table 1 (continued)

the first two stages, although Congress and the president did take action related to stem cell research, most of the policy action took place within administrative contexts. In the third stage, 1998 to 2000, action and attention from Congress and the presidency increased; however, it still remained mostly in reaction to decisions made in the administrative policy context. The table is meant as a guideline and heuristic for understanding the scientific, political, and policy development of stem cell research and for comparisons to trends in media coverage. It is not meant to be a complete summary of the issue's complex history, a project beyond the proper focus and scope of the current study. DHHS = Department of Health and Human Services; NIH = National Institutes of Health.

a. R. Weiss, "Fetal Cell Research Funds Are at Risk," *Washington Post*, Jan. 26, 2001:A3.
b. D. Milbank, "In Bush Cabinet, It's Both Advise and Dissent," *Washington Post*, Mar. 10, 2001:A1.
c. R. Weiss, "Bush Administration Order Halts Stem Cell Meeting," *Washington Post*, Apr. 21, 2001:A2.
d. C. Connolly and R. Weiss, "Stem Cell Research Divides Administration," *Washington Post*, June 12, 2001:A8.
e. R. Weiss and A. Goldstein, "Frist Backs Stem Cell Funding," *Washington Post*, July 19, 2001:A1.
f. R. Weiss and J. Eilperin, "House Votes Broad Ban on Cloning," *Washington Post*, Aug. 1, 2001:A1.
g. M. Allen, "Pope Tells Bush Views on Embryos," *Washington Post*, July 24, 2001:A1.
h. R. Weiss, "Scientists Use Embryos Made Only for Research," *Washington Post*, July 8, 2001:A1.
i. A. Goldstein and M. Allen, "Bush Backs Partial Stem Cell Funding," *Washington Post*, Aug. 10, 2001:A1.
j. D. Brown, "Stem Cell Decision Examined," *Washington Post*, Aug. 12, 2001:A8.
k. R. Weiss, "Mass. Firm's Disclosure Renews Cloning Debate," *Washington Post*, Nov. 27, 2001:A3.

unfolding of a series of events, suggesting what the controversy is about and the essence of an issue (Gamson and Modigliani 1989). Once an issue is framed or characterized early on in a debate by the media, it can be very difficult for policymakers or other interests to shift the image of the issue to another perspective (Linksy 1986; Schön and Rein 1994).

Recognizing the importance of media coverage in influencing policy outcomes, various competing political actors lobby the media to shape the attention and emphasis of coverage in ways that marshal support for their positions. Within this media agenda-building process (Berkowitz 1992) and media frame-building process (Scheufele 1999), competing interests operate as news sources, supplying strategically packaged news items and story information to journalists. Indeed, most stories are source generated (Gandy 1982), with some estimates identifying half or more of newspaper stories as source originated (Bennett 1990; Sigal 1973; Soloski 1989).

Certain types of interests, including government sources (Sigal 1973; Tuchman 1978), industry (Berkowitz 1992), and societal elites including scientists, doctors, lawyers, and celebrities (Cobb and Elder 1961), are likely to be more influential in setting the agenda and framing issues than others are. In previous studies of science controversies generally and biotechnology specifically, government officials, industry members, and scientists have dominated as sources in U.S. media coverage (Nelkin 1995; Nisbet and Lewenstein 2002). As a partial result, U.S. media attention to biotechnology has been driven mostly by

industrial and economic development of the technology, and coverage has historically been overwhelmingly positive, emphasizing frames of scientific progress and economic prospect. Only in the few instances of limited "crisis" related to biotechnology—including the announcement of the birth of the cloned sheep Dolly, the Monarch butterfly study, or the death of gene therapy patient Jesse Gelsinger—were nongovernment, nonindustry, and nonscientist sources such as religious interests, public interest advocates, or environmental groups able to receive significant coverage in the news (Nisbet and Lewenstein 2002).

Exceptions to traditional patterns of source influence, however, do exist. Most of these exceptions are outcomes of the professional orientations of journalists. As we will outline in the next section, source influence in the media agenda-building and frame-building process is attenuated in part by the preferences of journalists for dramatic news narratives (Bennett 2001; Cook 1998).

Negotiating Drama between Journalists and Sources

The way journalists and interests view their job and their relationship is the result of several forces that are in constant dynamic interaction. These interactions promote a shared culture between journalist and source that guides interactions, setting an unofficial set of ground rules (Berkowitz 1992), producing a "negotiation of newsworthiness" (Cook 1989, 1998), and a cooperative manufacture of news.

Of particular interest are journalists' preferences for storytelling. Journalists have a human tendency to prefer narratives to other forms of structuring information, as explaining complex events through stories is intuitively appealing and a natural human act (Bennett 1978). In fact, issues that receive the greatest media attention are those that are most easily dramatized or narratized. These news dramas emphasize crisis, the individual event over the past or future, and conflicts between personalities. Dramatized news downplays complex policy information, the workings of government institutions, and in-depth analysis of problems that provide background information and context (Bennett 2001).

"Drama-philia," or the attraction to drama, explains in part journalists' tendencies to frame news in terms of the episodic rather than the thematic (Iyengar 1994) and in terms of political strategy rather than substantive context (Capella and Jamieson 1997; Patterson 1994). In recent decades, market imperatives have reinforced preferences for dramatized news (Cook 1998), encouraging a surge in soft journalism coverage (Patterson 2001).

Bennett (2001) also describes journalists as relying on a limited stock of news plots and standardized news formats. When an event or new issue taps familiar themes from previous dramatic stories, journalists turn to these previously used story lines to recast actors and events in familiar relationships around the emerging issue. As part of the cooperative manufacture of news, sources recognize

journalists' preferences for drama and for familiar story themes and actively seek to formulate their message strategies to accent drama and familiar story formats.

Few studies have attempted to test theories of news narratives. Fishman (1980), in a participant-observer study, finds that if journalists can locate themselves within a continuing story, they are able to ascertain newsworthy moments and give larger meaning to passing events. Journalists construct an idealized "phase structure" that can be broken down into discrete units. News happens when the process moves from one of these phases to the next phase.

McComas and Shanahan (1999) observe that journalists construct narratives that use a specific temporal order of events to construct meanings. The specific frames that stories feature at any one particular time form a larger meta-narrative across time. Testing their assumptions with data derived from a content analysis of climate-change-related coverage, McComas and Shanahan show that the media's meta-narrative generally conforms to dramatic rules. Coverage of an issue begins with a crescendo of dramatic claims ("rising action") that attracts attention to the issue, peaks in coverage with efforts to solve the problem, and then declines in coverage during the denouement and resolution of the issue.

Dramatizing Biotech

Beyond the cloning announcements of 1997, biotechnology has never achieved considerable media attention in the U.S. context. In fact, Nisbet and Lewenstein (2002) report that even in 1997—biotechnology's peak year of coverage to date—cloning and other issues related to biotechnology still ranked rather modestly on the overall media agenda, gaining considerably less attention than major political issues such as gun control and welfare reform, popular culture events such as the deaths of Mother Teresa and Princess Diana, and even other science and technology–related issues such as nuclear energy and climate change.

In terms of drama and narrative, however, the stem cell controversy provided an abundance of familiar storytelling themes and dramatic elements that helped push it to the top of the media agenda during the summer of 2001. Embryonic stem cell research, able to be easily linked to genetic engineering and cloning, evoked vivid images from culture and history, a relationship not lost on various interests in opposition to research. These images, often used as sound bites in discourse by pro-life opponents, included references to playing God, Dr. Frankenstein, a brave new world, Faustian bargains, the Nazi Holocaust, as well as menacing adjectives such as *evil*, *murderous*, or *gruesome*. Competing interests in the stem cell controversy also played on familiar themes of tradition versus progress. If on one side of the debate was the image of a mad scientist experimenting on human embryos, on the other side was the notion of a religious zealot impeding scientific and social progress.

Journalists, much like the general public, have long had trouble coming to terms with the prospects of genetic engineering. Coverage of genetic engineering during the 1960s and 1970s has been characterized as using an "awe-and-mistrust" style of reporting, with journalists deferring to the technical authority of scientists but blending coverage with a fear and apprehension of possible social implications (Nelkin 1995; Van Diijk 1998). In this early coverage, journalists used a binary sourcing strategy that pitted the professional views of scientists against those of clergy. The first group is referenced as the advocates of scientific advancement, and the second group is appointed moral guardians of society (Van Diijk 1998). Today, journalists draw from a troika of characters, as bioethicists have been added to the mix, serving as neutral technical interpreters and moral arbitrators.

The controversy also evoked common themes from previous political controversies over abortion and fetal transplantation, with many of the same political interests again doing battle across a political minefield. Moreover, the timing of the stem cell controversy coincided with President Bush's first six months of office, setting the stage for familiar themes revolving around the implementation of campaign promises to influential supporters, anticipation of the president's first big political test in office, and the president grappling with moral dilemmas that accompany the burden of power. Indeed, former President Clinton's struggle with the issue of gays in the military offered a familiar dramatic backdrop for anticipation of Bush's ability to make good on campaign promises to a core constituency in the first months of his presidency.

The Current Study

To understand the evolution of media coverage of stem cell research over the past four decades, we chose to focus our analysis on several key research questions. As a point of comparison with the issue's scientific, political, and policy development, these research questions make reference to the stages outlined in Table 1.

Our summary of the literature indicates that variation in media coverage of stem cell research is the likely outcome of shifts in contestation across policy arenas from administrative to overtly political, the agenda-building activities of competing interests, and journalists' narrative considerations. This variation in coverage is a product of competing interests' attempts to push or keep stem cell research off the media and public agenda and journalists' own orientations toward the narrative cycle, increasing coverage of a story as it shifts from administrative policy arenas toward more dramatic decisions by prominent political personalities in overtly political policy contexts, allowing more dramatic frames to emerge and more familiar story formats to be applied.

The Nature of Media Attention

Our first set of research questions, therefore, deals with (1) the nature of the agenda-building process across stages of development, (2) the pattern of media attention relative to this agenda-building process, and (3) the pattern of media attention relative to the type of policy arena in which debate over stem cell research took place. Specific to media attention, we pose the following questions:

Research Question 1: What was the level of agenda-building activity related to stem cell research across its stages of development?
Research Question 2: How did media attention to stem cell research vary in relation to this underlying agenda-building process?
Research Question 3: How did media attention to stem cell research vary in relation to the policy arena in which debate took place?

Once Bush delegated the issue back to the NIH in August of 2001, we might expect that media attention would subside as the issue shifted back to administrative contexts. However, as outlined in Table 1, scientists, proponents of research, and their allies in Congress kept the issue on the political agenda, scheduling fall Senate hearings on the availability and nature of stem cell lines, and by openly questioning the Bush claims regarding the availability of sixty stem cell lines, ultimately forcing the DHHS to issue clarifications. Despite this continued political activity, the events of September 11 and the subsequent anthrax incidents were likely to limit media attention to stem cell research during the fall of 2001. Given these conflicting circumstances, it is unclear what we can expect relative to the level of media attention in the months following the August 2001 Bush decision. This leads to our fourth research question:

Research Question 4: What was the level of media attention to stem cell research in the months following Bush's August 11, 2001, announcement?

The Nature of Media Framing and the Negotiation of Drama

As we have previously reviewed, media attention is closely linked to media framing and the potential for drama. As outlined above, the greatest attention to stem cell research is expected to coincide with the stage of development that is most easily dramatized. Much of this dramatization is related to the framing devices that are pushed by sources as more dramatic grist for the journalist's storytelling mill and the relevance of previously used narrative themes that can be linked to emerging events. This focus on frames, the potential for drama, and storytelling themes leads to the following additional research questions:

Research Question 5: What were the most prominent frames in the coverage of stem cell research?

Research Question 6: How did the prominence of these frames vary in relation to stages of development?

Research Question 7: How did the use of familiar storytelling themes and dramatic metaphors vary across the stages of development?

Research Question 8: How did media attention vary in relation to these framing devices and the use of familiar storytelling themes and metaphors?

Finally, as an indicator of source influence, it is important to identify the competing interests that are covered in press accounts. Previous research has shown that coverage of science and biotechnology typically favors government, industry, and scientist interests. These sources for the most part are pro-technology and pro-research. However, this pattern of sourcing can be expected to shift in times of political contention. The 2001 debate over stem cell research mobilized a wide range of religious and pro-life interests and was at the top of the political agenda of members of Congress and representatives of the Bush administration. Given this unprecedented political concern with biotechnology, we pose our final research question:

Research Question 9: What were the most prominent sources in coverage across the last two stages of policy development?

Method

In exploring the above research questions, we chose to examine media coverage using quantitative content analysis, a method for the reliable comparison of the nature and variation in media coverage over time (Krippendorf 1980).

Sample

Using the news article as the unit of analysis, we ran a Lexis-Nexis keyword search to collect the population of articles in the *Washington Post* and *New York Times* related to stem cell research. This choice to focus on the elite national newspapers of record complements what other media analysts have observed: Stories tend to spread vertically within the news hierarchy, with editors at regional news outlets often deferring to elite newspapers and newswires to set the news agenda (Gitlin 1980; Rogers et al. 1991).

The *Times* and *Post* devote considerable resources to coverage of national politics, and both newspapers are national leaders in science and technology coverage, with a large and prestigious staff of science writers and editors. In particular, the *Times*'s weekly science section is regarded as an international model for quality, depth, and breadth of science coverage. Given their influence, both papers are primary targets of media lobbying by various political actors.

Although scientific and policy development related to stem cell research stretches back to 1961, the Lexis-Nexus database for the *Washington Post* and *New*

York Times is only indexed back to 1975, so our analysis is limited to a twenty-six-year period. All articles appearing between January 1, 1975, and December 31, 2001, with the key word *stem cell* in their full text were retrieved for analysis in this study. The search resulted in a population of 939 articles. During analysis, articles that were not substantially related to stem cell research, were duplicates, or were non-articles, such as content summaries for a newspaper edition, were discarded, resulting in a final population of 841 articles.

Coding Instrument

The coding instrument was developed across a period of several months. The researchers examined relevant articles in major newspapers and magazines, identifying common framing devices. Identification of framing devices was informed by reliance on previous content analyses of frames in coverage of politics and in coverage of science (Capella and Jamieson 1997; Durant et al. 1998; Iyengar 1994; McComas and Shanahan 1999; Nisbet and Lewenstein 2002; Patterson 2001).

In a test of face validity, a panel of graduate students and faculty in the fields of political communication and science and technology studies commented on an early typology of frames. The validity of the framing typology was further developed across a series of pilot studies that were used to train a team of three coders to apply the coding frame. In developing the framing typology, a classic measurement model approach was adopted that attempted to maximize inclusiveness of the full range of possible frames that might appear in coverage, not just the most frequently appearing (Bailey 1994; Nunnally 1978). The final eleven frames are described in detail in Table 2. Some frames, including strategy/conflict, ethics/morality, anecdotal personalization, and scientific uncertainty, have stronger elements of drama than other frames, such as scientific background or policy/regulatory background that tend to be more descriptive and technical in nature. Adopting a frame operationalization scheme from McComas and Shanahan (1999), each frame was coded as "not present," "present," or "outstanding focus/appearing in the lead."

In addition to the measurement of frames, the entire text of the article was examined by coders for the main focus of the article, type of stem cell source mentioned, and policy arena mentioned, and scored for the appearance or absence of each. The team of three coders was tested on a 20 percent probability sample of the population of *New York Times* and *Washington Post* articles. Using Krippendorf's alpha (Krippendorf 1980), a conservative measure that corrects for chance agreement among coders, reliability for each variable in our content analysis was an excellent .80 or higher.

During pilot studies and final coding, a keyword list was generated of commonly appearing pro-life interests, pro-research advocates, members of Congress, and bioethicists.[1] This list was further checked against policy documents,

Table 2
A framing typology for media coverage of stem cell research

New research (Rsch)	Focus on new stem cell–related research released, discovery announced, new medical or scientific application announced, clinical trial results announced. Includes government study, scientific journal article, scientific meeting paper, science-by-press-conference.
Scientific background (Sbkd)	Focus on general scientific or medical background of stem cell–related research or applications. Includes description of previous research, recap of "known" results and findings, description of potential medical applications/uses.
Ethics and/or morality (Ethics)	Focus on the ethics or morality of stem cell–related research, focus on religious perspectives or "traditional" values, emphasis on bioethicist(s) perspectives, discussion of the consequences of impeding scientific progress, discussion of the nature and/or value of human life.
Political strategy and/or conflict (Strat)	Focus on the strategy, actions, or deliberations of political figures, presidential administrations, members of Congress, other federal or state officials or government agencies, and the lobbying of interest groups in relation to stem cell research. Focus here is not on specifics, context, or background of policy or legislation but rather on maintaining, winning, or losing political and constituent support, or influencing the nature of political/policy decisions.
Policy and/or regulatory background (Policy)	Focus on regulatory rules for stem cell–related research/framework for regulation/jurisdiction or oversight over research, advantages and/or disadvantages of proposed policy regimes. Includes discussion of legality of policy or research, international scientific regulatory panels or international agreements related to biomedical research, and European policy/regulation.
Market/economic prospects or international competitiveness (Market)	Focus on the significance of stem cell research for stock prices, growth/development of industry or company, reaction of investors, development of products for market, implications for domestic economy, global competitiveness for the United States, U.S. companies, or a potential scientific "brain drain."
Patenting, property rights, ownership, and access (Patent)	Focus on ownership of stem cell research techniques, patenting of stem cell–related procedures or products, ownership or access to stem cell lines.
Scientific/technical controversy or uncertainty (Uncertain)	Focus on scientific uncertainty over efficacy or outcomes of stem cell–related research and applications, uncertainty over when stem cell–derived applications will be available or in use, dispute over medical or scientific advantages of embryo stem cells versus other types of stem cell sources, and uncertainty over number or viability of stem cell lines.
Public opinion (Opinion)	Focus on the latest poll results, reporting of public opinion statistics, general reference, and discussion of levels of "public support" or general reference to "public opinion" or the "battle" or contest for public opinion.

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Table 2 (continued)

Political localization (Localiz)	Focus on reaction or opinion specifically from an "average man on the street" or an "outside the beltway" nonexpert or local community leader. Nonpatient. No apparent political ties to research.
Anecdotal personalization (Anecdot)	Focus on a patient, or the families/friends of a patient, who is receiving stem cell–related treatment, suffering from stem cell–linked disease or affliction, or could benefit from stem cell research. Focus here is on personal narrative or testimonial.

Note: Parentheses contain abbreviations used in subsequent tables related to frames.

press releases, and Web sites that featured or referenced the official positions of various interests involved in the debate. Full text Lexis-Nexus searches were then performed that used the keyword strategy "stem cell and "actor's name" for articles appearing in the *New York Times* and *Washington Post* from January 1, 1998, to December 31, 2001. The results of these searches were then compared against the articles and coding results of the originally derived and cleaned population of articles that had been entered into an SPSS database. The presence or absence of these actors for each article, or unit of analysis, was then recorded in the database. This method, since it is based on computer-based text searching, allows for almost perfect reliability, reducing elements of human coding error. A similar method of keyword search strategies was used in relation to references and metaphors from science fiction and history and in relation to metaphors of "mass production" and "battle."[2]

Other Measures

Beyond the examination of articles in the *New York Times* and *Washington Post*, we also constructed an index of agenda-building indicators across the four stages of issue development outlined in Table 1. These indicators are potential sources of routine channel news, focusing events, or direct attempts to generate coverage. We chose indicators that were relevant to activity in the science community, in Congress, and among competing interest groups or decision makers.

For the indicators of science activity, we chose to look at the level of published scientific research. All English-language science articles archived through the ISI Web of Science database that contained the keywords *embryonic stem cell* or *embryonic germ stem cell* or *adult stem cell* or *hematopoietic stem cell* were tabulated. These specific technical/scientific terms were taken from a recent government review of the "state of the science" in relation to stem cells (DHHS 2001). As an indicator of congressional activity, we totaled all stem cell–related statements made in testimony before U.S. House and Senate committees and subcommittees as archived by the Federal News Service and searched via the Lexis-Nexus Congressional Universe using the full-text keyword *stem cell*. As an indicator of the media lobbying activities of various competing interests, we ran a full-text

keyword search *stem cell* of press releases distributed by the PR Newswire. The full text of these press releases are archived through the Dow Jones Interactive database back to 1988.[3]

Results

Since this study collected and coded a census of articles and a population of agenda-building indicators, our analysis and presentation of data do not require the use of inferential statistics. All relationships between variables reported are Spearman's rho correlations, the appropriate test of association for categorical data (Darlington 1990). We display our findings across the previously described stages of development, as this comparison is directly related to our theorizing regarding the role of policy arenas, agenda/frame-building activities, and events in shaping media attention and media framing.

Media Attention to Stem Cell Research

For our first research question, we were interested in the level of agenda-building indicators across stages of development. Figure 1 indicates that prior to 1993, the level of scientific output was fairly modest, accounting for slightly fewer than four hundred scientific articles across this eighteen-year period. From 1994 to 2001, however, the scientific output increased substantially. For example, in 1994, fewer than one hundred articles were published on the topic of stem cells, but by 1999, this output more than doubled to more than two hundred articles published. By 2001, research had more than tripled over 1994 levels, with more than three hundred articles appearing.

In terms of press releases, prior to 1998, very few appear. The number of press releases then jumped in 1998 and increased each year through 2000. In 2001, the number of press releases almost doubled from 2000 levels, an indicator of the increased mobilization by competing interests.

The level of congressional attention to stem cell research displays a similar trend. In reaction to the debate over embryo research funding, congressional attention first appears in 1995. Congressional attention then trailed off in 1996 and 1997. In response to the 1998 embryonic stem cell discovery, congressional attention increased, peaked in 1999, and then declined during the 2000 election year. In 2001, congressional attention increased sharply to its highest levels historically.

Our second and third research questions were specific to the variation in media attention to stem cell research relative to this agenda-building process and to the type of policy arena where debate took place. In this direction, we examine not only the number of articles appearing relevant to stem cell research but also the main focus of articles, the type of research mentioned, and the policy arena covered.

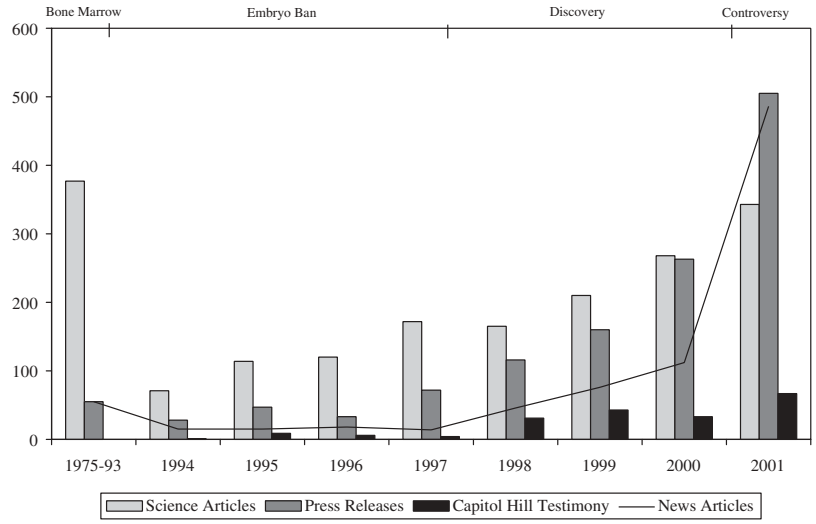

Figure 1
Agenda-Building Indicators and Media Attention across Stages of Development

Figure 1 indicates that across each of the first two stages of policy development, when debate remained within administrative policy arenas and agenda-building activities were minimal, media coverage was minimal. Across the eighteen years of the first stage, only fifty-five articles appeared on stem cell research. During the second policy stage, encompassing the years 1994 to 1997, media attention increased but still remained relatively modest, as sixty-two articles appeared during this four-year period.

Table 3 indicates that during the first stage of policy development, in nearly half of the articles, stem cell research was mentioned within the context of stories principally about bone marrow transplants or gene therapy. During the second stage, the main focus of articles shifted so that nearly 30 percent, a plurality of all articles, was focused specifically on stem cell research.

Prior to 1998, as Table 4 indicates, the media made few mentions of human embryos as a source of stem cells. This is despite ongoing research since 1981 on stem cells from embryos in animals and privately funded research on human embryos that began in the mid-1990s. Instead, the overwhelming majority of articles focused on relatively noncontroversial human and animal sources. As Table 5 indicates, in the two stages prior to 1998, the main policy arenas mentioned were for the most part administrative, with a heavy focus on the DHHS/NIH and FDA. Few articles mentioned the overtly political policy arenas of Congress or the presidency.

(Text continues on page 56)

Table 3
Main focus of articles across stages of development

	Stage of Development			
Main Focus	Bone Marrow Research 1975 to 1993 ($n = 55$) Percentage of Articles	Embryo Ban 1994 to 1997 ($n = 62$) Percentage of Articles	Discovery 1998 to 2000 ($n = 234$) Percentage of Articles	Controversy 2001 ($n = 486$) Percentage of Articles
Stem cells	12.1	27.9	58.1	62.1
Domestic politics	0.0	1.5	2.3	19.7
Cloning	0.0	2.9	4.5	6.5
Gene therapy	29.3	7.4	3.0	0.3
Bone marrow transplant	15.5	17.6	4.9	0.2
Organ transplant/donation	1.7	2.9	1.9	0.0
Cancer	6.9	13.2	10.2	1.4
Abortion	0.0	0.0	0.4	0.8
Fetal tissue research	1.7	2.9	1.0	0.3
In vitro fertilization	0.0	0.0	0.4	0.2
Genome project/genetics	1.7	1.5	1.5	0.5
Scientist/physician profile	5.2	0.0	1.5	1.1
Biotech industry	6.9	5.9	3.0	1.9
AIDS	3.4	4.4	0.4	0.0
Other	15.0	11.8	7.4	5.1

Note: Cloning refers to articles focusing on either reproductive or therapeutic techniques.

Table 4
Sources of stem cells mentioned in coverage across stages of development

	Stage of Development			
Source of Stem Cells	Bone Marrow Research 1975 to 1993 ($n = 55$) Percentage of Articles	Embryo Ban 1994 to 1997 ($n = 62$) Percentage of Articles	Discovery 1998 to 2000 ($n = 234$) Percentage of Articles	Controversy 2001 ($n = 486$) Percentage of Articles
No specific source	12.1	13.2	19.2	18.2
Human embryos or cloned embryos	3.4	11.8	52.8	74.7
Human adult cells	10.3	14.2	9.4	12.9
Human bone marrow or blood	58.6	47.1	21.9	8.3
Human fetal tissue	6.9	4.4	4.5	3.6
Human neural tissue	3.4	4.4	7.5	3.4
Human umbilical or cord blood	8.6	17.6	4.5	2.4
Animal, includes all tissue types	17.2	23.5	10.2	6.1

Note: "No specific source" refers to articles where details regarding the source of stem cells are not mentioned throughout the text. Instead, just the general term "stem cells" is used. "Human adult cells" include general reference to "adult stem cells" with no specified source, or other sources not noted already in the table, such as extrapolations from studies on animals to other adult stem cell sources including muscle, fat, skin, the digestive system, cornea, retina, and pancreas. Media coverage has been criticized for being nonspecific in its references to human embryo stem cells, rarely differentiating between human embryonic stem cells versus embryonic germ cells that are derived from early stage fetuses (Department of Health and Human Services 2001). In the case of "human fetal tissue," this refers to specific mention of stem cells derived from this source.

Table 5
Policy arenas featured in coverage across stages of development

Type of Policy Arena	Stage of Development: Bone Marrow Research 1975 to 1993 ($n = 55$) Percentage of Articles	Embryo Ban 1994 to 1997 ($n = 62$) Percentage of Articles	Discovery 1998 to 2000 ($n = 234$) Percentage of Articles	Controversy 2001 ($n = 486$) Percentage of Articles
Administrative/advisory				
DHSS/NIH	25.9	19.1	29.4	28.9
NCI	8.6	8.8	2.3	1.0
FDA	10.3	13.2	6.4	3.7
Other federal agency	6.9	8.8	3.0	5.6
NAS, NRC, other U.S. Scientific advisory panel	6.9	4.4	3.8	2.4
NBAC, HERP, PCB, other U.S. bioethics advisory panel	1.7	5.9	11.0	4.1
Political				
Congress	3.4	7.4	26.9	39.0
President	0.0	7.4	19.2	66.9
State or local	0.0	2.9	1.5	5.9
Other				
Federal court system	5.2	1.5	0.4	3.9
Europe or International	1.7	2.9	6.0	6.1

Note: DHSS = Department of Health and Human Services; NIH = National Institutes of Health; NCI = National Cancer Institute; FDA = Federal Drug Administration; NAS = National Academy of Sciences; NRC = National Research Council; NBAC = National Bioethics Advisory Commission; HERP = Human Embryo Research Panel; PCB = President's Council on Bioethics. "Other federal agency" includes U.S. Patent Office, Environmental Protection Agency, Office of Technology Assessment, Congressional Research Service, Department of Energy, Justice Department and Attorney General, and Federal Trade Commission. "State or local" includes state legislatures and their members, state governor's offices, and state courts.

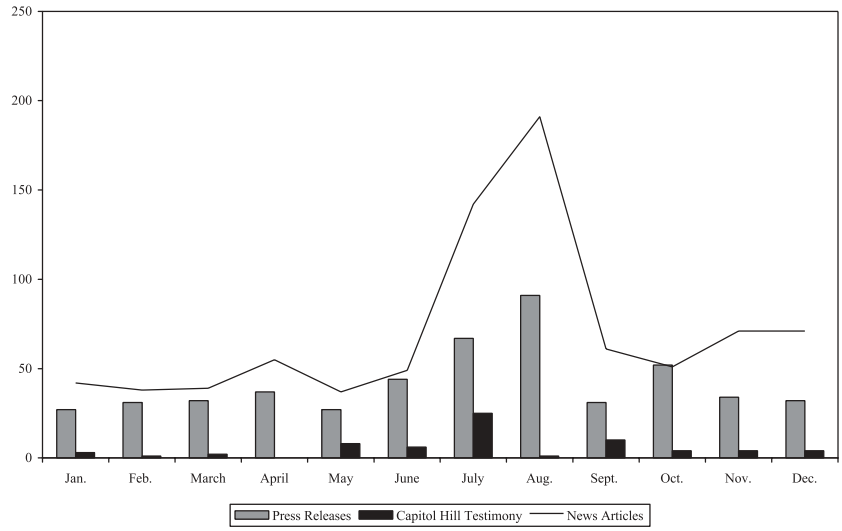

Figure 2
Agenda-Building Indicators and Press Attention across Month for 2001

After the 1998 announcement related to the isolation of stem cells from human embryos, media attention increased in correspondence to a rise in agenda-building activities, as 234 articles appeared across the three-year period from 1998 to 2000, with media attention rising across each successive year. A majority of articles specifically focused on stem cell research in this third stage, and a majority of articles mentioned human embryos as a stem cell source. Although administrative arenas, particularly the DHHS/NIH, remained prominent in coverage during this stage, there was an increase in attention to the overtly political arenas of Congress and the presidency.

In the fourth stage of development, as the locus of policy debate shifted fully from administrative to overtly political arenas and agenda-building activities increased, media attention spiked, with 486 articles appearing in 2001. This number accounts for more than half of all articles related to stem cell research in the twenty-six years of our analysis. The sharp jump in attention to stem cell research in 2001 is the likely outcome of increased media lobbying among competing interests, the routine channel news opportunities surrounding congressional hearings, the release of new scientific studies, and press statements or other pseudo-events staged by government officials and interest groups that fueled the building drama of the moment. In this stage, as might be expected, the dominant focus of articles was on stem cell research, the overtly political arenas of Congress and/or the presidency, and human embryos as sources of stem cells.

Our fourth research question was specific to the level of media attention across the months of 2001, specifically after Bush's August announcement. Figure 2 indicates that media attention gradually rose through June in anticipation of President Bush's decision. Media attention spiked during the months of July and August, as the House passed cloning legislation banning therapeutic procedures, competing interests intensified lobbying, the Jones Institute announced the creation of embryos for research purposes, and President Bush was lobbied by the pope on the issue of stem cell research during a visit to the Vatican. In fact, Figure 2 indicates that nearly a third of all articles contained in the twenty-six-year period of our analysis appeared during the months of July and August 2001. The spike in July corresponds with an increase in the number of press releases and a sharp increase in congressional attention.

Although Bush's early August decision provided some resolution to the controversy by relegating decision making back to the administrative policy arena, other political interests organized to keep the issue on the agenda of Congress. However, the events of September 11 and the subsequent anthrax incidents certainly had the potential to knock the issue from the media agenda. Yet, our findings indicate that stem cell research received greater coverage in September and October than it did in any month leading up to July. In November, media attention displayed a smaller, secondary spike, as advanced cell technology launched a public relations blitz surrounding its claims at successful extraction of stem cells through human therapeutic cloning.

The Nature of Media Framing and the Negotiation of Drama

Our next set of research questions was specific to media framing of stem cell research, the relationship to media attention, and the prominence of various sources in coverage. Our review of the literature leads us to suspect that, above and beyond the agenda-building process and the dominant policy arena, media attention would only peak when the issue of stem cell research could be most easily framed in dramatic terms and when familiar storytelling themes and metaphors could be applied.

Before elaborating on the development of frames across policy stages, it is necessary to first explore various descriptive dimensions of the frames and their relationships to each other. Table 6 indicates that across the total population of articles, the most prominent frames included strategy/conflict, ethics/morality, policy background, and scientific background. New scientific research was also prominent but not to the extent of the latter four frames. Table 6 also indicates that coverage that revolved around important aspects of market development in relation to stem cell research and around patenting, ownership, and access rights was for the most part ignored in coverage. In similar fashion, few articles were specific to public opinion on the issue or featured interviews with

Table 6
Frequency and relative frequency of frames for total population of articles

Frame	Rsch	Sbkd	Ethics	Strat	Policy	Market	Patent	Uncertain	Opinion	Localiz	Anecdot
Major											
Percentage	20.3	15.2	15.3	29.4	15.5	5.4	2.4	9.1	0.7	0.6	4.7
Number	70	127	128	246	130	45	20	76	6	5	39
Minor											
Percentage	4.2	28.8	26.9	15.7	27.1	5.5	6.3	24.7	4.4	1.2	2.3
Number	35	241	225	131	227	46	53	207	37	10	19
Absent											
Percentage	75.5	56.0	57.8	55.0	57.3	89.1	91.3	66.2	94.9	98.2	93.1
Number	632	469	484	460	227	747	764	554	794	822	779

Note: Range of values are 0 = frame is not present; 1 = frame is present but secondary ("minor"); 2 = frame is primary article focus ("major"). Rsch = research; Sbkd = scientific background; Ethics = ethics and/or morality; Strat = political strategy and/or conflict; Policy = policy and/or regulatory background; Market = market/economic prospects or international competitiveness; Patent = patenting, property rights, ownership, and access; Uncertain = scientific/technical controversy or uncertainty; Opinion = public opinion; Localiz = political localization; Anecdot = anecdotal personalization.

lay citizens on the street. These findings bring to mind several possible normative critiques of coverage that are beyond the scope of this article.

Table 6 also indicates that the framing devices were related to each other in different ways and were likely to appear in varying combinations with each other. The dramatic framing device of strategy/conflict, when it did appear, was more likely to appear as a dominant or lead frame of an article. Other dramatic frames, such as ethics/morality or anecdotal personalization, were more likely to appear as secondary, complementary frames. In terms of more informational or contextual frames, when the frame of new scientific research was found in coverage, it was more likely to appear as the dominant or lead frame of an article. Other contextual frames, however, such as scientific background or policy/regulatory background were more likely to appear as secondary, complementary frames.

An analysis of the relationships among these dominant frames using Spearman's rho correlations indicates that strategy/conflict was likely to appear in an article along with the secondary frames of ethics/morality ($r = .11$), policy background ($r = .30$), and public opinion ($r = .18$). New scientific research was likely to appear along with the frame of scientific uncertainty ($r = .34$). Policy background was likely to appear with the ethics/morality frame ($r = .24$). Scientific background was most likely to appear with the frame of scientific uncertainty ($r = .27$) and anecdotal personalization ($r = .12$). Besides policy background and strategy/conflict, the ethics/morality frame was not positively related to any other frames.

Our next research question focused on the variation in the prominence of frames across stages of development. Table 7 indicates that the prominence of these frames varied considerably across stages of scientific and policy development. During the first two stages of development, when policy surrounding stem cell research remained predominantly within administrative contexts and before the successful extraction of stem cells from human embryos, the most prominent frames were new scientific research and scientific background. Very few articles featured strategy/conflict or ethics/morality frames during these early years. Minimal elements of drama were maintained in coverage during these early years by relying on the theme of scientific uncertainty and anecdotal personalization. During the third stage of development, post-1998 discovery, the emphasis on elements of science decreases but remains prominent. However, the emphasis on ethics/morality and policy background increases. Strategy/conflict also increases in prominence during this stage.

During 2001, when media attention peaked, there is a strong shift in coverage from previous stages. The prominence of frames related to science decreases considerably, whereas the more dramatic emphasis on strategy/conflict spikes sharply, appearing on average in almost every article. The emphasis on ethics/morality remains prominent but does not change significantly from its elevated levels in the third stage.

Table 7
Means for article frames appearing in coverage across stages of development

	Stage of Development			
Frame	Bone Marrow Research 1975 to 1993 (n = 55) Mean	Embryo Ban 1994 to 1997 (n = 62) Mean	Discovery 1998 to 2000 (n = 234) Mean	Controversy 2001 (n = 486) Mean
Rsch	1.16	0.87	0.63	0.30
Sbkd	1.19	1.10	0.77	0.37
Ethics	0.16	0.31	0.62	0.62
Strat	0.02	0.18	0.41	1.02
Policy	0.10	0.27	0.59	0.70
Market	0.19	0.22	0.20	0.12
Patent	0.17	0.10	0.08	0.12
Uncertain	0.66	0.56	0.40	0.41
Opinion	0.00	0.02	0.01	0.10
Localiz	0.00	0.02	0.02	0.03
Anecdot	0.16	0.38	0.14	0.12

Note: Range of values are 0 = frame is not present; 1 = frame is present but secondary; 2 = frame is primary article focus. Tests for significance across time period are not necessary as data are derived from a population of articles rather than a probability sample. Rsch = research; Sbkd = scientific background; Ethics = ethics and/or morality; Strat = political strategy and/or conflict; Policy = policy and/or regulatory background; Market = market/economic prospects or international competitiveness; Patent = patenting, property rights, ownership, and access; Uncertain = scientific/technical controversy or uncertainty; Opinion = public opinion; Localiz = political localization; Anecdot = anecdotal personalization.

Table 8
Frequency and relative frequency for metaphors and storytelling themes appearing in coverage across stages of development

	Stage of Development							
	Bone Marrow Research 1975 to 1993 ($n = 55$)		Embryo Ban 1994 to 1997 ($n = 62$)		Discovery 1998 to 2000 ($n = 234$)		Controversy 2001 ($n = 486$)	
Metaphors and Storytelling Themes	Number of Articles	Percentage	Number of Articles	Percentage	Number of Articles	Percentage	Number of Articles	Percentage
Frankenstein, *Brave New World*, mad scientist, Orwell, Huxley	2	3.6	3	4.8	6	2.6	18	3.7
Nazi, Holocaust, Hitler, Mengele, or concentration camp	1	1.8	1	1.8	5	2.1	18	3.7
Evil, ghoulish, horror*, nightmar*, murder*, monstrous, gruesome, abomination, grotesque	4	7.3	2	3.2	21	9.0	56	11.5
Battle	4	7.2	3	4.8	21	8.9	66	13.5
Total	8	14.5	8	12.1	40	17.1	130	26.7

Note: The "total" row refers to the number and proportion of articles that mention at least one of the aforementioned storytelling themes or metaphors. This cell is not a sum of preceding rows since more than one metaphor or theme could appear in the same article. For words with an asterisk beside them, all articles that contained variations on the root word were included.

As an indicator of the media's preference for drama during the last two stages of development, we searched for the appearance of metaphors and storytelling themes related to science fiction, history (specifically Nazis and the Holocaust), colorful adjectives such as *evil* or *murderous*, and battle (a metaphor that emphasizes conflict and relates to previous contention over abortion). Table 8 indicates the absolute and relative frequency of these themes across the history of coverage. In terms of relative frequency, these storytelling conventions appear most often in the last two stages of development, with more than a quarter of articles in 2001 featuring at least one of these themes. The use of such storytelling conventions is the likely product of the negotiation of drama between sources and journalists: Political actors understand journalists' preferences for drama and fashion their message strategies, information subsidies, sound bites, and talking points in response to those preferences.

We were also interested in the relationship between media attention and the use of dramatic framing devices and storytelling themes. From our analysis, we see that prior to 1998, there was a relative absence of dramatic framing devices, with coverage focused mainly on technical aspects of scientific research. Post-1998, there was a strong shift toward frames that highlighted strategy/conflict and ethics/morality, as well as an increase in the use of familiar storytelling themes. It is during this third stage that media attention begins to increase, peaking in 2001 as media coverage featured the heaviest emphasis on conflict and drama. In this case, we see the interaction between the agenda-building process and the preferences of journalists: An issue will only rise to the top of the media agenda when the potential for drama is maximized.

Our final research question was specific to the sources that were used by the media. Given the unprecedented political attention to stem cell research, it was unclear what to expect in terms of source influence. Table 9 indicates that in 2001, GOP and Democratic supporters of stem cell funding were both more likely to be featured in coverage than GOP opponents. In regard to GOP supporters, this is a likely result of the general political prominence of several GOP senators including Arlen Specter, John McCain, and Orrin Hatch. However, it is also a likely outcome of the additional storytelling dimension that journalists could weave into press accounts, pitting the president's possible opposition to funding of stem cell research against the support of influential (in some cases pro-life) members of his own party.

In contrast to previous studies of biotechnology coverage that depict scientific and pro-research interests as overwhelmingly favored in coverage over religious groups or other interests that might stand in opposition to biotech, our results indicate that there was fairly equal if not greater coverage of pro-life and Catholic interests than the assembled members of the Coalition for the Advancement of Research, an umbrella lobbying organization that included several dozen scientific and medical organizations, patient advocacy groups, and pro-research

Table 9
Frequency and relative frequency of sources mentioned in coverage across last two stages of development

Actor	Discovery 1998 to 2000 (n = 234)		Controversy 2001 (n = 486)	
	Number of Articles	Percentage	Number of Articles	Percentage
Congress				
GOP opponents				
Trent Lott	0	0.0	6	1.2
Dick Armey	0	0.0	7	1.4
Dennis Hastert	0	0.0	3	0.6
J.C. Watts	0	0.0	7	1.4
Sam Brownback	10	4.3	12	2.5
Jay Dickey	12	5.1	3	0.6
Dave Weldon	0	0.0	4	0.8
Tom Delay	3	1.3	9	1.9
Other GOP members	0	0.0	17	3.5
Total GOP opposition	22	9.4	54	11.1
GOP supporters				
Arlen Spector	15	6.4	10	2.1
Orrin Hatch	2	0.9	12	2.5
Strom Thurmond	3	1.3	16	3.3
Bill Frist	1	0.0	13	2.7
Connie Mack[a]	2	0.9	13	2.7
John McCain[b]	6	2.6	16	3.3
Other GOP supporters	0	0.0	17	3.5
Total GOP supporters	21	9.0	86	17.7
Democratic supporters				
Tom Daschle	0	0.0	12	2.5
Tom Harkin	7	3.0	7	1.4
John Kerry	0	0.0	9	1.9
Ted Kennedy	6	2.6	7	1.4
Nita Lowey	1	0.0	10	2.1
Richard Gephardt	0	0.0	12	2.5
Other Democratic supporters	0	0.0	17	3.5
Total Democratic supporters	13	5.6	67	13.8
DEM opponents				
Total Democratic opponents	0	0.0	1	0.2
Interest groups				
Pro-life organizations				
Christian Coalition	0	0.0	10	2.1
Family Research Council	2	0.9	16	3.3
Other pro-life	7	3.0	21	4.3
Total pro-life	9	3.8	33	6.8

(continued)

Table 9 (continued)

Actor	Discovery 1998 to 2000 (n = 234)		Controversy 2001 (n = 486)	
	Number of Articles	Percentage	Number of Articles	Percentage
Catholic interests				
Pope or Vatican	1	0.0	31	6.4
National Council of Bishops	3	1.3	36	7.4
Total Catholic	4	1.7	60	12.3
Pro-research interests				
CAMR, specific reference	0	0.0	10	2.1
BIO	3	1.3	8	1.6
Morton Kondracke	0	0.0	3	0.6
Christopher Reeve	6	2.6	7	1.4
Patient's Cure	4	1.7	2	0.4
Michael J. Fox	6	2.6	5	1.0
Nancy Reagan	0	0.0	12	2.5
Other CAMR members	17	7.3	48	9.9
Total CAMR related	24	10.3	58	11.9
Bioethicists				
Leon Kass	1	0.3	25	5.1
Arthur Caplan	6	2.6	4	0.8
R. Alta Charo	2	0.9	13	2.7
Other bioethicists	24	10.3	26	5.3
Total bioethicists	31	13.2	51	10.5

Note: CAMR = Coalition for the Advancement of Medical Research; BIO = Biotechnology Industry Organization.

a. Connie Mack is a former senator from Florida.

b. John McCain initially opposed stem cell funding in 1998-2000 but reversed his position in 2001. The "total" row for each category of source refers to the number and proportion of articles that mention at least one source type. This cell is not a sum of preceding rows since more than one source from the category could appear in the same article.

celebrities. Moreover, among religious groups, Catholic interests were more prominent in coverage than Protestant-affiliated pro-life interests.

The prominent role of bioethicists in coverage is also underscored by our findings. Future research should explore more carefully the emerging role of bioethicists as dominant sources in coverage of science-related disputes. In one final note, the sharp increase in prominence of the various types of congressional, religious, and advocacy sources between these last two stages of development is an additional indicator of the increased agenda-building activities of these contending political interests that occurred in 2001.

Conclusions

Before we elaborate on the implications of our findings, it is necessary to look more closely at some of the technical aspects of our study.

Some Data-Related Considerations

This study was limited to a content analysis of two national elite newspapers. We are therefore constrained to some degree in our ability to generalize to all U.S. print outlets or to non–print media sources. We are also constrained in our ability to reach final conclusions regarding the relation between journalists and competing interests involved in the stem cell controversy. Content analysis only allows for nonobtrusive observation of the final product of the agenda/frame-building processes and the narrative negotiations between journalists and sources. Even though several valid and reliable interpretations are possible from this type of analysis, there remains some degree of uncertainty regarding the actual inputs to the process or the specifics of the process itself. Other studies should complement our "visible source impact" approach (Berkowitz 1992) with a tallying of source-media coverage success rates or with qualitative observations and interviews related to source-journalist interactions. These investigations would lead to further understanding of why and at what stages of issue development journalists rely on certain types of framing devices, storytelling conventions, or news sources. Moreover, future research should examine differences across types of media outlets, including print versus television sources, and across types of journalists, including science writers versus political journalists, in the level of attention to stem cell research and the nature of coverage.

Outlook

In this article, we build on previous theorizing related to agenda building, frame building, and the negotiation of news dramas between sources and journalists to reach several valuable conclusions related to media coverage of political and scientific controversy. First, policy contexts do matter. We demonstrate that despite elevated levels of agenda-building activities post-1998, stem cell research received only modest attention when policy development was still restricted mainly to administrative arenas where there was a relative absence of overt conflict among competing interests and little opportunity for dramatization in reporting. Only in 2001, when the issue received heavy attention from Congress and the president, did media attention peak.

Second, media attention increases when journalists can place themselves within the context of a larger narrative and when new events can be covered using recycled thematic formats and storytelling conventions. Even though stem cells were extracted from animal embryos as early as 1981, this line of research did not trigger media and political attention until 1998 and large-scale attention

till 2001, when aspects of the issue could be linked to familiar and dramatic storytelling themes related to human genetic engineering, previous controversies surrounding abortion and fetal transplantation, and, in 2001, the trials and tribulations of a newly elected president. In the first two stages of stem cell research's development, it is likely that journalists were unable to position themselves within the framework of a larger story, with a clearly identifiable beginning, source of conflict, and possible resolution. Stem cell research was ongoing, but it was difficult for both sources and journalists to construct a larger meaning around events.

Third, increased media attention coincides with the potential of an issue to be framed in dramatic terms. In the case of stem cell research, peak potential for storytelling was reached when events surrounding scientific research could be framed in terms of political strategy/conflict and ethics/morality. However, this potential is constrained by administrative policy contexts, with potential only maximized when political arenas such as Congress or the presidency pay close attention to an issue.

We believe that the above conclusions are not unique to the case of stem cell research. They can be generalized to other political controversies surrounding science and technology. For example, previous research has attempted to understand why the controversy over genetically modified (GM) agriculture, despite intensive public communication campaigns on both sides of the issue, has received limited media attention in the U.S. context (Nisbet and Lewenstein 2002) in comparison to the United Kingdom or Europe (Durant et al. 1998). Extrapolating from our findings in this article, we argue that one major reason is that policy debate on GM agriculture has remained within the administrative policy arenas of the FDA, the Environmental Protection Agency, the U.S. Department of Agriculture, and various scientific advisory boards, with little significant attention from Congress or the presidency. This is in contrast to the United Kingdom and Europe, where the issue has been debated within overtly political policy arenas for several years (Durant et al. 1998).

Moreover, in the U.S. context, there have been few familiar storytelling themes related to the GM agriculture debate that journalists can latch onto and dramatize in the news. Yet, in the European context, there exist several salient dramatic storytelling themes that have been previously used in relation to the events surrounding Mad Cow disease, the fallout from the Chernobyl disaster, and the antiglobalization movement.

The stem cell controversy continues to evolve. In 2002, the issue has been subsumed within a broader debate over therapeutic and reproductive cloning. A realignment of social and political contention has occurred as members of Congress who had supported stem cell research now oppose therapeutic cloning. In addition, traditionally liberal political interests such as environmental groups and feminist organizations have joined the growing chorus of opposition,

fashioning an "unholy" alliance with conservative pro-life forces. Our future research will continue to track the cycles of media coverage in relation to this ongoing controversy, as the age of press/politics merges with a new era of biopolitics.

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Notes

1. "Research advocates" refers to various members of the Coalition for the Advancement of Medical Research. These include the *Biotechnology Industry Organization* or *Morton Kondracke* or *Nancy Reagan* or *Christopher Reeve* or *Michael J. Fox* or *Patient's Cure* or *Alliance for Aging Research* or *American Liver Foundation* or *Mary Tyler Moore* or *National Health Council* or *Parkinson's Action Network* or *Parkinson's Disease Foundation* or *Patient's Coalition for Urgent Research* or *Project ALF* or *Alpha-1 Foundation* or *ALS Association* or *American Foundation for AIDS Research* or *American Infertility Association* or *American Society for Cell Biology* or *American Society for Microbiology* or *American Society for Reproductive Medicine* or *American Society of Hematology* or *American Association of Neurological Surgeons* or *Congress of Neurological Surgeons* or *Association of American Medical Colleges* or *Association of American Universities*.

   Bioethicists include *Leon Kass* or *Arthur Caplan* or *R. Alta Charo* or *Lori Andrews* or *George Annas* or *Daniel Callahan* or *Coutney Campbell* or *Alexander Capron* or *James Childress* or *De S. Cameron Nigel* or *Elliott Dorf* or *Margaret Farlay* or *Kevin T. Fitzgerald* or *John Fletcher* or *Robert P. George* or *Ronald Green* or *Ann Kiefling* or *Patricia King* or *Eric Meslin* or *Glenn McGee* or *Steven Muller* or *Thomas Murray* or *Bernard Lo* or *John A. Robertson* or *Harold T. Shapiro* or *Jeremy Sugarman* or *Leroy Waters* or *Dorothy Wertz* or *Carol Tauer*.

   "Pro-life" groups include *American Life League* or *Bioethics Project* or *William Kristol* or *Christian Coalition* or *Pat Robertson* or *Culture of Life Foundation* or *Eugenics Watch* or *Jerry Falwell* or *Family Research Council* or *Gary Bauer* or *Focus on the Family* or *James Dobson* or *National Right to Life League*.

   Catholic interests include the *Pope* or *Vatican* or the *National Conference of Catholic Bishops*.

   GOP congressional opponents include *Trent Lott* or *Dick Armey* or *Dennis Hastert* or *J.C. Watts* or *Sam Brownback* or *Jay Dickey* or *Dave Weldon* or *Tom Delay* or *Rick Santorum* or *Christopher Smith* or *Chris Smith* or *Mark Souder* or *Dan Burton* or *Jon Kyl* or *Bob Schaffer* or *Bob Barr* or *Kevin Brady* or *Zach Wamp* or *Ron Lewis* or *Billy Tauzin* or *Duncan Hunter* or *Charles Canady* or *Ron Paul* or *Steve Buyer* or *Jim Ryun* or *Peter King* or *Don Manzullo* or *Donald Manzullo* or *Steve Largent* or *Charles Pickering* or *Charlie Pickering* or *Todd Tiahrt* or *Tom Coburn* or *John Shimkus* or *Tom Tancredo* or *Peter Hoekstra* or *Pete Sessions* or *John Hostettler* or *John Doolittle* or *Rick Hill* or *Dave McIntosh* or *Helen Chenoweth* or *Joe Pitts* or *Robert Aderholt* or *Ron Lewis* or *Gary Miller* or *Ron Packard* or *Jim DeMint* or *Kevin Brady* or *Tom Latham* or *John Peterson* or *Jim Talent* or *Lincoln Diaz-Balart* or *Mark Souder* or *Sue Myrick* or *Roy Blunt* or *Henry Hyde* or *Ernest Istook* or *Richard Baker* or *Steve Chabot* or *Philip M. Crane* or *Phil Crane* or *Paul Ryan* or *Michael Forbes* or *Charles Taylor* or *Charlie Taylor* or *Asa Hutchinson* or *Bob Ney* or *Phil English* or *Ray LaHood* or *Joe*

Barton or *Spencer Bachus* or *Lindsay Graham* or *Ed Whitfield* or *Jack Metcalf* or *James Sensenbrenner.*

GOP congressional supporters include *Arlen Specter* or *Orrin Hatch* or *Strom Thurmond* or *Bill Frist* or *Connie Mack* or *John McCain* or *Connie Morella* or *Gordon Smith* or *Susan Collins* or *Michael Castle* or *Mike Castle* or *Mark Foley* or *Amo Houghton* or *Amory Houghton* or *Jim Greenwood* or *Olympia Snowe* or *Tom Davis* or *Steve Horn* or *Nancy Johnson* or *Deborah Pryce* or *Jim Jeffords* or *James Jeffords* or *Lincoln Chafee* or *John Warner*or *Kay Bailey Hutchison* or *Ted Stevens* or *Brian Bilbray* or *Duke Cunningham* or *Jennifer Dunn* or *Michael Simpson* or *Nick Smith* or *Richard Lugar* or *Dick Lugar.*

Democratic congressional supporters include *Thomas Daschle* or *Tom Daschle* or *Tom Harkin* or *John Kerry* or *Edward Kennedy* or *Ted Kennedy* or *Nita Lowey* or *Richard Gephardt* or *Barbara Mikulski* or *Carolyn Maloney* or *Mary Landrieu* or *Barbara Boxer* or *Henry Waxman* or *Harry Reid* or *Nancy Johnson* or *Jim Ramstad* or *Evan Bayh* or *Richard Durbin* or *Dick Durbin* or *Tim Johnson* or *Joe Biden* or *Jeff Bingaman* or *Bob Graham* or *Daniel Akaka* or *Joe Lieberman* or *Ben Nelson* or *Dianne Feinstein* or *Zell Miller* or *Charles Schumer* or *Charlie Schumer* or *Patrick Leahy* or *Carl Levin* or *Kent Conrad* or *Max Baucus* or *Max Cleland* or *Russell Feingold* or *Jon Corzine* or *Mark Dayton* or *Herb Kohl* or *Jean Carnahan* or *Bryon Dorgan* or *Paul Sarbanes* or *Jay Rockefeller* or *Ernest Hollings* or *Debbie Stabenow* or *Jack Reed* or *Tom Carper* or *Diana DiGette* or *Peter Deutsch* or *John Conyers* or *David Bonior* or *John Dingell*.

Democratic congressional opponents include *Ronnie Shows* or *Nick Rahall* or *Bart Stupak* or *Jim Barcia* or *Dale Kildee* or *Christopher John* or *Chris John* or *Solomon Ortiz* or *Mike McIntyre* or *David Phelps* or *Dave Phelps* or *Ike Skelton*.

2. Metaphors and storytelling themes related to science fiction include *Frankenstein* or *Brave New World* or *mad scientist* or *George Orwell* or *Aldous Huxley*. Metaphors and storytelling themes related to history include *Nazi* or *Holocaust* or *Hitler* or *Mengele* or *concentration camp*. Colorful storytelling adjectives include *evil* or *ghoulish* or *horror** or *nightmar** or *murder** or *monstrous* or *gruesome* or *abomination* or *grotesque*. Metaphors and storytelling themes related to battle include *battle*.
3. According to its Web site, PR Newswire distributes news releases and photos via newswire, fax, e-mail, satellite, and the Web for both blanket coverage or pinpoint targeting. Choices include international, national, regional and local news outlets as well as theme-based options such as features, business, and technology. All wire distributions include delivery to 2,600+ Web sites, online databases, trading sites and The Press Room, a Web site where more than 26,000 journalists access information. PR News Wire's fee-based clients include interest groups, universities, industry members, media organizations, and public figures.

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