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News Coverage of Genetic Cloning

When Science Journalism Becomes Future-Oriented Speculation

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This case study examines news coverage of genetic cloning in three major print newspapers and three major online news sources from 1996 to 1999. Both quantitative and qualitative methods were used to systematically assess issues of balance, sourcing, news focus, and language use in news articles about cloning. Four trends emerge from this study: a tendency to portray cloning as a technique and/or technology, a reliance on sources from research institutes and biotechnology companies, a use of language that depicts cloning in a positive light, and an overwhelming emphasis placed on the possible future benefits that may be associated with cloning. The author argues that these findings suggest a shift from conventional notions about what journalists do—report on events that have occurred. Instead, news reports about cloning involve speculative conjectures about potential benefits and possible futures. Such a shift may mean that a re-evaluation of journalistic practices is needed.

Keywords: *genetics; cloning; science journalism; news coverage; source use*

In February 1997, Scottish scientist Ian Wilmut's cloning of the sheep Dolly made world news headlines. It was the first cloning of an adult mammal, and it catapulted Dolly, and by association Wilmut and his associates at PPL Therapeutics, into a media spotlight. The cloning of Dolly was, in one sense, the culmination of decades of research and development that helped move cloning from theory to practice. It was also a critical event, and a critical juncture, at which the public's understanding of and attitudes toward genetic cloning would be shaped by news about such research.

Despite the intensity of the headlines, news about the cloning of Dolly was not entirely unexpected. Throughout the 1970s and 1980s, news organizations had become increasingly fascinated with all things genetic (Nelkin & Lindee, 1995; Van Dijck, 1998). Within science, technology, and business sections, the stage for Dolly had been set by news about a series of research projects that helped change the focus of genetics: the development of recombinant DNA (leading to gene-splicing and genetic engineering applications), the formation of the first biotechnology company in the United States (Genentech), and the allocation of federal funds by the Department of Energy

for the Human Genome Initiative. During this same period, the U.S. Supreme Court ruled five to four in *Diamond v. Chakrabarty* (1980) that microorganisms can be patented, and the Los Alamos National Laboratory and Lawrence Livermore National Laboratory began production of DNA clone libraries (1983) (DOE, 1997). By 1987, the U.S. Patent Office declared that it would allow patents on genetically engineered animals, and the Department of Energy (DOE) and the National Institutes of Health (NIH) designated research institutes responsible for genome mapping and began federal funding of various genome projects. By the early 1990s, the practice of "gene therapy" was approved by the FDA, and geneticists were then granted permission to transfer foreign genes into human beings for the first time (Wheale, 1995).

However, with the arrival of Dolly, cloning as a subset of genetics was thrust into the news spotlight and rapidly became a touchstone for controversies over public policy and the limits of cutting-edge science. On one hand, cloning had come to represent the new frontiers of science; its development suggested a variety of potential ramifications—among them, a redefining of our concepts of individual autonomy and of authenticity, as well as our notions of "life" or what is "natural" (Murphy, 1995). In conjunction with research efforts focused on the mapping of the human genome, scientists and social critics alike forecast that biotechnology research was expanding at such tremendous pace that genetics might overtake space exploration as the defining research field of this era and that the next one hundred years would be the biotech century (Kolata, 1998; Rifkin, 1998). On the other hand, such rapid advances in biotechnology played strongly into fears about scientists overstepping moral boundaries and stimulated debates over whether cloned sheep today would (or should) lead to cloned humans tomorrow (Fox, 1992; Hubbard & Wald, 1993).

Yet in spite of such forecasts and fears, questions about what kinds of information have been communicated to the general public about cloning remain largely unexplored—so, too, do questions regarding both the methods and means used by the news media to cover this topic. So, what have our news media told us about cloning? How was it defined and presented in news reports for a mass audience? Who were the main sources that journalists turned to in order to report this significant set of developments? What were the recurring messages or themes in news reports of cloning?

This study examines such questions. It analyzes the discourse about cloning in the news from 1996 to 1999 with a view to assessing the ways in which cloning has been reported as news. First, an examination of the literature on science journalism and reporting about genetics is undertaken in order to position this case study in the broader context of existing concerns about how science news tends to be reported. Second, the analysis is presented, along with the four trends that emerged related to news focus, sourcing, and the rhetorical structuring of cloning reports. Third, the trends are discussed in order to suggest that when journalism significantly shifts from reporting about current and past events into reporting about possible futures, as it does in the case of cloning, a reassessment of journalism's role and practice is merited.

Communicating News About Genetics and Cloning to a Public Audience

Despite the flurry of activity that has occurred in genetics and cloning, research on how this activity has been communicated to larger publics remains surprisingly sparse. Particularly within the area of cloning, there has been little news analysis. Much of the scholarship has focused more on forms of genetic engineering (with cloning as one integral subtopic) and is usually centered either in social philosophy, where authors have been dedicated to exploring the important ethical and legal issues related to cloning, gene therapy, and biological "copyright" and privacy laws (Cranor, 1994; Fletcher, 1974; Fox, 1992; Hubbard & Wald, 1993; Murphy, 1995; Rollin, 1995), or in history, where authors have primarily focused on the major discoveries, people, and technologies that have propelled genetic research (Bishop & Waldholz, 1990; Wheale, 1995; Whelan, 1982).

Of the studies that have looked at genetics and its presentation in the press, most follow the lines of two general arguments. The first is the argument that suggests that genetics, like many other fields in science, suffers from a lack of balanced and unbiased coverage due to the inherent tensions and often adversarial relationships between scientists and journalists. For instance, in *Reflections on Science and the Media* (1981), Goodfield reports that journalists cover neither the complex nature of scientific research nor the overarching purposes of its practitioners in any detailed or comprehensive manner. When journalists do cover their research, many scientists indicate that their purposes are taken out of context and their findings sensationalized.

Such an adversarial relationship between scientists and journalists is exemplified in the coverage of recombinant DNA. In *The Human Blueprint* (1991), Robert Shapiro chronicles the consistently uneasy relationships that emerged between geneticists and reporters during the late 1970s and early 1980s. According to Shapiro, at the Asilomar Conference for Recombinant DNA and again in the debate over plans to build a recombinant DNA laboratory at Harvard University, groups of scientists and journalists continually butted heads. In both places, Shapiro suggests, geneticists increasingly felt that journalists were out to discredit them and their work. With respect to the potential risks involving recombinant DNA, the press referenced uncontrollable bacteria creeping out of laboratories. At other times, reporters portrayed geneticists as overly eager to conduct laboratory experiments but extremely slow to examine both the potential hazards and larger ethical implications of their work. The ultimate consequence was that the news-reading public received rather stilted reports about the issues and implications associated with recombinant DNA research (Shapiro, 1991).

A second major focus in the literature concerns the "privileging" of certain scientific sources. According to Rae Goodell, the resentment felt by scientists about press coverage resulted in an important change in the way scientific news is communicated to the press and, consequently, to the public. In "How to Kill a Controversy" (1986), Goodell indicates that the negative feelings of many geneticists about the

news coverage in the Asilomar and Harvard cases initiated a direct change in the procedures that geneticists and biotechnology firms use in dealing with reporters. The most evident of these changes came in the form of reinvigorated industry involvement. Particularly following Asilomar, information about genetic research would come less from what journalists might dig up and more from industry-designated scientists or press officials. In their attempts to curtail controversies over recombinant DNA research and future developments, corporate press officials, lobbyists, and scientific spokespeople would set the news agenda. Consequently, whether it was about cloning research or potential government regulations, news about genetic research would originate from within the industry.

How can members of the public achieve any informational balance, given such developments? They cannot, suggests Dorothy Nelkin. Nelkin's books, *Selling Science* (1987) and *The DNA Mystique* (with Susan Lindee, 1995), provide the most comprehensive examinations to date of news coverage of genetic research and of the larger trends occurring throughout science journalism. In *Selling Science*, Nelkin focuses on the common economic interests that bind many scientific and media institutions, and on the business and technical frames through which scientific stories get filtered before being disseminated to the general public. According to Nelkin, the burdens of funding expensive and highly technical scientific research, when combined with the pressures of sustaining profitable competitive media businesses, place nearly all scientist-journalist relationships and news stories about science under the financial constraints of making stories both "newsworthy" and positively slanted.

The economic nature of this relationship, argues Nelkin, typically lends itself to two noteworthy trends. First, it tends to exacerbate sensationalized reporting—reporting that initially concentrates on either scientific crises or new scientific discoveries and then abruptly halts once a subject has lost its newsworthy shock and/or selling value. Second, such a relationship encourages the transformation of a traditional investigative "watchdog" journalism into a public-relations-minded business journalism, replete with an open-handed use of press releases given to journalists by public-relations sectors of scientific corporations. In either case, Nelkin suggests, the overarching implication is that scientific stories, regardless of their historical significance or long-term ramifications, are bound by the constraints of entertainment; they must be appealing and/or packaged in such a way as to attract audiences and advertisers. Thus the public has become immersed in a marketplace of science stories in which all news (about science, genetics, etc.) is *good* news (Nelkin, 1987).

In *The DNA Mystique* (1995), Nelkin and co-author Susan Lindee extend the arguments in *Selling Science* to the field of genetics and its presentation in the media. The aim of their research is to provide an overarching analysis of genetics, the media, and contemporary culture. They examine how the gene has not only invaded sections of our daily news but also an entire range of media products in American popular culture. According to the authors, the gene itself has become a pop icon of our culture. It has been assigned nearly magical powers, and has been adopted by numerous scientific and pseudo-scientific disciplines to popularize and

validate theory and research that often have only the vaguest connection to serious genetic science. In news content, the focus rests on the techniques of genetic manipulation and what such techniques will allow us to cure in the future.

Although there has been little scholarship that has focused solely on cloning, several analyses that examine the news coverage of biotechnology and medical genetics more broadly have recently rendered additional findings related to the mainstream news representations of genetic research. In covering genetics, as within many other fields of science reporting, mainstream news media rely heavily on high-profile scientists and government officials in covering science-related stories (Condit, 1997; Friedman et al., 1986; Ten Eyck & Williment, 2003), and journalists tend to develop an overdependence on ongoing events or prepackaged news releases staged for their benefit (AAAS, 1997; Conrad, 1999). Hyperbole in reporting genetics, along with a focus on pioneering science efforts and biographical portraits of scientists, all too frequently makes up significant portions of science news reports (Nelkin & Lindee, 1995; Petersen, 2001). Moreover, in reporting on various types of genetically related diseases, Conrad (1999) finds that reporters rely on scientists and researchers for quotations, in many cases to the exclusion of all other voices. Condit (1997) notes that reporters frequently over-privilege scientists as sources and operate with the false assumption that scientists have a sacred role in developing social policy.

Though these analyses make important points about news coverage of genetics, none of them examines the means by which cloning in particular has been covered by mainstream news organizations, nor the ways in which it may diverge from the broader news areas associated with biotechnology. Questions regarding *if* and *to what extent* stories about cloning are reported, and more specifically, *how* news organizations may have portrayed cloning stories through source use, topic selection, and rhetorical strategies have yet to be addressed in a systematic way. Moreover, questions regarding what assessments or slants reports might convey about cloning processes or those who have developed or employed them have yet to be examined. Each of these questions is a cornerstone in the research reported here.

Method

The principle aim of this study is to examine the ways in which genetic cloning has been covered as news by nationally oriented online news sites and newspapers in the United States. The method of inquiry chosen for this study was rhetorical analysis. Rhetorical analysis of news texts has been used extensively as a method for assessing the communication of science and social science research in a wide variety of cultural contexts (Bauer, 2000; Bazerman, 2003; Martin, 1998; Van Dijk, 1987). Research studies conducted by Nelkin and Lindee (1995), Sturken and Cartwright (2001), and Van Dijck (1998), among others, have been particularly effective in the use of such analysis in their examinations of popular media messages about genetics.

The goal in this study is to help extend research in the area of news coverage of cloning and also, more broadly, to explore the ways in which print and online news organizations are communicating scientific research to the general public. To this end, particular attention was paid to any patterns or common practices in the coverage of cloning, as well as to the roles or functions such practices might be playing in communicating information about cloning as a subset of the larger field of genetics. In particular, this study examined cloning news stories with respect to article lengths, primary news focus, and source use. In addition, language use in both the headlines and the text of news stories was assessed, including such elements as verb tense, conditional phrasing, and declarative statements, with a view to identifying any prevailing rhetorical patterns in cloning news coverage.

A total of 230 articles that mention genetic cloning were gathered from six major news outlets: three online sites and three newspapers. This represents all of the cloning stories published and/or posted by the six news organizations during this time period. The three online sources were CNN.com, MSNBC.com, and ABCNews.com. The three print sources were *The New York Times, The Washington Post*, and *USA Today*. These news organizations were chosen for their audience size, their dedication to science news coverage, and their online resources. Estimates suggest that the three newspapers have circulations of approximately one million each and account for as much as a third of the national printed news readership in the United States (Straubhaar, 1997). Studies of Internet use during this time indicate that these three online sources were among the most frequently visited news sites on the World Wide Web (*MediaMetrix*, 1999), and data collected in a 1999 survey indicated that CNN.com, ABCNews.com, and MSNBC .com were among the most frequently visited online news sites, with the CNN.com site alone attracting more than 10.5 million unduplicated users each week (*MediaMetrix*, 1999). Moreover, as mainstream national news outlets with some of the largest dedicated news staffs, the news organizations selected for analysis have traditionally played central roles in establishing the reporting agendas for smaller city, state, and local news periodicals, as well as for broadcast television and radio news (Burkett, 1986; Friedman et al., 1986; Gunter, 2003).

The selected time frame for the study is 1996 to 1999. This period represents a critical juncture for both cloning research and news reporting. For cloning, this time frame marks the period in which a number of public, private, national, and international genetic research agendas were firmly established and also in which systematic efforts in the engineering and cloning of many different life forms began (DOE, 1997). As for the news, this period marks a time in which the major national news periodicals had established themselves as important resources for coverage of current science news and the selected online sites had positioned themselves as prominent online news sources (SIPI, 1998). Online news audience sizes also increased at a rapid pace during this period. Internet news research estimates that between 1995 and 1998, more than 30 million Americans began using the Internet as an information resource (*Media Metrix*, 1999).[1] Furthermore, a 1999 study of online use indicates that between 1995 and 1997, nearly 40% of those online users utilized the Web

as an important source for getting their news, with the topics of science, health, and technology ranking as three of the most popular news topics online (Pew Research Center for People and the Press, 1999).

Analysis and Findings

As for the focus of cloning articles, the predominantly technique and/or tool-driven orientations of cloning news emerged vividly (see Table 1). In fact, out of the entire population of cloning articles published by the six news organizations examined, over one half focused on *the techniques and tools* associated with cloning research. In 1996 (the year prior to the breakthrough announcements about Dolly), the focus on the tools and techniques of cloning was clear (32%). In 1997, nearly all of the cloning articles posted by MSNBC.com focused on the techniques or tools of cloning, followed by CNN.com (58%), ABCNews.com (54%) and *The New York Times* (40%).

At least initially, such a sustained focus on technology in the cloning articles studied here appears consistent with larger reporting trends in journalism as a whole and science journalism in particular. Ellul (1964), Burkett (1986), Friedman (1986), Nelkin (1987), Nelkin and Lindee (1995), and LaFollete (1990), among others, have described the emphasis both general news and science news have placed on reporting new techniques and technologies. In particular, Burkett (1986) alludes to the historical tradition in American journalism, dating back to the 1700s, of focusing news reports on technological advances. In *Selling Science* (Nelkin, 1987) and the *DNA Mystique* (Nelkin & Lindee, 1995), Dorothy Nelkin further details the news focus on technology, suggesting that the institutional bonds between science, public relations, and the news media tend to breed a cultural obsession with technology (specifically genetic technologies). That obsession—fueled by the news media—is at the heart of our fascination with genetics and the increasing belief in genetics as a medical "holy grail," a panacea for all health problems, past, present, and future.

Finding a Focus: Cloning As a Technique and/or Technology

To begin the assessment of cloning news, articles were initially examined with respect to story selection and the principle focus of each individual article. The primary focus of an article was assessed through an analysis of the section or subsection in which an article was placed in conjunction with the content focus conveyed in headlines, subheaders, and lead paragraphs. Moreover, several common news categories associated with the communication of scientific research were also used to assist in the evaluation of news focus. These included the communication of science research in relation to (a) techniques or tools, (b) products, (c) social issues, or (d) the people behind science research.[2] As the study progressed, an additional category was added (other/legal) in order to incorporate focal points that fell outside the boundaries of the four original categories.

Table 1
Content Focus of Cloning Articles

	Technology/Tool	Social Issue	Product	Person	Other/Legal
Percentage of news stories	52.61	22.61	5.65	6.52	12.61
n	121	52	13	15	29

Indeed, in the news articles about cloning examined here, a majority adhered to this tradition through an emphasis on the "technical procedures" involved in cloning for the first time. For instance, throughout the weeks following the announcements of the first cloned sheep, and then the first cloned cows, mice, monkeys, human cells, and a potential dog, articles detailed *how* the procedures were accomplished—the techniques used for a "successful cloning." This emphasis in the language used in news reports was often also given a visual emphasis through accompanying informational graphics and sidebar sequence slides and/or lists.

Cloning As a Projected Panacea

In the weeks that followed the announcement of Dolly, these articles began to change in a series of substantive ways. First and foremost, the articles began to rely not so much on an actual event or particular procedure but on a projected one. Consequently, what might start out as a "how to" orientation of a particular procedure or new approach in cloning evolved into or was frequently accompanied by a secondary focus that speculated on the many "positive" benefits that cloning experiments might encourage in the near future. In fact, by March of 1997, only a relatively small percentage of articles specifically focused on the *actual* products that had been created through cloning research, as most articles that focused on cloning techniques and tools principally emphasized the range of potential cloning-related products that could benefit society at some future date. Throughout these articles, pharmaceutical products and possible medical procedures were often mentioned alongside cloning experiments, including "new drugs," "new treatments," and "possible cures" for health problems ranging from infertility to cystic fibrosis, hemophilia to heart disease, and different forms of cancer. Moreover, the dominant rationale that was usually given for nearly all reported cloning experiments was specifically to "advance" our current medical knowledge and to provide positive treatments for people in need. See Table 2 for a list of the most common potential applications and/or products addressed in cloning articles.

In contrast to the emphasis on potential applications, treatments, or products, less than 2% of all cloning articles examined focused on any potential side effects, byproducts, or negative consequences associated with cloning experiments, and less than 3% focused on any environmental consequences of new cloning technologies. In

part, this may be a result of it being "too early to tell" about negative consequences (i.e., it is too early in the evolution of cloning procedures for such products to exist and, therefore, too early to assess any negative consequences). Indeed, risk assessment of any research and development program is rarely, if ever, clear cut. However, such an explanation does not adequately explain the findings, particularly in view of the positive light in which new cloning advances were almost invariably presented. Although positive and negative reporting slants will be discussed in greater detail in the next section, it is worth noting here that the lack of reporting on negative or even potentially risky ecological repercussions of cloning experiments followed more general science reporting patterns throughout the field of journalism. Such patterns are also consistent with the positive slants large public relations firms have attempted to encourage in science news (Nelkin & Lindee, 1995).[3]

One surprising finding concerned the news focus on people and social issues associated with cloning research. During the past century, the news media have often focused on the "lives of scientists" as well as a range of social issues or responses associated with developments in the sciences. From a news stance, such articles not only add context or personality to stories about science but shed light on the character of the person or people behind the latest advances and cultural responses to them. However, only a small percentage of the cloning articles examined in this study (less than 10%) focused on the person(s) behind cloning experiments. In addition, less than one third of the articles published or posted by newspapers or online sites focused on social issues related to cloning. Although print papers had a slight edge over their online counterparts in this area, both focused on social issues related to cloning only 20% to 30% of the time. The news organizations with the highest percentage of stories focusing on social issues were *USA Today* (37%, 1997) and ABCNews.com (31%, 1998). The lowest scores for articles focusing on social issues came from MSNBC.com (0%, 1997) and *The Washington Post* (11%, 1998).

Important to note here, however, is that in the same year that the *Washington Post* focused only 11% of its cloning articles on social issues (1998), approximately 37% of its cloning articles focused on an array of legal and political issues resulting from the announcements of new cloning technologies. In fact, more than any other publication, *The Washington Post* consistently covered legal and political issues related to cloning. This coverage included moderately lengthy stories on the United Nations' recommendation to ban human cloning experiments, responses from the Federal Drug Administration regarding cloning, and the Clinton administration's recommendations against cloning. Although the principal focus of these articles was clearly not social issues (defined here as primarily economic, ethical, and philosophical in nature), nearly all of them addressed a range of issues very closely linked to the social issue category. Moreover, in reporting legal and political issues, many of the *Post*'s articles brought in international perspectives from the European Union, Israel, the United Nations, Britain, and Germany to a degree that no other source examined here rivaled.

Table 2
Possible Applications and/or Products Reported in Cloning News

1.	Potential treatments for AIDS
2.	Treatments for diabetes, Parkinson's, Alzheimer's Disease
3.	New treatments for multiple sclerosis
4.	New treatments for depression
5.	New treatments for psychological or behavioral disorders (e.g., schizophrenia, attention deficit disorder, etc.)
6.	Treatments for hair loss and male pattern baldness
7.	Treatments for inherited diseases (e.g., cystic fibrosis)
8.	Treatments for many forms of cancer (e.g., breast, lung, brain, rectal)
9.	Recreating extinct species (Panda Bears, Tasmanian Tigers, etc.)
10.	Cloning dead pets (e.g., dogs, cats, mice, etc.)
11.	Cloning host animals for spare body parts (e.g., organs, limbs, hair, etc.)
12.	Cloning animals that produce proteins to be used for future drugs
13.	Gene alterations to create stronger, more resilient animals
14.	Gene alterations to create more resilient, faster-growing plants

Getting to the Source: Source Use in Cloning News

In addition to the focus of news articles about cloning, the selection and use of sources that were quoted in these articles were examined in order to provide another vantage point from which news coverage of cloning could be analyzed. The sources a reporter selects and the extent to which those sources are used in an article play a central role in what information is conveyed and how it is conveyed. Sources routinely shape what reporters ultimately write. Within the communication of scientific research, there is a growing body of literature that suggests that sources play a central role in the articulation of mainstream science news (Conrad, 1997; Dunwoody, 1986; Rampton & Stauber, 2002; Yoon, 2005).

Because the variety of sources cited in news articles has important implications for the ways in which major issues or debates are presented to the public, three sets of data about sources were generated. The first involved tabulating the total number of sources quoted in each article and for all of the articles published each year by each of the news sources. The second set of data involved tabulating sources who were quoted as making statements (a) in favor of cloning research, (b) not favorable about cloning research, or (c) neutral about cloning research. The third set of data about source information was a list of those specific sources that were frequently quoted within cloning news articles.

With respect to the total number of sources quoted in cloning news stories, two general findings emerged (see Tables 3 and 4). First, the number of quoted sources used by print papers was generally higher than the number of sources cited by online news sites. On average, online news sites quoted approximately two sources in each article, whereas print papers averaged about three. Such a difference between print

and online news reports may be due in no small way to the story lengths associated with online and print news. For instance, throughout the duration of this study, the cloning articles published by the print publications were nearly twice as long as their online counterparts. Print news stories about cloning were as much as 20% to 70% longer than online stories. In 1996, the average story length for *The New York Times* was nearly 1,100 words longer than for CNN.com. This represented the greatest single difference between two news sources. However, although online story lengths increased throughout the course of the study, there was never a commensurate increase in the number of sources used in online reports.

Source Uniformity and Source Affiliations

Such differences in article length point to a second, and perhaps more significant, finding associated with source selection. This finding concerns the affiliations of those sources that were most frequently quoted by all six news organizations. At the outset of this study, it was anticipated that due to the controversial nature of cloning issues and the media's tendency to accentuate such controversy, sources with strongly oppositional views about cloning would be commonly quoted. Moreover, it was thought that due to the potential moral and ethical implications associated with the genetic creation and duplication of life forms, that a fairly wide diversity of sources would be consulted and quoted.

However, this was clearly not the case with the majority of articles examined here. Most cloning articles did not include a wide range of sources, particularly with respect to those who had either oppositional or even questioning views about cloning research. In each of the six news outlets examined, less than one fifth of all sources cited were represented as *not* in favor of cloning research. In most cases, the sources who were not in favor of cloning research were political leaders. Republican Senators Christopher Bond (Republican, MS), Bill Frist (Republican, TN), Richard Armney (Republican, TX), and others supporting the legislative move to ban human cloning in the United States were among the most frequently quoted critics of cloning. Comments made by Clinton and his administration were at times critical, as were statements made by representatives from the United Nations and the Council of Europe. A total of 86 countries in the United Nations and 19 European countries supported the ban on human cloning. However, quotes from such sources appeared in less than 5% of the articles. Moreover, less than 3% of the total articles examined in this study quoted people identified with religious groups. Of the small number that was quoted, the majority were identified as belonging to "anti-abortion" and "Christian" groups (National Right to Life, Southern Baptists, and Christian Coalition). However, it is important to note that these groups were mentioned fewer than five times in 230 separate articles.

In contrast, nearly three quarters of all sources quoted in the articles were represented as favorable toward cloning research. Several factors appear to contribute to

Table 3
Average Number of Sources Quoted in Cloning Stories (per article)

Average	*The New York Times*	*The Washington Post*	*USA Today*	CNN.com	ABC.com	MSNBC
	3.6	3.7	1.8	2	2	2.3

Table 4
Average Article Length (in words) of Cloning Stories by Year

News Organizations	1996	1997	1998
The New York Times	1369	1210	1097
The Washington Post	1242	1190	1014
USA Today	425	720	767
CNN.com	291	373	478
ABCNews.com	0	656	741
MSNBC.com	0	973	689

such discrepancies between favorable and critical source use. First and foremost were the types of people most frequently quoted in cloning news published during this time as well as the connections these people had to the research and development of cloning research. For instance, Table 5 represents a list of the top 17 people who were quoted in all six news organizations' reports. The list contains the names of people who were quoted more than seven times, along with the names of their affiliate organizations. In several cases, multiple affiliations are indicated, because one quoted source frequently represented the interests of different organizations. It is important to note, however, that in the text of cloning stories, both online and print, it was typical only to mention one affiliation for any given quoted source. Thus the list of source affiliations represents my *own* efforts to track affiliations by cross-referencing the media-provided description of "experts" and their organizations.

Several observations can be made about this list of sources, not the least of which is a strong leaning toward corporate and university research interests. In addition to holding doctorates, a credential that lends credibility to their statements, most sources quoted in news articles were either associated with or were spokespeople for biotechnology companies. These not only included corporate researchers but also many of those sources identified as university researchers. Other than Ian Wilmut and his colleagues at PPL Therapeutics, the three most frequently quoted sources, particularly by the *Post*, the *Times*, and ABCNews.com were Carl Feldbaum, Neal First, and Michael West, a representative of Advanced Cell Technologies. Feldbaum is the president of the political lobbying association, The Biotechnology Industry Organization, which represents the interests of more than 750 different biotechnology organizations in the

Table 5
List of the Most Frequently Quoted Sources

1. Dr. Carl Feldbaum, President of Biotechnology Industry Organization
2. Dr. Ian Wilmut, Cambridge, Researcher, Roslin Institute, PPL Therapeutics
3. Dr. Harry Griffin, Assistant Director, PPL Therapeutics
4. Dr. Keith Campbell, researcher, Roslin Institute, PPL Therapeutics
5. Dr. Ronald James, managing director, PPL Therapeutics
6. Dr. James Robl, Researcher University of Massachusetts, Advanced Cell Technology, Inc.
7. Dr. Steve Stice, Vice President, Advanced Cell Technologies
8. Dr. Lee Silver, Molecular Biologist, Princeton University
9. Dr. Harold Varmus, Director of National Institutes of Health
10. Dr. Michael West, CEO of Advanced Cell Tech, Founder of Geron Corp.
11. Dr. Neil First, Professor of Reproductive Biology, University of Wisconsin, ABS Global, Inc.
12. Dr. Arthur Caplan, Director of the Center for Bioethics, University of Penn.
13. Dr. Colin Steward, National Cancer Institute
14. Dr. Richard Seed, physicist, Chicago
15. Bill Clinton, President
16. Christopher Bond, Senator (R. Mo.)
17. Dr. James Grifo, Director of Reproductive Endocrinology, NYU

United States. Neal First, a reproductive biologist at the University of Wisconsin, was frequently quoted on his experiments in cloning cattle and often provided reaction comments to new cloning announcements. His ties are to the University of Wisconsin and the biotechnology firm ABS Global, Inc. Michael West and Steven Stice also provided reaction comments and represented the interests of their company, Advanced Cell Technology, Inc. Arthur Caplan, director of the Center for Bioethics at the University of Pennsylvania, was consistently quoted to provide an "ethical" perspective.

In addition to larger journalistic trends that might be associated with privileging "experts" (Rampton & Stauber, 2002), "selling science" (Nelkin, 1987), or sensationalizing science (Jarmul, 1991), the overrepresentation of positive sources coincides with common reporting practices in conveying new scientific discoveries. In many cases exhibited here, cloning stories were about breakthroughs. Announcements of *new* procedures, *new* cloned animals and *new* options for potential medical cures dominated many cloning stories, and such breakthrough announcements usually focused on the teams of scientists who helped produce them as well as those who might benefit from them. The frequency with which representatives of the Roslin Institute and PPL Therapeutics (organizations that sponsor Wilmut's cloning research) were quoted provides one example of this. Four of the sources most frequently quoted by all six news outlets were from PPL or the Roslin Institute. They included Ian Wilmut, Harry Griffin, Keith Campbell, and Dr. Ronald James. Such industry slants may also reflect either a lack of spokespeople knowledgeable enough to articulate criticisms of current cloning procedures or reluctance on the part of

news organizations to devote the space required to explicate problems, inadequacies, and risks in cloning research designs.

News of the Future?

One of the most striking means reporters used to cover cloning news was to rely heavily on future-oriented and frequently speculative terminology in describing cloning advances. The news is commonly thought to provide an unbiased chronicling of events that have already occurred. However, cloning stories tended to break with this convention by dwelling more heavily on the future. In fact, writers seemed to suggest that the future was the principal lens through which current cloning technologies *ought* to be viewed.

Several rhetorical techniques contributed to this future-looking orientation. First, in order to set up future-oriented descriptions, speculative terms and clauses were frequently invoked. "If-then" clauses, for example, were often used to indicate the benefits of present cloning research, as in "If researchers can get a cow to produce beneficial proteins that can't be produced in other ways, cloned cows would be vastly more valuable" and "If successful, such research could lead to more effective ways to combat hemophilia" (Sternberg, 1998, p. 1A). Second, positive verbs and verb phrases such as "promises," "will create," "may enable," "may allow," "could provide," "increases the chances," and "provides the opportunity," were frequently used. Other future-looking phrases commonly used included the following:

"In the future . . ."
"May help predict . . ."
"Can help solve . . ."
"If successful, then . . ."
"Coming soon . . ."
"The possibility suddenly exists . . ."
"Cloning research holds a glittering promise . . ."
"Cloning may help . . ."
"Cloning may make it possible to . . ."
"Could lead to stunning therapeutic advances . . ."
"May allow us to treat . . ."

Language Use: Declaring the Benefits and Raising Ethical Questions

Such future-oriented phrases were most commonly used to describe the potential benefits of cloning research and techniques. Similarly, future-oriented language was also used to introduce ethical issues into cloning reports, but in a notably different way. Although the future-oriented phrases associated with the benefits of cloning almost invariably took the form of assertions (i.e., declarative utterances), the future-oriented

language associated with ethical issues or risks usually took the form of questions, as in the following headlines: "Should we be cloning around?" (CNN.com, 1997a); "Will man be far behind?" (Fox, 1998); "Clones: Not now but when?" (Walliser, 1998, February 13); "Will headless human clones grow organs in 10 years?" (CNN.com, 1997c); "Will cloning food be next?" (CNN.com, 1997b); "Could Michael Jordan be cloned?" (Anderson, 1997, February 28, p. 7); or more simply, in one article published by *USA Today*, "Big Questions for Humanity" (Sharp, 1997, February 25, p. 6D).

Because both the potential benefits and problems associated with cloning research are potentialities that lie in the future, there is no logical reason why the former should be asserted in declarative form as likelihoods and the latter constructed grammatically as questions. Yet, even in the text of articles, this was the prevailing pattern: benefits were discussed in declaratives; problems, risks, social, and ethical issues were raised as questions. Should the government regulate cloning? Do the risks of cloning outweigh the rewards? Do humans have any business tinkering with the building blocks of humanity? Should scientists be allowed to conduct cloning research if it may ultimately benefit people? Few if any attempts were made in answering these questions. Rather, in most cases such questions were followed by a summation similar to the conclusion reached by one ABCNews.com reporter: "Thus far, the answers have been murky at best" (Walliser, 1998, February 13).

This was not the case in reporting the potential benefits of cloning. Much of the overwhelmingly positive slant of the articles stemmed from the large number of *potential* applications and products mentioned in connection to current cloning research projects. However, it is worth noting that at the time of reporting none of the identified treatments, applications or products (drugs) had actually been created. They were merely *possibilities* that cloning research *might* provide in some unspecified future. But over time, the continuous repetition of such anticipated benefits in articles on cloning seemed to move them closer to realities.

By 1997, the initially tentative language used in earlier reports on cloning began to be interspersed with more definite assertions: what "might" be accomplished through applications of cloning research gradually began to slip over into what "will" be accomplished. Of the range of possible applications and products associated with cloning research, the two most frequently predicted entailed (a) using genetically altered "host" animals to help create new forms of drugs, and (b) using cloning techniques to "recreate" or "accentuate" nature. The first, using host animals to create new drugs, was the more frequently mentioned. More than one third of the articles examined here included projections about the possible use of cloned animals to lead to new drugs and forms of medical treatment. A *New York Times* article, "Cloned Animals Offer Companies a Faster Path to New Drugs," provides a good example of the portrayal of potential benefits associated with the cloning of domesticated animals. In the article, *Times* reporter Lawrence Fisher stated:

> Leaving aside the science fiction scenarios and ethical debates, the first products to emerge from the remarkable cloning of an adult sheep by British researchers will probably be

> animals that can serve as drug factories. . . . Although the Roslin Institute's lamb is ordinary in every respect but its conception, scientists could easily clone animals genetically engineered to produce pharmacologically useful proteins in their milk. (Fisher, 1997, p. B8)

The following day, similar articles appeared in *The Washington Post* and *USA Today*. In the *Post* article, science correspondent Rick Weiss conveyed a message similar to Fisher's:

> Herds of cloned animals custom-made to have human diseases could also prove useful in the search for cures for those human ills, they said. Eventually, for example, barns filled with identical sheep all suffering from cystic fibrosis could replace the cages full of mice that are now the workhorses of such research, allowing testing of new drugs on animals whose lungs resemble human lungs much more than mouse lungs do. (Weiss, 1997, p. A1)

Similarly, in an article titled "Cloning animals for healthier humans," *USA Today* science correspondent Tim Friend suggested the following:

> Cheap and plentiful bio-engineered drugs that are made from human proteins will be the first practical application of the breakthrough in the cloning of adult mammals, experts said Monday.…While ethicists debate the issues of someday cloning humans, and politicians clamor for future regulations, scientists are awestruck by the benefits that the immediate cloning of animals hold for society. (Friend, 1997, p. 6D)

From animals as "drug factories" to cystic fibrosis "workhorses," the message is pretty clear: advances in animal cloning will ultimately make possible the mass production of more effective medicines. Initially, the focus of such stories centered on utilizing sheep. However, as other cloning procedures succeeded in producing cows, pigs, and mice, they too were mentioned for their potential utility as pharmacological hosts. The number of possible new drugs that animals might help generate became more diverse as well. By late 1998, possible drugs relating to hemophilia, bone cancer, infertility, AIDS, aging, and Parkinson's Disease were mentioned in cloning reports. Articles published in the following year increasingly added to the list of possible drugs. The main emphasis seemed to be that in the future, cloning will offer a virtually untapped storehouse of more effective, cheaper drugs.

Animal Cloning: Re-Creating Endangered or Extinct Species

In addition to reports about the cloning of Dolly and other animals, a number of articles appeared that focused on the creation (or in some cases "re-creation") of endangered animals or animals that were already extinct. For example, in late 1997, Australian researchers began experimenting with the "re-creation" of the Tasmanian Tiger, a form of dog that was wiped out by humans and has been deemed extinct since 1936 (Reuters,

1997). In the same year, Chinese scientists began to consider using cloning procedures to keep Panda bears from becoming extinct (Rubin, 1997). 1997 was also the year researchers in New Zealand began experimenting with cloning procedures to re-create forms of sheep that might be beneficial to New Zealand's economy, and livestock researchers used a technique known as sperm-sorting to reselect the genetic traits of a horse that was designed to be born female in August of 1998 (Verrengia, 1998). A later article reported on the hopes of French researcher Bernard Buigues to take some of the DNA from the frozen Woolly Mammoth he found in the Siberian arctic to "re-create" a clone of the animal that died nearly 20,000 years ago (Isachenkov, 1999).

The tone of such articles combined two, often emotional, elements. The first was eager optimism, as the possibility of "re-creation" of endangered or extinct forms of life seemed to generate a strong sense of intrigue and optimistic curiosity. Can such a feat really be accomplished? Is it really possible to resurrect extinct species? Could a species survive if resurrected? Absolute or even qualified answers to any of these questions were rarely provided and, in many cases, may not be known. However, articles continually conveyed the sentiment, *Why not try*? ABCNews.com's coverage of cloning a frozen mammoth included the results of a reader survey that highlighted such a sensibility. Of the 7,355 people who responded to the question, "Should cloning be used to resurrect long extinct life?" nearly 77% responded, "Sure, let's see what science can do," whereas only 20% responded, "No, let's take care of what now exists." A similar tone of optimism characterized an ABCNews.com article concerning the cloning of Giant Pandas. Here, possible cloning techniques were represented as a means of "staving off extinction of the panda for 60 years" (Rubin, 1997). (Current estimates suggest extinction of the Giant Panda by the year 2040.)

A secondary element in the tone of several articles on these dramatic potentials for cloning was skepticism, most often expressed toward the end of the article by including doubtful or critical comment from more sober sources. Articles such as ABCNews.com's story on the possible attempts to clone pandas or woolly mammoths, for example, included statements made by critics who deemed such experiments either outlandish or unethical, or both. One such critic, Lisa Stevens, zookeeper at the Washington National Zoo, was quoted as saying that ". . . cloning is a kind of pie-in-the-sky. Cloning certainly is not going to be the way to save an endangered species" (Rubin, 1997).

In the majority of cases, however, critical response to these types of cloning proposals was either reported very late in the article or not reported at all. In reporting the proposal to recreate the Tasmanian Tiger, ABCNews.com included no critical sources. In reports of the plan to clone Giant Pandas in China, criticism came only in the form of one statement suggesting that the proposed method was "more complex" and "difficult" than methods previously used in cloning farm animals. In MSNBC's report on the cloning of six identical calves, and then again in its report on the cloning of 50 mice by Japanese researchers, no critical or skeptical assessments were included. In fact, MSNBC.com's article on the cloned mice included a headline that suggested that this experiment validated and "put to rest" questions

about the authenticity of other cloning advances (Laino, 1997). Unfortunately, no additional evidence to substantiate this assertion was included within the article.[4]

Conclusions

A number of important trends emerged in this study of news reporting about cloning. First, cloning research was most often presented in a positive, future-looking light. The focus of most reports was on educating the reader about the technical procedures involved in cloning and the benefits likely to ensue. The major outcome of such procedures involved future medical treatments that were projected to cure a wide range of diseases and disorders facing humanity. Continued cloning research, it was suggested, would increasingly make cloning safer, more efficient, more financially lucrative, and ultimately, essential to progress.

What became apparent in this analysis, however, was that only a small portion of the news reports covered the social or ethical issues connected to cloning. Although social or legal questions might be raised and statements about ethics might be made, these often seemed to serve as little more than rhetorical devices, a means to draw readers into stories in which the principal focus was not ethics or morality, but the techniques and technologies of new cloning procedures. New advances, new methods, more efficient techniques, possible cures, future treatments—these were the subjects dominating cloning news.

To a large extent, of course, the focus and balance of news stories reflect the sources consulted and the information and perspectives those sources provide. For that reason, journalistic standards conventionally dictate that a variety of sources, representing different interests and points of view, be consulted and reported in an effort to achieve balance in news coverage. With regard to sources, results from this analysis of 3 years of media coverage indicate that research scientists and corporate spokespersons were the primary sources of information for the stories analyzed. In fact, if research scientists and corporate spokespersons were grouped together, they would account for the dominant sources in more than 80% of the cloning articles examined. No other groups played such a significant role in sourcing patterns.

This reliance on a relatively small set of sources with vested interests in furthering cloning research supports other arguments in the literature (Friedman, 1986; Nelkin, 1987; Rampton & Stauber, 2002), which suggest that research corporations and medical organizations are setting the agenda for the ways in which scientific research is reported. It also reaffirms the literature, which suggests that mainstream news sources are playing a central role in the "selling" of views that are favorable toward corporate science research (Nelkin, 1987). Furthermore, findings from this study of news portrayals of cloning update and expand earlier research on the range of ways in which genetics has been portrayed as a panacea for an increasing number and variety of human and environmental problems (Nelkin & Lindee, 1995).

In fact, very few negative or alternative points of view were conveyed. When critical perspectives were suggested, most were raised as ethical questions to be resolved at some unspecified future date, or were attributed to extreme people or organizations that did not have all the scientific facts or did not fully understand them. Consequently, despite an initial tone of amazement and anxiety that appeared early on in reports about the first cloned sheep, both online and print news sources increasingly conveyed a sense of acceptance—even excitement—about further cloning possibilities. Other animals, endangered animals, extinct animals, and ultimately humans—all of these would eventually be cloned, many news reports suggested, and decidedly to the improvement of human life.

The patterns that emerged in the analysis of cloning news reports indicate that elements such as choice of sentence structure and verb tense contributed to the positive orientation of reporting on cloning. Social or ethical issues raised by cloning, if mentioned, were more often raised as questions to be considered at a later date—so, too, were possible negative effects of cloning. Possible future benefits—cures for disease, new drugs—were more often reported using declarative sentences. An important question raised by this research is whether and to what extent this trend in future-oriented speculation is occurring in other areas of science news. This study also raises questions about reporting practice that are relevant not only to science news but also to journalism more broadly: When reporting starts to include speculations about the possible future (and not just "the facts" about events that have occurred), how should those speculations most appropriately be presented by journalists? What responsibilities do journalists have to investigate and acknowledge the vested interests of their expert sources in news reports?

Notes

1. Although a more extensive survey might include other national news publications, such a comparison should not be necessary to address the concerns of this study. Numerous studies of news coverage have established that consistent patterns of news presentation are prevalent across national news sources (Bagdikian, 1995; Gitlin, 1981; Tuchman, 1978). In her studies of science news in particular, Friedman (1986) concludes that "consonance among the major national news periodicals on all format criteria strongly suggests that national news periodicals share common news values and news procedures for gathering and presenting news" (p. 13).

2. Categories were derived from the works of Nelkin and Lindee (1995), Friedman (1986), and Cartwright (1995) in an effort to assess central focal points or patterns in content selection among science stories.

3. It is worth noting here that the trends in science journalism identified in this paper are specific to American mainstream science news. Scholars who have examined news coverage of issues related to genetics in other regions of the world (e.g., within the European Union) may have identified other trends and patterns. One such case is the study by Durant, Hansen, and Bauer (1996) of British newspapers' coverage of the Human Genome Project. The authors characterized the news coverage as composed of a "discourse of great promise" plus a "discourse of concern."

4. Many of the uncertainties about cloning are evident in the unexpected consequences which are resulting from cloning experiments. Scientists discovered that Dolly, the first cloned sheep, was aging

prematurely (MSNBC.com, 1999). When Dolly turned two, researchers found that she showed physiological signs of a fully mature 6-year old sheep and that she may have acquired other genetic mutations in the process of cloning. Also, later experiments conducted by American researchers at Advanced Cell Technology, Inc. have revealed the opposite effect in the cloning of six cows: signs of being younger than their chronological ages (MSNBC.com, 2000). The use of language in the headlines of these two examples seems to illustrate a continuing attempt at positive portrayals of cloning; when it is an apparently negative effect, conditional language is used, "Report: Dolly *may* age prematurely" (my italics). Or, alternatively, trying to find a positive spin for the cloned cows that are too young: "Is cloning key to fountain of youth?"

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