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The Presentation of Dolly the Sheep and Human Cloning in the Mass Media

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1. Introduction

He watched her drift away, drift with her pink face warm, smooth as an apple, unwrinkled and colorful. She chimed her laugh at every joke, she tossed salads neatly, never once pausing for breath. And the bony son and curved daughters were brilliantly witty, like their father, telling of the long years and their secret life, while their father nodded proudly to each. ("The Long Years", Martian Chronicles, Ray Bradbury) On the next day, John saw Jesus coming toward him, and so he said: "Behold, the Lamb of God. Behold, he who takes away the sin of the world". (John 1, 29)

1.1. Cloning as a media phenomenon

On 22 February 1997, the media covered the announcement of the birth of Dolly the sheep, the first mammal in history to be cloned from an adult cell. The animal's cloning by Ian Wilmut and his colleagues at the Roslin Institute, close to Edinburgh, rekindled a latent issue in popular culture: Is the cloning of human beings also possible? Dolly was the living proof that the images depicted in science-fiction literature and films could imminently become a disturbing prospect.

The media coverage of this story can be explained by the varied and complex implications of the human application of the *nuclear transfer*, cloning technique employed by Wilmut and his team to achieve the amazing feat of Dolly. Therefore, the media differentially framed the risks and benefits of human cloning. They trumpeted cloning as a means of curing a wide range of diseases and as a cheap and safe method of producing food en masse. But, above all, the media highlighted those applications of cloning that might potentially violate human nature.

According with [1], the author understands "human cloning" as the creation of a human embryo, whether for producing stem cells for biomedical purposes or for the gestation of a foetus and subsequent birth of a baby. Generally speaking, the media treat human cloning in

a discriminatory way: if its techno-scientific applications and potential benefits for biomedicine are emphasized, it is known as "therapeutic cloning"; if, on the other hand, the discourse is keyed to human reproduction, with all the disturbing scenarios that this conjures up, it is called "reproductive cloning". However, this differential treatment of human cloning is clearly a rhetorical strategy for disencumbering certain manipulations of human embryos for research or therapeutic purposes of their negative connotations. This is due to the fact that the media generate a great deal of apprehension on framing human cloning as a regenerative or reproductive process. Nevertheless, the dichotomy is not at all clear. On the one hand, therapeutic cloning is based on a reproductive technology (nuclear transfer) and, on the other, reproductive cloning can be regarded as a therapeutic procedure for treating, for instance, infertility, according to the *in vitro* fertilization model.

Since the presentation of Dolly, the media have consolidated human cloning as a feasible "scientific fact". The chronological milestones that have contributed to this can be summarized as follows:

- **February 1997.** The media covered the official presentation of Dolly at the Roslin Institute.
- **January 1998.** The American physician Richard Seed made a controversial statement about his intention to clone a human being [2].
- **November 2001.** The *Journal of Regenerative Medicine* published a paper by scientists working for the biotechnical company Advanced Cell Technology (ACT), in which they claimed to have cloned a (six-cell) "human embryo" [3].
- **June 2002.** The Italian gynaecologist Severino Antinori announced that the first cloned baby had already completed 14 weeks of gestation [4].
- **December 2002.** Brigitte Boisselier, spokeswoman for the International Raëlian Movement and director of Clonaid, convened a press conference to announce the cloning of a girl called Eva [3, 4, 5].
- **January 2004.** Dr. Panos Zavos announced before the press in London that he had implanted a recently cloned human embryo in a sterile woman [6].
- **February 2004.** Dr. Woo Suk Hwang, a practically unknown South Korean researcher, claimed to be the first person to clone a human embryo and obtain stem cells from it, thus stepping into the international spotlight. In less than two years, from being an anonymous researcher Hwang became a national hero, which was to be his undoing since at the end of 2005 his research turned out to be a monumental hoax [7, 8].

The cloning of mammals and, above all, the possibility of applying cloning techniques to human beings, is therefore one of the most important public techno-scientific controversies of the turn of the century [5, 9]. Cloning is a media phenomenon because it provokes mixed reactions among different sectors of society. The controversial aspects of cloning range from those that are purely technical and its potential applications in the fields of biomedicine, livestock breeding, and crop farming, to ethical and faith-based moral issues, through those touching on the control mechanisms and legal regulation that these techno-scientific practices

call for. Nevertheless, the press addressed these aspects in a biased way, magnifying some and minimizing others.

The focus was basically placed on the culmination of Dolly as a product and the social consequences of the experiment, rather than on its technical details. The information published about Dolly was more a catalyst of latent social fears than a driver for the pedagogical dissemination of scientific knowledge. This deep-rooted habit of journalism is usually heavily criticized by scientists, who dub it as "dumbing down" and hence a distortion of scientific research. However, techno-scientists aware of the power of the media as regards reach and publicity have exploited journalists for their own personal gain on quite a few occasions [10, 11]. The benefits that scientists and techno-scientific companies obtain from press coverage range from greater professional prestige and social legitimization to greater financial gain. It is with good reason that the extraordinary amount of publicity that Dolly obtained led to a climb of 65% in the share price of PPL Therapeutics, the company sponsoring the experiment, on the London Stock Exchange, just three days after the announcement had been made [12].

The cloning of Dolly is a significant example of what is called the "mediatisation of science" [13, 14, 10]. Unlike other techno-scientific breakthroughs, whose technical details are usually made known via formal channels, the cloning of mammals was disseminated via the mass media. This meant that the strictly scientific side of cloning had a lesser impact on public debate, while its social repercussions and disturbing future scenarios were indeed magnified [15, 16, 17].

This can be explained by taking a look at two interrelated factors: 1). Nowhere in the paper published in *Nature*, in which Wilmut and his team describe their experiments on the viability of offspring derived from foetal and adult mammalian cells, is there a mention to cloning and, even less, human cloning [18]; and 2). The possibility of applying the technique used by the Scots research team to human beings is based solely on a unique and fortunate animal experiment, not without its controversial aspects (see Note 3).

Despite these restrictions, the exploitation of Dolly as a media phenomenon – that is, the amplification of social controversy – was due in part to the fact that its rapid creation was related to given cultural suppositions, steering the debate towards the hypothetical although plausible field of human cloning. As a result, Dolly mobilized different social actors that, with divergent interests and arguments, shifted cloning into the realm of human testing and the ethical issues that these tests might raise. Such an extrapolation stirred up, undoubtedly, an overwhelming fear of automated replication, mass production and the loss of individuality, all of which belong to the recurring imagery of popular culture as regards cloning [19].

The fact that the journalists knew a little beforehand that the paper of Wilmut and his colleagues had been accepted for publication in *Nature*, one of the scientific community's most widely circulated journals, accorded the research a tacit legitimacy [15]. In any case, the lack of a critical attitude towards information coming from a scientific source, and the fact that the journalists in question probably did not even read the original paper in *Nature*¹, in addition to the lack of independent inquiry into the validity of the experiment, seem to be factors crucial to understanding why they saw fit to air their own opinions on the significance of the cloning of Dolly.

These disturbing journalistic interpretations triggered social and political pressure in favour of banning cloning [21, 22]. As will be seen, the statements of experts might also have contributed significantly to shifting the focus from animal cloning to the human kind, with the hope of safeguarding the former from restrictions. Neither was there any debate about (non-genetic) environmental influences on the development of the clone [23], nor – and this happens to be one of the most controversial points – on the differentiation state of the mammary cell used by Wilmut [24].² The cloning of Dolly was not only unusual because of the extraordinary amount of media coverage that it received, but also because the controversy – unlike other cases such as that of cold fusion [25, 26] – was not about scientific facts (although there were news stories that varied with regard to their representation of these facts), their interpretation, or even their implications for *per se* policies. The controversy was about how these facts affected ethical issues [27, 28].

Sticking to the reasons given by the Scots scientists and their sponsor PPL Therapeutics, the experiment that led to the birth of Dolly was conceived so as to develop lines of research on cellular differentiation and other basic aspects of cellular biology; in addition to opening up new ways of using cloning techniques in the field of biomedicine and livestock farming, with the commercial gain that its sponsors expected to obtain from such applications [15, 29]. However, the strictly scientific controversies, that is to say, those related to discrepancies in the interpretation of the data, the experimental protocols used, or the skill of the researchers, were practically ignored by the press. Furthermore, its application in the fields of medicine and livestock breeding were only taken into account in an advanced phase of the debate [30]. In contrast, as already mentioned, the debate focused on the ethical issues stemming from this new biotechnology and on the need to legislate on its application in human beings. An example of this can be found in the way that the press covered the success rate of nuclear transfer. Although the scant success rate of the method was the reason for dispute in scientific circles (Dolly was the sole successful result out of 277 previous attempts),³ this was never a controversial point for the journalists covering the story. It was only mentioned so as to illustrate how immensely difficult it was to clone a mammal from a mature cell. This example shows that, generally speaking, the media ignore those technical details on which there is no expert consensus.

1 The first news about Dolly was published on 24 February 1997, despite the fact that the paper appearing in *Nature* was not published until the 27th. The story was brought to light by a scientific editor working for *The London Observer*, who obtained the information from a source other than *Nature*, thus technically breaking the embargo that the journal had placed on the information (see [15, 20]).

2 Authors such as [24] dispute whether or not the mammary cell used by Wilmut to clone Dolly was in fact an adult cell. Since Dolly was developed from a cell extracted from the mammary gland of a six-year-old sheep in its last three months of pregnancy, and that it is known that given the fact that the mammary glands of mammals increase in size during the final phases of gestation, it is permissible to deduce that some mammary cells, although technically adult, still behave in a highly labile way, or even in a similar fashion to embryonic stem cells. This situation would lead them to be regarded as undifferentiated cells and, therefore, totipotent. As Gould has indicated, maybe it is only possible to clone from unusual adult cells with a potential embryonic effect, and not from any cheek cell, hair follicle, or drop of blood that falls prey by mere chance to a mad photocopier.

3 The 277 attempts is the figure published in the press; however, in a paper originally published in *Science*, the success of the experiment conducted with these mammary cells was practically attributed to a miracle: 434 nuclear transfer tests failed, but not Dolly's [31].

2. The cloning of Dolly as a "scientific fact"

The media converted Dolly into a kind of totemic animal, a sign of the times (Figure 1). It became a popular symbol of the transgressive potential of *new genetics*, since it was thought that its creation had violated certain biological dogmas [32]. Although Dolly was the result of a "successful" one-off experiment, for the media the animal's birth represented the *irrefutable proof* that cloning by somatic cell nuclear transfer was not only feasible, but also that its application in human beings had ceased to be a futurist dystopia to become a dismal techno-scientific prospect.

On the basis of the Actor Network Theory (ANT), the sociologist from the University of Trento Federico Neresini has demonstrated the role played by the mass media in establishing the cloning of Dolly as a genuine "scientific fact" [5]. His conclusions are based on the analysis of 95 articles published in two of Italy's most widely read daily newspapers – *Il Corriere della Sera* and *La Repubblica* – during the apogee of the Dolly case, that is, from 22 February-10 March 1997.



Figure 1. Professor Ian Wilmut and Dolly (Source: Roslin Institute)

According to the ANT, "scientific facts" are such thanks to complex processes of translation within heterogeneous networks in which different actors negotiate, among other things, the ontological statute of those facts. If the network's main actors are capable of persuading the rest of the need for establishing certain pretensions of knowledge as "scientific facts," then it is possible to say that these can be socially implanted with success, at least temporarily. Although the ANT does not underestimate the fact that common sense has made us accustomed to distinguishing "scientific facts" from the context in which they are produced, it does not accept the dichotomy between science and society, which it regards as false, and looks upon this disjunction as being an effect of the social process rather than its starting point. For this reason, ANT sociologists talk about *hybrids*: Dolly can be considered as a good example of a hybrid, since it is impossible to exclusively classify it as a techno-scientific fact, social construction, or natural entity [33].⁴ For Neresini, during the *chain of translations* Dolly, as a "scientific fact,"

shifted from one set of contexts to another so as to attract the attention of new and varied actors. This means that, in some way, the "scientific fact" can acquire different meanings for these new actors (hence, translation as betrayal and the hybrid notion as something impure and hazy), distinct from its meaning for the researchers responsible for the experiment. The latter's concern was basically to consolidate animal cloning, according to certain techno-economic criteria [5]. Neresini observes that during the first few days of debate in the Italian press, the network of actors spread, thus giving rise to the first translations. The objectives of these actors, other than being diverse, were also in some cases contradictory: to consolidate their own opinions about *in vitro* fertilization, to put the accent on its applications in the field of livestock breeding and experimental medicine, to limit scientific research, especially in the area of genetic engineering, or to avoid the risk of denaturalizing reproduction, with the consequent loss of human identity, among others. However, they all contributed to socially reinforcing the cloning of mammals from differentiated cells as a genuine "scientific fact". A clear example of translation was that made by the Catholic Church. The Church used the debate on the cloning of Dolly to strengthen its beliefs by reopening other collateral debates such as that of abortion, contraception or the social definition of "family"; way beyond the expectations of Wilmut and his team when they thought up and conducted the experiment. So, the ability of the main actors in a heterogeneous network consists in making diverse divergent aspirations converge in a common objective: in the case in hand, accepting the cloning of Dolly as an unquestionable "scientific fact".

It is interesting to note that the actors that opposed human cloning could not help but maintain the cloning of Dolly as a genuine "scientific fact", since they were not opposed to the "scientific proof" that Dolly represented, but precisely against the application in human beings of certain biological principles that had led to this achievement. The fact of cloning is taken for granted; what is rejected is human cloning, with arguments of an ethical (as in the case of Dolly) or techno-social-political nature (as in the case of the Raëlian movement in the Spanish daily *El País*; see [3]). Even the Catholic Church was interested in establishing the cloning of mammals from somatic cells as a "scientific fact", although neither with the aim of improving its own scientific reputation, nor that of defending freedom of inquiry (which, for obvious reasons, was indeed in the interests of the team led by Wilmut), but with the aim of condemning abortion and assisted reproduction techniques with scientific arguments, so as to reaffirm a certain family model (defined by Catholic morals as "natural") and to reclaim the authority of the Church as regards the definition of the meaning of "human being". So, public debate on the possible uses and/or consequences of the use of cloning techniques in human beings legitimized the issue as a "scientific fact", at least in the mass media world [5]. What is more, if for a limited core of experts the cloning of Dolly might have been technically controversial, the mass media actively contributed to constructing it publically as an indisputable fact, focusing on certain elements of the debate and excluding others. The media helped citizens, policy-makers, businessmen, and scientists accept the phenomenon of the cloning of Dolly as a genuine "scientific fact", each defending their own interests.

4 Franklin suggests regarding Dolly as a form of ownership. All forms of *ownership* are cultural inventions, and Dolly cannot only be regarded as a scientific invention, or as an ethical dilemma, but also as a cultural product.

It is widely known that media agenda setting had a powerful influence on political decision-making about cloning, both at an administrative and legislative level. In some countries, political reactions to the announcement of Dolly were quick and decisive, the majority of them coming before the publication of Wilmut et al.'s paper in *Nature*. This rapid political reaction suggests that establishing Dolly's cloning as a "scientific fact" and its possible applications in humans played a decisive role in the tone of the statements made and in the nature of the directives issued by the main official agencies (UNESCO, UN, EU, etc.) and world governments. Media coverage determined to a great extent the focus of policies on research that might affect the nature of human life. As it happens, for instance, the British government withdrew the funds assigned to Wilmut's research group [15].

Media agenda setting also had an influence on the political agenda. The mass media do not try to force people to think in a certain way, but they do indeed succeed in narrowing down the issues that in their opinion should concern the general public [34]. The hopes of the general public as to the potential future benefits of cloning, along with their fears about eventual malicious applications, imply that people accepted the cloning of Dolly as a well-established "scientific fact", giving legitimacy to the experiment conducted at the Roslin Institute.

Therefore, the role of the media in socially establishing the cloning of Dolly as an undisputable "scientific fact" was decisive, since they contributed to sustaining a heterogeneous network of actors that, by means of chains of translation, linked Dolly's cloning to other situations that the scientists responsible for the experiment had never even contemplated, explicitly at least, such as *in vitro* fertilization, the ontological statute of the human embryo, or the loss of individuality. Due to this, many other actors were prepared – for diverse reasons and with different objectives in mind – to be included in the debate and thus steer the discussion towards topics that already formed a part of the thematic agenda of the media. Dolly has at least two characteristics that make it ideal for arousing media interest. The first is that it has an identifiable name and image, and the second is that cloning has sufficient ingredients of attraction and repulsion so as to fit the type of stories told by the media. It awakens our collective imagination and affects our emotions on linking techno-scientific advances with images that are deeply rooted in popular culture. In this sense, it is important to take into account that the media are one of the main actors in the construction of heterogeneous networks in which identities, interests and facts are negotiated.

3. Nuclear transfer, techno-scientific biofantasies and the "exact copy myth"

As already mentioned, the announcement of the birth of Dolly was a major media event. During the whole of 1997 and part of 1998, the ethical debate centred on the possibility of applying the technique to human beings, grabbing the headlines in a number of newspapers and generating a significant amount of informative content and opinion [35]. The evolution of the social debate on cloning was clear in the Spanish context. Since the first days following the presentation of Dolly, representations based on science fiction and the fears stemming from these got the upper hand on the technical descriptions of the experiment. During 1997, the

media presented the debate as an ethical and legislative problem, before bringing it in line, from 1998 onwards, with a discourse more akin to the biomedical applications of the novel method – tissue banks, organ transplants avoiding the problems of genetic rejection, or human reproduction (see Peralta quoted in [35]; [30]). In 1999, little was published about cloning, but from August 2000 onwards, with the British government's acceptance of the cloning of human embryos for therapeutic purposes, the ethical and legislative debate re-surfaced [36]. The declaration of the United States Congress of 1 August 2001, banning the use of human embryos for biomedical research purposes, as well as the statements made by the Italian gynaecologist Severino Antinori about his intention of cloning humans, rekindled the ethical debate on the boundaries of scientific research. Furthermore, in November of the same year, the company ACT announced that it had managed to clone a human embryo [37]. At the end of 2002 and the beginning of 2003, the announcement made by the Raëlians about the cloning of a healthy baby girl reopened yet again the debate on the boundaries of research and the need to legislate as regards these practices. In particular, in the Spanish daily *El País* cloning was presented as more of a scientific policy problem than an ethical issue. It called on policy-makers to clearly differentiate between reproductive cloning – ethically and technically reprehensible – and therapeutic cloning – necessary for combating certain degenerative diseases. It was hoped that the former would be banned and the latter promoted [3]. From this, it is clear that the ethical debate has always revolved around the need for enacting laws on the use of reprogenetic techniques.

The media frequently describe cloning as a procedure for obtaining "exact copies" from an original mould. As a result, cloning awakens public concern about genetic uniformity. However, the nuclear transfer technique generates, as it were, "more imperfect copies" than those represented by monozygotic twins, since these develop from the same fertilized ovum, while Dolly developed independently from the donor ewe [24, 38, 39]. Nevertheless, the press simplified the issue and used literary and film stereotypes present in popular imagery as a benchmark.

The technique used to clone Dolly is easy to understand. It involved introducing the nucleus of a somatic cell, taken from the udder of a white donor sheep, into an enucleated ovum (from whose nucleus all the genetic material had been previously removed) of a black-faced sheep, which behaved from this moment on as if it has been fertilized. With the fusion of the nucleus of the adult cell and the enucleated ovum by means of electrical discharges, a "reconstructed ovum" was obtained in laboratory conditions which was then implanted in a third sheep (also black-faced) which ultimately engendered Dolly (Figure 2).

Nuclear transfer is a *reprogenetic technology*, that is to say, a technology geared to the genetic reprogramming of the manipulated cell. In the strict sense of the word, Dolly is identical to the ewe that donated the mammary cell only in terms of nuclear genetic material, but clearly different with respect to the micro- and macro-environmental factors to which it was exposed (conditions depending on the uterus containing the embryo and the unique events making up the life history of each individual) (Peralta quoted in [35]).

On drawing upon social stereotypes, the media contribute to disseminating and publically establishing certain myths of a scientific origin in a continuous dialectic process of information

flow. The "exact copy myth" of cloning that threatens human uniqueness and individuality is, without doubt, a stereotype that the media use to simplify information and satisfy the rhetoric of emotions [40]. Appealing to the rhetoric of emotions is a very effective strategy if in addition it is reinforced by an efficient rhetoric of scientific rationality, which lends the discourse a sufficient level of credibility so as to defend politically-correct social attitudes.

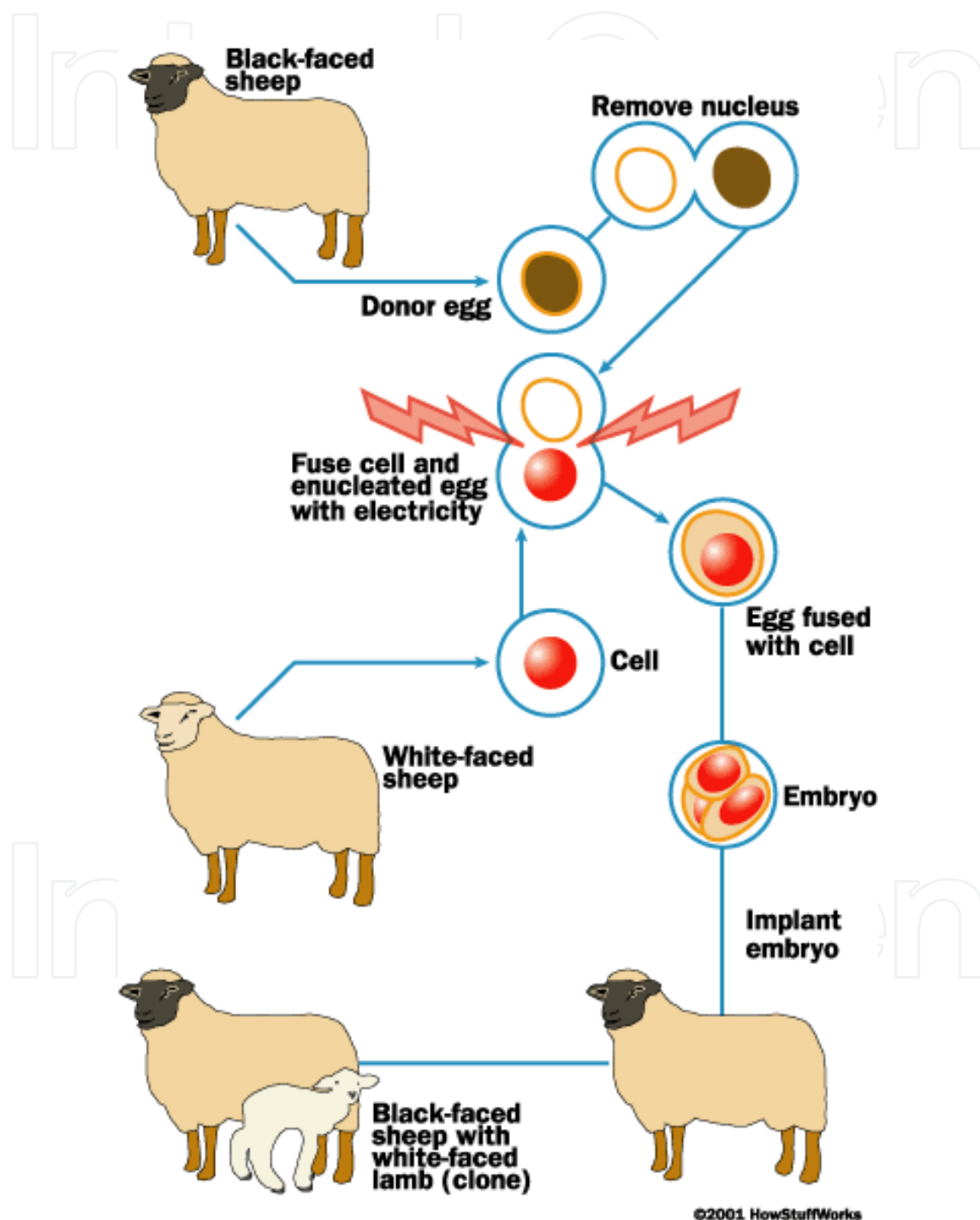


Figure 2. Nuclear transfer is the technique used to produce the embryo that resulted in the birth of Dolly the sheep (Source: HowStuffWorks).

Peralta (quoted in [35]) found that, just after the announcement of Dolly's birth, an initial effect of rejection of cloning was produced due to the way in which the media covered the story: the debate rapidly shifted to the ethical problems related to the possibility of cloning human beings (or parts of them) [5, 19, 30, 33]. According to Peralta, several factors contributed to conjuring up such a disturbing and, to a certain degree, perverse image of cloning. On the one hand, the continuous references to the diffuse symbolic imaginary created by science-fiction literature and films, above all, the futurist scene described by Aldous Huxley in *Brave New World* [41-44] and the technical madness of multi-cloning Hitler in both the book and film versions of Ira Levin's *The Boys from Brazil*. On the other hand, the photos and infographics included in news stories reinforced the "exact copy myth". Both factors worked synergistically.

A quick glance at some of the headlines of stories published in the Spanish press during the first week after the announcement of Dolly's birth might help to see how science fiction helped to evoke images, once seen as "terrifying fiction" and now, thanks to techno-scientific progress, as feasible:

- La oveja «Dolly» abre el camino para crear humanos en serie (Dolly the sheep opens the way to mass producing humans) (*El Periódico*, 24/02/97).
- La ciencia-ficción se convierte en realidad (Science fiction becomes reality) (*El Mundo*, 24/02/97).
- Dolly: entre animal y máquina (Dolly: half animal, half machine) (*El Mundo*, 25/02/97).
- La oveja «Dolly» resucita el fantasma de la clonación de seres humanos (Dolly the sheep resuscitates the spectre of human cloning) (*ABC*, 25/02/97).
- Dolly no fue la primera. *La literatura y el cine se adelantaron a la ciencia en la creación de clónicos* (Dolly was not the first. *Literature and films anticipated science in the creation of clones*) (*La Vanguardia*, 26/02/97).
- «Dolly» abre la puerta a la copia de personas muertas y congeladas (Dolly opens the way to copying dead and frozen people) (*El Periódico*, 28/02/97).
- Las ovejas clónicas convierten la ciencia-ficción en realidad (Cloned sheep makes a reality of science fiction) (*La Vanguardia*, 01/03/97).
- Las imposibles granjas para humanos (The impossible human farms) (*El Periódico*, 02/03/97).
- Frankenstein y su obra (Frankenstein and his work of art) (*El Mundo*, 02/03/97).

Infographics and photos also played an important role in giving the impression that Dolly was in all senses identical to the ewe from which the mammary cell - with which the sheep was cloned - was extracted (Peralta quoted in [35]). From then on, the visual representations of cloning publically established the false image of clones as being "exact copies" (Figure 3).

In the case of Australia's main newspapers, Alan Petersen arrived at similar conclusions: both the verbal information and the visual messages (including infographics explaining the process used to create Dolly) disseminated and reinforced the popular image of cloning as a kind of "Xerox" mechanism [15].

4. Cloning as a laboratory counterfeit and genetic determinism

One of the most alarming images that the mass media highlighted about cloning was the "loss of individuality". The idea that a cloned person is not a unique individual implies two very closely related assumptions [19]. The first is that however exact the copy (clone) is, it does not transcend its condition of "laboratory counterfeit". The spurious nature of the clone is identified with its illegal provenance. After announcing a five-year federal moratorium on human cloning, Bill Clinton, the then President of the United States, stated this perception very eloquently.⁵ Indeed, a clone, as an illegitimate laboratory copy, is regarded as an unnatural entity, that is, artificial, and therefore its "production" is contrary to human dignity. The story in *Time* magazine, for instance, held that "Dolly does not merely take after her biological mother. She is a carbon copy, a laboratory counterfeit so exact that she is in essence her mother's identical twin" (10 March 1997, p. 62).



Figure 3. The photographic composition illustrating the report *Clonación salvaje* (Savage cloning) reinforces the "exact copy" myth, so frequent in popular representations of human cloning (Source: *El País Semanal* 1279, 1 April 2001).

The second assumption implies that the idea of loss of individuality is directly related to the first one. What is involved is the popular belief that genes determine *all* the characteristics of an individual. It is what is known as *genetic determinism*. Belief in genetic determinism leads one to conclude that the copy will be identical to its original, including its psychological

⁵ "What the legislation will do is to reaffirm our most cherished beliefs about the miracle of human life and the God-given individuality each person possesses. It will ensure that we do not fall prey to the temptation to replicate ourselves at the expense of those beliefs [...]. Banning human cloning reflects our humanity. It is the right thing to do. Creating a child through this new method calls into question our most fundamental beliefs" (Clinton quoted in [19]).

attributes, although its social status is of a lower rank. In [45, 46] has shown that the media depict genes and their iconic representation in a regular and ubiquitous way, emphasising their role in health, human behaviour and its diversity. In popular culture, genes have emerged as the panacea that provide simple, irresistible and apparently scientific answers to questions that are as complex as they are eternal: the cause of good and bad, the foundations of moral responsibility, and the nature of human relations. For these authors, media representations of genes express a genetic essentialism that favours biologically determinist and socially discriminatory public attitudes.

In connection with the representation of genes as omnipresent and ubiquitous entities, [47] points out that in the 1990s preference was given in the press to determinist representations that associated a certain gene to a disease or a human behaviour. On many occasions, the headline is determinist and the body of the news item is not, thus producing the so-called *framing effect*. According to this technique, the headline of the story substitutes the content (it frames it, so to speak), because few people read the whole story. Even though the body of the text contains non-determinist information, the headline is so powerful that its effect "frames" the interpretation of the reader, who tends to regard the information as a whole as determinist. In the case of Dolly, the press rarely mentioned the influence of non-genetic (environmental) factors or that of multi-factor genetic interactions as causes of the phenotypic features of the clone [23]. News stories with a determinist headline and body of the text were more commonplace, although those with a determinist headline and a body of the text containing non-determinist references were also published, although less frequently.⁶ The latter is what the author has coined as "headline-body dissymmetry", a relatively common phenomenon in scientific journalism covering genetics. Its most evident effect is the dissemination of paradoxical information: while the headline has been written according to deterministic criteria, the story's content tries to depict genes as not being totally responsible for the characteristics of an individual, but rather the latter is a result of a complex multi-factor interaction where genetics and the environment act in a synergetic way.

5. The media framing of human cloning and its associated metaphors/images

As has been seen, the debate on cloning and genetic engineering is strongly influenced by fictional narratives and literary and film stereotypes. These products of popular culture represent in turn a hotbed for creating multiple images and metaphors, which are then widely used in media debates. Dolly aired what popular culture had already successfully exploited in Hollywood films, television series and best-sellers. Therefore, cloning as a possibility, above

⁶ The following story published on the front page of the Spanish newspaper *El Mundo* (24/02/1997) is a good example of this: La ciencia logra «fotocopiar» por primera vez a un mamífero vivo (Science manages to "photocopy" a live mammal for the first time). The body of the text contains phrases such as the following: "It is nothing less than an exact *genetic photocopy* of another sheep"; "With a sole mammary cell from an adult sheep, these Scots researchers have managed to *produce* another identical sheep". There is not one reference to environmental factors, but rather the accent is put on the powerful influence of genes in *determining* that the cloned sheep is *identical* to its "original version".

all with a perverse end in mind, had attracted the attention of the general public long before Wilmut and his team presented Dolly and their achievement was submitted to public opinion. Although the media debate was first channelled towards ethical and legal issues, other interpretive frames were used afterwards.

The intrinsic relationship between the media and their audiences is a complex phenomenon of which media scholars do not have a thorough understanding as yet [48]. However, the mediation role seems to clearly indicate that the media reinterpret events, using certain structures, parameters and values, which ultimately cater to specific interests and certain conceptions of reality. Thus, the treatment of information is constrained both by internal factors (psychosocial features of communicators, professional routines, editorial viewpoints, etc.) and by those of an external nature (far-reaching ideological frameworks, cultural myths and stereotypes, economic interests of media corporations, audiences, etc.) [49].

The techno-scientific issues covered by the media are subject to these constraints, since they are coded on the basis of ideological criteria, news value and cultural norms [50, 51]. On considering that the media represent one of the chief information sources for citizens and that public support is frequently a necessary condition for implementing some or other policy, media content becomes a critical component of the interactions between citizens and politicians.

On the conceptual basis of the framing theory, it is possible to identify groups of metaphors that function within specific media frameworks. Framing is the act of emphasizing certain aspects of an event (and minimizing others) so as to allow the audience to interpret and contextualize the information by making it more understandable [48, 52]. In other words, framing is to define certain issues – generally by the elites – for public consumption, and to disseminate these definitions by means of the mass media [53]. The media are exceedingly relevant actors in framing techno-scientific controversies with social, political, economic and ethical implications. To start with, it may be helpful to adopt the definition of framing put forward by [54], which has been most lauded in the field of communication studies:

To frame is to select some aspects of a perceived reality and make them more salient in a communicating text in such a way as to promote a particular problem, definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described.

Therefore, **frames** *define problems* – by determining what a causal agent does and at what cost and benefit, generally measured in terms of common cultural values; they *diagnose causes* – identifying the forces giving rise to the problem; they *make moral judgements* – evaluating causal agents and their effect; and they *suggest remedies* – offering and justifying ways of addressing the problem and predicting their probable impact.

Based on the work of several authors that have studied the application of framing to techno-scientific issues [55-58], the following media frames to human cloning and several examples of their associated metaphors/images should be considered. It is important to note that some frames have a positive valence (i.e., promise, progress, economic prospects), and others a negative valence (i.e., ethical, Pandora's box):

1. *Promise*: usually referring to developments that will have significant consequences on how people live, eat, and view healthcare. "Rhetoric of future benefits".

"[la clonación]... tiene como objetivo lograr animales, que actúen como verdaderas fábricas vivas de drogas y proveedores de órganos susceptibles de ser trasplantados a seres humanos" ("The aim [of cloning] is to produce animals that act like authentic living manufacturers of medicines and suppliers of organs susceptible to being used for human transplants") (ABC, 07/03/1997).

2. *Progress*: celebrating new developments, breakthroughs; direction of history; conflict between progressive/conservative-reactionary.

"Lo que cabe esperar de los responsables políticos es que se actúe diligentemente contra los intentos irresponsables de fotocopiado de bebés y, a la vez, se proporcione un apoyo decidido a las técnicas de clonación que sí tienen un fuerte interés biomédico" ("What is expected of policy-makers is that they take action against the irresponsible attempts to Xerox babies and, at the same time, strongly support cloning techniques that do indeed have highly interesting biomedical applications") (El País, 07/01/2003).

3. *Economic prospects*: economic potential; prospects for investment and profits; R&D arguments;

"Según los científicos, los ganaderos podrían beneficiarse de esta técnica al conseguir animales clónicos a partir de otros animales adultos de sus ganaderías que hubieran demostrado ser más productivos y resistentes a las enfermedades" ("According to scientists, stockbreeders could benefit from this technique so to obtain cloned animals from other adult animals forming a part of their livestock which have proved to be more productive and resistant to disease") (La Vanguardia, 24/02/1997).

4. *Ethical*: calling for ethical principles; thresholds; boundaries; distinguishing between acceptable/unacceptable risks in discussions on known risks; dilemmas.

"La modificación genética para evitar enfermedades será aceptada mucho antes que la destinada a *mejorar* cualidades de los hijos como la forma física o la inteligencia" ("Genetic modification for preventing disease will be accepted long before its use for improving the characteristics of children such as physical fitness or intelligence") (El País, 12/01/2003).

5. *Pandora's box*: calling for restraint in the face of unknown risks; warnings prior to the opening of floodgates; unknown risks as anticipated threats; catastrophe warnings; disturbing future scenarios related to science fiction.

See all the examples included in the chapter that correspond to this frame.

6. *Nature/nurture*: environmental versus genetic determination; inheritance issues.

"Con una sola célula de las glándulas mamarias de una oveja adulta, estos investigadores escoceses han logrado *fabricar* otra oveja idéntica" ("With a sole mammary cell from an adult sheep, these Scots researchers have managed to *produce* another identical sheep") (El Mundo,

24/02/1997). There is not one reference to environmental factors, but rather the body of the text represents cloning as a model of genetic determinism.

7. *Public accountability*: calling for public control, participation, public involvement; regulatory mechanisms; private versus public interests.

Los pioneros de la clonación advierten que la técnica sería aplicable en humanos en dos años. *El doctor Wilmut pide normas internacionales para evitar esta posibilidad* (The pioneers of cloning warn that the technique could be applied to humans in two years. *Dr Wilmut calls for an international regulatory framework so as to avoid this possibility*) (ABC, 07/03/1997).

8. *Globalization*: calling for global perspective; national competitiveness within a global economy

"La nación que no quiera subirse al tren del progreso está condenada a ser un país de tercera división" ("Nations that miss the train of progress will condemn themselves to being third rate countries") (ABC Cultural, 07/03/1997).

9. *Freedom of inquiry*: science vs. applied science or technology; value free science; neutrality of science.

"Quien adultera la ciencia no es el científico sino los mercaderes oportunistas que transforman la plusvalía de la ciencia en una moneda de cambio podrida de intereses ajenos a la mentalidad científica. Por lo tanto, no es la ciencia quien precisa ser regulada, sino los traficantes del progreso" ("Those who adulterate science are not the scientists themselves but opportunist merchants that transform scientific benefits into a bargaining chip whose interests go against everything that science stands for") (ABC Cultural, 07/03/1997).

This wide range of frames suggests that the media debate on human cloning, which began with the presentation of Dolly, was, and still is, complex and multifactorial. Along these lines, it is interesting to highlight that certain metaphors can have different meanings, depending on the context in which they are used [59]. For instance, there is the metaphor that identifies cloning with a Xerox mechanism producing perfect copies. For those that interpret cloning within a frame with a positive valence, clones are useful products and, therefore, desirable. For those that interpret cloning within a frame with a negative valence, cloning is to produce a copy that is contrary to the essence of human beings, opening the way to manipulation and totalitarian control. Therefore, any attempt at cloning a human being or his/her parts would be regarded as a reprehensible act.

6. The representation of human cloning as an ethical problem: The boundaries of scientific research

All the studies conducted on the media coverage of Dolly seem to coincide in pointing out that the press represented cloning as an ethical problem in urgent need of legal regulation [5, 15, 19, 23, 27, 28, 33]. Indeed, the mass media gave priority to ethical problems stemming from the possibilities opened up by the cloning of a mammal and created virtual scenarios to fuel public

concern about human cloning. It is logical to presume that such a glut of information affected policies and social attitudes towards cloning to a greater extent than academic debate on bioethics would have been able to achieve on its own.

The representation of cloning as a fundamentally ethical problem revolves around three interconnected issues: 1). *The loss of human uniqueness and individuality*; 2). *The (nearly always perverse) motivations for cloning*; and 3). *The fear of irresponsible scientists or science out of control* [19].

6.1. Loss of human uniqueness and individuality

One of the greatest concerns shown by the media was the alleged loss of uniqueness, as a consequence of the clone's spurious nature. A loss of uniqueness leads inevitably to that of human identity. Among other significant examples published in the North American press, Hopkins points out that the photo appearing on the front page of *Time* magazine (10 March 1997) showed two large identical adult sheep against a background of around 30 small copies, with the caption: **Will There Ever Be Another You?** (Figure 4). The inside cover page talked about cloning as a "Xerox" mechanism, and the photomontage used as an introduction to the main body of the text depicted a fruit machine dispensing identical people. A last photo showed several identical human bodies coming out of a test tube.

For Hopkins, these visual images transmit a provocative message that clones are exact denaturalized copies, while the body of the text strives to clarify that clones are not in fact exact copies, that is to say, to explain the inconsistency of arguments based on genetic determinism ("headline-body dissymmetry" and "graphics-body dissymmetry"). It is interesting to point out, as Hopkins himself suggests, that journalistic commentaries that try to explain and clarify erroneous essentialist interpretations do not have a clear pedagogical purpose as regards the genetic basis of human behaviour, but rather try to persuade readers that their fears about the loss of uniqueness are unfounded. Therefore, it has been observed that the media exaggerate and mitigate, simultaneously, concerns about the assumption that a clone, as an "unnatural" copy, prejudices human dignity. Hopkins asks himself whether the dominant message of the media about the loss of uniqueness is not a manifestation of the American people's peculiar emphasis on individualism, for which reason he suggests that comparative studies be conducted in other countries with different values and beliefs. The author speculates putting forward the hypothesis that in the press of other countries this obsession with individualism would not occur. In this sense, the only indicative study to date is that conducted by Neresini on the Italian press [5]. In Italy, there was also concern about the loss of individualism, although not to the obsessive extent that Hopkins sees in North American press coverage.

6.2. Motivations for cloning

In an attempt to assess the market that human cloning could generate, the mass media have imagined multiple possibilities and scenarios that would require cloning to reach certain goals. Speculation on hypothetical future uses of cloning cannot be censured, but it seems that their influence on the public image of cloning is by no means negligible, especially when such virtual

scenarios are presented as perverse and are morally assessed. These hypothetical examples find their way into the collective conscience, acquiring a certain dose of credibility [19]. Before such scenarios actually occur, people already have a more or less detailed idea of the motivations that others might have to resort to cloning. In order of appearance in the media, Hopkins has detected the following:



Figure 4. Cover of *Time* magazine (10 March 1997)

The Megalomaniac. This motivation stems from the images projected by science-fiction literature and films. For instance, in *The Boys from Brazil* an attempt is made to multiply clone Hitler so as to perpetuate Nazi ideology. Woody Allen's futurist satire *Sleeper* revolves around the desire to clone an evil political leader using his nose. In *Jurassic Park*, terrified innocent people flee from the attacks of hungry *Tyrannosaurus Rex* clones, created so as to entertain visitors to a theme park. But these references to science fiction only illustrate "hypothetical

scenarios". However, *Time* magazine toyed with the possibility of an eccentric millionaire that has never wanted to have children, but now, thanks to cloning, can have a child that not only bears his name but also his own genetic code. The magazine concluded: "Of all the reasons for using the new technology, pure ego raises the most hackles." (10 March 1997, p. 70). Despite having previously rejected genetic determinism, *US News & World Report* also clearly echoed the idea that a megalomaniac might decide to immortalize his or herself by cloning an "heir" (10 March 1997, p. 60).

The Replacement Child. This is the motivation of couples that want to "replace" a dying child. Along these lines, the benchmark for the global press industry *The New York Times* asked readers to consider "the case of a couple whose baby was dying and who wanted, literally, to replace the child" (24 February 1997: B8). On raising the issue of desperate situations such as this in such a naïve way, the media create paradoxes and myths. Implicit or explicitly, the "replacement" of a child implies that the cloned child will possess all the characteristics of the child being replaced, which contrasts with the simultaneous opinions of scientists and experts in ethics arguing against genetic determinism. It is important to note that the media transmit a negative image of these couples: they are people with psychological disorders, egoists and incapable of accepting death. A curious point is that they never align these motivations with those of other parents that, faced with the loss of a child, decide to have another, or even with the most common all for having children which is none other than to make the parents' lives more rewarding. The motivations of the former are pathological; those of the latter normal or even commendable.

The Organ-Donor Cloners. The mass media also raise the possibility of certain individuals resorting to cloning their offspring or themselves so as cure themselves from a disease or to create a genetically compatible organ and tissue bank. For instance, *Time* magazine (10 March 1997) began its special report with the hypothetical case of a couple whose only daughter has leukaemia: "the parents, who face the very likely prospect of losing the one daughter they have, could find themselves raising two of her—the second created expressly to help keep the first alive" (10 March 1997, p. 67). This motivation is usually treated with suspicion, as in the report published in *The New York Times* on 1 March 1997.

The Last-Chance-Infertile-Couple. This is presented as the least objectionable motivation for cloning. Also the least controversial, it could be justified depending on the medical status or the degree of misfortune of the infertile couple in question. Cloning would be the last resort for these couples, after trying orthodox fertility techniques that have failed. In this way, cloning is tacitly regarded as a psychological and morally inferior reproduction method than others.

6.3. Fear of irresponsible scientists or science out of control

The mass media have not only reported on cloning in negative terms, but they have also emphasized its potential benefits for medicine, agriculture and livestock breeding – although such benefits are always juxtaposed with their dangers [19]. On occasions, scientists are reproved for wanting to "play God"; this implies seeing science as an activity that can provide answers to many important questions, although its intrinsic amorality can be dangerous. For

instance, the headline of the article, **Little Lamb, Who Made Thee?**, appearing in *Newsweek* (10 March 1997), seems to point to the intrusion of scientists in the sacred domain of the divine.

But the most interesting discussion that the media construed on the boundaries of scientific research is based on the secular fear of its achievements and the perception that these are relentless. While it is reaffirmed that science is dangerous and that cloning is a technique against which people should react and, consequently, reject if allowed, it is recurrently admitted that science is relentless and that human cloning is inevitable, only being subject to the restrictions imposed by refining techniques and methods [60]. The same article appearing in *Newsweek* stated that the creation of Dolly teaches us a clear lesson.⁷ From all this it can be inferred that the media and the general public perceive science as a robust enterprise as regards its achievements, amoral by definition, relentless in its progress, and inevitable in the application of its knowledge. From this perspective, the legal regulation of the application of scientific knowledge is like trying to gate-keep in a world without fences. The boundaries of scientific research are always of a technical kind which, one day, will be surpassed by the scientists themselves, but never boundaries stemming from ethical or other kinds of non-scientific imperatives.

In his analysis of the coverage of the Australian press, Petersen defends an identical stance. In the first stories to be published, journalists used phrases and metaphors evoking a kind of social engineering and authoritarian control. An ambivalent image is implicitly found in these articles: a belief in the all-embracing power of science, but also mistrust with regard to the motivations of scientists and fear of the results of their research [15]. A deep fear of "immoral science" is evident in many of the news stories about the cloning of Dolly. As [19] concludes: "The collective message here seems to be that a brave new world is detestable, but may be unavoidable".

7. The role of scientists in the defence of freedom of inquiry and the neutrality of science

After examining in some detail how the media represent cloning as an ethical problem in urgent need of legal regulation, it is interesting to analyze the role played by scientists themselves in focusing concern on the use of the technique in human beings, encouraged by their desire to defend their right to conduct research. What Dolly raised with redoubled starkness was the eternal issue about the "boundaries of science", specifically, about what should be done and how to regulate scientific research. In an attempt to preserve freedom of inquiry and its merits – i.e., a "neutral research model" – so as to impede policy-makers from implementing generic bans, the experts also contributed to sparking media concern about human cloning [5].⁸

⁷ "Science, for better or worse, almost always wins; ethical qualms may throw some roadblocks in its path, or affect how widespread a technique becomes, but rarely is moral queasiness a match for the onslaught of science" (p. 59).

Scientists became obsessed with clearly differentiating between animal and human cloning. They believed that this strategy would allow them to divert the focus from animal cloning to the human kind, in such a way that the former would not be seen as the gateway to the latter. The idea was to channel criticism from politicians, church authorities, and expert in bioethics towards human cloning, thus freeing animal cloning from moral and legislative burdens. This shift of focus was accompanied by an efficient "rhetoric of future benefits": the development of research in the field of animal cloning is important because it represents a source of potential benefits for medicine and livestock breeding. The "future benefits" strategy pretends to avoid public and political rejection of cloning, thus contributing to its social acceptance and, therefore, its development, on maintaining its sources of funding.

So, the researchers involved in the creation of Dolly did not limit themselves to technical comments about the experiment, but were more interested in safeguarding freedom of inquiry and the funding that makes it possible from the intrusions of politicians, church authorities, experts in bioethics, and public opinion. It is interesting to note that in the British press the differences of opinion on human and animal cloning constituted one of the most solid lines of argument in the debate on the cloning of Dolly. For example, an enormous effort was made to separate the idea that humans *should* be cloned versus whether this was actually possible; that is to say, an ostensible effort was made to separate the correct from the feasible. Therefore, animal cloning should have been seen as a positive concept, regardless of the technical, ethical and moral issues that the more than reprehensible cloning of humans would raise.

For his part, [5], in addition to the strategy for clearly differentiating between animal and human cloning, points to two others that scientists used to defend themselves from the offensive unleashed by certain political and/or religious groups: 1). *Emphasizing environmental rhetoric*: the separation between animal and human cloning is underlined, emphasizing the importance of environmental factors, at the expense of genetic factors, in the shaping of human identity. The experts tried to transmit the idea that even in the unlikely event that a person was cloned his or her identity would be safeguarded, since it depends on the unrepeatable history of an individual's interactions with the environment. In short, they attacked genetic determinism. So as to bring to the fore that cloning would not mean a loss of individuality, scientists referred to monozygotic twins as genetically identical but different as regards their behavioural and personality traits, and 2). *Distinguishing basic science from technology*: in their pursuit to safeguard a neutral research model, some scientists drew a clear boundary between basic and applied science. They tried to establish clear boundaries between basic scientific knowledge and its applications (science/technology dichotomy), as well as between scientific

8 With respect to this, several days after the announcement of Dolly's birth, Wilmut himself referred to human cloning only to condemn it. This can be seen in the following headlines and bylines appearing in the Spanish press: **La ciencia ficción se convierte en realidad**. *La técnica utilizada en Escocia puede utilizarse con las personas, pero los autores dicen que sería antiético (Science fiction becomes reality. The technique used in Scotland can be applied to humans, but the authors state that this would not be ethical)* (El Mundo, 24/02/97); **Ventajas e inconvenientes de una oveja clónica. «No vemos razones clínicas para clonar seres humanos», ha dicho el artífice de Dolly (The pros and cons of cloning sheep. "We don't see any clinical reasons for cloning human beings," states the person responsible for Dolly)** (El País, 26/02/97); **Los pioneros de la clonación advierten que la técnica sería aplicable en humanos en dos años. El doctor Wilmut pide normas internacionales para evitar esta posibilidad (The pioneers of cloning warn that the technique could be applied to humans in two years. Dr Wilmut calls for an international regulatory framework so as to avoid this possibility)** (ABC, 07/03/97).

knowledge itself and non-epistemic values (science/values dichotomy). By means of this strategy, scientists aspired to shake off the responsibility for the "bad" ends to which others might eventually put their basic research. Therefore, they not only wanted to fend off personal accusations, but also to configure science as an intrinsically neutral activity. Consequently, science could continue on its path without the need for ethical or legal limits.

Science as value free is a very weak line of reasoning. On the one hand, because those same scientists are the ones demanding an acknowledgement for themselves and for scientific research, which, without doubt, stems from its potential applications: treating diseases, developing new medicines, improving transplant techniques, increasing livestock production, etc. And on the other, because, in a strict sense of the word, these scientists are techno-scientists; in other words, experts tied to the market demands of the biotechnological companies at which they work, or which sponsor them, as was the case of the team that cloned Dolly. Research at these companies is geared to obtaining economically profitable results.

On attempting to use the benefit rhetoric in the mid- and long-term to justify their research projects, scientists perversely showed that in reality their activity is closely linked to its applications, be they positive or negative [5].

8. Conclusions

The public presentation of Dolly the sheep unleashed certain latent biofantasies in popular culture, since they had already been successfully exploited by literature and films, like for instance the loss of human individuality, the mass production of slaves, or eugenics.

Even though Dolly was, in the strict sense of the word, only identical to the sheep donating the mammary cell as regards nuclear genetic material, the media described the animal as an "exact copy". This science-fiction approach conjured up disturbing future scenarios, and contributed decisively to framing the discourse on cloning more as an ethical problem in urgent need of legal regulation than a techno-scientific issue.

The scientists involved in the cloning of Dolly invested quite a bit of time in trying to clearly distinguish animal cloning (correct, feasible, ethically irreproachable, and with both commercial and biomedical benefits) from the human kind (reprehensible, immoral and unacceptable because of its technical risks).

Since the media play a relevant role in constructing social reality and modelling the images that the general public has as regards science and technology, it is important to consider the frames that they use to achieve this. By means of these frames, they emphasize or minimize certain aspects of an event so as to allow for its interpretation and contextualization, thus making it easier for the audience to understand the information. In this framing process, the media use multiple resources, including myths, cultural stereotypes, images, and metaphors, so as to make the information more accessible to the audience. As has been seen in the case of human cloning, these resources have been used profusely, which is a good indicator of the importance of the social debate fuelled by Dolly's presentation.

However, the presentation of Dolly involved a varied network of social actors (scientists, biotechnological companies, experts in bioethics, religious authorities, policy-makers, citizens, etc.) that, each in their own way and on the basis of their specific interests, contributed to establishing the cloning of Dolly as a genuine "scientific fact" and, consequently, the extrapolation of reprogenetic techniques to humans as feasible.

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