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Article

Genetics and biotechnologies in Italian mass media

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Several researchers operating in the sociological field have recently theorised that genetics and biotechnologies are at the core of the public perception of science. The present study aims at verifying empirically whether or not this is mirrored in Italian mass media, as well as at analysing the topics most frequently present in Italian newspapers and the economic and editorial reasons behind the results of editorial choices. Besides, it provides statistics about the major Italian newspapers published in the last third of 2002. This period has been chosen because some important news was published in December: it consequently offered the chance to carry out a long-term analysis as well as a study of the most important differences - in content and editorial lay-out - between scientific articles which are published in the appropriate sections inside the newspaper and those which make the front page. Ours are going to be purely quantitative considerations; but, from the point of view of the content, the data are sufficient to identify various narrative currents. These currents could be the object of further research on the frames used to contextualize the news and the reasons (anthropological, socio-cultural and editorial) for the way they are used by editorial staffs.

Keywords: genetics and biotechnologies, mass media, scientific journalism.

Introduction

Researchers studying public representations of science have stressed that biology, and molecular biology in particular, has recently become of great public interest. Jon Turney, for instance, in his reconstruction of the history of popular images of biology, underlines that this subject is currently enjoying the same renown that once characterized physics.[1] Richard Lewontin, author of several treatises on the social repercussions of biological research, notes that in 1958, one year after the Sputnik was launched, *Isis* and *Philosophy of Science* dedicated but two articles to biology, whereas the discipline currently boasts two specialized journals, *Biology and Philosophy* and the *Journal of the History of Biology*.[2] Dorothy Nelkin, who has been studying the relationships between science and mass media for years, maintains that the gene has become a cultural icon, to be rated among the main causes of social and political phenomena.[3] Lastly, Massimiano Bucchi points out that, economically speaking, molecular biology is currently attracting a large percentage of the investments in Big Science.[4]

Other signs coming from specialized literature support the centrality of molecular biology and show how the study of Dna, which began towards the end of the 1940s, gradually captivated the attention of the scientific world. In 2002, both the Nobel Prize for chemistry and the one for medicine went to studies on the form and development of organic molecules. In the same year, publications on genetic switches achieved the top three positions in *Science*'s annual top ten scientific studies.

Considering all this, and since in our era pubic opinion influences research policies,[5] it is interesting to see whether the centrality of genetics and biotechnologies in the scientific and sociological scenario is mirrored in the mass media as well. The mass media are the forum that is socially dedicated to the discussion of science[6] and the main source of information on research for the majority of people.[7] Besides, they perform a catalysing function as regards public opinion: as McQuail points out,[8] not many people can remember an occasion when they formed an opinion or obtained an important piece of information without the media.[9]

The present article[10] follows this line. It illustrates the results of a quantitative investigation which means to determine the incidence of genetics and biotechnologies on the whole of science

communication; it also means to identify the main thematic areas which could become the object of further qualitative studies on the frames used to present the news to the public. The statistics employed in the article refer to the 590 newspaper issues published by the five Italian daily newspapers with the widest circulation in the last third of 2002; i.e., in a period of time comprising months of ordinary scientific news (from September to November) and a month of front-line news (December).

Methodology

The present analysis has been carried out by drawing statistical correlations within a corpus of newspaper articles from non-specialized Italian daily newspapers. Below are details about the delimitations of this study, the methodological criteria that have been followed and the analytical categories employed.[11]

Delimiting the field

The period monitored goes from 1st September 2002 to 31st December 2002. During these 122 days, every newspaper published 118 issues, since there are no issues on the 25th and 26th December (Christmas Day and Boxing Day) and journalists went on strike on 17th November and 21st December.

This period allows for a long-term analysis, with an eye to the differences between ordinary and extraordinary news. Since the data monitor a period of four months, they can be interpreted as average indexes, comparable with those of similar studies, thus providing a long-term analysis. And by comparing the data of the first three months, which did not witness any particularly important piece of news, with the December ones, the differences between ordinary and extraordinary news can be analysed. December was actually inserted into the monitored period purposefully, in order to include one of the most sensational pieces of news about genetic and biotechnological research in recent history: the announcement, made by the Raelian sect, that the first human cloning had taken place.[12] Even though the event quickly turned out to be false, it absolutely magnetized the attention of some newspaper issues, modifying some figures in a significant way, which is well worth analysing.

The sample is made up of the following newspapers: *Corriere della Sera*, *La Repubblica*, *La Stampa*, *Il Messaggero* and *Il Sole24Ore*, i.e. the five Italian newspapers with the widest circulation (with the exception of the *Gazzetta dello sport*). Altogether, the newspapers sell 2,385,800 copies,[13] about 50% of the total national circulation, sports newspapers included.

Analytical categories

Each piece of news examined has been inserted into a grid of categories defining the pertinence of the piece itself, as regards the scientific content as well as the way it is dealt with from an editorial point of view. This in order to draw a statistical trend of the coverage genetics and biotechnologies receive in newspapers.

As far as topics are concerned, the field “genetics and biotechnologies” has been divided in five macro-areas. According to its content, each article has been placed in one of the following categories: biomedicine,[14] genetics[15] (for basic research), bioethics,[16] scientific culture[17] and politics of science.[18] Some pieces of news could have been placed in more than one category; but each article has been put only in the category best suited to its content, in order to be able to evaluate the incidence of every area on the total.

Besides, some indicators have been adopted in order to determine the journalistic category the pieces of news belonged to. The examined articles have been divided into reports, leading articles and interviews. The length of the articles has been taken into consideration as well: articles occupying less than 150 sq cm are considered to be “short”, articles occupying between 150 and 300 sq cm are “medium length” and articles occupying more than 300 sq cm (charts and illustrations included) are “articles of discussion”. The incidence of articles about genetics and biotechnologies on the whole of the space available in each newspaper (advertising excluded) has been quantified, as it is an indicator of the importance of the article in the structure of the newspaper. Two more indicators have been added:

whether the article was mentioned on the front page or not and the page the article appeared on. As regards the latter, articles have been grouped as follows: those appearing on page 1, 2 or 3; those appearing from page 4 to page 11; and those appearing from page 12 onwards.

Finally, the sources and the experts quoted and the author (if present) have been recorded, in order to have an indicative view of the personalities mentioned in the press with regard to the various issues.

The selection criterion

Not only popularizing newspaper articles, but also a number of media products only marginally connected with science have been included in the present study. This in compliance with the indications coming from the sociology of science and the sociology of communication. Bruno Latour, for instance, maintains that nowadays hybrid articles dealing with a mix of various disciplines keep increasing.[19] Evans and Priest confirm this theory, recalling that, in the current situation, both editors and the beneficiaries of mass communication "seem less and less inclined to distinguish between news and entertainment. [...] After all, like most popular entertainment, news is a form of storytelling".[20]

Scientific information, therefore, reaches the public in composite forms, often a mix of politics, social news and economics. Given all that, the problem was: what is the level of "contamination" that an article can tolerate to be still defined "scientific"? For this purpose, the methodological indications have been followed elaborated by the Master in Scientific Journalism of the Sissa (International School for Advanced Studies) in Trieste, which divided the communication of scientific information in Italian mass media into three categories:[21]

- *Proper communication of science*: articles and TV reportages with a minimum scientific content. Under the label "scientific content" are comprised the popularization of scientific principles, discoveries and applications or the providing of information on current medical and scientific problems.
- *Parascientific communication*: mixed products, where a scientific issue, though present, is only marginally dealt with and other parts of the message are privileged, mostly the measures taken by the authorities, the political debate and the repercussions on social life.
- *Service information*: articles and TV reportages with an explicit, immediate, concrete aim, such as preventing an illness or improving one's personal wellness.

In the same study, the Sissa suggested that the category "Parascientific communication" be excluded. Each selection keeps a significant element of arbitrariness. The press constantly intertwines genetics and biotechnologies with ethical, political and economic considerations; so much so, in fact, that articles of "Proper communication" would be fewer than ten. Therefore it has been acknowledged that a medley of topics was in itself a significant peculiarity of the material examined.

Results

The collected data are to be elaborated (according to the methodology just described) and summarized. The present article is then going to illustrate: 1) the space given by mass media to genetics and biotechnologies and the incidence of the two topics on the whole of the communication of science; 2) the internal structure of the topics dealt with; 3) the collocation and editorial lay-out of the news; 4) the differences between the way ordinary and extraordinary news are given.

Genetics and biotechnologies: ¼ of the communication of science

In the monitored period and in the newspapers examined, 375 pieces of news have been found regarding genetics and biotechnologies, i.e. an average of 0.63 pieces of news a day per newspaper. In comparison with the editorial content of the newspapers (commercials excluded), the corpus occupied an average 0.44% of the space available (see Table 1).

Table 1 – Percentage on the available area during the whole period

Genetics and biotechnologies in newspapers Percentage of space taken by every category 01/09/02 - 31/12/02	
Category	*Average*
Biomedicine	0.15
Genetics	0.03
Bioethics	0.15
Culture	0.07
Politics	0.05
Total	*0.44*

This means that about ¼ of the space given by the newspapers to the communication of science is occupied by genetics and biotechnologies. The investigation carried out by the Sissa in 2002, following analogous methods, showed that "the space given to science is about 1.6% of the editorial content of the daily newspapers, advertising excluded".[22]

By comparing some data of the two studies, this figure is confirmed (see Table 2). In the Sissa study, biomedicine, bioethics and molecular biology applied to human health formed a single group, which occupies 0.9% of the available space; in the present study, medical genetics and bioethics together account for a 0.3%, one third of the general figure of the Sissa study, which comprises all articles on clinical medicine, nutrition, wellness, psychology, psychiatry and neurosciences. Likewise, basic genetic research (genetic category) occupies 0.03% of the space available, advertising excluded; again, one third of the 0.1% occupied by hard sciences and technology, two categories that in the Sissa study include studies external to the medical field. Finally, in the Sissa study genetics and biotechnologies (0.4%) total more than environmental issues (0.3%), in spite of the attention for meteorology and climate changes.

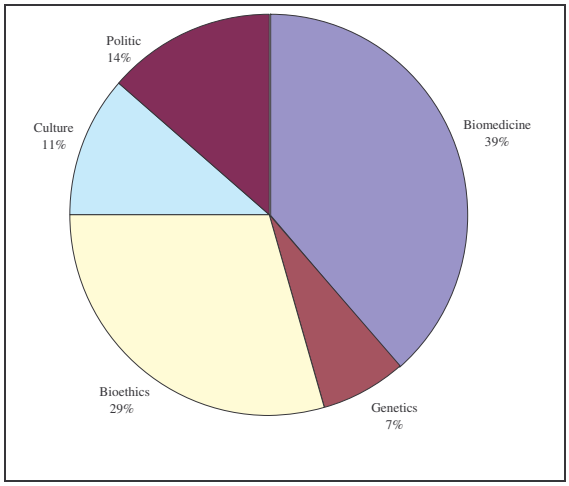
Table 2 – Data collected by the Sissa study on communication of science and data on genetics and biotechnologies

Data on communication of science (Sissa study)		*Data on genetics and biotechnologies*	
Biomedicine (medical molecular biology and bioethics)	0.9	0.3	Biomedicine and bioethics
Hard sciences and technology	0.1	0.03	Genetics
Total	1.6	0.44	Total

Therefore, the mass media tend to show the centrality of molecular biology theorized by sociological literature and supported by the numerous awards given to scientific publications dealing with this field. Dna currently attracts the attention of Italian newspapers more than other scientific issues, especially for its many applications in the medical field.

Contents: biomedicine reigns, basic research only of minor importance

Graph 1 – Daily newspapers: distribution of news per category in the whole period



Biomedicine is the most covered thematic area in Italian daily newspapers: it has 145 articles to its credit, i.e. 39% of the total 375 (see Graph 1). Here is confirmation of the Sissa figure that 55% of scientific news is medical news.[23] And here is confirmation, too, of Paola Borgna's study on public representations of science. Borgna writes that "for the Italians, science and technology are – or should be – first of all a matter of creation of knowledge and its application to the study, prevention, diagnosis and therapy of diseases".[24]

The category "genetics", on the contrary, occupies only a minor place. This category includes basic research and studies aiming at technological applications external to medicine, a field in itself rather varied.[25] But a mere 7% of the articles actually present these characteristics, 26 texts mainly about new agricultural products and bioevolutionist research, such as the publication of the genetic map of rice or genetic investigation on Columbus's remains.

Between these two extremes are the other three categories, culture, politics and bioethics. Articles on "culture of science" (11%) are mainly related to the awarding of the Nobel prizes and important TV events about health, such as those organized by Telethon, the 40-hour non-stop fund-raising programme. On these occasions, biographies of prize-winning researchers are frequently published.

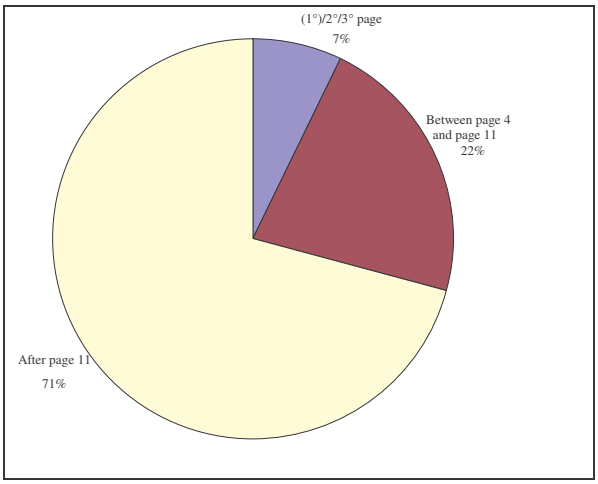
Articles on politics of science (14%) are interestingly homogeneous: 70.6% of the 14% is about Gmos and their usage in agriculture; more than their technical development (2 texts), their path through Parliament is covered (the remaining 34 texts). The phenomenon is due to the fact that Gmos are the negative technological icon that supporters of biological products and "slow food" employ in every legislative battle in favour of the quality and the safety of Italian products, as shown also by a study of the Pavian Observatory.[26]

What is relevant about "bioethics" (29%) is the centrality of cloning: 71 articles out of 110 date back to December, when Stanford University announced the laboratory cloning of embryonic cells and the Raelian sect claimed it had cloned the first human being.[27] Susan Hornig Priest[28] already highlighted this ethics/cloning link in the Dolly case. She hypothesizes that the primary reason behind it is the fact that cloning is seen as a technique[29] and the need is consequently felt to reflect on how to use it. The secondary reason is the fact that cloning tends to make two crucial values of our society clash, namely our faith in progress and the sacredness of the individual.[30] Her theories are plausible, as cloning is often present in the analysed articles, with debates on the border between basic and applied research and the limits to observe in order to grant unborn children their autonomy.

Editorial lay-out. Short pieces after page 11

The corpus analysed is made up of short pieces and profiles (36%), medium-length articles (30%) and longer texts (34%), often accompanied by graphs and prints on one or more pages. 71% of the articles appears after page 11, in the miscellaneous section, after important news and internal politics. Before these, the reader meets the articles published between page 4 and page 11 - 22% - and those appearing in the first three pages – 7% (see Graph 2).

Graph 2 – Daily newspapers: distribution of news per position in the whole period



Therefore, even though 33% of the articles are mentioned on the front page, in terms of lay-out and position scientific information plays a secondary role and much of the work consists in re- elaborating external releases. Pieces of news coming from different newspapers are often very similar to each other and are frequently published without any editorial intervention. Bearing witness to this is the fact that only 42% of the articles are signed and the percentage has to be distributed among editors and various personalities: ministers, representatives of the consumers or of economic-productive sectors, bishops, philosophers, writers and cooks. A sign that competence tends to be "ghettoized" in editorial offices, as stated by Romeo Bassoli, director of Zadig-Roma, in an interview. When the news is of significant calibre, editorial interventions (16% of the articles) are preferably delegated to someone outside the office. Bassoli says:

> "I would like to start by illustrating the anomalous way Italian journalism has of using experts. Abroad, scientists are given precious little space, because it's journalists who are rightfully given the task to organize the facts organically. In Italy, on the contrary, newspapers top managements believe science to be something mysterious, incomprehensible to any journalist, rightful property of people who possess a scientific degree. It might seem a respectful attitude, but it is in fact an escamotage to prevent science from receiving a proper organic treatment, to quickly cover a piece of news when the lack of nice, first-page streamers makes a larger, more structured effort on the part of the editorial staff unadvisable".[31]

If it's newsworthy, it's bioethics

The data so far discussed, summed up in Table 3, give an overview of the whole period.

Table 3 – Data summing up the whole period

Genetics and biotechnologies in daily newspapers Summary of the data on the whole period 1st September 2002 – 31st December 2002	
Total pieces of news	375
Daily average of news per newspaper	0.63
Average surface occupied	0.4%
Main category	Biomedicine
Journalistic lay-out	Ordinary news below 150 sq cm
Main position	After page 11
Articles mentioned on the front page	33%
Signed articles	42.8%

However, it is interesting to distinguish between the first three months and the last one. December saw the release of two very important pieces of news: the cloning of human embryos at Stanford and the claim that the Raelians had cloned a human being for the first time.[32] Consequently, the corpus of data coming from this sub-period is ideal in order to identify the deviations from the norm that journalistic coverage has in the presence of first-page scientific news.

The alleged birth of Eva the cloned girl, announced on 28th December 2002,[33] had a quantitative incidence: 161 articles out of the total 375 (i.e. 43%) were published in December. But it is even more interesting to observe that the increase consisted almost exclusively in articles of bioethics (71 articles out of 161, i.e. 44.1%). An analysis of the hottest days of the Eva case confirms the figure: between the 28th and 31st December 2002, 1.65% of the average 3.6% out of the total space occupied by genetics and biotechnologies (advertising excluded) was monopolized by declarations, more or less related to ethics, of politicians, clerics and philosophers.

Variations from the average occurred also as far as position and typology of the articles were concerned. December saw the publication of 24 articles in the first three pages (out of 27; they were about therapeutic cloning and human cloning), 84 front-page headline boxes out of 123, 57 articles occupying more than 300 sq cm (out of 129) and 20 leading articles (out of 42).

Table 4 – Data of the first three months and those of December

Genetics and biotechnologies in daily newspapers: various data		
	1st September – 30th November	December
Number of articles	214	161
Average surface occupied	0.32%	0.79%
Main category	Biomedicine	Bioethics
Articles mentioned on the front page	40 (19% of the total of the three months)	84 (52% of the total of the months)
Distribution of the articles	Pages 1°-3° = 2% Pages 4°-11° = 11% Page 11° onwards = 87% Nb. Percentage on the total of the three months	Pages 1°-3° = 14% Pages 4°-11° = 36% Pages 11° onwards = 50% Nb. Percentage on the total of December
Signed articles	138 (55% on the total of the signed articles)	114 (45% on the total of the signed articles)

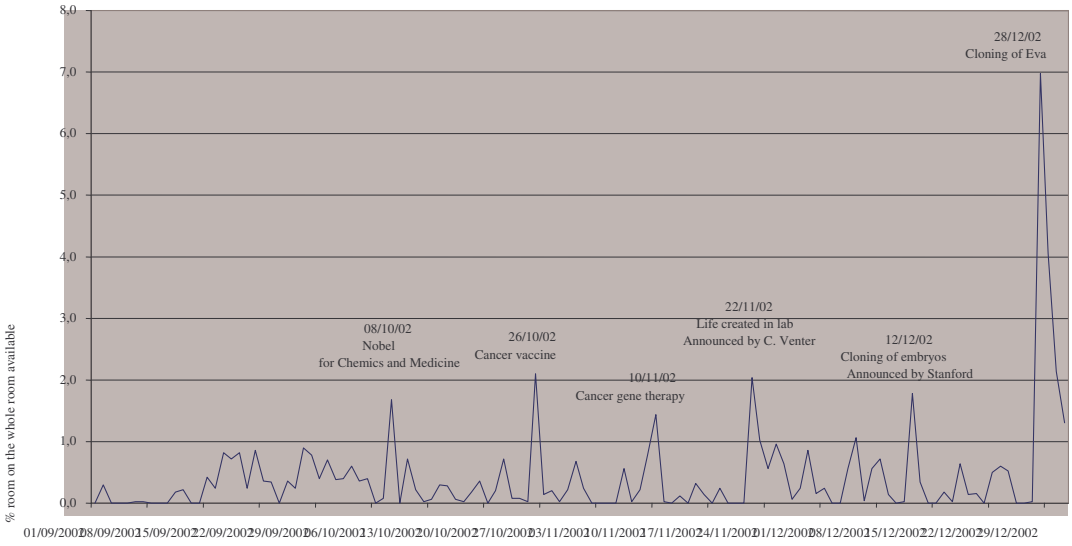
An analysis of the differences between the data of the first three months and those of December, summed up in Table 4, shows that first-page news brings about quantitative variations in the space occupied by scientific articles, variations amounting to some decimal points: from 0.32% in the first three months to 0.79 in December. They also cause a change of content category and editorial treatment: when genetics and biotechnologies are newsworthy and exceed the space and lay-out they usually occupy (= short pieces from page 12 onwards), the topics dealt with have to do with direct manipulation of life and are narrated through leading articles related to ethics, signed by non-journalists. As declared by Pietro Greco: “Basic research generally fills appropriate sections, whereas bioethics usually reigns in generic pages”.[34]

The trend of the coverage: between economics and newsmaking

Graph 3 shows the trend of the average daily space occupied by genetics and biotechnologies on the whole space available, advertising excluded. The six peaks bear witness to the fact that research on the structure of the Dna and its applications systematically becomes front-page news. The war against cancer and the manipulation of life are the topics most frequently placed on the front page. Cloning caused the most significant peak, thus proving to be able to reverse the ordinary tendency of journalistic coverage, which usually favours biomedicine.

Despite these exceptions, however, the majority of the tracing is below 1%. The number of articles about genetics and biotechnologies is a significant percentage of the total articles about the communication of science, but taken as an absolute value it is still rather low, due to economic pressures and newsmaking processes.

Graph 3 – Daily newspapers: average daily space occupied on the whole space available, advertising excluded



In fact, more than cultural institutions, the media today are industries, economic agents, trading firms. Their choices are not autonomous, but the result of the political pressures deriving from the owners of the media themselves, the economic constraints typical of every private-owned company and the production routines elaborated by professionals in order to adapt fluxes of information to the technological infrastructures which spread them.

Economic pressures

In his analysis of the economics of daily newspapers, Mosconi maintains that, economically speaking, means of communication operate on a double market: copies of the newspaper – i.e. information, entertainment and culture - are sold to the readers, advertising space - i.e. the attention of the aforementioned readers – is sold to advertisers. "Demand for the second product (advertising space, or rather access to audiences) is deeply influenced by the sales of the first product (circulation)".[35] Therefore, circulation – tightly linked with readers' preferences – can be seen as the economic mainspring of the communication industry.

Genetics and biotechnologies are an issue on the Italian agenda, as demonstrated by a telephone survey carried out in October 2001 on a sample of 1017 people representing the Italian population above 18 years of age. According to the results, 36% of the interviewees talked about biotechnologies at least once in the three months prior to the survey.[36] Confirmation comes from the fact that 80% of European citizens complain they are not sufficiently informed about biotechnologies.[37]

These data could be an incentive for the publishing world. But they have to be interpreted considering the kind of media content the Italians prefer. According to a survey carried out by Censis (the Centre for Social Investments Studies) in 2001,[38] only 15.5% of the people who read daily newspapers and 7.3% of those who listen to the radio and watch TV are interested in the category "culture" (which may include genetics and biotechnologies). Culture follows national news, international news, sport, politics and economics.

In conclusion, since scientific communication totals 1.6% of the whole of communication and genetics and biotechnologies about one fourth of it (0.4%), it is reasonable to infer that the media understand that these topics are of particular importance for the public but fulfil the demand for this kind of information respecting the wishes of consumers not particularly interested in scientific news as a whole.

The role of production routines

Like any other industrial system, the mass media have developed standardized production mechanisms, necessary for their growth on an organizational level. Mauro Wolf stresses the importance of these mechanisms, concentrating on the definition of news values, i.e. the criteria indicating "events believed to be interesting, meaningful and significant enough to become news"[39] and guiding the selection of the materials to be published among those which reach an editorial office. Wolf lists the typologies of the main news values[40] and explains how they work, but what is relevant to the present article is just the dimension of the ambit these heuristic strategies operate in.

The 375 scientific articles found in the monitored period may seem very few, considering that in the same period the analysed newspapers published some 100,000 articles altogether. But every piece of news has to face enormous competition, before being published.

By multiplying the monitored period of four months by the average daily number of dispatches from news agencies to be managed, weighed up and finally skimmed (7,000), one realises that editorial staffs applied the aforementioned selection criteria and extracted the pieces of news about genetics and biotechnologies from a flux of information totalling some 854,000 units. Since the advent of telematic services in editorial offices, the phenomenon has developed unimaginable proportions. In his dossier on environmental communications Romeo Bassoli, in order to describe how every chief editor feels in the evening, quotes Charles Schultz's Snoopy, who reflects that during the day he has taken 513 decisions, all of them wrong.[41]

The Italian public is interested in scientific disciplines, but still rates them second to other aspects of political and economic life. The collected data can consequently be seen as the way mass media react to this public, an answer which is economically endurable and compatible with editorial needs. Among its production routines, the communication industry has developed filters to find news on genetics and biotechnologies, but tends to relegate these disciplines to secondary positions, on internal pages, because of the pressure of other categories.

Conclusions and ideas for further analyses

The analysis of Italian daily newspapers has confirmed the initial theory that genetics and biotechnologies are at the core of the current scientific research. In fact, even excluding December because of the extraordinary piece of news of the first human cloning,[42] the space occupied by biomolecular research (0.32%) on the whole space available, advertising excluded, is symptomatic, especially if compared with the 1.6% occupied by the whole communication of science in the first months of 2002. Further confirmation lies in the fact that the figure of the whole monitored period, 0.4%, is higher than the figure obtained by the Sissa study for the "environment" (0.3%).[43]

But it is also true that this low absolute value is partly due to economic pressures and production routines (see Paragraph 4). And a low absolute value means a constant but minor presence in the media, with short articles in internal pages. Among these articles, biomedicine turned out to be the most recurrent topic, as typical of the medicalized society described in Paola Borgna's study.[44] But it was bioethics that proved able to make the front page and make a popular topic out of science.

As regards possible future content analyses, the collected data seem to agree with what Massimo Bucchi said about the journalistic coverage of the mucilage, mad cow and methanol-adulterated wine emergencies: science communication in Italy does implicitly respect a macro frame, and that is, the legitimacy of human intervention on nature is always questioned.[45] What are the limits to be imposed on research? The question is present in every article, including those about genetics and biotechnologies, while the answers may vary according to the topic being discussed.

As far as medicine is concerned, *a priori* limits appear to be unnecessary. Here, the end justifies the means: criticism is rare and, where present, it only concerns a statistical evaluation of costs and benefits. Medicine, in short, is easily forgiven if it makes mistakes and is allowed to make daring decisions even in uncertain circumstances. Medical news is inserted in a narrative frame constantly citing progress, often a miracle-working one.[46]

On the contrary, no concession is made to Gmos, unattractive, useless, poor-quality hybrids. Risks always seem superior to benefits and pressures superior to legislative guarantees. Gmos are a political issue, because it's through politics that consumers claim their right to choose what to eat.[47]

Finally, cloning: the modern taboo, according to Bassoli. Just like space in the 1970s, just like the atom bomb after the Second World War, it symbolizes the human challenge to nature. "The fear of cloning has even deeper roots", Bassoli observes. "This technique violates the taboo of individual uniqueness, and in so doing makes it easy for everybody to think that the worst atrocities might become real".[48]

Every consideration on cloning, therefore, pivots on the question of the limits of research. Articles about cloning question a multitude of limits and invite the reader to take sides for every single one, depicting on the one hand the advantages of stem cells[49] (therapeutic cloning) and on the other the abomination of human cloning.[50]

Apparently, there are three issues – medicine, Gmos and cloning - and three different frames to situate them. The word "frame" was first used by Gamson, who carried out an accurate frame analysis of the journalistic account of some crucial moments of the history of nuclear energy. According to him, it would be interesting to examine these groups of interpretation rules and the reasons behind their social success more carefully. The American sociologist states these reasons can be ascribed to three categories: long-term social repercussions, support from influent opinion leaders and concordance with the logic of mass media.[51]

Finally, as far as production routines are concerned, it would be useful to try and find out why our mass media are such easy prey to false news. The perfect example is the announcement of the first human cloning, which was so widely discussed at the end of December. Claudia Di Giorgio is probably right when she says that professional deontics compelled reporting the piece of news but nothing compelled the endless ethical debate on something inexistent: "You can't neglect an announcement like the Raelian's; everybody is discussing it, and they have good reasons to, and saying something about such a significant event is part of your duty as a reporter anyway. […] What is criminal is the way the event has been made the object of an ethical debate whose tone and content were devastating".[52]

Translated by Marta Zago, Scuola Superiore di Lingue Moderne per Interpreti e Traduttori, Trieste, Italy.

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[9] Jenny Metcalfe and Toss Gascoigne [J. Metcalfe and T. Gascoigne, "Science journalism in Australia", *Public Understanding of Science*, 4, 1995, p. 411-428], as well as Bucchi and Neresini [M. Bucchi and F. Neresini, "Biotech remains unloved by the more informed", *Nature*, 416, 2002, p. 261], do not believe the media to be effective as primary educators; but they believe the media can give the public some guidelines, by setting the agenda of the issues to be discussed and their frames. As far as that is concerned, their considerations are supported by McCombs' and Shaw's works on the agenda-setting function [M. E. McCombs and D. L. Shaw, "The agenda-setting function of the press", *Public Opinion Quarterly*, 36, 1972, p. 239-44] and in Graber's studies on news processing [D. Graber, *Processing the news*, Longman, New York, 1984].

[10] The study is part of *Organismi Giornalisticamente Modificati* (Journalistically Modified Organisms), a doctoral dissertation for a degree in Communication Science, discussed at the University of Bologna in November 2003 (unpublished)

[11] The methodological criteria employed in the statistical survey have been obtained from the Permanent Observatory on the Communication of Science through the media, operating at the ISAS from 2002 with financing done by Ilesis, the Institute for Research and Training on Health Systems [SISSA, *Osservatorio permanente sulla comunicazione pubblica attraverso i media* (Permanent Observatory on Public Communication through the Media), Ilesis, Rome, 2002]

[12] On 27th December 2002, mass media announced the birth of the first cloned baby girl, nicknamed Eva. She had allegedly been born in secret laboratories whose staff was coordinated by Brigitte Boisselier, the biologist recruited by the Raelian sect in order to reach eternal life through scientific research. The Raelians are led by the prophet Rael, ritual name of an ex-pilot who claims he received his illumination after meeting aliens, and they believe that science can give mankind eternal life, cloning being the first step in that direction.

[13] Average circulation of the newspapers, as monitored from June 2002 to August 2002: *Corriere della Sera* = 683,800 copies; *La Repubblica* = 636,800; *Il Sole24Ore* 391,000; *La Stampa* = 390,200; *Il Messaggero* = 284,000 (source: *Prima Comunicazione*, September 2002)

[14] To this category belong all genetic research and all biotechnological applications pertaining to the medical field or strictly related to the safeguarding of health.

[15] To this category belong all other articles of "pure science" describing genetic and biotechnological research not directly pertaining to the medical field, such as the study of human evolution and of produce.

[16] To this category belong articles comprising scientific news as well as institutional declarations on the roles and limits of genetic research, such as comments of the Pope and other members of the Church, opinions of political leaders, interviews to celebrities and theses by experts of bioethics.

[17] To this category belong articles about philosophy of science, history of science, famous personalities of the scientific world and scientific celebrations, as well as articles describing the scientific creationism of the Raelians and other peculiarities of the sect (see note no. 13).

[18] To this category belong articles about genetics and biotechnologies debating legislative and economic issues, such as how to finance research, how to regulate it and which principles to adopt in decision-making processes.

[19] B. Latour, *Science in action. How to follow scientists and engineers through society*, Harvard University Press, Cambridge, 1987.

[20] W. Evans, S. H. Priest, "Science content and social context", *Public Understanding of Science*, 4, 1995, p. 327-340.

[21] Sissa, Osservatorio *permanente sulla comunicazione pubblica attraverso i media*, cit.

[22] *Ivi.*

[23] *Ivi.*

[24] P. Borgna, *Immagini pubbliche della scienza: gli italiani e la ricerca scientifica e tecnologica*, cit., p. 151

[25] At the University of Bologna, the degree in biotechnologies has six different curricula, covering the pharmaceutical sector as well as the agrarian, zootechnic and industrial ones.

[26] Pavian Observatory, *Le agrobiotecnologie nei media italiani* (Agrobiotechnologies in Italian Mass Media), 2002, available at: http://www.osservatorio.it

[27] Average circulation of the newspapers, as monitored from June 2002 to August 2002: *Corriere della Sera* = 683,800 copies; *La Repubblica* = 636,800; *Il Sole24Ore* 391,000; *La Stampa* = 390,200; *Il Messaggero* = 284,000 (source: *Prima Comunicazione*, September 2002).

[28] S. H. Priest, "Cloning: a study in news production", *Public Understanding of Science*, 10, 2001, p. 59-69.

[29] Back in 1997, Ian Wilmut himself regretted being unlikely to win a Nobel prize for the technical experiment he had carried out [S. H. Priest, "Cloning: a study in news production", cit.].

[30] Regulating research would appear to be an injustice even as far as cloning is concerned. But leaving the field clear for scientists to genetically "photocopy" human beings makes people fear that individual uniqueness could be cancelled, and crucial elements of society together with it, such as the legal system and the *self-made man* ideology [S. H. Priest, "Cloning: a study in news production", cit.].

[31] Extract from the interview to Romeo Bassoli, director of Zadig-Roma, in appendix to *Organismi Giornalisticamente Modificati*, quoted.

[32] Average circulation of the newspapers, as monitored from June 2002 to August 2002: *Corriere della Sera* = 683,800 copies; *La Repubblica* = 636,800; *Il Sole24Ore* 391,000; *La Stampa* = 390,200; *Il Messaggero* = 284,000 (source: *Prima Comunicazione*, September 2002).

[33] *Ivi.*
[34] Extract from the interview to Pietro Greco, director of the Master in Scientific Journalism of the Sissa in Trieste, in appendix to *Organismi Giornalisticamente Modificati*, cit.
[35] F. Mosconi, *Economia dei quotidiani* (Economics of the newspapers), Il Mulino, Bologna, 1998.
[36] Poster s.r.l., *Biotecnologie fra innovazione e responsabilità* (Biotechnologies: innovation and responsibility), 2002. The investigation was carried out by Poster on behalf of the Giannino Bassetti Foundation. Edited by M. Bucchi and F. Neresini. Downloadable from the Internet in Pdf format at http://www.poster.it
[37] "Biotechnology and the European public", *Nature Biotechnology*, 18, 2000, p. 935-938. See also J. L. Lujan's, O. Todt's, "Perceptions, attitudes and ethical valuations: the ambivalence of the public image of biotechnology in Spain", *Public Understanding of Science*, 9, 2000, p. 383-392, for an analysed monograph of the Spanish studies; H. Bonfadelli's, U. Dahinde's, M. Leonarz's, "Biotechnology in Switzerland: high on the public agenda, but only moderate support", *Public Understanding of Science*, 11, 2002, p. 113-130, for an analysed monograph of the Swiss studies; J. M. Gutteling', "Biotechnology in the Netherlands: controversy or consensus?", *Public Understanding of Science*, 11, 2002, p. 131-142, for an analysed monograph of the Dutch studies; and *Public Understandig of Science* volume 11 fascicle 2, which has a special section entitled "Public attitudes to biotechnology".
[38] Source: Censis/Ucsi survey (Ucsi = Catholic Union of the Italian Press), *Primo rapporto sulla comunicazione in Italia* (First Report on Communication in Italy), 2001
[39] M. Wolf, *Teorie delle comunicazioni di massa* (Mass communication theories), Bompiani, Milan, 1984.
[40] At first, Wolf identifies four typologies of news values: considerations about the main characteristics of the piece of news; suitability of the materials available as compared to the form of the informative product; supposed attitudes of the public; and pressure from competitors. Each area is then sub-divided. For example, as far as content is concerned, Wolf relates the importance of the piece of news to the hierarchical level of the people involved, the national impact, the number of people implicated and possible future effects. [M. Wolf, *Teorie delle comunicazioni di massa*, cit.]
[41] R. Bassoli, "Agenda ambientale: i percorsi dell'opinione pubblica", *Problemi dell'informazione*, 3, 1999, p. 333-371.
[42] Average circulation of the newspapers, as monitored from June 2002 to August 2002: *Corriere della Sera* = 683,800 copies; *La Repubblica* = 636,800; *Il Sole24Ore* 391,000; *La Stampa* = 390,200; *Il Messaggero* = 284,000 (source: *Prima Comunicazione*, September 2002).
[43] Sissa, Osservatorio *permanente sulla comunicazione pubblica attraverso i media*, cit.
[44] P. Borgna, *Immagini pubbliche della scienza*, cit.. Lewontin's observations on the crucial importance of medicine are also interesting: "We may be interested, in a detached way, in how long ago the Big Bang resounded, or how many kinds of indissoluble little bits make up all matter, but what we really want to know is why some people are rich and some poor, some sick and some well, why a woman can't be more like a man and why I can't live to be a sexually active centenarian." [R. Lewontin, *It ain't necessarily so*, cit.].
Jean Rostand can be useful as well: "The best way to gain an idea of what the human, *emotional* value of biology can be, is to look through some of the strange correspondence that a biologist receives. [...] People take him for a magician, a healer, a confessor, a friend. [...] The science that provokes such appeals, prayers and confessions, the science that penetrates into private life and whose warnings or advice can influence a marriage, a decision to have children, a person's destiny, is no ordinary science." [J. Rostand, *Can Man Be Modified?*, p. 32-33, quoted in J. Turney, *Frankenstein's footsteps*, cit.].
[45] M. Bucchi, *Vino, alghe e mucche pazze* (Wine, sea-weeds and mad cows), RAI-VQPT, Rome, 1999.
[46] For instance: "Elixir of life? Forget potions, magical recipies and arduous diets: the secret of longevity lies in a common protein with truly miraculous effects." *(Il Messaggero*, 1st November 2002).
[47] For instance: "National Academy of Sciences: No risks. Consumers: We want more guarantees." (*Il Corriere della Sera*, 17th September 2002).
[48] Extract from the interview to Romeo Bassoli, director of Zadig-Roma, in appendix to *Organismi Giornalisticamente Modificati*, cit..
[49] "Therapeutic cloning promises to defeat all degenerative diseases" (*La Stampa*, 28th December 2002)
[50] "If it's true, monsters are one of the risks we're running" (*Il Messaggero*, 28th November 2002)
[51] W. A. Gamson, "Media discourse and public opinion on nuclear power: a constructionist approach", *American Journal of Sociology*, 95, vol. 1, 1989, p. 1-37. See also W. A. Gamson, "Media images and the social construction of reality", *Annual Review of Sociology*, 18, 1992, p. 373-393; W. A. Gamson, "Beyond the science – versus – advocacy distinction", in *Contemporary Sociology – A journal of Reviews*, vol. 28, 1999, p. 23-26, and for a theorical panorama of the sociological concept of "frame", see E. Goffman, *Frame analysis,* Harper and Row, New York, 1974.
[52] Extract from the interview to Claudia Di Giorgio, contributor to *La Repubblica*, in appendix to *Organismi Giornalisticamente Modificati*, quoted.

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