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Scientific knowledge on
audiovisual media

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Introduction

Growing interest in popularising science and technology is linked to the spectacular advances made in research in various fields of scientific knowledge, especially in those closely related to people's wellbeing, quality of life and health. In the process of socialising this new scientific knowledge, the mass media operate as a second ring of dissemination, after the increasingly more decisive filter of leading scientific journals. It is on this second level, and particularly with regard to the audiovisual media and formats, that edition 30 of our *Quaderns del CAC* focuses.

In fact, this edition contains a wide range of contributions exploring the relations between science, image and the popularisation of science and technology, from the origins of the moving image to the internet, naturally also including radio and television. In the first article, Milagros Pérez Oliva talks of the great responsibility of scientific journalism today ("Ethics and engagement in scientific communication"). The initial block offers a diverse view of how science and technology have always been present in the development of audiovisual culture: Bienvenido León examines the rich history of the science documentary ("Science documentaries and their coordinates"); Jordi José tackles the image of science in contemporary cinema ("2001 odysseys through space-time: (uncon)science in the cinema?"); the team made up of Óliver Pérez, Mercè Oliva, Fermín Ciauurriz and Frederic Guerrero analyse the videogaming world ("Playing at scientists: Video games and popularising science"), and Luis Ángel Fernández Hermans examines the new relationships between the scientific community and social communities resulting from the internet ("Internet users are shaking the tree of science"). The three subsequent articles present case studies: Nel·lo Pellisser studies the impact on environmental awareness ("The scientific popularisation of environmental problems by the media. The case of the documentary *An Inconvenient Truth*"); Charo Lacalle identifies archetypes of doctors in serialised fiction ("Doctors in TV fiction") and the team made up of Miquel Àngel Mayer, José Luis Terrón and Angela Leis studies the value of certification for health-related information on the internet ("Health on the internet: proposals for quality and certification"). The final two articles present results from empirical research carried out in Catalonia on the popularisation of science and technology on television (Gemma Revuelta and Marzia Mazzonetto, "Science and technology on Catalan area television") and on the radio (Maria Gutiérrez, "Popularising science and technology on generalist radio").

In the "Observatory" section we include two articles on recent work carried out by Catalan researchers: David Fernández presents the status of independent audiovisual production ("Independent television production in Catalonia in a changing market") and Laura Aymerich investigates the new forms of interactive advertising on television ("New interactive advertising formats on television. A proposal for their analysis and classification").

Last, but not least, the *Quaderns del CAC* journal is pleased to announce that, as from this 30th issue, it will promote the section "Critical Books Review". Coordinated by lecturer Carles Llorens, this section will use reviews by specialists to draw attention to the most important recent publications on communication and broadcasting of the time.

Josep Gifreu
Director

Ethics and engagement in scientific communication

Milagros Pérez Oliva

- *The information related to science, technology and, especially, biomedicine, attracts increasingly the attention of the media, not only because of the growing interest on the part of the public, but also for the economic growth of the sector or the spectacular nature of the advances obtained in the last times. In this context, and due to the characteristics of the information to spreading, the scientific journalism has to assume the challenge of guaranteeing the rigor of the information and the accuracy of the contents, as well as a treatment of the news as objective as possible.*

Keywords

Science, biomedicine, quality information, scientific communication, journalism ethics

Over the last few years there has been a considerable increase in the attention paid by the media to themes of science and technology and, most particularly, biomedicine. This increase may be attributed to three key factors. Firstly, the growing interest in this kind of news on the part of the public, as different market surveys have shown that the subjects of biomedicine and science have gone up the ranking in terms of public preference. On the request of press editors, a study carried out by the Spanish Centre for Sociological Research shows, for example, that the health and biomedicine supplements come second in the list of most-read.¹ In a special edition of the Eurobarometer published in 2007 on which news items interest European Union citizens most, those related to scientific research came fifth, with 31% of the preferences.²

Secondly, science in general and biomedicine in particular are among the most dynamic and fastest growing sectors, with millions of professionals interested in learning about anything new as quickly as possible, not just in their own area but also that of science in general. These are particularly demanding receivers, accustomed to working under highly competitive conditions and with a methodological rigour which they also wish to see reflected in the news products they receive.

The third factor that explains the growing interest in news lies in the spectacular nature of advances occurring over the

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Chief Editor of El País

1 CIS. *Estudio n.º 2.537. Hábitos de lectura de diarios*. September 2003. <http://www.cis.es/cis/opencms/-Archivos/Marginales/2520_2539/e253700.html>.

2 EUROBARÔMETRE. *La investigación científica en los medios de comunicación*. Brussels: Eurobarometer, 2007. No. 282. <http://ec.europa.eu/public_opinion/archives/ebs/ebs_282_en.pdf>

last few years. We have still not finished exploring all the paths for organ transplants, with face transplants being the latest landmark, but we can already find the first bio-artificial heart built with tissue engineering techniques. Human cloning is resisting but it's very close and while a probe is exploring the surface of Mars and is sending us images of an impressive quality, terms such as quantum computation, proteomics and nanotechnology appear increasingly more often in the pages of newspapers.

Guaranteeing the rigour of information, the accuracy of content and the objectivity of treatment of news items is the great challenge facing scientific journalism. In fact, these are the great challenges of journalism in general, but in the case of scientific journalism the difficulties that must be overcome are very specific and not always easy to identify. In these times, when the word *fast* impregnates everything, from *fast food* to *fast thinking* and *fast living*, we can also see growing pressure for fast, brief, easy to consume information. But if there is an area where information cannot be fast nor brief if we want to achieve a minimal level of quality, that area is science.

One of the elements that has most changed the so-called media society is how scientific knowledge is socialised. The media have become the main instrument for transmitting new knowledge. Now, discoveries and advances are communicated at the same time to the scientific community, via their specialist journals, and to the public at large, via the media. Scientific journals' capacity to impact is no longer measured only by their penetration among researchers but also by their capacity to catch the attention and news space of the general press.

Before the media society, scientific knowledge followed pre-established itineraries via official institutions. When this knowledge finally reached the public, it had passed through various verification filters and had had time to settle, making it much more secure. When it was finally disseminated through, for example, the educational system, it was relatively well established knowledge. Now, scientific knowledge goes directly from the laboratory to the public, which has its advantages but also its drawbacks. It is true that this allows us to rescue it from some elites that often

used to use it for their own benefit, and that direct disclosure empowers the public, i.e. their decision-making capacity. But the knowledge that arrives via the media is, by definition, provisional knowledge. There has often not been enough time to validate it and it is frequently modified, corrected or directly refuted in later stages. The episode of false human cloning on the part of the Korean scientist Hwang Woo-Suk is the latest and most infamous example but not the most important: newspaper archives are full of new treatments that have promised to cure illnesses but which continue without any possibility of cure.

In spite of all this, the scientific method provides science with a plus of credibility that also benefits the media in their work as disseminators. This is what allows Furio Colombo³ to state that scientific news travels through news space with a huge load of added value, which makes it attractive and dangerous at the same time: attractive because it contributes towards the prestige of the medium and helps to increase reader loyalty, and dangerous because any error in this area can wreak havoc on the medium's credibility.

Precisely because science advances thanks to the empirical method, in scientific communication speed is usually inversely proportional to certainty. On the other hand, the internet and networking has encouraged exponential growth in data and information in circulation, something which makes validation even more difficult. If, today, even for scientists themselves it is difficult to remain up-to-date with everything occurring and published in their specific field, it is just the same for the media, which attempt to cover all fields and, moreover, to do so with such speed: very often the production time for scientific information is no longer than a few hours. "What makes a piece of news valuable is the number of people likely to be interested in it, [...] but also the speed with which it is disseminated. If you have some information and take one month to disseminate it, it loses a lot of its value. The question is: what is the plausible degree of speed? Today it is instantaneousness and it is evident that instantaneousness involves great risks", warns the journalist Ignacio Ramonet⁴.

How to distinguish, from among the huge amount of

3 COLOMBO, F. *Últimas noticias sobre periodismo*. Barcelona: Ed. Anagrama, 1997. (Col. Argumentos), p. 96-111.

material produced, what is truly important and represents an innovation or a leap forward is one of the main challenges of good journalism. The circulation of information has grown exponentially, to the point that, at this time, newspapers with thousands of pages could be produced with just the material that reaches newspapers directly, provided by the different interested sources. How can rigour be maintained under these conditions? And, above all, how can we identify the hidden agendas that are often behind the information that arrives? Knowing the risks surrounding information is the prior requisite to being able to tackle good information from an ethical point of view. Only by knowing the nature of the possible traps can we arbitrate defence strategies and mechanisms to neutralise them.

As in all professions, among journalists there are also cases of professional malpractice that must be energetically fought via internal, self-regulating standards. But these individual cases are not the ones that are habitually behind many of the misrepresentations that occur. These are often the consequence of news dynamics that affect all media and disregard the will of journalists themselves, especially if they are not vigilant. We might say that, today, as always but perhaps more than ever, a prime requisite for ethical journalism is to have an active and permanently critical attitude, which means questioning both the data that arrive as well as the sources providing these data.

Guaranteeing the ethical quality of scientific news requires precise knowledge of the risks and challenges inherent in this kind of information. Firstly, we must tackle the certain tendency to exaggerate and sensationalise. The media often allow themselves to be contaminated by the hagiographic approaches of the scientific community itself, which increases their potential with exaggerated qualifiers. Given the nature of the sources and the material in question, scientific news is one of the most susceptible to becoming what Furio Colombo classifies as news-reverence: "The natural resistance to investigate that is spreading throughout contemporary journalism is not only reinforced

when the source is scientific but tends to present it as absolutely sure", he says.

The tendency to sensationalise generally makes itself known in two ways: by increasing the number of news items published not because of their importance but because of their capacity to cause impact, and with a treatment prone to emphasising the most vociferous aspects in all kinds of information. This tendency, the result of competition between the different media, is also contaminating scientific journals. In the entrenched battle maintained for two years by the journals *The New England Journal of Medicine* and *JAMA*, the latter was often accused of taking the possible media repercussion too much into account when choosing the subjects it published. In 1999, George Lundberg, the director who, over 17 years, had converted a simple internal newsletter of the American Medical Association into a leading scientific journal, was finally dismissed. The reason was because he had published research of doubtful scientific value on oral sex, based on data obtained years previously, coinciding exactly with the impeachment trial against President Bill Clinton for having lied regarding his sexual relations with the intern Monica Lewinsky.

Days before, scientific journals provide the media with brief notes on the work that will be published. Studies carried out on these press releases show a tendency to select those subjects with most potential to attract the media's attention. The tendency towards sensationalism also often contaminates the activity of social actors themselves, who resort to spectacle to catch media attention. Anders Hansen⁵ and his team from Leicester University have studied this phenomenon in organisations such as Greenpeace, which has gone from being a small group of locally-based activists to a multinational ecological corporation capable of affecting the political agenda thanks to its "astute publicity" and the intelligent use made of the media's tendency to sensationalise.

Since, at the end of the nineties, two scientists from Utah University, Pons and Flechsman, announced in a global

4 RAMONET, I. *La tiranía de la comunicación*. Barcelona: Editorial Debate, 2003, p. 56.

5 HANSEN, A. *The Mass Media and Environmental Issues*. Leicester: Leicester University Press: Centre for Mass Communication, 1993.
HANSEN, A. "Greenpeace, el éxito de un grupo de presión ambiental". In: *QUARK*. Barcelona: Observatori de la Comunicació Científica (Universitat Pompeu Fabra), October-December 1995.

press conference and also in an article in the journal *Nature* that they had achieved cold fusion with deuterium, in what was considered one of the most scandalous frauds, various teams have successively fallen into the same trap and the same ridicule. Among them, the University of Valencia, which held a hasty press conference to present the work of a team that had supposedly found a way to easily obtain energy from water. The fear of being copied led them to announce this supposed discovery to the press before the scientific community and, in the excitement of the moment, one of the scientists raised a small bottle and said that, with that water, enough hydrogen could be obtained to go from Bilbao to Valencia

Many of these fiascos are the consequence of the ferocious competition between teams. The fear of seeing yourself overtaken by a rival team was just what led the Korean Hwang Woo-Suk to falsify data from research into cloning, an area in which he was truly competent and which might have produced results. Not knowing how to wait led him, overnight, from glory to ignominy.

One variant of this tendency to sensationalise combined with the pressure to publish is that which, in biomedicine, favours the creation of false expectations. The craze to be the first and the need to legitimise research socially in order to obtain economic results is leading to scientific discoveries being published at increasingly earlier phases of the research process. They are the “futures” of medicine, the molecule that has just been discovered and is presented as the next treatment for an illness, without taking into account the fact that, in any case, this will only happen once it has been proven to be effective, first in animals and then in humans and, moreover, if it has no adverse effects, i.e. after ten years and hundreds of millions of euros, supposing that everything goes well. Many of these “futures” announced in the media never actually materialise. Rigorous, ethical information must avoid creating false hopes because it can cause frustration and suffering in the readers and because it can help to undermine the credibility of the media themselves.

It is even more difficult to guarantee the quality of information against a more insidious risk: the existence of hidden agendas or spurious interests in the information reaching the media. These are news items whose data, or how the information is presented by the sources, have been

biased to achieve a non-declared aim. One of the best-known cases of this kind of distortion starred NASA when, in August 1996, it held a global press conference to announce that it had found evidence of life on Mars in the remains of a meteorite. The news, obviously, was on the front pages of all the newspapers in the world. Afterwards it was realised that this evidence was no more reliable than evidence which had already been studied and rejected some time before and that it had all been a set-up to force President Bill Clinton to rectify the announced cuts in the space agency's budgets.

Although not so spectacular, episodes like these are repeated with a certain frequency, sometimes to obtain resources, other times for prestige or simply for market objectives. One of the areas where bias can have the most serious consequences, due to the subject in question, is once again biomedicine, particularly with regard to new drugs and therapeutic procedures. In some cases, the danger lies in the possibility of information being published on new therapies with insufficient evidence regarding their properties.

How can the media guarantee true, accurate information for their readers? What mechanisms of quality control can be applied? It's difficult for the media to have their own evaluators for each and every specialty of medicine ready to evaluate at all times the latest discoveries from leading teams. They can have trustworthy sources they consult on specific matters but that isn't enough.

That is why those media that wish to be rigorous used the same control mechanisms as the scientific community: the verification of content on the part of solvent scientific bodies. In the case of medicine, this might take the form of publication in leading scientific journals such as *The Lancet*, *The New England Journal of Medicine*, *JAMA*, *Nature Medicine*, *Cell*, *Stroke* or *Proceedings*, among others. When selecting the work to be published, these journals use a peer review system, i.e. review by the best specialists in the area in question. Sometimes work presented at scientific congresses can also be considered as reliable, although, in this case, credibility is less due to the strong dependence on the industry financing them.

In the last few years, however, there have been a number of serious incidents concerning the safety of new drugs that have revealed that this validation system also has serious

deficiencies. The credibility of the pharmaceutical industry as a source of information has been damaged and the perception of insecurity has increased among citizens, which leads companies to present their new products through intermediaries, i.e. scientists that collaborate with them and that often do not declare this. News from the industry is now suspect, not only among journalists but also to a large extent in the scientific community.

Given that the media are frequently used to introduce and promote the use of new drugs and therapeutic procedures, it is an ethical imperative to carry out the utmost vigilance and even calls into question the work arriving from the most prestigious sources, with additional checking and a greater demand for transparency in the publication of clinical data. Achieving this is not at all easy. Globalisation has radically changed journalists' relationship with sources, so that many professionals today have the impression that their capacity to control what is published is less than before. In theory, all the information produced in the scientific world, wherever it is, is available for any journalist interested in it. There is a lot of information, more than ever, perhaps even too much. But what information is it?

Obviously, when a team achieves a spectacular breakthrough, its members cannot be personally available to the thousands of journalists from all over the world interested in checking the data with them. In these cases, the press services provide a good support, with popularised explanations of the habitually cryptic scientific language. This system works reasonably well in many cases and has helped to improve the quality of content of many written and audiovisual media that do not have specialist journalists.

But when the subject is controversial, the difficulty in accessing sources represents a serious risk to the quality of the information. When a particularly controversial piece of news breaks, and a decision has to be taken quickly, very often an insuperable paradox occurs: close, accessible sources do not have enough information for an evaluation (or they don't want to give an opinion) and the sources that have the information are not within reach of the journalist. Put another way: the well-informed sources are not available and those that are available are not informed. Very often, the only decision remaining to the journalist is whether to publish the information or not as it has arrived, without being able to access the details that may be relevant

for the conclusions and therefore to evaluate and title the item. Sometimes these data are deliberately hidden. Opacity is the worst enemy of rigour in information and good journalism.

All interests may be legitimate, including, evidently, the desire of the pharmaceutical industry to get as much profit as possible from their products. Often the methods used to do so are not so legitimate. In recent years, changes have been seen in the marketing strategies of many pharmaceutical companies. The difficulty in obtaining new molecules and the high costs of research have led many companies to look for profit via other means. For example, creating new needs or achieving new indications for their old products. That is how we have gone from having ill people searching for drugs, to having drugs searching for ill people.

The growing medicalisation of natural processes, such as the menopause or the feeling of pain after a loss are, in part, a consequence of this new strategy. In this context, doctors are not the only target for promotional campaigns. Now it is also the public at large, and the way of reaching them is through the media.

The case of hormone replacement therapy is a paradigmatic example of this new dynamic and its serious consequences. Although, in the United States, hormonal products started to be prescribed at the end of the forties, their use was very limited. Suddenly, at the end of the eighties, newspapers started to receive dossiers and research studies on the huge disorders associated with the menopause and the risk involved of suffering osteoporosis and coronary disease. All the media published extensive reports on this issue.

That sudden interest was not, however, the consequence of new discoveries or the arrival of women in research centres. The true reason emerged a short time afterwards, with the launch of hormone replacement therapy, presented as a miraculous remedy for women. They didn't need to suffer anymore. I remember a press conference with the, at that time, heads of gynaecology from the main hospitals in Barcelona in which hormone replacement therapy was recommended as a preventative treatment for all women as from 50 years of age and for at least ten years. When the social security refused to finance it in general, some women's groups and doctors talked of discrimination. In reality, what women were being offered was eternal youth with a

drug that seemed innocuous. But what scientific evidence was actually available?

Hormone therapy was the object of great controversy for years until, in May 2002, the study entitled Women's Health Initiative⁶ that was carried out with 16,800 women on the request of National Health Institutes in the United States to definitively evaluate the preventative properties of the treatment, had to be suspended although it still had three years to run. At that point it was already clear that not only did it not have the benefits announced ten years previously, but that the risk of ictus and breast cancer increased. From that moment, hormone therapy returned to the place that it should never have left, i.e. a treatment that might be useful in certain cases but with a prior, rigorous individual assessment of the risks and benefits.

The case of hormone therapy is a good example of the new strategies to conquer the market. Firstly, the aim is to identify or create a new therapeutic need, the wider the better. Then to mobilise the social actors related to this need, basically patient associations and medical societies. And, finally, to colonise the media with news items produced by these agents on the solution being offered. Some of the most widely sold drugs in the last few years, such as Prozac (fluoxetine), Viagra (enalapril) or Serotax (paroxetine), that form part of the so-called "happy pills", have been a commercial success thanks precisely to this kind of approach. If in Spain there were really as many depressed people as indicated by the sales of anti-depressants (more than 20 million packs a year), we would have to be seriously concerned.

In spite of the fact that it has been marketed in Spain since 1992, paroxetine was launched to the "whole world" from London in 1999 as the "shyness pill" and, in the press releases, as a new therapy against social phobia. In its report to the AGM in 2000, 2000, Barry Brand, CEO of Glaxo-Smith-Kline, could not express himself more clearly: "Every marketer's dream is to find an unidentified or unknown market and develop it. That's what we were able to do with social anxiety disorder". He had managed to build a positive by dint of mobilising doctors and shy people to

colonise the media. In 1999, the New York office of *PRNews* counted a thousand million mentions of Paxil, the trade name of the drug in the United States.

Sometimes, however, the fight to occupy the market can have serious consequences for patients, as demonstrated by the Lipobay case, a drug against cholesterol that was withdrawn in August 2001 when a hundred deaths had been notified. That of COX2 (selective inhibitors of cyclooxygenase) is the latest example and the most serious. In 1999 many newspapers published, with big headlines, the marketing of these new revolutionary anti-inflammatories that, unlike the old NSAIDs (no-steroid anti-inflammatory drugs), did not cause gastric problems. Quickly the new anti-inflammatories pushed out the old ones. Two years later, the first independent study was published that warned about possible serious cardiovascular side effects. Merck, the pharmaceutical company that held the patent, counter-attacked by questioning the validity of this study. When, three years later, the drug Vioxx was withdrawn from the market because of adverse side effects, more than 20 million patients had taken it in the United States alone. In Spain, around 277,000. The US Food and Drug Administration estimated, in a study later published in *The Lancet*, that Vioxx might have caused between 88,000 and 140,000 cases of heart attack or serious coronary disease in the United States alone.

The drug is now facing 17,000 lawsuits and, apart from whether information was hidden on side effects noticed in the research stage, which is still highly controversial, what has been proved is that the clinical studies had serious deficiencies. For example, only 2.1% of the patients who took part were older than 65, when anti-inflammatories are prescribed principally for elderly people, whose arteries are normally in the process of arteriosclerosis.

This serious incident has brought into doubt the whole system of clinical research and the publication of results. Different articles published in scientific journals in later years have already shown the growing concern of the scientific community due to how clinical research is evolving. *The New England Journal of Medicine*, for

6 AMERICAN MEDICAL ASSOCIATION. "Risks and benefits of estrogen plus progestin in healthy postmenopausal women: principal results from the Women's Health Initiative randomized controlled trial". In: *JAMA*, 17 July 2002. 228 (3): 321-33.

example, published in June 2000 a long article by Thomas Bodenheimer⁷ based on a survey, carried out with guaranteed confidentiality, on 39 of the most eminent scientists from different specialties. They revealed themselves to be very concerned about the loss of control over clinical research, not only with regard to study design but also concerning the interpretation and publication of findings.

This loss of control is related to the growing role of the so-called contract research organisations (CRO), which are employed by pharmaceutical companies to carry out clinical research. They are the ones responsible for recruiting doctors and patients for clinical trials, often in third world countries where ethical requirements are less rigorous. CROs control the whole process, from the study design to the tabulation and publication of findings. In 1990, 80% of the clinical research carried out in the United States was done through academic institutions. Eight years later, the percentage had fallen to below 40%.

In September 2001, thirteen of the most prestigious research journals published a joint editorial expressing their concern about the deviation of clinical research and demanded more transparency in the conflicts of interests, more independence and more respect for scientists. Obviously, from the media's point of view, clinical research designed and controlled by hierarchical, transparent public institutions is, in principle, much more trustworthy than other research carried out by often opaque structures in the private sector.

Sometimes conflicts of interest occur not at the time of the research but in the marketing of the product. And, in this case, the media can also be involved. In the information society, being on the information agenda has become a prior requisite to being on the political agenda. Often dilemmas and controversies about whether new products should be introduced or whether they should be financed by public funds are settled in the media.

The recent approval of the vaccine against the human papillomavirus to prevent cervical cancer is a good example of this. Although the studies we have do not allow us to

guarantee that the vaccine covers the whole life of women, nor that it is exempt from side effects in the long term, the decision has been taken to give it to all girls as part of the official vaccination schedule. In Catalonia, this means practically doubling the cost of vaccinating. Prestigious specialists in public health have questioned the decision as they feel it is hasty. There is no doubt that the vaccine can save many lives in countries where vaginal infection caused by this virus is endemic. But in Spain, the mass vaccination of girls (it must be administered before they have sexual relations) is a controversial measure, given the low incidence of cervical cancer and the existence of another preventative procedure, the cytology or Papanicolaou smear test, which should still continue for decades because there will still be a lot of women who have not been vaccinated.

The aforementioned specialists estimate that, when the first death can be avoided thanks to the vaccine (in about thirty years' time), the public health authority will have spent around 4,000 million euros on vaccination campaigns. The question is: how many lives could be saved if this money were allocated to other measures, such as the early detection of breast or lung cancer? And how many PET-CT machines could be installed in hospitals to improve cancer diagnosis? It is not a question of exchanging some deaths for others. Without the vaccine, deaths from cervical cancer could also be avoided by simply improving screening with the smear test.

This is a good example of the growing complexity of the issues settled in the debates on public health, where often an attempt is made to direct social actors and public opinion towards certain positions. In this case, the strategy has followed an old tactic: the so-called "peer effect". The idea is to get some medical society to recommend the vaccine and some autonomous community to proclaim its decision to vaccinate, as done by the Community of Madrid, in order to achieve a domino effect on the rest. The same thing happened with the vaccination against meningitis by *Haemophilus influenzae*. What politician would risk being accused of not wanting to protect his or her teenagers?

But in debates on public health, it is not enough to

7 NEWMAN, T. J.; BELLIN, E.; BODENHEIMER, T. "Uneasy alliance: Clinical Investigators and the Pharmaceutical Industry". In: *The New England Journal of Medicine*. 17 August 2000. <<http://content.nejm.org/cgi/content/extract/342/20/1539>>.

determine the cost and benefit of a product or procedure. When the resources available are limited, it is an ethical imperative to think not only of each patient but of people as a whole, because sometimes a sick person can be deprived of something necessary in order to provide something that is unnecessary. For this reason, it is not only a question of new products proving to have a good balance from a cost-efficacy point of view but also from a cost-opportunity perspective. Some of the most widely prescribed drugs today would not pass this test.

If we wish to serve society well, if we wish to guarantee rigour and an ethical approach to the task of informing, the media cannot ignore the conflicts of interest that often lie behind the information published. I have already mentioned that all interests can be considered legitimate but very often the problem lies in how these interests are defended. And often their defence includes the manipulation or biasing of information. Given these challenges, both journalists and publishers have to have a very clear idea of where our loyalties lie: with our readers. On this clear idea depends our credibility, the most important asset in our profession.

Science documentaries and their coordinates

Bienvenido León

- *This article focuses on some fundamental axis of the science documentary from a multiple perspective. Firstly, it attempts to draw the limits of this subgenre by means of some of its most common characteristics, such as the direct connection to findings of scientific research and the presence or support of scientists. Secondly, a brief historical review is undertaken, focusing on some of the pioneers who made a decisive contribution to conform it. Finally, it presents some key trends that help to define the present situation, including the search for entertainment and trends resulting from the use of digital technology.*

Keywords

Science documentary, concept, history, market, current trends.

A subgenre of imprecise limits

It is no easy task to precisely delimit the terrain of the science documentary, as many different forms, objectives and target viewers can be distinguished. Sometimes, the documentary is constructed with images recorded during the research processes themselves, while at other times material is used that has been recorded *ex profeso*. Some documentaries are conceived as an instrument of communication between specialists, while others are aimed at the public at large. Some have the prime objective of informing, while others educate and some entertain their audience.

Neither should we forget that all documentaries ultimately have some connection, more or less direct, with some scientific discipline, as all present knowledge or facts that, in one way or another, have been investigated by some branch of science.

However, apart from this variety, it seems evident that TV channels have scheduling timebands labelled as “science documentary”, where programmes are included on astrophysics, nature or medicine, just to name a few frequent examples. These usually include programmes tackling issues that have been specifically studied by some scientific discipline, normally highlighted by the presence of the researchers themselves in the documentary and sometimes by including images obtained during the actual research.

In principle, we could demand that the structure and basic approaches of scientific documentaries be somewhat in line with scientific method. However, we mustn't forget that science is popularised by the audiovisual media “through a kind of peculiar statement, the means and purposes of which are not necessarily scientific” (León 1999, 180).

This approach coincides with that expressed by other authors, who point out that the popularising discourse is not usually a mere *translation* of a scientific text into language

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that is easily accessible for the public at large, but is rather the creation of a new thing, with its own being, characteristics and purposes (Roqueplo 1983, 114). By means of this new statement, it's possible to create the necessary link between discourse that is "specialised and general discourse, oral and written, empirical and phenomenological [...]; in short, between science and common sense" (Silverstone 1986, 81).

Bringing together these ideas, we may consider the science documentary to be a subgenre that includes audiovisual works meeting two requirements (León [et al.] 2007):

1. They deal with the subject by focusing on the findings of research, facts or knowledge related directly to some discipline of science or some argumentation based on scientific knowledge, including natural, applied and social sciences.
2. They explicitly show (in the image, narration or credits) that they have had the collaboration or support of scientific experts or institutions, which have taken part as sources of information or advisors on content.

These characteristics allow us to identify a kind of production that forms part of the history of cinema since its very beginning. The work of these pioneers, which we will review briefly but by no means exhaustively below, allows us to establish some fundamental coordinates, as their approaches have guided the development of the science documentary up to the present day in terms of the issues dealt with and the underlying approaches.

The contribution of some pioneers

Cinema and science have been closely related since the very first film crews appeared at the end of the 19th century. On the one hand, cinema finds sufficiently interesting reasons in science to transfer it to the big screen. On the other, scientists employ the moving image as a research tool because it allows them to observe those natural phenomena that occur too rapidly or too slowly to be appreciated by the naked eye.

Medicine was one of the first disciplines to turn to cinema. In 1896, only one year after the Lumière brothers presented their cinematograph, this invention was used in Russia to film various surgical operations. As from the following year,

the Pole Boleslaw Matuszewski, a cinematograph operator, also filmed several operations. In 1898 in Great Britain, Dr. Panchen made three films on different illnesses.

Animals and their behaviour have been filmed since the start of cinema. According to Bousé (2000, 44), the first animal film of which we have evidence is entitled *The sea lion's home* (1897), filmed by Edison. According to this author, from that time on two traditions co-existed within this area of documentary, developed respectively in Europe and in North America. The European tradition attempts to film the behaviour of creatures in their own habitat and tries to make sure that the filming process does not interfere with them. The North American tradition, on the other hand, particularly aims for spectacular images, which often leads it to film situations set up for the camera.

Apart from serving as an instrument for scientific research, cinema has also been used as a means of popularising science since its early days. The first outstanding attempt was made in England by the firm Urban Trading, founded by Charles Urban. Among its first productions are some brief films with microscopic images, such as *Circulation of the Blood in the Frog's Foot* (1903), which would later form a part of a series entitled *Unseen World*.

In France the same year, Dr. Jean Comandon made for Pathé *La vie microscopique dans un étang* ("Microscopic life in a lake", 1903), considered to be the first biological film. The aim of this film was to "demonstrate to his colleagues certain phenomena of very short duration, to delineate experiments or devote himself to the general observation of things, beings or facts" (Calvo Hernando 1977, 270). In 1909 he filmed, for the first time, the organism that causes syphilis (*Spirochaeta pallida*), and sent the material to the Science Academy in Paris as part of his doctoral thesis. But scientific films were also being made in other countries. For example, in 1904 the Italian R. Omega filmed the different phases of a butterfly's metamorphosis.

As from that time, the cinema of scientific popularisation started to occupy a certain space in some of the news reels or shorts that preceded the fictional feature films shown at cinemas, or as a complement to other shows. A large number of them dealt with areas of human science, especially travelogues, as well as natural sciences. The film by Oliver Pike, entitled *In Birdland*, was premiered at the Palace Theatre in London in 1907. At that time, it appears that the

public of the British capital was already used to seeing films with this kind of content at the end of music hall shows (Bousé 2000, 45).

Animated films provide scientific and popularising documentaries with many possibilities. One of the earliest experiences in this area can be found in the film by Émile Cohl *Joyeux Microbes* ("Lively microbes", 1908) and later, also using animation, Atlantic Films produced the series *Trois Minutes* ("Three minutes"). At the start of the twenties, one of these short films, entitled *Trois Minutes d'astronomie* ("Three minutes of astronomy", 1934), reproduced the speeded up movement of the planets and the moon. The same technique was used by Étienne Lallier to popularise the theory of relativity. This series was recognised as an example of scientific cinema, for its inventiveness and its great capacity to transmit knowledge to the layman.

In France, at the beginning of the 1910s, an interesting rivalry arose in the production of informative documentaries between the companies Eclair, Pathé and Gaumont. In 1911, Eclair launched a series *Scientia*, while Pathé, since the previous year, had included a line of films in its catalogue made under the supervision of Jean Comandon, which were called "of scenes of scientific popularisation" (*scènes de vulgarisation scientifique*). For its part, during the same period Gaumont launched a project entitled *Encyclopédie*, which included films on new scientific disciplines and was notably successful. These films can be clearly distinguished from those made by scientists as a means of research, as they have a different end purpose, distribution circuits and narrative forms. In the case of popularising films, the importance of "editing and didactics" can already be seen (Gaycken 2002, 354).

In Spain, there is evidence that cinema was also used in the same decade as a means of scientific research. In 1915, the ophthalmologist Ignasi Barraquer presented various films at the Hospital Clínic in Barcelona made by Francisco Puigvert on surgical operations for cataracts. At the same time, Antonio P. Tramullas recorded the research of Dr. Rocasolano on the mobility of silver micelles, using the camera as a microscope (Álvarez 1996).

At the end of the twenties, Frenchman Jean Painlevé produced his first work, mostly cinematographic experiments on underwater life in which he used advanced production techniques, such as high speed filming and slow and fast

motion, which would be widely used in the years following. His first works are *Le pieuvre* ("The octopus", 1928), *Oeufs d'Épinoche* ("Stickleback eggs", 1928), *Les oursins* ("Sea urchins", 1928) and *L'Hippocampe* ("The sea horse", 1934). Later on he made films on the lives of great French scientists, such as Paul Langevin, Jean Perrin, Louis Loumière and Louis de Broglie, among others. One of Painlevé's main successes was applying the spirit of avant-garde artists to scientific cinema, which brought him enthusiastic comments from the artists of the time. For example, Fernand Léger said of his film *Caprella et Pantopoda* ("Caprella and Pantopoda", 1930) that it was the most beautiful ballet he had ever seen, and Marc Chagall referred to its "incomparable plastic beauty" (Bellows [et al.] 2000, 19).

As from the thirties, a large number of zoological studies no longer focused on the taxonomic work of previous years but dedicated themselves fundamentally to attempting to explain the behaviour of living beings. As a consequence, interest grew in cinema for scientists and the number of films multiplied. In Germany, the production company UFA created a scientific cinema section, led by Dr. Ulrich Schultz. Among the films produced by this section were particularly *Im Paradies der Vögel* ("In the paradise of birds", 1935) and *Die Stärke der Pflanzen* ("The strength of plants", 1935). In this last film, the technique was used of accelerating the plants' movement so that the human eye could perceive it. On the use of this resource, reviewers of the time wrote the following: "The extraordinary admiration the viewer feels is due to the fact that cinema appears as a magical instrument, miraculous, by the grace of which the most profound mysteries of nature are revealed" (Raichavarg and Jacques 1991, 197). This technique would be widely used in subsequent years.

In 1932, the first films by Dr. Guillermo Fernández Zúñiga were shown at the International Entomology Congress held in Madrid. These focused on the behaviour of bees and ants, whose filming had employed artificial hives and colonies designed and constructed by hand. Later on, Zúñiga directed more than twenty films on different scientific subjects, many of them shown in cinemas before the fictional feature film. Some won leading prizes at international events, such as the best short awarded by the Association of Cinematographic Reporters of Argentina in

1951. In 1966, Zúñiga founded the Spanish Scientific Cinema Association and is considered to be the pioneer and master of audiovisual popularisation (Álvarez 1996).

Documentaries with scientific content acquired greater relevance when television consolidated its position as a popular medium, as from the fifties. Among the extensive production of scientific documentaries made in various countries, of note is the British series *Horizon*, which the BBC started to broadcast in 1964 and which is still broadcast today, becoming an international benchmark for quality in scientific documentaries. Since the start of the nineties, *Horizon* has developed its own narrative form, in which the link between the issues being covered with viewers' lives is extremely important. This style has brought it great international renown, numerous awards and good audience figures.

Continuing with the British public channel, we can also note the production of nature documentaries, which started in the fifties. Among the leading authors is presenter and writer David Attenborough, considered to be one of the most important popularisers of our time. His successful career is based on several series of great length, from *Life on Earth* (1979) to *Life in Cold Blood* (2008). All strike an appropriate balance between television values and scientific rigour.

Inspired by the *Horizon* model, Michael Ambrosino created the series *Nova*, which was first broadcast in 1974 on the North American public channel PBS. Produced by WGBH in Boston, it is still being broadcast and has won the most important international prizes, becoming a model of quality popularisation. It stands out for its pace, clarity of narration and the originality of its scripts. Among many award-winning documentaries we can note, for example, *The Miracle of Life* (1983), *Spy Machines* (1987) and *The Elegant Universe* (2003), which have been broadcast in more than a hundred countries.

Another leading North American producer is the National Geographic Society, which was already making films about scientific expeditions at the start of the last century and has enhanced its production line of scientific documentaries as from 1961. Its documentaries were broadcast regularly on the CBS channel as from 1964, afterwards going on to ABC in 1973 and on PBS since 1975. National Geographic's productions are characterised by their particularly spectacular images, often possible thanks to innovative

technological developments and sophisticated production systems.

In France, of note was the work by Jacques-Yves Cousteau, who made a large number of films from the forties up to his death in 1997. His first short films on underwater life are *Par dix-huit mètres de fond* ("At eighteen metres deep", 1943) and *Épaves* ("Remains", 1945). His first great international success came with the feature film, in colour, entitled *Le monde du silence* ("The world of silence", 1956). Cousteau went on to achieve more success with *Le monde sans soleil* ("The world without sun", 1965), *Experience precontinent III* ("The World of Jacques-Yves Cousteau", 1965), and *Voyage au bout du monde* ("Voyage to the end of the world", 1975).

Cousteau also produced a large number of documentaries for television. Among the distinctions and awards obtained over the years there are three Oscars from the Hollywood Academy and the Palme d'Or from the Cannes Festival. For over half a century, Cousteau made numerous explorative expeditions on land and seas around the planet. From his recordings, documentaries have emerged that are broadcast on television channels the world over, today the symbol and prototypes of the most exciting ecological audiovisuals programme.

In Spain, of note is the work by Félix Rodríguez de la Fuente, considered to be the most important populariser of the country's fauna and flora. His first documentaries for television were in 1966, the year when he made two expeditions to Africa, in which he filmed five programmes for the series *A toda plana* ("Full spread"). His most extensive series is *Planeta azul* ("Blue planet"), with 153 episodes (1970-1973). Afterwards, he wrote and produced the work that would bring him international renown: *El hombre y la Tierra* ("Man and the Earth", 1974-1980). In his documentaries, he used various narrative resources that helped bring science closer to the everyday reality of the viewers.

The work of these pioneers has allowed us to outline some of the key issues in understanding the coordinates along which scientific documentaries run and exclusively constitutes the launching pad for a subgenre that, over the years, has gradually become highly relevant for television. Its contributions have been of decisive help in shaping a prosperous global market, which we analyse in the following section.

An important international market

Although there are very few data on this area, we can state that, at present, the production and broadcasting of scientific documentaries has achieved a significant volume. The international production of documentaries, on any subject, is around a million hours a year and is fundamentally carried out in Europe (38%), North America (19%), Asia (17%) and Latin America (17%). Its market value at the start of the decade was calculated at around 400 million dollars (Real Screen 2001). Regarding the subjects covered, around 40% of this work is of scientific content, particularly "History and ethnology" (17.5%), "Discoveries, nature and wildlife" (13.7%) and "Science and knowledge" (12%) (MIPDOC 2001).

The breakdown of broadcasts by country is very unequal. The available data show us that, in Europe, those countries that broadcast most documentaries are Germany (around 11,800 hours/year), France (5,100), Spain (4,400), the United Kingdom (2,990), Italy (2,670) and Denmark (2,260). There are also significant differences between the number of channels that schedule these documentaries and the times they are broadcast in different countries (European Documentary Network, 2007).

Although there are no specific data on the broadcasting of documentaries of scientific content, in general public television channels schedule them most frequently, the most important being the BBC (United Kingdom), ZDF (Germany), ORF (Austria), France 2 and France 5 (France), ABC (Australia), TVNZ (New Zealand), NHK (Japan) and PBS (USA).

It seems clear that generalist channels have lost hegemony in this area, as around 70% of the documentaries are broadcast on specialist channels (Francés 2003). We might conclude that the rise in the number of channels has led to significant growth in production. However, in reality many channels restrict themselves to repeating programmes broadcast by others. Neither has it led to an increase in production costs, as many specialist channels rely on low cost programmes.

Worldwide, the most important specialist channels are Discovery Channel and the National Geographic Channel. Discovery, which started broadcasting in 1985, currently reaches over 450 million households in 160 countries. The

channel's parent company (Discovery Communications) has 10 television channels and 85 different broadcasts in 35 languages. For its part, the National Geographic Channel, owned by the National Geographic Society and other firms such as the international group News Corporation, started broadcasting in 1997. It currently broadcasts via cable and satellite in 143 countries and 25 languages, and reaches 160 million households. The company also broadcasts five further different programmes.

In general, the countries where most scientific documentaries are broadcast are also those that produce the most. Although there are no data on world production, attendance figures at international forums of producers can provide us with some clues. In the most important professional congress for the speciality in 2007, held in New York, the countries with the largest number of producers registered were the United States (107), the United Kingdom (77), Canada (60), France (38), Australia (34), Germany (31) and Italy (23) (World Congress of Science and Factual Producers, 2007).

In Spain, the documentary genre, as a whole, is constantly increasing its presence on programming grids. The generalist channels that broadcast most documentaries are La 2 from TVE and the autonomous community channels K3/33, Punt Dos and ETB1. In terms of time, 64% of the documentaries broadcast were Spanish productions, compared with 22.5% European, 9.5% North American and 4% other nationalities (EGEDA 2006). There are no data on the broadcasting or production of documentaries with scientific content, although some subjects, such as nature, undoubtedly rank quite highly.

Among the trends observed in the international market, we can note the growing importance of commercial criteria. Research into audience ratings is decisive in selecting the subjects and design of the narrative modes. The stiff competition in the fight for audience share, in markets with a lot of channels, affects both private and public companies.

One of the consequences of this fight for audiences is the greater presence of types of documentaries where entertainment becomes the fundamental objective. According to John Corner (2002, 257), we are immersed in a "post-documentary" stage in which fun is the prime objective. Consequently, the documentary resorts to narrative elements from other genres and to a great extent loses its traditional sobriety and seriousness.

In the search for entertainment as a means of gaining audience, scientific documentaries have resorted to new strategies. One of the most successful is the use of hybrid genres. One of the most outstanding examples from the last decade is the so-called “dramatised documentary” which combines the narrative forms of the traditional documentary with dramatised scenes, played by actors, in which historical situations are recreated based on information provided by scientists. Leading examples of this format are *D-Day* (BBC - Discovery Channel – ProSieben - France 2 - Telfrance, 2004) on the Normandy landings in the Second World War, and *Pompeii, the Last Day* (BBC, 2003), which recreates life in the Roman city before the volcano Vesuvius erupted, which destroyed the town.

New technologies for a new documentary

As has happened with other television content, in recent years the expansion of digital technology has had a decisive effect on the development of the science documentary. The traditional 16 mm or super 16 mm film has given way to digital video formats, both of standard definition (e.g. Betacam digital) and high definition (HDTV). Cinematographic film has been relegated to large budget productions, particularly in the area of nature and animal life. Some directors continue to value the better quality of cinematographic images, with regard to sharpness and contrast, and the best results in slow motion, made by filming at fast speeds. However, the fact that the BBC recently chose high definition video to film its ambitious serious *Planet Earth* (2007) could mark the definitive end to celluloid for scientific documentaries.

The development of digital technology has reduced the cost and consequently increased the number of images created by computer, both in two dimensions and in three. In the case of scientific documentaries, this resource is of great importance, as it means that certain concepts can be represented in images that do not have an immediate visual representation. So it is possible to offer viewers a probable or plausible representation of theories developed in scientific fields such as physics or palaeontology. A leading example of this trend is the BBC series *Walking with*

Dinosaurs (1999), where these animals are recreated, in this case using a sophisticated combination of image synthesising and animated real models over real images of the landscape.

After the great audience ratings achieved by this series, certain debate also arose on the accuracy of the recreations. According to some authors, this series is an example of the postmodern science documentary, where the contemporary aesthetic tends to eclipse the scientific content per se, giving way to pure spectacle based on science (Darley 2003, 209). On the other hand, other authors defend the validity of the recreation and even maintain that the images recreated might be, in themselves, a source of knowledge, insofar as the visual resources serve as an element to construct knowledge and not simply to illustrate it (Van Dijck 2006, 6).

The use of animated images has made it possible for television to tackle subjects that were previously considered to be inappropriate because of the difficulty in showing them in images. For example, the series *Europe, a Natural History* (BBC-ZDF-ORF, 2005) has achieved great audience ratings in various countries in spite of dealing with geology, a science traditionally forgotten by television. In this case, an innovative combination of real image and animation has made it possible to narrate the geological evolution of the continent in an absolutely captivating way.

Other techniques have also contributed to the proliferation of subjects. Some have been used for decades but have taken on a new dimension thanks to recent technological developments. In the very slow filming of processes, time lapse photography is often used. To carry this out, a timer is used called an “intervalometer”, which automatically regulates the shooting of each image after a previously set period of time. Once filmed, the process can be shown in less time at a faster pace. This technique is used to record a wide range of processes, such as the flowering of a plant, the metamorphosis of a silkworm or the decomposition of an organism.

Sometimes, time lapse photography is combined with camera movements (travelling shots), coordinated by computerised systems. In this way scenes in movement can be filmed, recording dynamic but very slow processes (e.g. a plant growing up a tree trunk). A notable and innovative example of this technique is the series *The Private Life of*

Plants (BBC, 1995), where it was used to explain the life of nature from the original point of view of plants.

Viewing systems are required that allow us to see objects of microscopic size. When the object is too large to see through a microscope but too small for conventional photography, macrophotography equipment and techniques are used. In this case, macro lenses are employed, which magnify the object but preserve image quality.

In macrophotography, depth of field is very limited and lighting tends to be one of the main problems, as the light needs to be strong enough to show the details of small objects and the direction must be suitable to show these points. Artificial light tends to raise the temperature above what is ideal to reproduce certain processes, so that cooled equipment, cold light or fibre optic systems are required to concentrate a lot of light onto a small point, without releasing heat. In recent years, the equipment used to record this kind of images has developed considerably and has led to a notable improvement in the final quality.

In many cases, filming requires the development of special production procedures and techniques. In documentaries on nature and animal behaviour, filming is frequently carried out from hides to record scenes without altering the natural behaviour of the creatures. Other times, the images filmed in nature can be replaced or completed with others of animals in captivity or trained animals, which are taken to natural settings or studios where the natural environment is simulated. For some years now, remote control cameras have been used, as well as others that automatically film when any movement is detected. Thanks to these types of equipment, it has been possible to record surprising images of animal behaviour.

In the last decade, the use of interactive materials has gradually become more relevant, in some cases integrated within the broadcast itself and in others via the channel's website. In the case of scientific programmes, complementary information is usually offered on the subjects covered, including texts, complete versions of interviews, computer graphics, etc. In the case of interactivity offered via the television itself, interesting experiments have been carried out offering two or more alternatives in the narration, so that the viewer can choose the text's degree of difficulty.

The use of these strategies has helped to consolidate the position of the science documentary on television pro-

gramming grids. In some European countries, such as the United Kingdom, Germany, Austria and Italy, great documentaries of scientific content are broadcast at prime time. This is possible thanks to the fact that public channels have been committed to scientific documentaries for several decades now, both solidly and continuously, which has led to high audience ratings in the medium term.

In other countries, such as Spain, the science documentary still needs to conquer prime time. This difficulty in accessing the times of maximum audiences must be attributed to the fact that Spanish public television channels, quite unlike some of their European cousins, have not shown any clear commitment to this kind of content.

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2001 odysseys through space-time: (uncon)science in the cinema?

Jordi José

- *The text looks at the image of science as shown by cinema, from a dual perspective: on the one hand, it presents the (bad) treatment of scientists and their laboratories, a source of the (un)popular view of science and its creators; and, on the other hand, a small collection of examples that illustrate the uses and abuses of scientific knowledge in cinematographic discourse.*

Keywords

Science, scientists, physics, cinema, science fiction, scientific popularisation.

“Science fiction is not only good fun but it also serves a serious purpose, that of expanding the human imagination. [...] Today's science fiction is often tomorrow's science fact. To confine our attention to terrestrial matters would be to limit the human spirit.”

(Stephen W. Hawking, 1995)

1. By way of introduction

We live in a time of constant changes and, naturally, also of contradictions. In a society that defines itself as technologically advanced, in which broad sectors of the population enjoy inventions that have become everyday (from the mobile phone to GPS, including laptops and all kinds of domestic appliances), nonetheless irrationality and a lack of scientific culture have still not been expelled. The dizzying scientific and technical progress our society has experienced (or suffered!) in the last fifty years has not left much time for this to be assimilated. At no other time have so many changes come together in such a short period of time; changes that come in such quick succession that, whether we like it or not, we are forced to live with them and familiarise ourselves with them. Today it is not only essential to learn but also to be ready to learn how to learn. As the astronomer and science populariser Carl Sagan used to say, getting used to change is the key to survival for our civilisation and even for humanity itself.

Immersed in their daily routines, most citizens look on as science and technology get further and further from their understanding. Growing specialisation, the jargon used, as well as the very characteristics of research complicate even further the possibilities of building bridges between scientists (people who *do* science) and society (those who *receive*, in the short or long-term, the practical applications

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of this science). Science is perceived as a veritable ivory tower that provides shelter for a few privileged souls (scientists), often not very used to the fact that elements alien to their *closed circle* can access it. Getting close to science requires effort and many scientists are not willing to waste valuable time by popularising this knowledge. The ground is therefore ready for the appearance of all kinds of irrational attitudes. In spite of all this, however, it must be said that the flame of interest in scientific issues is still alight, in spite of the small number of volunteers willing to carry the torch.

Although the accusing finger points inexorably at the scientist, in general academic and governmental authorities invest little effort to improving the stifling level of knowledge of the average citizen in scientific and technical fields. And not only citizens! The media themselves are stuffed with incorrect ideas and incomprehensible errors that denote a clear lack of specific training in these areas. So, the newspaper *El Punt* published the following news item on 8 August 1996: “Scientists from the United States find remains that indicate there might have been life on Mars, by analysing a meteorite that fell to Earth 13,000 million years ago”. At the very least a surprising statement, considering that the age of the Earth is estimated at around 4,550 million years! In another medium, *Las Noticias*, this curious news item also appeared (2006): “A team made up of 73 astronauts from 12 countries has discovered a planet similar to Earth at a distance of around 20,000 million light years, close to the centre of the Milky Way. [...] The most fantastic thing about this piece of news is the distance: to reach the planet OGLE-2005-BLG-390 you would have to travel for 20,000 million years at the speed of light (300,000 kilometres per second). It’s a bit far”. We must disagree: the most fantastic thing about this news item is the writer’s incapacity to realise that 20,000 million light years is a greater distance than the dimensions of the known universe! It is, indeed, “a bit far”. Someone, without much of an idea, decided to add six zeros to the real distance of 20,000 light years... Even in the evening news programme of the first television channel we could hear, in March 2005 and regarding one of the largest meteorites in Europe exhibited in a museum in León: “the carbon 14 tests have proved that it is made of iron”. Perhaps we should remember that the carbon 14 test determines the proportion of carbon 14 of a

sample and, possibly, dates it. Unfortunately, we will never be able to find out whether the meteorite contains iron by using this analytical technique...

Science, seen as a body of knowledge but also as a method of getting closer to the world that surrounds us, is possibly one of the most important facets to which part of humanity has dedicated itself throughout history. Not knowing who Shakespeare, Cervantes or Beethoven were is, without any doubt, synonymous with outright illiteracy. Paradoxically, the same protectors of these standards of culture do not consider names such as James Watt, Gregory Mendel or Carl Friedrich Gauss to be important, just to give some examples. Science is the heritage of humanity and our duty as *priests of this religion* is to communicate science and to get society involved in its advances.

2. Bad, mad or dangerous? Scientists on film

Neither has the image, a little sinister, of science and scientists shown to us by the cinema, helped to redirect this rejection or undervaluation of science. In fact, in the popular imaginary scientists are usually presented in an undeniably masculine key: men, therefore, either middle aged or elderly, flat personalities, almost of cardboard, obsessed with the search for knowledge (which often leads to veritable environmental chaos), closer to the status of villains than heroes, preferably recluses in remote, isolated laboratories and constantly dressed in a way not very suited to their activity, with immaculate white coats. As a contrast, they are usually located in the midst of veritable Technicolor laboratories, with neon lights (more typical of a disco than of a real research laboratory), test tubes that distil green, blue or red liquids, flasks with a whole range of smoking fluids, microscopes and, if the budget allows, other instruments of various characteristics with a whiff of technology.

The stereotypes that the cinema, like other narrative media, have set up around the figure of the scientist have been amply analysed in various publications [see, for example, the exceptional book *From Faust to Strangelove* (1995), by Roslynn D. Haynes]. In this section, therefore, we will leave to one side the classic *alchemists*, *absent-minded professors*, *romantic scientists*, *idealists* and other archetypes to focus on the more or less contemporary image of

the scientist (and his environment) as shown by contemporary cinema. We will start with the costume, the object of curious if not stifling situations in the cinema. To the eyes of the 21st century, attitudes such as those shown by the star of the film *The Giant Spider Invasion* (B. Rebane, 1957) seem to be quite out of place. In the film, a NASA researcher goes to an astronomic observatory to interview a colleague and puts himself in the most ridiculous of situations by not accepting the evidence in front of him (possibly brought about by a huge number of chauvinist traditions rooted in his subconscious): the woman dressed in a white coat who is handling an enormous telescope is not a daughter or wife or sister but the person he has come to see! Yet another example of the obsessive tendency in film to relate, unequivocally, the wearers of white coats with the role of scientist, in spite of the mental blindness shown by the star. In contemporary cinema, however, the iconographic white coat is starting to lose its followers (in accordance with reality). Films such as *Hulk* (A. Lee, 2003) support this new trend: in the opinion of the film's director, it was preferable to dress the stars in naturally coloured practical clothes and with the bohemian touch so characteristic of San Francisco, where the action takes place. Why would a scientist need a white coat while sitting in front of a computer screen?

The last few decades have also seen scientists mutate from their almost exclusive condition as a lone wolf, a veritable sniper ready to go and fight and do their own research (war?), to one forming part of a research team. So, on Nublar Island, close to Costa Rica, a select team of scientists are working on the complex (not to say crazy) task of cloning dinosaurs with fossil DNA, filling in the holes in the chains with frog DNA (*sic*). Long ago are the times when, in the cinema, such an extraordinary project could be tackled by a scientist alone, in the midst of a toy laboratory, where the modest equipment available seemed to be taken straight out of a "bargain store" ... On the other hand, the laboratory of *Jurassic Park* (S. Spielberg, 1993) constructs a veritable ode to modernity, with latest generation computers, virtual reality monitors, ergonomically designed furniture, incubators, microscopes, refrigeration chambers for embryos... The complex has, however, a kind of white room from where the growth of the dinosaur eggs is controlled. A room where, nonetheless, the brilliant palaeontologist Dr. Grant and other

guests on the inaugural tour access in their hiking boots, without hesitation... A similar structure, based on teamwork, also appears in *Hollow Man* (P. Verhoeven, 2000), a film that is also notable for the extensive technological equipment of its laboratories. The team, made up of three women (one African American) and four men, in an unusual proportion of genders, are "some of the best experts in the country". Curiously, all appear to be around 30 to 35 years old, an age that is more appropriate for a promising scientist than one classifiable already as an authority in his or her field.

In all, contemporary cinema commits quite a few casting errors in its characterisation of scientists, combining elderly wise people, something compatible to a certain degree with the presumed prestige and experience of the person, and comparatively too young (and preferably blond!) females for similar tasks. A paradigm of this curious custom is Dr. Christmas Jones in *The World is not Enough* (M. Apted, 1999), an nuclear physicist who is an expert in dismantling military nuclear installations but only 30 years of age...

Figure 1. *The World is not Enough*



Source: *The World is not enough*, Metro-Goldwyn-Mayer.

* Dr. Christmas Jones, in the film *The World is not Enough* (1999), the "most improbable nuclear physicist of all history" according to some film critics. Of her (rather meagre) costume, dangerous for working in a military installation with nuclear weapons (for various reasons!), the only thing saved is an (also) miniscule radiation counter, as usually carried by physicists and technicians in similar places with a high risk of radiation. A costume, in any case, more suitable for going camping...

3. Science or fiction? Science in science fiction films

Like a modern Prometheus, we scientists should take on the challenge of stealing the fire of knowledge from the gods to give it to humans. There are many different ways to achieve this goal. In this section, we will illustrate how science fiction on film (without forgetting or underestimating other aspects, such as comics or literary science fiction) can become a veritable Trojan Horse, capable of infiltrating scientific knowledge beyond the frontiers of irrationality and ignorance.

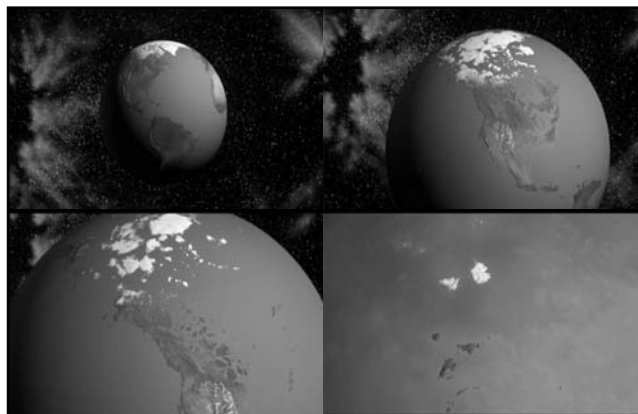
The Earth and the winds of (climate) change

A planet in rotation, our dear Earth, over a background of stars is the beginning of the futurist film *Waterworld* (K. Reynolds, 1995), the story of a “predicted flood”... The narrator’s voice in off gives us the background while, in a spectacular image, the earth’s surface becomes totally covered by water: “The future. The polar ice caps have melted, covering the Earth with water. Those who survived have adapted to a new world.”

Just as the day breaks, under a multicolour symphony and on a particularly paradisiacal, cloud-free morning, a small boat is sailing the seas, defiant. Its pilot, the bold sailor (Kevin Costner), survivor of a decimated humanity, is steering his trimaran across this infinite sea towards Atoll, a city in the midst of the sea, a veritable commercial centre of an Earth in complete decadence.

Waterworld is an interesting reflection on the future of our planet. The depletion of the ozone layer, growing levels of pollution and the rising trend in global temperatures of the planet are some of the aspects of this climate change, a veritable nightmare of the 21st century. Together with other effects, global warming questions the very stability of the large masses of polar ice. Even so, you don’t even need to have finished your secondary schooling to realise that, although the melting of the ice caps would be catastrophic, it would obviously not lead to an Earth completely covered by water. It is estimated that the Earth’s ice content (concentrated in places such as Greenland and the South Pole) totals around twenty thousand billion tonnes. A considerable mass, undoubtedly, and one which, if melted, would have devastating effects on coastal towns although,

Figure 2. *Waterworld*



Source: *Waterworld*, Universal Pictures, 1995.

* An Earth completely covered by the waters from the polar ice caps melting (or the effects of climate change amplified by the creative minds of Hollywood scriptwriters). Images which more than one farmer in times of extreme drought will dream about... From the film *Waterworld* (1995).

unlike what is suggested by the film, there would still be a lot of the Earth uncovered. In fact, the equivalent of this ice in liquid water would lead to an increase in sea levels of less than... 20 metres! Goodbye film! Skyscrapers, mountains and a large portion of the continents would mock the initial image of the film, where the whole Earth (whole!) is literally submerged underwater. In fact, in the film, the probability of finding a simple rock is so remote that, two hundred years after the catastrophe, the existence of a mythical “dry Earth” has become a legend.

Simple arguments based on the Archimedes principle allow us to reduce this estimate even further: a mass of ice that is loose (an iceberg, for example) does not increase the water level when it melts.

On the other hand, the effects noted in *A.I. Artificial Intelligence* (S. Spielberg, 2001) seem at least somewhat more realistic. In one of the spectacular scenes the film presents us, a small helicopter is flying over a decrepit New York, in another time a vibrant, multiracial metropolis. Partially covered by water, all that remains of the formerly emblematic Statue of Liberty is its right arm, carrying the torch that rises up, phantasmagorical, in the midst of the turbid waters. Inaugurated in 1886, the Statue of Liberty (a

gift from the French government, whose structural design was by Gustave Eiffel himself), is 46.5 metres high (93 if we count the pedestal), a significant height. The view presented by the film, with the arm of the Statue visible above the water, in spite of being a little exaggerated, is much more in line with reality than the not very propitious predictions of *Waterworld*...

From star wars to galactic encounters

"A long time ago, in a galaxy far, far away..." a science fiction film, *Star Wars* (G. Lucas, 1977), catapulted Luke Skywalker, Han Solo and princess Leia to veritable legends of the genre. In the different films that go to make up the saga, the object of absolute veneration by legions of fans of the genre (the sacred *gospel* according to Saint —George— Lucas?), we can note the little rigour with which the scriptwriters tackle the displacement of the spacecraft, gravity and the battles themselves that have the void as their bloody setting. Perhaps aiming for stardom, a bold translator decided to extend one of the already improbable star wars to an even more unsustainable confrontation between galaxies, as the title in Spanish suggests ("La Guerra de las Galaxias" or war of the galaxies)...

In one of the liveliest scenes of *The Empire Strikes Back* (I. Kershner, 1980), a squadron of imperial TIE fighters is frenetically pursuing the rebel ship *Millennium Falcon*. Han Solo, its intrepid pilot, tries to avoid the enemy ring by making daring manoeuvres and dodging the crossfire of the laser batteries. Loops, twists and turns and complex acrobatics compensate his futile attempts to connect the impulse system that should launch them (faster than the speed of light!) through the sinuous corridors of hyperspace. Meanwhile, a large number of lasers are hitting the energy shield of the Falcon. The rebels are awaiting their fatal destiny with resignation. Everything is lost... or almost. Facing a small probability of survival (1 in 3,721, according to the faithful android C3PO), Han plunges the *Millennium Falcon* into an asteroid field...

Asteroids, bodies of varying sizes, with typical dimensions from scales less than a centimetre up to 1,000 km in

diameter, are relics from the formation of a planetary system. These aggregates, made up of the same nebula in which stars and planets are shaped, do not possess enough mass to generate, alone, an asteroid belt (in a short time, on an astronomical scale, the various fragments would disperse, if it were not for the presence of a central Sun). However, in the only asteroid belt known to date, the one between the orbits of Mars and Jupiter, in our solar system, the average distance between its components is considerable. In fact, it is estimated that the probability of a collision between two asteroids of 10 km radius in this belt is once every 10 million years! Far removed from the frenetic image of the film that is more reminiscent of a walk along Portaferriça road in Barcelona, the night before the Epiphany¹ than the ordered chaos of an asteroid belt.

This is not the only badly treated aspect in this scene that, without doubt, could pass into the annals of cinematography for its large number of scientific errors (more than a dozen contained in a fragment of one and a half minutes!). The characteristic noise of the crafts' impulse engines (a sound that, in the film, manages to be transported by a vacuum), the generation of gravity in a spaceship (even in repose!), the perception of the trajectory taken by the lasers (moving at a much slower speed than light and clearly visible in the film), the acrobatics resembling airplane flight or the very presence of a monumental worm that is about to swallow the *Millennium Falcon* and its crew, in a place as little frequented as an asteroid belt. How has the worm got there? Is it logical to find a predator isolated in an environment lacking in prey? Perhaps its diet is limited to intrepid but unfortunate travellers.... What a sybarite!

Errors of little gravity?

As illustrated in the film *The Empire Strikes Back*, a widespread practice in cinematographic science fiction (as well as on television) is the systematic absence of any effect produced by a change in gravity. Globalisation, it seems, has also affected gravitational pull! It doesn't matter if we're walking on a star of neutrons, inside a spaceship that's adrift or on a small asteroid. In Hollywood, at least, the *American*

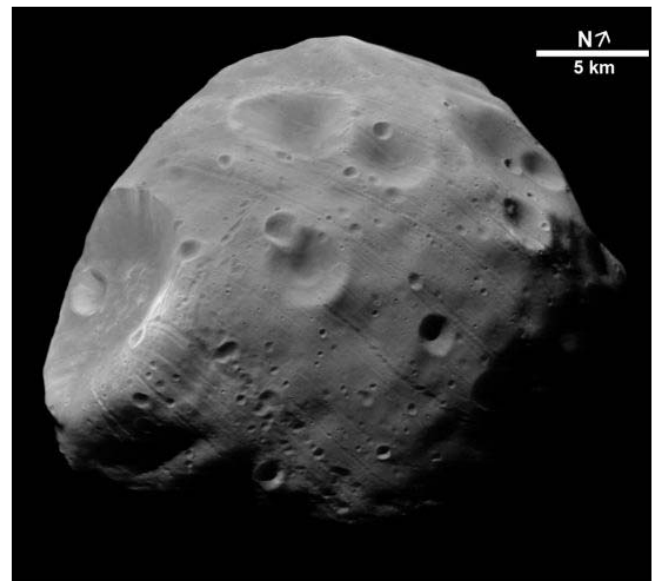
1 Translator's note: Portaferriça road is in the centre of Barcelona and is often very busy, especially the night before January 6th (Epiphany), the day when the Three Kings bring children gifts.

way of life seems to have turned its back on the laws of physics...

For a human, as surprising as a habitat with extreme gravity may be (with the exception of Bruce Willis, capable of *accelerating at 9.5 g for 11 minutes* in the film *Armageddon* (M. Bay, 1988)), a conventional human would not withstand acceleration of more than a few terrestrial gravities or a world with little gravity (a scene, however, that is ideal for performing a thousand and one acrobatics). The small escape velocity of some minor bodies in the solar system has provided curious plots for various narrations and films of the genre. So the astronauts on a rescue mission in the B movie *Queen of Blood* (C. Harrington, 1966) experience an unexpected odyssey that takes them to the surface of Phobos, one of the two miniscule Martian satellites (with a radius of only 13 km!). In a memorable scene, two astronauts decide to invoke the goddess of fortune to tackle an uncomfortable situation: the discovery of a living alien inside a spaceship that has crashed into the Martian satellite. They decide to toss for who will leave the rescue craft (and who will remain on board). Perhaps we should ask the scriptwriter why two astronauts are sent in a two-seater rescue craft! Are they unlikely to find anyone living in the place of the accident? And, if not, why bother to send a rescue craft at all? In spite of this, it would be even better to ask the scriptwriter about the method employed to resolve the problem: making use of a *lucky dollar*, one of the astronauts tosses the coin into the "air" (a doubtful expression in a world without an atmosphere, like Phobos), leaving their destiny in the hands of fate.

The gravity on the surface of Phobos is insignificant. Its value can be estimated based on its average radius and its density: the gravitational pull would be 2,300 times less than that of Earth. On Earth, you need to toss a coin at around 3 metres a second for it to go 40 cm (a similar distance to that seen in the film). Under the ridiculous escape velocity on Phobos (only 10 metres per second, compared with 11,200 metres per second for the Earth), the coin would reach an altitude of almost 1 km (with the spaceship's roof permitting!), which we would call a *notable launch*... The astronauts, for their part, would have to be patient and wait more than twenty minutes for the small object to fall, and all three would die, given that, according to the film, the maximum time they have to connect to the mother ship is only 16

Figure 3. Fobos



Source: ESA/DLR/FU Berlin (G. Neukum)

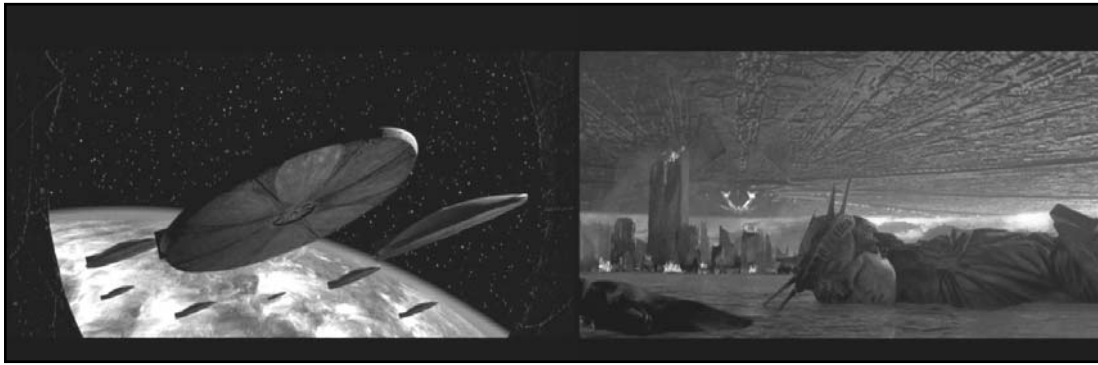
* High resolution photography of the small Martian moon Phobos, taken by the probe *Mars Express* (ESA) in 2004, from approximately 200 km distance. To the left of the image you can see the huge impact crater Stickney.

minutes! It is therefore evident that a minimal knowledge of physics can save lives, even on Phobos...

The day of independence (from the laws of physics)

Science fiction has been prodigious in covering extraterrestrial invasions. A recent example of this recurring (and at the same time fruitless) alien invasion has been the box office success *Independence Day* (R. Emmerich, 1996), yet another recreation of the perils that come from outer space. The film starts with the images of a colossal spaceship crossing interstellar space on its way to Earth. Its powerful engines seem to announce the arrival to the solar system with a symphony of terror: an intense acoustic vibration (there we are again!) which is capable of wiping out the footprints left behind on the lunar surface by the Apollo XI astronauts. A spectacular image, without any kind of doubt, although from a physics point of view it makes you think about the price for the cinema ticket: so clearly announced by the advertising poster for the film *Alien*, "in space, no-one can hear you scream"... Sound, a mechanical wave that

Figure 4. *Independence Day*



Source: *Independence Day*, 20th Century Fox.

* The alien invasion of *Independence Day* (1996). Flying saucers of 25 km in diameter (left-hand photo) could hardly withstand the inexorable tidal forces in their extreme approach to a large number of terrestrial cities.

requires a medium of propagation such as air or water, cannot be transmitted through empty space. So, in the absence of an atmosphere, the moon becomes a world of impenetrable silence.

It could be argued, and not without reason, that the presence of a spaceship as shown by the film, with the mass of one third of the lunar mass and a radius of 550 km (data from the film), could exercise significant gravitational disturbance on our satellite: the so-called *tidal forces*. The earthquakes and slides produced by these disturbances could lead to intense vibrations that would reach the surface (and would have a lot more success in erasing the footprints left almost four decades ago by Neil Armstrong and Edwin Aldrin on the Moon). Are we witnessing a team of scriptwriters from Hollywood with solid knowledge of physics and who respect how the subject should be treated? Perhaps, although other huge errors seem to suggest the opposite. Otherwise, how can we justify the presumed origin of the aliens: “they come from a world 90,000 million light years from Earth”, i.e. from a planet that is beyond the limits of the known universe (and probably beyond the limits of the universe itself!).

In the odyssey that takes them to the solar system, the alien ship must have ignored millions and millions of galaxies, stuffed with an infinity of planetary systems. Does the Earth deserve such an honour? The duration of the

journey isn't a serious problem for the scriptwriters either, who seem to have ignored the fact that, in order to complete their improbable mission, even travelling at the improbable speed of light, they would need a period five times longer than the age of the universe itself ...

These small but at the same time representative examples highlight the little care taken by cinema with the world of science (although it has occasionally been aided by scientific advisors!). Something that not very surprising, however. It is evident that the ultimate function of the cinema, seen as a spectacle, is to entertain the masses, not to popularise science. But the patent asymmetry in the treatment of humanities and sciences raises juicy questions: might we forgive, indulgently, a scriptwriter who places George Washington at the time of the Roman Empire, or who states that Miguel de Cervantes was from Venezuela? However, the function of the cinema is not to inform! But, why would we consider these examples as veritable affronts to culture while the most basic scientific aspects are systematically ignored and violated? The fear of the box office and the desire for commercial success seem to have led cinema more towards unconsciousness than towards science. Truly a pity. We have wasted the only chance to get our money's worth, enjoying not only the show and entertainment but at the same time a few healthy drops of the elixir of knowledge...

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Playing at scientists: video games and popularising science

Óliver Pérez, Mercè Oliva, Frederic Guerrero and Fermín Ciaurriz

- *What differentiates video games from other audiovisual media for popularising science lies in their capacity to transmit knowledge of complex systems through experimentation and experience. Moreover, as a form of popular culture, video games constitute a particularly interesting vehicle to popularise science. The aim of this article is to analyse the potential and limitations of video games in terms of popularising science. To do so, the rules of play are analysed, as well as the player's interactive experience (gameplay) in four commercial video games related to an area of science. The sample selected includes: Crayon Physics, a laboratory of classic mechanics; Trauma Center, where the player adopts the role of surgeon; SimCity 4, on town planning, and Civilization IV, a journey through universal history.*

Keywords

Video games, popularising science, rules of play, gameplay.

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1. Introduction

This article aims to analyse the potential and limitations of video games in terms of popularising science. According to B. León (1999, 42), the popularisation of science can be defined as “a communicative activity that attempts to provide the general public with certain knowledge taken from science via a new discourse whose purpose and form are not necessarily scientific”. In order to attract the general public, León highlights the value of legends and dramatic structures in popularising science (León 1999, 49). Video games, as they form part of popular culture, also constitute a particularly interesting vehicle for popularising science. But beyond this, given that video games allow the simulation of complex systems by means of computational techniques, they are also an ideal medium to transmit scientific knowledge of how these systems work.

The particularity of popularisation via video games is that the content does not need to be explained but rather the player can also be expected to assume the theoretical content implicitly, via experimentation and experience within the context of the simulation.¹ In this respect, to analyse an implicit dimension of the popularisation through video games we cannot limit ourselves to the game's audiovisual surface but must also focus on the internal structures, which can be divided into two broad areas. On the one hand, the game rules: the operational rules (regulating how the player acts) and constitutive (*sic*) rules (governing the changes in game status and how the elements in its universe behave) (Salen and Zimmerman 2005, 130). On the other hand, the

1 Concerning this question, see SCOLARI, C. A. “Interfícies per a saber, interfícies per a fer. Les simulacions digitals i les noves formes de coneixement”. In: SCOLARI, C. A. (ed.): *L'Homo videoludens*. Vic: Eumo Editorial / Universitat de Vic, 2008.

interactive experience designed for the player or the *gameplay* (Rollings and Morris 2004, 59; Juul 2005, 83).

Finally, we should also mention that, in most of the analyses regarding video games' capacity to popularise science, the sample is usually limited to the so-called *serious games*, games created with an explicitly educational purpose in mind and to be used in the classroom. However, the sample we have selected in this article focuses on commercial video games. The reasons for this choice are their social impact, on the one hand, and the fact that this kind of game clearly highlights the tension between the scientific reference and the fun had by the player on the other. Both the potential and limitations of video games in terms of popularising science emerge from this tension.

2. Case analysis

2.1. *Crayon Physics* and classic mechanics

Crayon Physics highlights how scientific knowledge can be transmitted by means of a simple game, both in terms of player interaction and also with regard to the rules that govern how the elements in the game's universe behave.

Created by Petri Purho, *Crayon Physics Deluxe* gives the player an objective (or problem to be solved) that is very simple to achieve, namely that, in a specific scene, a ball must touch the place where there is a star.² The game is inspired on the children's book *Harold and the Purple Crayon*, by the North American artist Crockett Johnson, which tells the story of Harold, a 4-year-old boy who creates his own universe with a purple crayon.

For the ball to move in such a way as to reach the star, the player must create objects with the crayon that transmit movement to the ball. The basic rules governing the behaviour of the objects are the laws of Newton from classic mechanics. In this way, for example, the player learns that, if no force is applied to the ball, it will remain in its initial state of rest, in accordance with Newton's first law or Galileo's principle. Although it may seem obvious, this is one of the fundamentals of physics. So the player must create objects that transmit movement to the ball, following the formulation

of Newton's second law or the fundamental law of dynamics that also make the ball follow a certain path towards the star. Movement is transmitted by taking advantage of the fact that all the objects created by the player are affected by the law of gravity, which determines their movement, as well as their effect on the rest of the objects created. In this last case, Newton's third law becomes evident, or the law of action and reaction. So these are the three underlying laws in the constitutive rules concerning the behaviour of objects created by the player of *Crayon Physics Deluxe*.

With regard to the interactive experience or *gameplay*, one of the main characteristics of the game is that in each of the stages (the game is divided into different screens in which the objective is increasingly more difficult), there is not one single solution possible so the player can choose from an infinite number of strategies to achieve the objective. This means that the game awakens creativity in the player in resolving problems of greater complexity. At the same time, the player needn't only go for an effective solution but can also try for an elegant one, experimenting with the game itself on the behaviour of the objects created and incorporating beauty to the movement of the ball like, for example, billiard players, synchronising the movements of the objects.

Moreover, the player can also create complex objects such as levers (taking into account the law of leverage and the moment of force) with the help of which the ball can follow a specific path along each arm of the lever or the weights on each side.

Consequently, the game has an interest that goes far beyond achieving the original objective. The game allows players to create systems of bodies that interact with each other under ideal conditions, to verify their behaviour under these conditions and, on the rebound, develop their imagination and creative capacity.

It should be noted that *Crayon Physics Deluxe* is not a definitive version, although the author has announced that this is being worked on. Another interesting fact is that there is a group of programmers adding stages to the original, with scenarios more difficult to resolve and, we hope, with objects related to classic mechanics (such as pendulums,

2 *Crayon Physics* can be downloaded at: <<http://www.kloonigames.com/blog/games/crayon>>

pulleys, springs, liquids) that will make *Crayon Physics Deluxe* a complete laboratory to experiment with the laws of classic mechanics.

As a final detail, it should be noted that *Crayon Physics Deluxe* has inherited the aesthetics of the cartoon version of Johnson's work: the screen background simulates a crumpled piece of paper where there are different drawings, with the characteristic lines of drawings by small children. The aim, in this case, is to make one of the dreams of small children come true: to make their drawings move.

2.2. Trauma Center and surgical operations

Trauma Center: Second Opinion is a video game for the Nintendo Wii console that has been marketed as a "medical simulation", although it's aimed at entertainment. In the game, the player plays the young doctor Derek Stiles, with the aim of successfully carrying out a series of surgical operations with a time limit and increasing difficulty. At the same time, the game also offers narrative interludes, where the story around the protagonist evolves, including his relationships with his colleagues, etc.

Unlike *Crayon Physics*, the connection of *Trauma Center* with the scientific reference is not clearly placed in a single sphere of our two areas of analysis: the rules and the gameplay. In *Trauma Center*, the changes in the status of the game (processed by internal rules and reflected in reactions of the patient's body) follow a certain "realism" but the mechanics to resolve problems are related to a real reference: in this case, the protocols of surgical operations.³

In this respect, what is essentially "simulated" in *Trauma Center* is not the behaviour of a natural, social or artificial system but the experience of a subject (the surgeon), using the reference of real surgical protocols. However, as in the rest of the cases analysed, the principles of game design to optimise the fun experience can enter into tension with this reference. Below we provide some interesting examples with regard to this point.

Some of the operations in the first part of the game have objectives like the following: extraction of foreign bodies

(glass fragments) from the body of a patient who has been in an accident, extirpation of polyps, repairing a fractured radius and ulna, aspiration of a thrombus, etc. In general, immediately one can see that the procedure prescribed for the player excludes any preparatory or preliminary component to the operation. The player does not take x-rays of the affected zones and neither does he or she give any anaesthetic. *A priori*, it can be considered that the fundamental reason of the designers for ignoring this is the credibility of the player's fictional role, given that x-rays and anaesthesia are normally carried out by other doctors, not by the surgeon. But sometimes the game does require the player to carry out the work of an anaesthetist, such as providing drugs to stabilise the patient's vital signs. We can therefore see here a tension between credibility of the game with regard to the medical reference and the enrichment of the player's interactive tasks to design more dynamic gameplay.

Even regarding the initial stage of the operations, it is interesting that the *gameplay* follows a rigid pattern with regard to access to the patient's affected zone. This pattern consists of disinfecting the zone and making a precise incision with a scalpel. The question is that, in the case of a patient with polyps on the larynx, the play prescribes the same habitual procedure for access to the affected zone (disinfection and scalpel), but in a real operation of this type access is via endoscope, without "opening up" the affected zone. Here we find a deviation from real surgical procedures motivated by a reason that is quite different from the enrichment of interaction: the simplification of certain mechanics of interaction that, in reality, might be judged by designers as not very exciting or excessively complex (at least at this stage of the game).

Concerning this, it is interesting to take into account the fact that the poles of simplification and enrichment of interactivity are closely related to the game's difficulty curve, a highly relevant concept for designers.⁴

Simplifying the reference and enriching interactivity are "deviations" that can make the popularisation of science

3 For the analysis of this video game, we would like to thank the collaboration of Dr. Miguel Ángel López-Boado, specialist in general surgery and lecturer in the foundations of surgery at Barcelona University.

4 In video game theory, the difficulty curve is usually conceived based on the psychology of optimum experience according to Mihaly

more attractive and, at the same time, graduate the difficulty curve. But, apart from this, “deviations” can respond to different levels of proximity with regard to the reference, from invention to analogy. We can see two important examples in *Trauma Center* regarding this point:

Firstly, in an operation to drain a blood clot in a patient, the player must start by detecting the clot with an ultrasound scan. This is correct medically but before proceeding to drain the clot via the tube (a procedure also in line with reality), the player must stop the clot with the forceps while some others escape. This has nothing to do with real surgical procedure, but added to interactivity increases the difficulty of the challenge, makes it more exciting and fills the scene with suspense. However, this deviation from the real reference is pure invention, inserted in the middle of the game process. As we can see in the next example, such a radical deviation of this type the reference is not necessary in order to make the game more attractive.

In this respect, we have taken a look at the operation for a fractured radius and ulna proposed by the game. The “way to win” in this operation consists basically of draining the blood from the arm, collecting the loose bone fragments and putting them back into place as if it were a puzzle. The intermediate step of these three is false (the bone fragments are not normally extracted), while the other two would be relatively faithful to medical procedure. However, the most interesting thing here is the fact that how the bone fragments are put back together is clearly “idealised” in the game as a puzzle. Nonetheless, this design still has some similarity with the real procedure: putting together bone fragments in the most anatomically possible but without, in reality, achieving the perfect fit between the different pieces. In the game, however, there is a reduction in the complexity of the real operation with pieces that fit perfectly together. The process is also “accelerated” in the game, as the pieces are welded together immediately and magically, unlike the real slow process of welding in bones.

The idealisation and acceleration of this medical pro-

cedure undoubtedly are “deviations” from the real reference but of a different nature to the use of forceps to stop the flow from clots (previous example). While the representation of the fracture operation as a puzzle is an idealised and simplified analogy, at heart it is faithful to the real procedure. On the other hand, adding a game mechanism consisting of stopping clots with forceps may make the game more difficult and exciting but it loses its realistic connection with the medical reference.

In summary, we can establish that popularising content via the game involves a dual balance: on the one hand, between the simplification and enrichment of the interactive dimension of the reference and, on the other, between the adding of inventions and analogies with regard to this reference.

2.3. *SimCity 4* and town planning

SimCity 4 is a strategic video game that offers the player the chance to create cities and to experiment with how they function. By assuming the role of mayor, the user manages a city built according to his or her preferences and is responsible for it developing correctly. The main author of the game, Will Wright, based the game’s internal rules on different theoretical sources of town planning and the computer modelling of systems.

Firstly, the study by Witold Rybczynski *City Life* (1995), which theorises on a grid model, allows urban expansion via proportional population growth.

Regarding *SimCity 4*, the game, right from the beginning, encourages the grid model, forcing the player to strike a balance between the expansion of the city and population growth. In this way, the player not only acquires knowledge about how the city behaves as a complex system but also about a balanced form of urban development.

On the other hand, when starting the game, the player finds a lot of space to build on. This evokes an observation from Rybczynski: the fact that, unlike Europeans, the first North American town planners had abundant natural

Csikszentmihalyi (quoted in: Salen and Zimmerman 2005, 351; Juul 2005, 113). Broadly speaking, this theory proposes the notion of “optimum experience” as an appropriate balance between the difficulty of a challenge and the degree of skill/experience of the person with the resources to achieve it. An imbalance towards the difficulty of the challenge would lead to a “frustrating” experience, anxiety and/or impotence. It is the balance between both factors that generates, according to Csikszentmihalyi, a *Flow* or optimum experience. This principle is fundamental in the design of difficulty curves for video games.

spaces. This influences the adoption of a certain model of town planning and, at the same time, encourages the application of free market rules to undeveloped land.

We can relate this issue with the fact that an attempt to represent a social reference such as a city inevitably involves the adoption of a certain ideological point of view. In the case of *SimCity*, its constitutive rules reproduce the dynamics of the laws of supply and demand, resulting from a capitalist view of the city. In this respect, Barry Atkins, in his semiotic analysis of the game, concludes as follows: “in *SimCity*, capitalism isn’t only a way of winning, it’s the only way to play” (Atkins 2003, 129).

Likewise the theory of *pattern language* by architect and mathematician Christopher Alexander. This theory proposes a generalisation of routines to solve problems associated with certain contexts, from which a categorisation of “patterns” results. For example, a pattern language would represent different rural homes with a similar appearance due to the fact that they share problems and routines of resolution.

In relation to this, in *SimCity* the player gradually learns a “pattern language” for the game, which is evident, for example, in the fact that the residences respond to a limited variety, according to a pattern that is repeated. In this way the landscape becomes uniform, leading to segregation by zones, related to the type of residences built.

Finally, the most important reference in the design of *SimCity* is the theory of urban dynamics by Jay W. Forrester (*Urban Dynamics*). Considered the “father” of system dynamics, Forrester transferred this perspective to the modelling of the behaviour of cities. His theory interprets the city as a complex system that grows and changes over time.

SimCity attempts to reproduce the functioning of a city based on a specific model. This model simplifies the city by selecting the same fundamental variables present in Forrester’s theory: housing, industry and trade/business. These subsystems are subdivided into three levels: low density, medium density and high density. The importance of these three variables in the game becomes evident as follows: the stagnation or growth of the city in the game depends to a large extent on the flows of population and, in turn, these flows in population depend on the degree of balance between housing, industry and trade maintained by the player.

But the most particular feature of the case of *SimCity 4* regarding the popularisation of science is that this game adds (and doesn’t only take away) complexity to its theoretical reference. Counter to simplification and ideological bias which would “deviate” the game from a strictly pedagogical potential, *SimCity 4* adds variables to the constitutive rules that were not in Forrester’s original model. In this respect, D. Lobo (2006) states that *SimCity 4* “solves” some problems of its theoretical reference:

“Forrester’s model applied statistical data to the city as an integral unit instead of treating the effects on a more localised scale. For example, when the model is applied to the police, it observes the relationship between the total number of offences and the number of policemen working in the city, instead of focusing on the different coverage rates of the police and the different trends in crime in each district. The first versions of SimCity also used generalising measures on the city but SimCity 4 solves this problem, albeit only up to a certain point. The producer of SimCity 4, Kevin Hogan, says: “we wanted to take location into account, in such a way that wherever you decide to put the schools has a certain effect.”

So, instead of moving away from reality, *SimCity 4* establishes close similarities with its scientific reference and turns them into a fun recreation of laboratory practices

2.4. Civilization IV and universal history

Civilization IV is a game of strategy where the player adopts the role of supreme head of a civilisation. The objective is to make it evolve at an economic, artistic, political, scientific, religious and military level from the 4000 BC to the present day and, at the same time, rule the world.

It is therefore clear that the reference for the game is universal history but specifically from two historical perspectives:

- World history: a discipline developed in the United States that attempts to leave behind the views of history that are excessively focused on the west. So, on the one hand, this discipline focuses on the joint analysis of the different cultures or civilisations and places them at the same level (Stoakes 2001).

We can find a clear connection between this approach and *Civilization*, as the “characters” in the game are

different cultures that attempt to take over the world: Greeks, Romans, English, North Americans, but also Egyptians, Mayans, Chinese, Indians, Persians, etc. And although each civilisation has its own characteristics, they all have the same chances to win the game.

On the other hand, world history also focuses attention on the economic, cultural, technological and other exchanges occurring throughout history between different cultures, searching for the roots to the processes of coming closer together (which end up leading to the current globalisation) and difference (maintaining identity) characterising the world today (Geyer and Bright 1995).

We also find this aspect reflected in *Civilization*, in the sense that contact with neighbouring cultures can lead to the exchange not only of resources and gold but also of technologies. In other words, establishing contacts with other civilisations is positive for the development of your own civilisation.

- Agroecological history: focusing on the relationships between geography, ecosystems and history. In other words, the aim is to enrich the study of history by analysing the role of resources and geography in the development of different civilisations (Worster 1990).

In this aspect, *Civilization* also includes this reference, situating (randomly) different resources in the land where each civilisation is installed. These resources will be key to their evolution. For example, if a civilisation has stone in its territory, it will be able to build cities and marvels, such as the pyramids, more quickly; if it has marble, it will be able to construct the Taj Mahal; over time, if it discovers iron, copper, steel, uranium or petroleum, this will also have an effect on its evolution and the relationships it can establish with the rest of the civilisations.

At the same time, the geography (i.e. the existence of rivers, plains, mountains, deserts), the climate, fauna, flora will influence what a civilisation can or cannot do, where cities will be built, the ease or difficulty of communications between them, etc.

In fact, Kurt Squire (2004), in his analysis of the pedagogical potential of *Civilization III* for secondary schools, points out the link of the video game with these two perspectives. At the same time, Squire also emphasises how the video game can help in learning different political concepts (monarchy, legislation, liberalism, etc.), cultural concepts (alphabet, epic, literature, etc.) economic (currency, banking, etc.), military (gunpowder, weapons, etc.), scientific (perspective, scientific method, fusion, etc.) and religious (polytheism, monotheism, theology, etc.), as well as the relations established between them within the context of history. Therefore, for this author, what *Civilization* teaches us are not the facts of history but history as a complex system in which different elements of different natures interact.

However, the game's popularising potential finds its limits in the tension established between the representation of the reference and the need to turn it into an entertaining game. So, once again, we find significant simplification, common in all simulations, scientific or entertaining, and inevitable if we wish to represent a complex system. In this respect, the selection of aspects that have to do with historical evolution, reducing them to economy, science, religion, culture (arts) and war already is a simplification. At the same time, the elements that go to make up the tree of technologies whose principles each civilisation will be based on throughout its history or even the marvels and the great personalities that appear in the game are also simplifications, around which a debate can be established on the accuracy and precision of the representation of historical facts.

However, beyond these inevitable simplifications, we believe it interesting to talk of other kinds of "manipulations" that have to do with the fact that *Civilization* is a game. So, in first place historical rigour is sacrificed in order to increase the variability of games or *replayability*: for example, the use of different kinds of maps, all of them "fictitious", the random assignment of territory to each civilisation and of resources assigned to each territory, etc.⁵

Secondly, it is interesting to analyse the quantification of

5 In this respect, it is curious to see how Squire, to take *Civilization III* to schools, introduces some changes: he draws up a map of the Earth identical with the real map and adapts the climate conditions, fauna, flora and different resources to those that really existed. So Squire is breaking some of the simplifications and deviations of *Civilization*, befitting its status as a game, to make it a more faithful copy of reality.

the different aspects that form part of each civilisation. In other words, the fact that a certain civilisation in the game advances in the fields of science (discovering writing, the scientific method, fibre optics, etc.), arts (building great marvels, “producing” great artists, developing literature, etc.) or politics (“discovering” legislation, a constitution or universal suffrage) ends up being reflected in the player’s score. Finally, not only is each civilisation quantified, but the game also constructs a ranking of cultures and shows us which is the most advanced (and reflects this in different statistical figures).

Finally, and in relation to quantification, we find the presence of competition between cultures (we mustn’t forget that the aim of the model player in the game is to rule the world) and, consequently, the pre-eminence acquired by the military aspect. These two elements will also have consequences for the idea that is conveyed of history, as we shall see below.

However, the main limitations of *Civilization IV* as a tool for popularising history are the ideological deviations we find in the representation of this discipline. These deviations result fundamentally from the game’s constitutive rules. A clear example is “the tree of technologies” and the “principles” followed by each civilisation. Both the tree of technologies (where, in spite of the name, not only technological elements are included but also scientific, economic, religious, etc.), and the principles (of government, legal system, labour conditions, economy and religion) construct the path marked out by the game that must be followed by the different civilisations. So, although the player has a certain margin to choose the time to “research” (adopt) each of the technologies or principles, in reality there is an established

order along the path that must be followed, in which a certain element always comes after another. So, for example, at a religious level, we start at mysticism, go on to polytheism and then to monotheism, and we can’t change the order of these elements or miss out any stage. Finally, the path taken by all civilisations is the same.

This aspect is very interesting because, through this, we can detect a certain way of understanding and representing history. In this case, what is conveyed via this path that each player/civilisation must follow is the idea of causality and predetermination, as well as progress.

At the same time, if we look at the specific steps each civilisation must follow, we see that *Civilization*’s representation of history falls into a marked Euro-centrism (especially centred on the United States).⁶ Given that the links between religious, cultural, political and other elements are fixed, only one history can be played over and over again, and this is western history. So, although we find different civilisations, precisely what is not allowed by the game is to try different evolutions of history. As stated by Bako Bitz (2002), as a player, *Civilization* allows you to be any civilisation although you must evolve like western culture has evolved, thereby becoming *the only history possible*. This is intensified if we take into account the fact that, in practice, the differences between civilisations are minimal (purely aesthetic). Finally, what is staged (and legitimised) is the “western dominance” of the world, magnified by the fact that the model player’s objective is precisely to rule the world.⁷

So, although *Civilization IV* allows great strategic variety, the game does not allow this “*what if*” on a historical level, i.e. what would happen if the facts had been different. It only

6 This can also be seen in more superficial aspects, such as the visual appearance of the characters (the game starts with visible difference between the different civilisations but, as from when we enter the modern age, our characters – workers and soldiers – are dressed in a western style, whatever the civilisation we are playing with) or the fact that all the marvels from the contemporary age are exclusively western.

7 Be it through military dominance (militarily conquering the rest of the civilisations), cultural dominance (cities with “legendary” culture, with a score over 10,000 points and doubling that of their rivals), scientific dominance (winning the race for space in being the first to conquer Alfa Centaury), geographical (being the civilisation that dominates a certain percentage of the Earth’s surface), demographic (containing a certain percentage of the world’s population), diplomatic (constructing the United Nations, having at least 25% of the territory and of the world population and having good international relations in order to be voted head of the UN) or historiographic (being the first in the ranking of cultures for 2050). This gives us, therefore, a militaristic and aggressive view of the history that Schut (2007) attributes to the nature of the medium.

allows us to represent history as it happened,⁸ showing a significant lack of (historical) imagination on the part of the game's designers. This is where we would find its popularising potential (in understanding past facts), as well as its limitations.

3. Conclusions

The main value of video games as a means of popularising science is their capacity to make the functioning of complex systems understandable via experimentation and experience. This characteristic, resulting from the particularities of the medium, is what differentiates its transmission of knowledge from other audiovisual representations. This way of learning, called *learning by doing*, is based on assuming knowledge implicitly, knowledge resulting from the theoretical basis being inserted into the game's rules and gameplay. So commercial video games are a potential transmitter of scientific knowledge, although this is not their main purpose.

However, we have seen that this potential for popularisation often enters into tension with the need to make the underlying theory "playable". Added to this need to model the real reference (inevitable issue), we must add the decisions concerning the game's design, which may either strengthen or weaken this popularising potential.

Firstly, we find a dichotomy between simplifying the reference and enriching its interactive dimension. Simplification makes it possible to represent the reference and, at the same time, makes the underlying scientific knowledge more accessible for the public at large. On the other hand, enriching the interactivity may suppose some deviations from the reference, but in exchange can make the player's experience more entertaining and motivating. In relation to the dichotomy between simplification and enrichment of interactivity we find the importance of design of the game's difficulty curve, which establishes challenges for the player that he or she cannot resolve without previously taking on new knowledge or skills. This therefore encourages the player to learn.

Another element that is related to this tension between a faithful representation of the reference and the game's design is the usefulness of having a factor of variability in the games (*replayability*). This means that each game can be different, although often it involves a distancing from the reference (for example, the random assignment of resources and territories to each culture in *Civilization IV*).

Thirdly, we find the quantification of the elements that go to make up the system represented. Quantification is a necessary feature of the game, encouraging competition and the desire to get better, which are motivating aspects for learning. However, quantification and competition can also project an ideological load on the reference (for example, competition between the cultures found in *Civilization*). In fact, in the video games based on social sciences, precisely the ideology implicit in the game's constitutive rules becomes the main limitation to its popularising capacity.

In general, then, we have seen that the tensions between scientific content and game design revolve around a "risk" of losing information but we have also found a significant case where the opposite happens: in *SimCity 4*, certain rules of the game add information and complexity to the town planning theory on which the game is based

To end, we should note that our analysis has focused on a very specific area: video games as a "text", in order to understand the risks and opportunities of video games regarding the popularisation of science. This approach should be complemented with an analysis aimed at the reception of the game, which would provide greater insight into the relationship between video games, learning processes and the game's social context. Regarding this question, it would be particularly interesting to tackle the exchange of scientific information in virtual communities created around certain video games. One significant example is the case of *Spore*, a video game on the evolution of the species that has recently been published but, before it was even launched, lead to intense debate on the internet concerning the different evolutionary theories that might be implicit in the game's rules. All things considered, it would provide us with greater and better insight into the capacity of video games to popularise science.

8 We can relate this idea with Nigel Gilbert (1998), who talks of the ineffectiveness of scientific simulation in social sciences to predict the future, and that it should rather focus on understanding the past.

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Games

Civilization IV (Firaxis/2K Games; PC, 2007)

Crayon Physics Deluxe (Kloonigames; PC)

Sim City 4 (Maxis/Electronic Arts; PC, 2003)

Spore (Maxis/Electronic Arts; PC, 2008)

Trauma Center: Second Opinion (Atlus/Nintendo; Wii, 2006)

Internet users are shaking the tree of science

Luis Ángel Fernández Hermana

- *The growing participation of citizens in producing information and knowledge on the internet has reached the doors of science. Many of the social networks deployed on the internet and promoters of blogs are not only voracious consumers of information generated by scientific and technological communities but they more and more frequently assume a leading role in processing and distributing this information. Now the tide is turning: citizens are starting to intervene in the process of research via the internet. Scientists themselves are laying the foundations with a series of initiatives that are opening up laboratories to the internet. At present it is difficult to assess the huge possibilities that are opening up with this gentle tumbling down of the old walls that had preserved the scientific community from “contamination” on the part of amateurs or those lacking experience in the mysteries of scientific research. Citizens now not only contemplate the tree of science or receive and consume its fruit but have also started to shake it, from the internet, to intervene in its growth and its diversification.*

Keywords

Social networks, science, technology, laboratory, internet, network, computing, biology, audiovisual, research, blog, citizens.

Can science be carried out on the internet? Can a laboratory be opened up in virtual space and experiments be carried out via the web and even notable advances be achieved in scientific journals? In this case, are we talking about laboratories open to internet users, without the need to examine professional credentials? Or, as has happened up to now, must science be delimited by a strict boundary built up on the professional credit of researchers and the rigour of scientific method for the scientific community to accept their discoveries? In other words, can (and must) science have the talent of citizens expressed on the internet as another reference of research? If the answer is yes, how can this be achieved? In which fields? How can the results of their work be validated?

These are some of the questions that appear more and more frequently in scientific symposiums and conferences. Research centres and firms, both in the public and private sector, are starting to understand that the tools of the internet, not only the machinery and programs but the very possibility of creating internet networks, open the doors behind which no-one as yet knows what the scenery is like that's awaiting us on the other side. Science arrives at these questions following the trail of technology. As already established years ago by Herbert Simon, “the technological method”, based on the popular saying “if it doesn't work, change a part or give it a kick”, does not seem to resemble the scientific method at all. Its way of progressing, even in the most complex terrains, is the most experimental and open. The popularity of “Do it yourself” testifies to this chasm that separates technology from science. For this reason, among others, numerous fields of technology have enjoyed the benefits of network teamwork on the internet, beyond canonical institutions and the weight of academia.

Perhaps the best and clearest exponent is the development of machinery and programs. Among the first “working

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groups” noted on the internet were, logically, hackers. Intruding into computer systems allowed them to study their architecture, to detect errors and propose solutions that, in many cases, were not only related to pieces of programs or encoding systems but also to the fixed parts of computers (plaques, connections, switches, etc.). This pioneering activity evolved towards veritable experimental laboratories on the web where people discussed, worked, shared and, the most important of all, arrived at solutions. To thousands of solutions in correspondence with the thousands of problems that were caused (and are caused and will be caused) by computer technology.

Teams of engineers and amateurs

This is how legendary lists arose, such as that of the Internet Engineering Task Force (IETF), a group of voluntary engineers that has safeguarded the health of the internet for the last three decades. Their discussions and agreements have encouraged the development of many of the parts that go to make up the backbone of the internet, from computer protocols to the organisation of traffic between servers and routers. The online technological laboratory has diversified into numerous paths, aimed at emerging problems for which the industry has not had the necessary time or very often the necessary resources to attempt to sort out. Sometimes the difficulty lies in the very nature of these problems, which cannot always be tackled from the traditional orientations of polytechnics or IT engineering firms.

The most popular outcome of these virtual laboratories is perhaps that of the operating system Linux, developed by dozens of engineers and amateurs, who gradually assemble parts, check that they work, communicate any errors detected and then get back to the drawing board in order to modify them. The speed of the “online manufacturer-online user-online manufacturer” loop, without any intermediaries, has become one of the low-cost paradigms that has established a strong foothold in some activities of the economy outside the internet. In the background, the main drive for these activities has always been the free exchange of ideas for the mutual benefit of participants.

Along the way, technologists, experts or amateurs, have learned two fundamental things to achieve their goals, also by the trial and error method: to organise themselves in

order to work online and to design virtual spaces capable of recording (“remembering”) their exchanges. Both aspects are related to overcoming what is a distinctive feature of online groupwork: its temporary nature, sometimes not very structured and without the supports (even when digital) on which to cement continuity. The success of these sections is uneven but they constitute the foundation for the possibility of research and innovation via the internet. Undoubtedly organisation is the key issue, the mother of all sciences on the internet. It is a first step that involves, even though this may not be the intention, innovating what has been done to date. And this is the case because, on the internet, it is users that construct the organisation based on their objectives and their work methodology, on the potential users/interactors and the technological platform used which, in turn, structures the virtual space where the exchanges are carried out and organised (in differing degrees), be they localised, disperse, open or closed.

In other words, it is users (be they individuals, groups, companies, institutions, governments, etc.) that fix the operational rules, the structure of the virtual space where they work, how exchanges are recorded and organised, whether there should only be their own contributions and/or those from outsiders, whether to synthesise or not the activity recorded in this space, being able to consult all the material, modify it, modulate it or redistribute it, etc. All this entails one of the most phenomenal deployments of talent, ingenuity and innovation and also one of the most ignored by the online society or, to be more precise, by the society of virtual social networks. Especially (but not only) because the people who manage to design and materialise these organisations are usually people who have not gone to any business school or do not have the qualifications that would be required in any other sphere in the physical world in order to do a similar job (if possible), but they often have a degree of flexibility and resources that are hard to find among those considered to be experts. This is another of the keys to the success of online technological laboratory networks.

Science’s turn

But science is another matter. There’s a good reason why we talk of the *scientific community*, which conveys an idea more befitting a brotherhood, with its codes and votes,

hallowed as much by the particularities of its activity as by tradition. The scientific method has consecrated a way of accepting the advances of science that constitutes a funnel with a very narrow exit: discoveries are first published in renowned journals providing the arbiters (specialists in the field in question) approve the articles and, afterwards, these must be reproduced by their peers. In this equation there isn't much room for the social disquisitions that have gradually formed a substantial part of technological research on the internet. With the "do it yourself" of science we are talking of more serious things, from the complex environment of laboratories to the thorny procession for publishing research findings in renowned journals.

But, notwithstanding this, the scientific community is moving and... expanding. The discussions at the end of the last century in which the scientific community became involved concerning the validity of the system of arbiters and renowned journals in order to sanction a scientific advance don't make sense today. The possibilities offered by the internet from the point of view of publishing and communicating have stirred up the status quo. Today there are numerous repositories on the internet, public and private, where scientists deposit abstracts or complete articles on their work and that, for the rest of their peers, are starting to have the same validity as articles published in renowned scientific journals. This is a growing trend and one that is being confirmed, to a great extent, by the potential of initiatives such as the Public Library Of Science, where people are starting to reflect, in a more reliable way than ever, on the complexity and diversity of scientific activity the world over. However, as many people claim, the truth is that the scientific community's fundamental codes have remained intact in spite of the hurricane of the internet. Or have they?

Well, no. Quite the opposite. Contrary to its appearance of anarchy, its redundant or what many call "excess information" (have they ever entered a library?) or its "lack of organisation", the internet is the only space where everything resides, from sublime stupidity to the most extraordinary talent, according to whoever is judging. In other words, like life itself, only that now it is displayed in an environment that is, in principle, visible to everyone and, in principle, always organised according to the objectives of the person promoting the production of information and interaction.

Within this context, the challenge of the talent expressed in many of these networks, not only that of individual talent but of talent embodied in collaborative networking, must soon come knocking at the doors of the scientific community.

In just a few years we have witnessed (and been involved in) a notable change in discourse. Before, what stood out (and stands out and will stand out) was concern for the "social communication of science via the internet". However, in the blink of an eye (in just 10 years), what previously had been confined primarily to the traditional media or to the communication offices of corporate bodies or public bodies related to science, has today become an important part in the communication activity of any organisation dedicated to science and research, be it public or private, and whether it performs this activity with greater or lesser success. Moreover, dozens of thousands of internet sites amplify this communication via blogs, specialist pages or various corporate strategies, which have taken on a leading role in the social communication of science.

It has been these very initiatives by internet users, seen as individuals and groups interested in the development of science, in its applications and in debates on scientific policy, that is one of the most innovative aspects of the communication of science on the internet, as they have breached institutional walls to show us, first, research and its findings and, afterwards, the protagonists and, finally, the institutions or companies where the work is being carried out. Here there is an orientation that must be followed given the avalanche of institutional information on the internet that comes in the opposite way: first, the institutions and firms, afterwards the scientists and their work and, finally, the findings of their work in the field of science (although there is always less of this than there should be).

The visual tree of science

Now, in addition to the social communication of science via the internet, people are also starting to think that the internet has sufficient plasticity to be used even to promote and develop certain research online. In this case, *plasticity* means the possibility of organising virtual environments with the adequate tools in order to permit a flow of ideas capable of becoming direct actions and results in the field of scientific research.

Scientists themselves are showing us the way. The rise in digital audiovisual communication on the internet has stimulated the nerve endings of innovation in many of these scientists. Armed with a camera, a script, music and a lot of ingenuity, short films are starting to appear on the internet explaining what they do, how they do it and the results obtained. Access to these materials is open and free and, in passing, the authors take the audiovisual productions with them to scientific congresses and transform the traditional talk into a kind of “live and recorded” performance in which they show their work and the results they are achieving to colleagues. Some of these scientists have even achieved a well-deserved reputation for this way of presenting their research, such as Kota Miura, a Japanese biologist from the European Molecular Biology Laboratory (EMBL, Heidelberg).

One of the most interesting and curious examples of this new trend is that of bioclip.com, where short audiovisuals are shown, focusing primarily on molecular and cellular biology, a field where, added to its complexity, are the technological structures required to obtain the elements that go to make up the research. Moreover, at bioclip.com there are also tools to “manufacture” films. Some scientists have designed ingenious and innovative videos where music plays a leading role while we see, for example, the result of a sweep by an electronic microscope for cellular structures invisible to the human eye, or contemplate the moment when a virus takes up residence in an organism and starts to reproduce, or how a macrophage acts, or cell division in a tumour. The layman, the internet user, is not only a spectator of this live science but, within the limitations in each case, also “learns” how to do it.

Along these lines, in less than two years and to some degree because of the appearance of YouTube, the internet has filled up with sites where the boundary between the scientific community and social community is starting to blur in the name of a relationship based not only on the protection of accredited professionalism but on the open expression of an unexpected collective talent. From the pioneers of a couple of years ago, we have gone on to a growing number of internet sites offering this blurry intermediate phase between tradition and innovation in how science is carried out.

GEOSET, Vega Science Trust, TSN, Athena Web,

jove.com and scivee.tv are some of the firms that occasionally form part of recognised research centres, such as TechTV and MIT. As in many cases regarding creation related to the society of knowledge, Spain is still on the starting blocks in this field. The TV broadcasts undertaken by some universities aim for a “marketing effect” rather than the dissemination of knowledge produced by research. But there are some initiatives that undoubtedly will become leaders in this new trend, such as *recerca.tv* and particularly *Investiga la investigació*, both in Catalonia.

In this incipient phase it’s easy to confuse, mix or overstate the technological aspects compared with those of organisation, i.e. base the progression of the discourse on the services provided by the technologies of the time, such as wikis or blogs, rather than the capacity to organise innovative environments on the internet where collaboration and exchange are possible, as well as the recording of this activity in organised files (historical, chronological), the summarising of all exchanges and contributions in documents that express much more than simple interactions (knowledge history) and, last but not least, their distillation into products of knowledge, new strategies and alliances, the opening up of new fields of research and even new fields of knowledge. From this point of view, technology is the substrata where this organisation is deployed and where the “manufacture” of its products is possible.

Of course, this entails a slight modification in the traditional structures of the scientific community, in how it thinks and acts and in its public representation on the internet, which, in turn, involves transforming work routines to a certain extent; in other words, making them virtual. At heart, we are talking about constructing and professionalising the virtual laboratory with teams that, in this case, not only hang from the tree of science but also from that climbing plant that is the transition stage between scientific objectives and how these are materialised in the field of social virtual networks. And we are also talking about delimiting this laboratory via specific work methodologies and projecting it via the fruits generated by the activity carried out here. One of the best-known examples of this gigantic leap, unthinkable until just three years ago, is what is called “network economies of scale”. In this case, the common ground has been promoted, on the one hand, by corporate bodies known throughout the market, such as Procter&Gamble, Chrysler

and Boeing and, on the other hand, by the appearance of intermediate entities responsible for organising the virtual laboratory, such as InnoCentive, created by the pharmaceutical firm Elly Lily, or Ninesigma.

In these cases, where corporations have advanced due particularly to their financial muscle, the relationship between supply and demand, between needs and solutions is formulated as a question, which is what will mobilise talent on the internet. The intermediate entity organises the virtual space, establishes the work methodology and determines how goals will be achieved which, depending on the case, may conclude in a patent and therefore repay the effort with different types of remuneration. All this means reversing a part of internet culture, namely that which aims for mutual benefit via open collaboration. But it persists in the public scientific community, which depends on contributors and on millions of internet users moved by impulses and motivations impossible to classify and categorise. When all is said and done, this benefit may take many forms, especially on the internet, and does not only exist when based on a pecuniary tradition.

In any case, the different dynamics of the public and private sectors can be measured by their respective capacity to remove obstacles when emerging objectives appear unexpectedly. In the case of the public sector, there is a notable tendency to discover new trenches when old walls are brought down. In any case, it will not be easy to combat the “network conspiracy” because, as can be seen throughout the internet, it already forms part of the scientific community itself, of the new generations and of the everyday demonstration that certain apparently awkward problems become procedural issues when tackled via collective work as a network in a highly organised and suitably managed virtual environment. In other words, in what we might call the most advanced version of social networks.

Moreover, bloggers are present along the way. At the end of August 2008, the magazine *Nature* invited the so-called “blogger scientific community” around the world to a great gathering in London. One of the most notable questions on the agenda was: “Can blogs contribute to scientific research and to the career of researchers?”. Apart from themselves, scientists, bloggers or not, millions of internet users, bloggers or not, are awaiting the answer to this question

with the belief that, whatever the arguments for or against, many of them will form part of the scientific adventure and not only as passive receivers of information but as participants and, at least we hope, key characters.

Links consulted

A selection of scientific audiovisual websites and experimental science websites on the internet, directories for this kind of website and sites mentioned in the article:

Internet Engineering Task Force

<<http://www.ietf.org/>>

Ninesigma

<<http://www.ietf.org/>>

Innocentive

<<http://www.innocentive.com/>>

Vega Science Trust

<<http://www.vega.org.uk/>>

Athena Web

<<http://www.athenaweb.com/>>

Bioclips

<<http://www.bioclips.com/>>

Universitat Politècnica de Catalunya. Canal UPC

<<http://www.canalupc.tv/>>

Canal U

<<http://www.canal-u.education.fr/index.php/canal/>>

Universitat Autònoma de Barcelona – UAB Divulga

<<http://www.uab.es/servlet/Satellite?cid=1096482312445&pagename=UABDivulga%2FPage%2FTemplatePageLlistatVideos#>>

Directory of scientific video channels of the Generalitat de Catalunya
<<http://www10.gencat.net/dursi/AppJava/links.jsp?area=2&idcat=4545&sub1=6&su>>

Geoset
<<http://www.geoset.info/>>

Investiga la investigació
<<http://www.investigalainvestigacio.cat/>>

Journal of Visualised Experiments
<<http://www.jove.com/>>

Live Science
<<http://www.livescience.com/>>

Madrimasd
<<http://www.madrimasd.org/cienciaysociedad/mediateca/default.asp>>

Un minut de ciència
<http://edu365.cat/eso/muds/ciencies/minut_de_ciencia/index.htm>

MIT Open Course Ware
<<http://ocw.mit.edu/OcwWeb/Physics/8-01Physics-IFall1999/VideoLectures/index.htm>>

MIT. TechTV
<<http://techtv.mit.edu/>>

Nano
<<http://www.nano2hybrids.net/>>

NASA
<<http://www.nasa.gov/multimedia/nasatv/index.html>>

Recerca en Acció
<http://www.recercaenaccio.cat/agaur_reac/AppJava/ca/vidEOS.jsp>

Research TV
<<http://www.research-tv.com/>>

Royal Society TV
<http://royalsociety.tv/dpx_live/dpx.php?dpxuser=dpx_v12>

Si.es.tv
<<http://www.sies.tv>>

Science Hack
<<http://sciencehack.com/>>

Steve Spanglers Science
<<http://www.stevespanglersscience.com/video/>>

Scivee TV
<<http://www.scivee.tv/>>

Science.Gouv.fr. Tele Science
<<http://www.science.gouv.fr/index.php?qcms=telescience>>

The Science Network
<<http://thesciencenetwork.org/>>

Canal del Institut Català de Paleoecologia Humana i Evolució Social
<<http://es.youtube.com/user/iphesvideos>>

Ciencia en la cocina
<http://www.weshow.com/es/p/16144/ciencia_en_la_cocina>

University of California. Berkeley
<<http://es.youtube.com/ucberkeley>>

Nature. Congreso de blogs científicos
<<http://tinyurl.com/2fl52o>>

PLOS Public Library of Science
<<http://www.plos.org/>>

iscience.server
<<http://iscience.eu/>>

The scientific popularisation of environmental problems by the media. The case of the documentary *An Inconvenient Truth*

Nel-lo Pellisser

■ *Environmental issues are of increasing interest and are becoming more prominent in the media these days. This is particularly true of audiovisual formats, which have been especially effective in popularising scientific and environmental subjects. Al Gore's documentary An Inconvenient Truth represents a substantial leap in raising awareness worldwide about the effects of global warming and the need for everyone to take action. This documentary was the starting point of a campaign that not only placed the subject in worldwide public opinion but also contributed to promoting a green 'wave' that has extended to other different areas of society.*

Keywords

Popularisation of science, media communication, audiovisual languages, scientific documentary, global warming.

Science and the media

Science and the media are two distinct areas with very different methodologies and procedures. The most obvious of these is speed. Scientific research is known for being slow, methodical and accurate. Its findings are unpredictable: no one knows when – or even *if* – results will happen. However, the media is ruled – excessively – by the clock: so much so, in fact, that new methods of communication have further limited the amount of time available, which risks distorting the entire communication process. This can have devastating consequences. With electronic formats, information and the framework that supports it are forever open, providing an uninterrupted flow of information. This – now more than ever – is making the task of dealing with these two speeds even more complex.

Other problems relate to language: on the one hand, you have the technical language used by scientists and, on the other, the standards that journalists adopt, with an insistence on simplifying and adapting everything so it reaches as wide an audience as possible, rather than a more specialised one. This is ultimately the meaning of the term 'popularisation'.

Another of these obstacles concerns the objective nature of science. Scientific experiments have to be reproducible and the results, therefore, provable. The media, on the other hand, always approaches issues from a distinctly subjective viewpoint, in spite of long-maintained but false claims of objectivity. However, it's also true that popularisation, as it refers only to communication aimed at the public at large, underlies both these areas. Both science and the media therefore seem fated to understand each other.

There are also other questions, such as conditions of space and time imposed by the media, or, on the other hand, how scientists mistrust journalists to reliably represent

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their work. It is also well-known that some members of the scientific community are contemptuous of colleagues who have become media presenters. This happened with Carl Sagan, a scientist first and foremost who then became a presenter and was reproached for his lack of investigative agenda.

The popularisation of science and audiovisual language

If the relationship between science and the media is not an easy one, it is still less so with the audiovisual media. It is important to remember that science disseminates its findings through the written word, fundamentally through specialised magazines and books. This enables it to convey ideas in a structured and logical way (León, 2002). Audiovisual media would not seem the most suitable way of explaining concepts or abstractions (Sartori, 1998). As J. González Requena (1989) says, an image is not as effective at explaining or conceptualising, even though it may be a powerful tool for description.

Moreover, although science is based on reason, audiovisual communication resorts to rhetorical narrative devices to create programmes that effectively convey scientific information to the general public. Bienvenido León has distinguished between narrative, dramatic and plot techniques. While the first two have a poetic dimension, plot techniques are much more rhetorical in nature

A story is developed through the use of various devices to overcome such obstacles. Devices which, in the case of audiovisual genres, simplify the content, promote unusual or unforeseen facts, suppress controversy, reduce the size of the theme chosen or use elements that will contribute to the viewer's entertainment. The most profitable involves the use of dramatic techniques, which involve the viewer and provide emotional stimuli. But the more these types of techniques are used, the greater the danger of distorting reality. As B. León says, 'Some presenters resort to using narrative techniques that blur the accuracy of scientific information, giving precedence to matters of less importance because they will be of greater interest to the public. This dramatisation of science is more evident in audiovisual media, in which the demands of staging are clearer.' (1999, 47)

Popularising scientific documentaries

In spite of using these devices, the difficulties of reporting scientific issues in the daily press is well-known, with mini-stories often lasting no longer than a minute. It is especially difficult to make them digestible for the viewer in such a short space of time. Like other thematic areas, these areas can only be approached confidently if more extensive formats are used: discursive options that allow questions to be explored and deepened to make it possible to understand the subject in question. And all this without ignoring the other important aspects that make up these stories, such as diversity and originality, just to mention a few.

In audiovisual discourse, one genre has traditionally been associated with the popularisation of knowledge, particularly historical and scientific knowledge: the documentary. With its origins in cinema, and like other audiovisual formats, it quickly found its place in television where other methods had previously enjoyed a similarly strong development. Moreover, thanks to the dual existence of cinema and television, the documentary has been able to widen its base, giving it some stability in an age where audiovisual discourses are often subjected to constant redesigns and adaptations, according to new demands. We can even say that it has attained a certain prestige, given how documentaries, in recent years, have been offered a showcase at cinema festivals or specific contests. The number of movie makers who use this genre to explore certain subjects is also revealing. Michael Moore's *Bowling for Columbine* (2002) and *Fahrenheit 9/11* (2004); *Into Great Silence* (2005), by Philip Gröning; *The Basque Ball: Skin Against Stone* (2003), by Julio Medem, or *The Wings of Life* (2007), by Toni Canet are not mainstream but have caught the public's imagination. In some cases, the polemic nature of the subject, or of its main focus, has caused controversy. In others, the originality of the story or the intensity and sensitivity of its content has awakened the viewers' interest. For one reason or another, these projects have not gone unnoticed. This is the same with *An Inconvenient Truth*, Al Gore's documentary about climate change. Curiously, until now, condemnatory environmental documentaries have not been very commonplace in scientific popularisation. Traditionally, they have followed one of two possible approaches: either anthropological or nature documentaries. These two

types, taking the form of either a one-off episode or a series of programmes, have attracted high audience numbers and enjoyed great popularity, thanks to the cinematographic nature of the screen and/or television. You only have to think, for example, of David Attenborough's BBC series, or Jacques Cousteau and Félix Rodríguez de la Fuente or, more recently, the National Geographic Society. Certainly, nature documentaries have always generated great interest, first at the cinema, then on television, and now in domestic formats. This was the case with *Earth (The Film of Our Planet)* (2007), by Alastair Fothergill and Mark Linfield, which looked at the environmental issues threatening our planet; *Darwin's Nightmare* (2004), by Hubert Sauper, which examined the problems caused by the introduction of the Nile Perch, a predator that caused real ecological disaster for biodiversity when it was introduced into Lake Victoria. Or, closer to home, Luis Miguel Domínguez's film *Korubo, To Die Killing* (2005), an unedited account of the life of the Korubo tribe in the Amazons.

The case of *An Inconvenient Truth*

But the most paradigmatic work is the documentary *An Inconvenient Truth*. Starring the former vice-president of the United States and former presidential candidate, Al Gore, and directed by television director Davis Guggenheim, the idea behind *An Inconvenient Truth* was to draw attention to the consequences of global warming and to provide some suggestions on how to approach it.

Shown for the first time in North America in May 2006, the film quickly became a box-office hit. In only a few months, it collected 23 million dollars, making it the third highest-grossing documentary at the US box office. Awards soon started flooding in: named best documentary by the National Board of Review, by the New York Film Critics Online and by the Los Angeles and Chicago Film Critics Association Award. It also won two Oscars: one for best documentary and the other for best song. Al Gore won personal acclaim for his role, including the Prince of Asturias Award for

International Cooperation, and the Nobel Peace Prize, together with the United Nations Environment Programme's (UNEP) Intergovernmental Panel on Climate Change (IPCC) for 'their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change', according to the jury.

But the documentary was not a stand-alone venture. It was just the tip of a multimedia¹ iceberg, of a campaign that has included: a book of the same name (subtitled 'The Planetary Emergency of Global Warming and What We Can Do About It'), translated into 21 different languages; and a series of lectures by Al Gore, starting in 2005, in auditoriums throughout the USA and which, thanks to the documentary, have now gone worldwide. Indeed, the origin of *An Inconvenient Truth* can be found in these lectures, where the famous environmental activist Laurie David and the cinema producer Lawrence Bender verified Al Gore's powers of persuasion. From there on, contact between Scott Z. Burns, director of a creative agency, and Jeff Skoll, a producer with Participant Productions, who has been behind such films as *Good Night and Good Luck* and *Syriana*, made the project possible.

Al Gore's international series of lectures became more intense after the documentary was launched and this is somehow reminiscent of the process undergone by candidates in the North American electoral system, something Al Gore experienced firsthand as a Democrat candidate in 2000. The words he uses in the documentary precisely reveal his understanding of what constitutes effective communication: 'I gave myself an objective: to get my message across as clearly as possible. The only way to do so is from city to city, person to person, family to family. I have faith that, very soon, we will have changed enough minds to say we have crossed the threshold.'

The documentary takes the same form of one of these lectures, complemented by the use of all available resources to achieve the most spectacular staging possible, in the purest 'Hollywood' style. Starting with the lighting and continuing with the scene-setting and presentation of

¹ This project was first realised as a computer presentation to illustrate a conference. Afterwards, it was made into a documentary, the soundtrack was published, as well as a book and a website.

statistical figures using Keynote, the Apple² program, with which the lecture's computer presentation is elaborated. The elevating platform he uses to reach the point of the forecast CO2 concentration levels in the atmosphere for the next few years is a good example of this treatment. And all this used by an omnipresent Al Gore. As B. León (2002) points out, personification is an effective way of building a good story with dramatic potential. *An Inconvenient Truth* is a good example of this.

The piece is organised into two interweaving narrative threads. In the first, Al Gore acts as spokesman for the scientific community. To make himself credible, he repeatedly reminds us that his interest in this topic is nothing new. He talks about when he was a student at Harvard, where he attended natural sciences professor Roger Revelle's classes, one of the first people to draw attention to the worrying levels of CO2 absorption into the atmosphere and the oceans, and of the consequences for the world's climate. Later, when he arrived at Congress in the middle of the 1970s, and afterwards in the Senate, he spearheaded several initiatives related to global warming. In 1992 he published the book *Earth in the Balance: Ecology and the Human Spirit*. And when he became vice-president of the United States, from 1993 to 2001, he tried to – unsuccessfully – convince the Senate to ratify the Kyoto Treaty, among other initiatives. However, conversely, he has no pretensions of being either a scientist or a scientific pre-senter like Carl Sagan, whom he regards as a 'friend'. We also see him flying over the Amazon and travelling to the Arctic in a nuclear submarine to see for himself the effects of global warming in situ. All this, reinforced with flawlessly executed images, both for the scenes of the lecture as well as the images he uses to illustrate the scientific arguments and in the use of graphs and animation.

In the other narrative thread, Al Gore adopts a more personal, even intimate tone. This discursive thread is the reconstruction of a personal journey during which he keeps insisting on the need to consider environmental questions. Biographical episodes are included, such as memories of his father and the family farm in Tennessee and especially

of other, more relevant, events such as his six-year-old son's near-fatal accident in 1989, or his older sister Nancy's transplant, caused by lung cancer, all the while remembering the family's leaf tobacco farm. This gives the documentary a biographical tone, similar to a biographical film. What we cannot know with any certainty is whether this is only a dramatic strategy typical of the genre or, instead, if there is an intention to project a certain image of the film's 'star into the public arena, with the aim of revealing a new side of him as a person, the purpose of which are as yet unknown. Whatever the case, this is reflected in the treatment of image, with the use of close-up, static photos and black and image images. At this point, his allusion to his defeat by George W Bush in the presidential race to the White House in 2000 is particularly revealing: 'It was a very hard blow, but... what could I do? Learn a lesson. This helped me see – very clearly – the mission I had started many years before [...]'.³

Throughout the documentary, Al Gore adopts a catastrophic rhetoric. For this reason, many viewers of the film, some of them members of the scientific community, think that the documentary contains more arguing and shouting than facts and forecasts, portraying the most catastrophic outcome possible. This approach is based on the idea, associated with the effects and the consequences of global warming, that there is a 'problem'. From this point on, he builds a rhetorical argument that aims to 'understand the problem', first, and to 'face up to the problem', afterwards. A kind of semantic crescendo occurs as the story continues, with such expressions as 'warning signs', 'very alarming symptoms', 'horrible consequences', 'danger', 'conflict', 'tragedy', 'fight', 'pressure', 'absolute devastation', 'obstacles', 'solutions' or 'determination'. Gore used a similar technique when he accepted the Nobel Peace Prize, as columnist Andrés Ortega remembers, "Unfortunately because, perhaps to persuade the American public, he used expressions typical of nuclear deterrent during the Cold War, such as 'mutually assured destruction', and he talked of a 'universal threat' and of 'mobilising as if to war'.³ This talk of environmental catastrophe also appears in the

2 Al Gore is a member of the board of directors at Apple Computers.

3 "Guerra contra la tierra". *El País*, 17 December, 2007.

documentary. However, it is necessary to comment on the didactic tone, with the use of such techniques as comparison, emphasis, irony and humour, as well as cruelty on a few occasions. Visually, and in an eagerness to appeal to many viewers, the work also includes cartoons, such as a scene from *Futurama*, by Matt Groening, creator of *The Simpsons*, and computer animations.

In spite of everything, or perhaps because of it, *An Inconvenient Truth* managed to move concern about global warming into the public arena. The documentary's success in bringing the subject matter into the spotlight and highlighting the need to take immediate measures seems undeniable. An example of the success of *An Inconvenient Truth* could be seen when the Spanish Ministry of the Environment acquired, through the Biodiversity Foundation, 30,000 copies of the documentary with the aim of distributing it in all state schools. In this way, and with an approximate cost of 600,000 euros, the Spanish government wished to make the youngest members of society aware of the devastating effects of climate change. More recently, we have been able to observe that, in the *Environmental Atlas*, edited by *Le Monde Diplomatique* in the first quarter of 2008, references to the international success of Al Gore's work have been reiterated. In the introduction, Ignacio Ramonet, referring to the impact of work like *An Inconvenient Truth*, writes: "These reports seem to have brought about a healthy collective impact in recent years. Especially Al Gore's documentary, *An Inconvenient Truth*." In a different passage from the same volume, Dominique Vidal affirms that "The international success of *An Inconvenient Truth*, Al Gore's film, reflects – and at the same time accentuates – people's growing realisation of the ways in which the environment is changing, the causes and the solutions". Another important issue raised concerns the scientific argument employed in the documentary.⁴ This aside, the documentary, alongside Al Gore's high-profile activity, has

been useful in keeping the subject at the top of the media agenda. Naturally, the documentary and everything associated with it has appeared at a time when the ground was already well prepared. Warning voices about this and other environmental issues were not new. In any case, the virtue of *An Inconvenient Truth* has been one of helping to raise awareness of the potential problems of global warming and the need to adopt measures immediately, and globally. One only has to look at the reverence with which Al Gore is received in China. However, he particularly targets his North American audience, one of the most polluting countries of the planet and with such weak commitment to the environment that it has not even ratified the Kyoto treaty yet. In this sense, the references made to the North American Declaration of Independence and to the fathers of the Nation, and the messages with which he finishes the documentary are revealing, almost like advertising. And all this without damaging his own reputation; Al Gore offers up a flawless oration⁵ so that, with *An Inconvenient Truth*, he rises like a phoenix from the electoral ashes after his political defeat of 2000. Let's not forget that, as he himself has suggested, *An Inconvenient Truth* is now his political platform. However, is it merely his way of doing politics now, or will this give him a shortcut into the political race, in the classic sense? The film's biographical narrative, previously discussed, certainly does seem disturbing. As are the following words, added into the documentary's credits: "Vote for leaders who promise to save us from this crisis". It is also true that, as a counterforce, Al Gore, his talent for communication, and the narrative treatment, all act as a hook for viewers. If, instead of the former North American vice-president, we'd had Wangari Maathai, the creator of the Green Belt movement, an organisation of Kenyan women that planted 30 million trees in 2004 and who was also rewarded with the Nobel Peace Prize, the impact would probably not have been the same.

4 As a result of the appearance of *An Inconvenient Truth*, Channel 4 produced the 2007 documentary *The Great Global Warning Swindle*, by Martin Durkin, which was like the other side of the coin to Al Gore's documentary.

5 One shouldn't lose sight here of Al Gore's considerable knowledge and experience of the media. After graduating in public administration from Harvard and enrolling in the Army, he was an Army reporter in Vietnam. His first proper experience in this area of work took place when he returned from the war to work as a journalist on *The Nashville Tennessean*. It's also worth remembering his time as a congress-man and his experience as vice-president of the United States of America.

A green wave

Environmental questions are worrying and, therefore, of interest to public opinion. It is not surprising that, for the first time, the CIS barometer for November 2007 included some environmental questions. The result confirms this trend: 75% of those polled are interested in these subjects. Of them, a third follows them with 'a lot' of interest, while the other two-thirds (50% of the total) admit 'quite a lot' of interest. 25% of the polled population follow these types of subjects with 'little or no' interest.

Beyond these appraisals, it seems unquestionable that *An Inconvenient Truth* has opened up a path. A path that leads in several directions, one of which we have previously discussed: it has placed the debate surrounding global warming on the media's agenda and, therefore, high up in public opinion. On the rebound, it has also boosted a format that was not new but which, in this case, has brought benefits for scientific and environmental documentaries. You only have to look at the recent productions following in the footsteps of *An Inconvenient Truth*. For example, movie star Leonardo Di Caprio – acting as producer, scriptwriter and narrator – released *The 11th Hour*, a documentary about the effects of global warming and other interventions by man-kind, in which he gave voice to 51 scientists, thinkers and opinion leaders. Moreover, musician Neil Young starred in *LincVOLT*, a documentary which saw him travelling across North America in his 1959 Lincoln Continental, swapping its engine for a less polluting, electrical hybrid biodiesel one to raise people's awareness. One of the latest National Geo-graphic productions is *Six Degrees Could Change the World*, another documentary about the consequences of global warming. And, more generally, *The March of the Penguins*, a film that follows the life of the emperor penguin, which won an Oscar.

Moreover, and on a global perspective, we are riding a green wave that, like an octopus, is gradually spreading its tentacles into different parts of society. You don't have to

look far to see that increasing numbers of different sectors have joined in. It is well-known just how quickly production systems can adapt to the latest trend in industry and business. People are even talking about a spiritual dimension: an ecological spirituality. In this sense, Al Gore's discursive strategy is a good example of this trend. Especially when he gives it the feeling of a mission, in which he seems to have assumed the role of prophet. We are left with the image at the beginning and end of *An Inconvenient Truth*, in which he walks along a corridor towards the stage, his silhouette backlit like some sort of rock star or TV preacher with Messiah pretensions. Moreover, since the summer of 2006, Al Gore has promoted *The Climate Project*, to spread the word about the crisis of global warming. Currently, it has more than two thousand volunteers worldwide who, before giving their presentation, ask their audience for 'a spiritual connection'.⁶ This approach, argues biologist Miguel Delibes de Castro, "is almost religious".⁷ Perhaps it's worth remembering that Al Gore is not only deeply religious but, as well as graduating from Harvard, also studied, law, theology and philosophy at the University of Vanderbilt (Tennessee).

All of this forms part of the emotional message behind *An Inconvenient Truth*. It has none of science's rational approach and perhaps this explains the documentary's success, and of the campaign behind it. Although, as we have seen, other things play a part. And some of these are certainly disturbing.

6 For more about the activities of Al Gore's *The Climate Project* to create an 'army of opinion leaders' who will spread the word about climate change from *An Inconvenient Truth*, see the website <<http://www.theclimateprojectspain.org/>>

7 PÉREZ-LANZAC, Carmen. "Cambio climático: ¿la nueva religión?". *El País*, 14 February, 2008

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Doctors in TV fiction

Charo Lacalle

- *The hyperrealism of contemporary medical dramas (House, Grey's Anatomy, Hospital Central, etc.) and their appeal for viewers lead to controversial reactions in the health sector. So, therefore, while the Collegial Medical Organisation (OMC in Spanish) believes that hospital fiction encourages patients to ask their doctors for inexistent or ineffective treatments, the Spanish Neurology Society (SEN in Spanish) highlights their role in health education. A look at the North American programmes since the first medical series premiered in 1951 provides us with privileged insight into the construction of archetypes and the impact of current productions among audiences.*

Keywords

Medical fiction, United States, Spain, health organisations, television, effects, public opinion.

A report by the Central Deontology Committee of the Collegial Medical Organisation (OMC) concerning the image of doctors and health personnel in TV fiction, published 17 January 2008¹, led public opinion to debate the effects of a genre which, in recent years in Spain, has combined high audience figures with an enthusiastic welcome by critics. Medical dramas as popular as the North American *House* and *Grey's Anatomy* (broadcast in Spain on Cuatro since 2006) and Telecinco's series *Hospital Central* (broadcast since 2000) amply illustrate the pedagogical nature of audiovisual narrative, the role in health education recognised by the Spanish Neurology Society (SEN).² But the hyperrealism of how medical life is represented and the social impact caused among viewers by this kind of programme have raised many doubts among medical experts concerning the prominence of sensationalism and the legitimacy of the inextricable fusion between reality and fiction.

In this report, the Collegial Medical Organisation regrets the fact that medical series encourage false expectations among patients, who flood surgeries demanding unnecessary or even inexistent treatments from their doctors. The OMC also denounced the frivolity of the health-related characters constructed by fiction that lean much more towards their romantic relations than their work, and alerted people to the false expectations that a distorted image of the medical profession might arouse in future students of medicine.

1 <http://www.cgcom.org/notas_prensa/2008/08_01_17_tv.html> [Consulted 14 April 2008].

2 <<http://www.europapress.es/ocio/tv-00127/noticia-house-urgencias-aumentan-conocimiento-medico-televidentes-rigor-cientifico-20080422194912.html>> [Consulted 23 April 2008].

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From the broadcasting industry, the production house Videomedia (responsible for *Hospital Central* and *MIR*) replied to the OMC reminding them of the different campaigns carried out via the long-running Telecinco programme *Hospital Central* (blood donation, use of contraceptives, international aid, etc.), also insisting that medical fiction cannot limit itself to portraying reality per se. An opinion also shared by Juan Algarra, A&E doctor at the Hospital Clínic in Madrid and script advisor for *Hospital Central*.³ Moreover, representatives from Videomedia reminded the OMC of the constant interaction between this series and the emergency services of the Community of Madrid, claiming that they have always counted on the collaboration of experts and institutions.⁴ But fiction is not the only macro-genre to arouse criticism from the OMC. Just a few months earlier, the Collegial Medical Organisation gave a warning to the programme on Antena 3 TV *Cambio radical* (2007) because it offered its contestants physical transformations via plastic surgery, defining the programme as a show that did not sufficiently respect people's dignity. This criticism was repeated by associations of TV viewers and feminist organisations, which also considered the reality show to be openly "chauvinistic".⁵

Since the start of the fifties, the debate on how health is represented in TV fiction has been constant in the United States. The wide range of programmes starring medical staff (69 to date) contains some of the most important milestones in world television, such as *Dr. Kildare*, *Quincy*, *E.R.*, *House* and *Grey's Anatomy*, just to name a few examples.⁶ As in other areas of television, the North American experience can act as an observatory to help us understand the complex relations between what becomes

sensational and what becomes social, the two feeding back both on representation and reality. That is why, on the following pages, we will take a brief look at the genres and formats that have gradually shaped viewers' collective imaginary concerning medical staff in order to determine the axiological, thematic and structural elements that go to make up the narrative universe of present-day hospital productions.

In order to explain North American medical fiction to the reader (of which 15 programmes we have been able to see on Spanish television and 4 on the Catalan station, TV3), figure 1 provides a list of all the programmes broadcast since the first hospital drama premiered in 1951 up to the present day. For reasons of space, productions focusing on nurses have not been included, although they have also been well represented in the history of North American TV fiction since the premiere of the serial *The nurses* on CBS in 1962.⁷

The early days

The first cinematographic medical drama dates back to 1937. *Internes Can't Take Money*, a film by Alfred Santell starring Barbara Stanwyck and Joel McCrea in the role of Doctor Kildare. The character of Kildare later inspired 15 films, seven books, various short stories published in magazines, a radio series, a TV series and an avalanche of merchandising (toys, lunchboxes, tee shirts, etc.), as well as a conspicuous controversy among those who adored the character and those who criticised how the doctor's role in society came second to his personal life.

The script for *Internes Can't Take Money*, by the prolific

3 *El País*, 19 January 2008.

4 <<http://www.diariocordoba.com/noticias/noticia.asp?pkid=377532>> [Consulted 14 April 2008]. The Spanish Neurology Society also advises *Hospital Central*.

5 *El País*, 31 March 2007

6 Apart from British productions (17 to date), health fiction is an area that is not widely practised in Europe, where there are only two programmes that can be classified as actual hits: the series *Hospital Central* (Telecinco, 2000) and the German series *In aller Freundschaft* (ARD, 1998).

7 The poor ratings for *The nurses* led its producers to include doctors in the cast for the second season, and they even changed the name to *The nurses and the doctors*.

Table 1. North American medical fiction programmes (I)

Programme	Channel	Genre	Format	Episodes*	Duration
<i>City Hospital</i> (1951-1952)	CBS	Drama	Series	9	30
<i>The Doctor</i> (1952-1953)	NBC	Drama	Anthology	43	30
<i>Medic</i> (1954-1956)	NBC	Drama	Series	58	30
<i>King's Row</i> (1955-1956)	ABC	Drama	Anthology	7	60
<i>Donna Reed Show</i> (1958-1966)	ABC	Comedy	Series	275	30
<i>Hennesey</i> (1959-1962)	CBS	Comedy	Series	96	30
<i>Diagnosis: Unknown</i> (1960)	CBS	Drama	Series	9	60
<i>Ben Casey</i> (1961-1966)	ABC	Drama	Series	153	60
<i>Dr. Kildare</i> (1961-1966) (Doctor Kildare, TVE, 1964)	NBC	Drama	Series	191	60
<i>The Eleventh Hour</i> (1962-1963)	NBC	Drama	Series	62	60
<i>Breaking Point</i> (1963)	ABC	Drama	Series	30	60
<i>The Bold Ones: The Doctors</i> (1963-1982)	NBC	Drama	Serial	5.182	30
<i>General Hospital</i> (1963)	ABC	Drama	Serial	11.546	30
<i>Medical Center</i> (1969-1976) (Centro Médico, TVE, 1971)	CBS	Drama	Series	170	60
<i>Marcus Welby M. D.</i> (1969-1976) (Marcus Welby doctor en medicina, TVE, 1971)	ABC	Drama	Series	169	60
<i>The Bold Ones: The New Doctors</i> (1969-1973)	NBC	Drama	Series	45	60
<i>Matt Lincoln</i> (1970-1971)	ABC	Drama	Series	16	60
<i>The Interns</i> (1970-1971)	CBS	Drama	Series	24	60
<i>The Psychiatrist</i> (1971)	NBC	Drama	Series	6	60
<i>Temperatures Rising</i> (1972-1974)	ABC	Comedy	Series	46	36
<i>Emergency!</i> (1972-1979)	NBC	Drama	Series	124	60
<i>M.A.S.H.</i> (1972-1983) (M.A.S.H., TVE, 1983)	CBS	Dramedy	Series	256	25
<i>Doc</i> (1973)	CBS	Comedy	Series	31	30
<i>Doc Eliot</i> (1973)	ABC	Drama	Series	14	60
<i>Bob Crane Show</i> (1975)	NBC	Comedy	Series	14	30
<i>Medical Store</i> (1975-1976)	NBC	Drama	Series	11	60
<i>Doctor's Hospital</i> (1975-1976)	NBC	Drama	Series	9	60
<i>Quincy M. E.</i> (1976-1983) (Quincy, TVE, 1977)	NBC	Drama	Series	148	60
<i>Code R</i> (1977)	CBS	Drama	Series	13	60
<i>Rafferty</i> (1977)	CBS	Drama	Series	13	60
<i>Westside Medical</i> (1977)	ABC	Drama	Series	13	60
<i>The Lazarus Síndrome</i> (1979)	ABC	Drama	Series	4	60
<i>House Calls</i> (1979-1982)	CBS	Comedy	Series	57	30
<i>Trapper John</i> (1979-1986)	CBS	Drama	Series	150	60

Source: author.

* The number of episodes or chapters of programmes currently being broadcast is shown up to May 2008.

Table 1. North American medical fiction programmes (II)

Programme	Channel	Genre	Format	Episodes*	Duration
<i>St. Elsewhere</i> (1982-1988) (A cor obert , TV3, 1986)	NBC	Drama	Series	137	60
<i>Chicago Story</i> (1982)	NBC	Drama	Series	13	90
<i>Cutter to Houston</i> (1983)	CBS	Drama	Series	9	60
<i>E/R</i> (1984-1985)	CBS	Comedy	Series	22	30
<i>Buck James</i> (1987-1988)	ABC	Drama	Series	28	60
<i>Island Son</i> (1989-1990)	CBS	Drama	Series	18	60
<i>Doogie Howser M. D.</i> (1989-1993) (Un médico precoz , TVE-1, 1993)	ABC	<i>Dramedy</i>	Series	97	25
<i>Doctor Doctor</i> (1989-1991)	CBS	Comedy	Series	41	30
<i>H.E.L.P.</i> (1990)	ABC	Drama	Series	2	60
<i>Lifestories</i> (1990-1991)	NBC	Drama	Anthology	10	45
<i>Northern Exposure</i> (1990-1995) (Doctor en Alaska , La 2, 1993)	CBS	<i>Dramedy</i>	Series	110	45
<i>Chicago Hope</i> (1994-2000) (Chicago Hope , Antena 3 TV, 1999)	CBS	Drama	Series	141	60
<i>E.R.</i> (1994-) (Urgencias , TVE-1, 1999)	NBC	Drama	Series	303	60
<i>Port Charles</i> (1997-2003)	ABC	Drama	Serial	1.458	30
<i>L.A. Doctors</i> (1998-1999)	CBS	Drama	Series	24	60
<i>Strange World</i> (1999-2000)	ABC	Drama	Series	13	60
<i>Providence</i> (1999-2002) (Providence , TV3, 2001)	NBC	Drama	Series	96	60
<i>Third Watch</i> (1999-2005)	NBC	Drama	Series	132	42
<i>Gideon's Crossing</i> (2000-2001)	ABC	Drama	Series	20	60
<i>City of Angels</i> (2000)	CBS	Drama	Series	24	60
<i>Strong Medicine</i> (2000-2006) (Doctores de Filadèlfia , TV3, 2002)	Life	Drama	Series	132	60
<i>Nip/Tuck</i> (2000-) (Nip/Tuck , TV3, 2005)	FX	Drama	Series	73	60
<i>Scrubs</i> (2001) (Scrubs , Canal +, 2005; Cuatro, 2007)	NBC	Comedy	Series	146	22
<i>Doc</i> (2001-2004) (El doctor , TV3, 2002)	ION TV	Drama	Series	88	60
<i>Presidio Med</i> (2002-2003)	CBS	Drama	Series	14	60
<i>Kingdom Hospital</i> (2004)	ABC	Drama	Series	13	45
<i>Medical Investigation</i> (2004-2005) (Medical Investigation , Telecinco, 2005)	NBC	Drama	Series	20	45
<i>House</i> (2004-) (House , Cuatro, 2006)	FOX	Drama	Series	86	60
<i>Grey's Anatomy</i> (2004-) (Anatomía de Grey , Cuatro, 2006)	ABC	Drama	Series	74	60
<i>Inconceivable</i> (2005)	NBC	Drama	Series	10	60
<i>3 lbs</i> (2006-)	CBS	Drama	Series	8	60
<i>Saved</i> (2006)	TNT	Drama	Series	14	60
<i>Heartland</i> (2007-)	TNT	Drama	Series	9	60
<i>General Hospital: Night Shift</i> (2007-)	SOAPnet	Drama	Serial	13	60
<i>Private practice</i> (2007-) (Sin cita previa , Fox España 2007)	FOX	Drama	Series	9	60

Source: author.

* The number of episodes or chapters of programmes currently being broadcast is shown up to May 2008.

writer and scriptwriter Max Brand (known as Frederick Schiller Faust), was made up of different stories inspired by a well-known urologist in New York, Dr. George Winthrop Fish (1895-1977) who, according to Faust, fitted to perfection how doctors were represented in film: he was very attractive, he was very good with people and his immaculate curriculum was exempt from those human errors and social deficiencies that the doctors starring in other professional dramas would gradually take on. In fact, the film about Kildare contained a good dose of action unrelated to health issues, as it centred on what happened to the doctor when he attempted to rescue the daughter of a widow with whom he had fallen in love.

The NBC series that was inspired by the character of Kildare (*Dr. Kildare*, 1961-1966) was not, however, the first medical drama on television. The pioneer, *City Hospital*, started on CBS in 1951 and starred a married couple who were both doctors, modifying the cinematographic representation of the first doctor in audiovisual fiction. Before adapting *Internes Can't Take Money* for television, NBC counter-attacked its rival with *Medic* (1952-1953), a story that had a lot in common with CBS's *City Hospital* but mostly structured around the emotional implications resulting from medical cases.

The obsession of *Medic*'s creator (James Moser) to get the highest possible level of realism, led him to ask for the support of the Los Angeles County Medical Association (LACMA), at that time interested in raising public awareness of the need to invest in new medical technologies in hospitals. The success of *Medic*, backed by the widespread conviction among health professionals that the dissemination of medical knowledge would make patients feel more secure, was sometimes tarnished by the successive attacks of Catholic organisations against the public exhibition of issues such as giving birth or sexually transmitted diseases.

The initial idyll between the LACMA and *Medic* was the start of a long relationship in which their mutual readiness was often affected by the echo of disputes between health institutions and the producers. In fact, the successive restrictions introduced by NBC to the realism of *Medic*, under pressure from the LACMA, led Moser to change to ABC, where he forged one of the biggest successes of the sixties, *Ben Casey* (1961-1966), based on surplus material from his first medical series. This new series adapted one of the

narrative motifs of the police genre, the professional couple, contrasting the impetuousness and capacity to improvise of the young Dr. Casey with the composure and much more orthodox methods of his mentor, Dr. Zorba. NBC responded to *Ben Casey* with *Dr. Kildare* (1961-1966), the first medical drama to be seen in Spain on TVE as from 1964. The TV Kildare was an updated version of the film character of the same name who, like the young Casey, shared star status with another veteran doctor, called Leonard Gillespie.

In spite of the uncountable similarities between both series, there were also differences, determined in part by the expectations of the respective channels regarding their target audience. So while *Ben Casey* dedicated a lot more attention to hospital issues than *Dr. Kildare*, the star of the latter (played by a very young Richard Chamberlain) lavished his great appeal on the more personal facet of the numerous plots, which took precedence over the medical stories. So while Kildare enthralled a female audience aged between 15 and 30, those over 31 adored Casey.

Both *Ben Casey* and *Dr. Kildare* contained all the narrative stereotypes in fashion at the start of the sixties. But, unlike any other subgenre of TV fiction, both series became the epicentre of controversy concerning the representation of health professionals in TV fiction. For this reason, as the Advisory Committee of the American Medical Association (AMA), which on this occasion advised both series, increased its criticism of the great licence taken in their representations, both *Dr. Kildare* and *Ben Casey* made an effort to highlight the social and medical issues of the different stories and to portray scientific innovations with more emphasis.

The exhaustion of both medical series, after six seasons of intensive broadcasting, led to a kind of exhaustion of hospital drama, which also largely tinted the success of other ambitious productions of the period, such as *The Eleventh Hour* (NBC, 1962-1963), a series about a young psychologist who worked with psychiatrists, and *Breaking Point* (ABC, 1963), a kind of sequel to *Ben Casey* structured around two psychiatrists whose patients were not mentally ill but had reached a "breaking point" in their lives. Consequently, although the medical comedies *Donna Reed Show* (ABC 1958-1966) and *Hennessey* (CBS, 1959-1962) got reasonable audience ratings, the networks decided to explore other formats and looked to anthology and series to

provide them with the suitable support to diversify.

The anthology *The Bold Ones: The Doctors* (NBC, 1963-1982) was initially made up entirely of self-contained episodes on medical emergencies but a little later adopted the serialisation that was bringing such good results for *General Hospital* (ABC, 1963). This production, which had the popular Doctor Gregory House among its loyal fans, constitutes one of the longest running soap operas on North American television, with more than 11,546 episodes broadcast up to 30 April 2008.⁸

In spite of the success of both serials, the series that would place medical fiction in the epicentre of public opinion would be *Marcus Welby MD* (ABC, 1969-1976) and *Medical Center* (CBS, 1969-1976), two giants that were also broadcast by TVE from 1971.

Medical Center, set in the university hospital of Los Angeles, once again took up the happy rivalry of earlier programmes between inexperience and experience but inverted this relationship, contrasting the conventionalism of the very young Doctor Gannon with the medial heterodoxy of the compassionate and mature Doctor Lochner, although the two's friendship systematically prevailed over their many discrepancies. Notwithstanding this, although Marcus Welby also contrasted medical orthodoxy associated with youth (embodied by Doctor Kiley) with the lesser conventionalism in the methods used by the older doctor (Doctor Welby) to cure patients, ABC made Doctor Welby the main star of the new production. Moreover, Welby wasn't a surgeon but a GP, who combined human warmth with great skill in diagnosing rare illnesses. This quality would be surpassed many years later by the controversial House.

Given the restraint of *Medical Center*, not only did *Marcus Welby* have to quarrel occasionally with the AMA and the American Board of Family Practice (generally less incisive

than the AMA), but it also had to suffer harsh attacks on the part of organisations that, like the Gay & Lesbian Alliance Against Defamation nowadays, denounced the perpetuation of negative stereotypes and generalisations (in this case, concerning the association between homosexuality and pederasty). In short, there were evident signs that times were changing, as well as the relations between television and society, also highlighted by the introduction of a Hispanic nurse-secretary (the character of Consuelo López) in *Marcus Welby*.

Following the footprints of *Marcus Welby*, *The Interns* (CBS, 1970-1971) and *Matt Lincoln* (ABC, 1970-1971) attempted to balance escapism with reality; social portrayals with family comfort, in order to be able to fit into the convulsive North American society of the sixties, while *The Bold Ones: The New Doctors* (NBC-1973), much more along the lines of *Medical Center* than the previous two, dodged the numerous obstacles resulting from the synthesis between conventionalism and innovation by introducing themes in line with the demands of the time and once again highlighting medical technology.⁹ On the other hand, the decline of the AMA in the most rebellious period in the history of the USA gradually released producers from institutional pressure and prepared the ground for new fictional representations of medical practice in line with the development that would be undergone by both professional dramas and police series on television as from the seventies.

M.A.S.H. (CBS, 1972-1983), a black comedy set in the Korean War and resulting from an adaptation of the film of the same name directed by Robert Altman in 1970,¹⁰ reflected the disenchantment of post-Kennedyism, embodied in United States' disastrous involvement in the Vietnam War. Although CBS's comedy represents a case apart in the history of North American medical fiction, the series became

8 *General Hospital* has two sequels, the serials *Port Charles* (ABC, 1997-2003) and the recent *General Hospital: Night Shift* (Soap, 2007-), which has revived the initial formula given the success of *Grey's Anatomy* and of *CSI: Las Vegas* (both set in the night shift).

9 Unlike the serial of 1963 *The Bold Ones: The Doctors*, *The Bold Ones: The New Doctors* was a rotating series within a container (*The Bold Ones*) that alternated with the broadcasting of another three series: *The Protector*, *The Lawyers* and *The Senator*.

10 In fact, although the similarities between the film and the series are notable, the producers of the TV adaptation avoided the film's copyright by claiming that they had been inspired by the novel *MASH* by Richard Hooker, a doctor and writer of several of the scripts for the CBS series produced in 1969. Hooker also took part in another medical series for CBS, *Trapper John M. D.* (1979-1986).

a veritable TV institution, the legacy of which, inter-generational and timeless, would logically be more visible in the subsequent evolution of medical fiction; especially in the construction of such unrestrained characters as Doctor Greene in *E.R.* or such eccentric characters as House. *M.A.S.H.* arrived on TVE in 1983, after CBS had ended its broadcasts.

Coinciding with the start of the first paramedic programme of *Los Angeles County Fire Department* (LACoFD), the NBC brought out *Emergency!* (NBC, 1972-1979), a series that combined the skills of doctors, firemen and health professionals and thereby started up a new seam that could be mined, whose ultimate exponent would be *Third Watch* (CBS, 1999-2005). Notwithstanding this, doctors would not get truly close to policemen until *Quincy M.E.* (NBC, 1976-1983), which for the first time made a forensic scientist into the star of a medical drama. Quincy was a kind of medical Colombo, whose marked vocation and freedom provided by his profession systematically brought him up against both the police and his own boss. The series (which came to TVE in 1977) was broadcast in rotation with other programmes such as *Colombo*, *McMillan* and *McCloud* and, although the police element was gradually lost, Quincy is a direct ancestor of the forensic scientists portrayed in contemporary action series (*CSI*, *Without a Trace*, *Criminal Minds*, etc.).

The era of realism

St. Elsewhere (NBC, 1982-1988) contained the association between medical themes and intrigue that both *E.R.* and *Quincy* had bestowed on hospital drama, but this was reproduced based on the new police paradigm installed one year before by *Hill Street Blues* (NBC, 1981-1987), the

series that renovated TV fictional drama at all levels. As happened with the police on *Hill Street Blues*, the doctors in *St. Elsewhere* were characterised as heroes-victims and, for the first time in the history of medical drama, the problems came much more frequently from the doctors themselves than from the patients. The enthusiasm of the medical team at the hospital of St. Eligius was welcomed both of the media and groups from the health sector, but it did not help to mitigate repeated accusations of yuppieism for characters designed by yuppies, the contradictions of which resulted from the complex combination of vocation and ambition that characterised the different protagonists. TV3 broadcast *St. Elsewhere* in 1986.

The new 'dirty realism' induced by *Hill Street Blues* in *St. Elsewhere* reached its peak in *E.R.* (NBC, 1997-2008), a successful combination of personal stories and professional cases, seasoned with very high doses of action and led by light, daring camerawork, capable of providing the viewer with a subjective perspective of the different stories. Sarcasm constitutes another essential ingredient of a programme that North American doctors accused of lacking in realism but which has millions of fans worldwide. The long-running NBC series, created by the prolific Michael Crichton on the request of Steven Spielberg, is about to complete its 14th season in the USA and it is expected to end 2009 with the 15th and last season of just four episodes.¹¹ TVE-1 has been broadcasting *E.R.* in Spain intermittently since 2001.

To date, *E.R.* has been nominated 130 times for EMMY awards, testimony to the series' great impact. However, its popularity among doctors themselves¹² has not been enough to save it from repeated criticism by other groups in the health sector, which on occasions have even asked advertisers to cancel their ads.¹³

After the success of *E.R.*, which is a landmark in hospital drama, NBC also renewed medical comedy with *Scrubs*

11 <<http://www.variety.com>> from 11 March 2008 [Consulted 14 April 2008]. 309 episodes of *E.R.* have been broadcast as of 1 May 2008.

12 In a debate held at the Madrid Press Association in May 2007, on the representation of doctors in the media, Doctor Verónica Casado, president of the National Committee of Specialties, stated that *E.R.* had become a cult series among Spanish doctors. <http://www.diariosur.es/prensa/20070510/gente/medicos-prefieren-rigor-urgencias_20070510.html> [Consulted 14 April 2008].

13 In 2005, the Center for Nursing Advocacy launched a campaign asked 23 large sponsors of NBC/Warner to withdraw their ads for *E.R.* in order to pressurise the producers to improve how nurses are portrayed. <http://nursingadvocacy.org/press/releases/2005/er_sponsors.html> [Consulted 14 April 2008].

(2001-), broadcast in Spain by Canal + and Cuatro. Along the lines of *M.A.S.H.*, *Scrubs* combines the comical and dramatic elements of the former with agile plots to construct a gallery of characters as peculiar as those from *M.A.S.H.*, led on this occasion by the surrealist narrator, Doctor John "J.D." Michael Dorian, whose dreams (heir to the purest sarcasm of *Ally McBeal*) can be seen by the viewers.

Strong Medicine (Lifetime, 2000-2006), the first alternative production to the proposals by the large networks, was another of the acquisitions of TV3 which Catalan viewers could see in 2002. Created and produced by Whoopi Goldberg, *Strong Medicine* centred on the activity of two female doctors working in a women's health centre, which allowed Goldberg's programme to tackle issues only suggested by a subgenre that, although its audience is mostly female, traditionally adopts a male perspective. The excellent audience ratings of a programme repeatedly classified as feminist (whose seven seasons on air have made it the longest running drama for a cable channel) encouraged other subscriber channels such as FOX (*House* or *Private Practice*) to explore the territories of medical fiction that had hardly been touched by the networks.

Just when it seemed that the social sphere was the privileged point of reference for medical productions after *E.R.*, hospital dramas from the second half of 2000 converted the realism of their predecessors into hyperrealism, in an authentic exercise of technical and technological skills in the style of *CSI*, distancing itself from the ethical dilemmas of the preceding period by mutating the conflicts and detachment of the previous characters into frivolity (*Nip/Tuck*, 2003-; *Grey's Anatomy*, 2005-) or extravagance (*House* 2004-).

Unlike *Quincy*, the research carried out by *House* is not police-based but medical, so that the clues provided by forensic investigation are symptoms that camouflage/reveal the illness. The star, a modern-day Sherlock Holmes from Princeton, whose exploits become TV stories dotted with

reality show style visual effects,¹⁴ is also filtered by Umberto Eco's Guillermo de Baskerville (*The Name of the Rose*, 1980) but seasons the arrogance of its literary references with the surrealism of the *Scrubs* narrator and the vulnerability of the *E.R.* doctors.

Unlike the other great TV giants, *House* has spectacularly increased its audience ratings in the United States season after season¹⁵ and has inspired the documentary series *Medical Challenges* that, at the time of writing, is being produced by Four Luck Banana. 'Housemania' has also affected Spain since it premiered on Cuatro on 24 January 2006 and, although none of the episodes of the fourth season (broadcast between 8 January and 4 March 2008) has equalled the record of more than four million achieved on three occasions in 2007, its impact on public opinion is still notable, as shown by the different statements issued by the OMC and TV viewer associations or the most recent by the SEN, mentioned at the start of this section.

One year after the renovation of medical drama carried out by *House*, *Grey's Anatomy* (2005-) reinvented the hospital soap opera (inaugurated by ABC in 1963 with *General Hospital*). Inspired by its creator's fascination with relations between health professionals, scriptwriter Shonda Rhimes, *Grey's Anatomy* combines the themes and narrative continuity of a serial with the production and episodic structure of a series, along the lines of another great programme by ABC, *Desperate Housewives*, (ABC, 2004-), inspired by the voice in off of Meredith Grey concerning the human relations induced by the specific theme of each episode.

The dominance of the personal over the professional in *Grey's Anatomy* turns Seattle Grace Hospital into the background for relations between the students and interns and leads to a different receptive attitude in viewers that, unlike the audience for *House*, no longer feel as stimulated to convert the medical environment represented into a reference in the real world. *Grey's Anatomy* has therefore hardly been criticised by health professionals for reasons other

14 The hospital reality show (*Life in the E.R.*, TCL, 1997-2004; *Women Docs*, Lifetime, 2001, *Maternity Ward*, TCL, 2000-2001; *Code Blue*, TCL, 2002, etc.) has notably influenced the figurative construction of medical fiction. The docuseries *Bellvitge Hospital* (TV3, 1999) is a good example of the mix between reality and fiction that feeds both TV macro-genres in the area in question, although, in this case, what was spectacular is always subordinate to social aspects.

15 The episode "Frozen", 3 February 2008, achieved the record figure of 30,310,000 viewers.

than that of frivolity in its portrayal of characters, these being traditionally provoked by any medical drama. Moreover, the racial diversity of the protagonists (the result of a 'blind casting' in which race was not taken into account) has been well received by North American public opinion.¹⁶

The success of *Grey's Anatomy*, conceived initially only for broadcast for a single season, has led ABC to extend a series that also tops the ranking of North American fiction and even has a sequel, *Private practice*, (2007-). This last series is constructed around the character of Addison Montgomery (Kate Walsh) who, incapable of continuing to fight for her husband (head of neurosurgery and the lover of Doctor Grey), moves to the Oceanside Wellness Clinic in Santa Monica, where her friends Naomi and Sam Bennett work. The initial criticism due to the excessive importance of Doctor Montgomery¹⁷ and the inevitable comparison of *Private Practice* with *Grey's Anatomy* have not reduced viewers' interest in a series whose favourite target audience is aged between 18 and 49. Antena 3 TV has bought the rights to this programme, which Fox Spain has been broadcasting since 10 January.

Spanish hospital drama

The localisation of *Farmacia de guardia* (Antena 3 TV, 1991-1996) encouraged the introduction of medical themes in the first series of Spanish contemporary production for fiction, although it only served to contextualise the everyday relations of a divorced couple, their two children and the assistant in the chemist shop run by Lourdes Cano (Concha Cuetos).

In 1995, the premiere of *Médico de familia* (Telecinco, 1995-1999) turned Doctor Nacho Martín (Emilio Aragón) into the most popular Spanish fictional doctor and, although the area of health was also the background to the family and sentimental relations of this Globomedia series, a greater pedagogical intent could be observed than in *Farmacia de guardia* when tackling social issues related to illnesses or

disabilities. In the last season of *Médico de familia*, the inclusion of Doctor Martín in the emergency unit of the health centre (a narrative strategy aimed at increasing the dynamism of the different stories that went to make up each episode) allowed new themes to be introduced, such as work-related and traffic accidents, etc. .

Notwithstanding this, Antena 3 TV was the first Spanish channel to make the incursion into hospital fiction drama in 1996, with a series that the Catalan production house, Gestmusic, filmed in Terrassa Hospital starring Xavier Elorriaga, Mercedes Sampietro and Jaime Pujol. Like its predecessors, *Hospital* focused more on personal relations than on hospital issues per se, these providing the framework for the different plots starring the doctors and nurses of the health centre. This series' debut on prime time on Antena 3 TV went practically unnoticed in the summer period when it started, a fact that determined its intermittent presence on the programming grid of the only five episodes to be broadcast (between 1 July and 25 August 1996), the average audience for these being 1,632,400 viewers (18.7%).

The success of professional dramas such as *Periodistas* (Telecinco, 1998-2002) and *El Comisario* (Telecinco, 1999-), together with the transition undergone by the last season of *Médico de familia* and the impact among critics of *E.R.*, constitute the precedents for *Hospital Central*, one of the most profitable programmes for Telecinco since it started on 30 April 2000 to the present day, as shown by its 4,114,000 viewers (24.1%) on average, in its fourteenth season. Undoubtedly based on *E.R.*, whose copyright restrictions Videomedia managed to avoid, *Hospital Central* combines medical cases in a hospital A&E ward with the dense web of love and broken hearts among the medical staff.

Telecinco's series has won a large number of awards, including those given by different viewer associations, of note being the different awards given to Jordi Rebellón, the actor who plays the surliest doctor at Hospital Central, Doctor Vilches. The introduction of charitable actions in the last two seasons of Hospital Central (with episodes set in Guatemala and India, respectively), acts as a counterweight

16 O, *The Oprah Magazine* <http://www.oprah.com/omagazine/omag_ocut_flash.jhtml?issue=200612> [Consulted 14 April 2008]

17 <<http://www.washingtonpost.com/wp-yn/content/article/2007/09/25/AR2007092502418.html>> [Consulted 14 April 2008]

to growing criticism from the health sector due to the huge licence with which the programme portrays the activity of the A&E unit of a large hospital, as well as the frivolity with which the many and changing sentimental relationships between the protagonists are handled.

The success of *Grey's Anatomy* on Cuatro and the need to rejuvenate the audience for *Hospital Central* led to *MIR*, another medical drama on Telecinco starring five students and the respective staff doctors. The audience ratings for the first season (broadcast between 10 January and 29 March 2007) were below the channel's average, but the increase of the last three broadcasts made Telecinco decide to extend the series after some modifications. However, the introduction of new items such as euthanasia, genetic therapies, natural birth, etc. and the profusion of special collaborations by famous actors were not enough to improve on the figure of 2,303,000 viewers (13.4%) obtained at the start of the second season early in 2008, which ultimately led to the series being cancelled. On the other hand, neither the increase in socially controversial issues nor the inclusion of a disabled female character among the main characters (a houseman who was deaf due to meningitis) was enough to offset the large amount of criticism for the series on the part of the different professional groups represented, on this occasion in addition to that of TV critics.

Unlike Telecinco, when it embarked upon its hospital drama, Antena 3 TV preferred to focus on nurses with *CLA*. *No somos ángeles*, a daily strip of Euro-productions that inaugurated the 2007-2008 season. Although Antena 3 TV stated it was firmly committed to realism, claiming that it had permanent professional advice and had also included a doctor on the scriptwriting team for *CLA* (acronym for "Clínica Los Ángeles" or Los Angeles Clinic), the lesser relevance of the medical sphere in the serial compared with the series and the limitations inherent to the format with less budget than TV fiction did not convince either critics or audiences. For this reason, the channel Planeta cancelled *CLA* one month after it started, after 23 episodes and two changes in broadcasting time, giving it an average audience of 1,001,000 viewers (10.76%).

At the time of writing, Antena 3 TV has announced that it has acquired the rights to adapt *Doc Martin*, a 'dramedy' by the British channel ITV with a legion of admirers in the UK.

On this occasion, Doctor Martin (the star of two TV films before adopting the serial format) deconstructs one of the classic references of medical fiction (the successful surgeon who swaps a hospital in the big city for a provincial practice), with a tragic-comic character (played by Martin Clunes) who, unlike the pleasant characters in series such as *Doc* (CBS, 1973), *Doc Eliot* (ABC, 1973), *Northern Exposure* (CBS, 1990-1995) or *Providence* (NBC, 1999-2002), this time is characterised by his lack of tact and empathy.

Health on the internet: proposals for quality and certification

Miquel Àngel Mayer, José Luis Terrón and Angela Leis

- *The services offered by the internet are producing significant changes in many fields of communication. This phenomenon is particularly present in the area of health, as it is one of the most intensive sectors in the use of online information. Different organisations and institutions have set up quality initiatives with various implementation strategies, as well as proposals to resolve the problems identified with regard to the use of health information available on the internet. In this paper we also present the quality and certification programme Web Mèdica Acreditada that stands out in Spain.*

Keywords

Internet, health, quality, accreditation, certification, credibility.

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The services offered by the internet are producing significant changes in many fields of communication, in science, personal relations and access to information. This phenomenon is particularly present in the area of health, as it is one of the most intensive sectors in the use of online information and has a large number of potential beneficiaries, due to the resolution of problems of geographical distance between patients and health professionals, the reduction in costs and infrastructure and waiting times, as well as access to large amounts of information and its management. It is therefore a new communication tool that is characterised by interaction between users, personalisation of the consumer relationship, ease of publishing content of any kind, universality and lack of control, as well as ease and simplicity of updating the content.

Notwithstanding this, we must also consider the existence of a number of risks that must be avoided. Health information obtained from the internet can give a false feeling of confidence in patients that, on exercising their autonomy, may lead to incorrect decisions or even decisions that can endanger their own health. Users are using the internet increasingly as a source of health information, as shown by several of the studies carried out. Between 50% and 80% of adult internet users habitually look for information on health in general and on their own and other illnesses.

According to the last survey published by Red.es ("Panel of households, XVII wave" July-September 2007), 42% of Spanish homes are connected to the internet, and 53.5% of the population (including those over 15) use the internet. Of these users, 70.9% consider themselves to be frequent users (i.e. 37.9% of the population aged 15 or more). In the survey for January-March 2007, 42.6% of users had searched for information related to health, compared with 24.4% for January-March 2004 (in the United States this figure was 80% in 2006). 25.7% of the queries were made

to the public administration via the network for health services.

All this has created new and different needs. Firstly, greater control is essential of the quality of the websites with health content, creating accreditation systems that have standards and reference criteria to evaluate these websites, guaranteeing that this information will be of adequate use for patients and users in general, and that professionals can also base their decisions on this information and comment on this information's suitability and application in each case. Secondly, it can facilitate the guided improvement of health education for the public at large, opening up new perspectives and useful tools for non-professional internet users.

Given this situation, different initiatives have been set up and recommendations, strategies and good practices have been drawn up in order to guarantee a minimum quality of health-related websites and to protect users and patients with regard to the misleading, false or confused information that abounds on the internet. In the survey carried out in 2005 by the Health on the Net Foundation (HON 2005), 59% of the participants would be in favour of certifying websites, compared with 25.3% who would disagree.

Proposals to improve the quality of information on the internet

Since 1996, different proposals have arisen to improve the quality of health-related websites. The most elementary are limited to providing recommended quality criteria for health-related websites and propose codes of ethics and conduct which those responsible for the websites can sign up to voluntarily. A more sophisticated system consists of guaranteeing the quality of the format and content of a website by an independent organisation systematically reviewing it.

Among the first of these initiatives we might highlight the proposal by HON, consisting of a quality seal that could

freely be included on any website that voluntarily signed up to a series of criteria, without anyone checking whether these criteria were being complied with. Currently this initiative is carrying out an active review of the websites that have joined its scheme and it can be considered as a third party review system. Other initiatives characterised by the non-controlled subscription to a code of conduct are Hi-Ethics and the Internet Healthcare Coalition. The American Medical Association (AMA)¹ is another example where, in addition to drawing up a guide of recommendations, they also review the websites related to the aforementioned institution and compare the quality of their scientific content with similar criteria to those of a scientific publication. So there are differing degrees or levels of accreditation and of quality control, all with their own characteristics, that determine to what extent users can trust the information supplied, a trust that can be considered directly proportional to the depth of quality control carried out. In the United States, the organisation URAC,² in which several different American scientific institutions and societies collaborate, also grants a seal of accreditation, with the idea of regulating and guaranteeing the quality of the information and the safety of the data exchanged on the internet, in all those health-related activities supported online. Moreover, there is a large number of initiatives with the common objective of offering guidance to internet users on what good quality health-related websites should be like or, in any case, to advise on the limitations and precautions that should be adopted with these websites and information they contain on specific aspects such as recommendations concerning treatments, for the use of children or even for the use of health professionals.

In Spain, of note is the accreditation system known as the Web Mèdica Acreditada (Accredited Medical Website), set up by the Official College of Physicians of Barcelona in 1999 and which has established itself as a quality reference point for Spanish and Catalan-language websites. This initiative, as reflected in a survey published in 2005 by the Health on the Net Foundation,³ ranks fifth among the systems for

1 AMA: <<http://www.ama-assn.org/ama/pub/category/1905.html>>

2 URAC: <<http://www.urac.org>>

3 HON Foundation: <<http://www.hon.ch>>

accreditation and quality seals for the best-known health-related websites in the world.

The European Union, as a supra-national institution and reflecting the importance and concern of this issue, established in 2000 a working group with representatives from all member States, scientific societies, the pharmaceutical industry, universities, user associations, the World Health Organisation (WHO), etc. to draw up quality criteria that should be followed by health-related websites, establishing a common point of reference based on which the different agents working in this area could adapt the recommendations to the needs and characteristics of each organisation and country. Finally, in 2002, the definitive document was published with the aforementioned recommendations.⁴

The existing quality initiatives have different strategies of implementation, as well as differing proposals to resolve the problems identified. These initiatives, recommendations and accreditation systems have been the object of different studies in order to further our knowledge of their differentials and classify them appropriately. According to the existence or not of an external evaluation process and, if one exists, the methodology used to carry out this evaluation, as well as how the recommendations are implemented, various mechanisms are defined, proposed to improve the quality of health-related websites, which can be classified as follows:

- **Codes of conduct:** consisting of a number of quality criteria that any interested websites can sign up to voluntarily.
- **Quality seals:** which can be included on the websites with the undertaking to follow a series of quality criteria.
- **User guides:** a number of recommendations to guide users on how they should interact with health-related websites.
- **Filters and classification portals:** that manually or automatically classify and/or filter resources and websites.
- **Third party certification:** based on verifying compliance with a series of quality criteria, describing the website's

characteristics and often granting a seal that certifies the website has been reviewed and how.

Table 1 shows the best-known initiatives, presented according to the different strategies on which they are based.

The Web Mèdica Acreditada Quality Programme

Firstly, we should note that there are no other medical accreditation systems that have offered general data on the characteristics of the websites that form part of their quality programme. Secondly, as pointed out by an international study carried out by the Health on the Net foundation (HON 2005), we should underline that this is one of the leading accreditation entities in Spain and the world. And, thirdly, if we take into account the fact that most of the websites accredited by this quality programme are Spanish, the data provided below allow us to draw up a very approximate profile of accredited medical websites in Spain.

The quality programme of the Web Mèdica Acreditada (WMA)⁵ is promoted by the Official College of Physicians of Barcelona⁶ and is aimed at all websites in Spain and Latin America that offer health information and services via the internet in which professional doctors participate and collaborate, as well as other health professionals. This quality initiative applies the review and recommendation of a set of quality criteria specific for medical websites and of the medical deontological code. This programme incorporates the experience and advances promoted by projects of the Directorate General of Health and Consumers of the European Union (EU) and of the Safer Action Plan Plus for a safer internet also of the EU, in which it actively plays a part. This quality programme is characterised by being voluntary, free and transparent, so that the websites following the process of review and the incorporation, if applicable, of certain recommendations obtain the WMA accreditation seal, which they show on their site.

4 eEurope 2002: Quality Criteria for Health related websites: <<http://www.jmir.org/2002/3/e15/>>

5 Web Mèdica Acreditada: <<http://wma.comb.es>>

6 Col·legi Oficial de Metges de Barcelona: <<http://www.comb.cat>>

Table 1. Quality initiatives for health-related websites

Mechanism	Initiatives
Codes of conduct	<i>Internet Health Coalition</i> <i>American Medical Association</i> <i>e-Europe</i> <i>Hi-Ethics</i>
User guides	<i>DISCERN</i> <i>Net Scoring</i>
Filters and classification portals	<i>OMNI</i> <i>CISMeF</i> <i>AQuMED</i>
Third party certification	<i>MedCIRCLE</i> <i>Health on the Net Code (HON)</i> <i>Proyecto Webs Médicas de Calidad</i> <i>URAC</i> <i>Web Médica Acreditada (WMA)</i>

Source: author.

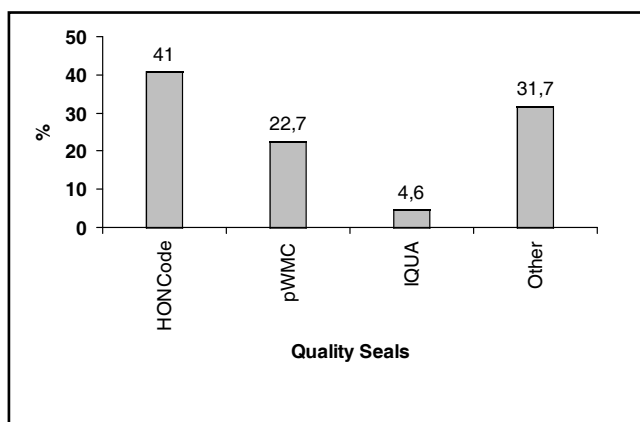
At 31 December 2007, a total of 1,148 applications had been received via the form available on the WMA website. These applications are from the period between July 1999 (when the service started up) and 31 December 2007. Out of the total of 1,148 applications received up to this date, 524 accreditations have been awarded. During 2001 and 2002, a larger number of applications were made, with 171 and 165, respectively. Excluding erroneous applications ($n = 41$) and websites that did not ultimately enter the accreditation process ($n = 108$), the percentage of websites that have completed accreditation out of the total applications received was 55.66%. These data may be surprising but sometimes the changes suggested imply extra work for those in charge of the websites which, on many occasions, cannot be undertaken due to a lack of resources or because, as happens in a few cases, the characteristics of the website require significant changes in content, which makes their adaptation unviable. On the other hand, a large number of websites that did not conclude the accreditation process disappeared in the first few months of their existence. Out of the total websites that have been accredited ($n = 524$), in this period of time 67 have disappeared (13%);

most of these disappearances occurred in websites that had applied for accreditation between 1999 and 2001. This might be explained by the fact that, during these years, there was great interest in the internet and in creating services online without the necessary support to ensure their continuation, and many of these sites are no longer in operation. These disappearances mean that the number of accredited websites at 31 December 2008 totalled 457.

Of all the websites accredited by the WMA, 56% ($n = 258$) have at least one other seal of approval. The distribution of seals on these websites is shown in figure 1. Health on the Net certification is the one most frequently associated with websites accredited by the WMA. Among "Other" there are their own codes, DobleU, eHealth Ethics, TNM and Trust_e. The two most frequent seals found (HON and pWMC) are specific for the health area. The most frequent certification of a general nature is that of the Internet Quality Agency (IQUA)⁷ promoted by the Consell de l'Audiovisual de Catalunya. It should be noted that a little more than half the websites have at least two accreditations (especially health seals). The possible reasons for this are diverse but, in a study carried out by the WMA, those in charge noted that

7 IQUA: <<http://www.iqua.net>>

Figure 1. Other quality seals present on websites accredited by the WMA



HONCode: Health on the Net
pWMC: Proyecto Webs Médicas de Calidad,
IQUA: Agència de Qualitat d'Internet

Source: WMA.

having more than one quality seal is related to the perception of greater quality, on the one hand, and that there is no single seal of reference.

Table 2 shows the sources of funding declared by the accredited websites. We should note that 240 websites (52.5%) answer this question when filling in the questionnaire to apply for accreditation. The data suggest that many of the websites are the result of voluntary initiatives, no so much of entities but rather of people and, therefore and as can be seen subsequently in their review, their real cost is not reflected or is so low (hosting, etc.) that those in charge of making the application do not feel it necessary to even note it down. This lack of means (voluntary) entails the closing down of websites and an excessive effort to access quality standards in health-related websites. The declaration of the source of finance of websites is a standard of quality and trust, clearly informing users of how it is funded. On the other hand, we are also witnessing the appearance of seals and codes of doubtful independence and origin, in which there may be non-declared financial agreements.

Table 3 contains information on the types of websites accredited. The type of healthcare centres is the most numerous, followed by the websites of scientific and professional associations and personal websites. In the survey carried out by WMA, among those responsible for accredi-

Table 2. Sources of funding of accredited websites

Types of funding	No. websites	% out of 240
Private contributions	84	35.00
Sponsored by pharmaceutical industry	58	24.26
Member fees	44	18.33
Advertising	29	12.08
Public funds	24	10.00
Sponsored by non-profit organisations	22	9.16
Sponsored by health firms	14	5.83
Donations	11	4.58
Subscription	10	4.16
Sale of products and other services	10	4.16
Venture capital	1	0.41
Other	28	11.66

Source: WMA.

ted websites, the reasons of professional ethics are those considered most important for applying for the accreditation seal. The number of accredited websites of public administrations, universities and research centres is not high, and this could be attributed to the fact that these centres do not consider such certification to be necessary.

Table 4 shows clearly that, among the accredited websites, the desire to serve society in general or health professionals in particular is of special importance.

In general, the accredited websites declare that they were designed more with regard to content than to a type of audience. On the other hand, it should be noted that almost half of them are aimed at health professionals, while more than half are aimed at non-health professionals who are looking for health-related information. We must bear in mind that there are websites aimed both at health professionals and also patients/users. These data can be completed by

Table 3. Categories of websites accredited

Types of websites	No. websites	% total
Healthcare centres	135	29.5
Scientific and Professional associations	91	20
Professional personal websites	70	15.3
Publishers and media	19	4.15
Other educational institutions	21	4.43
Patient or support group associations	19	4.15
Pharmaceutical companies	18	3.79
NGOs	14	2.95
R&D institutions	10	2.32
Universities	11	2.32
Other companies	8	1.68
State administrations	4	0.84
Other	37	8.09

Source: WMA.

Table 4. Overall objective declared by those responsible for the accredited websites

Overall objective	No. websites Spain	Total no. websites	% total
General information	177	206	45.07
Scientific education	152	179	39.16
Training	29	37	8.09
No reply	25	25	5.47
Support groups	10	10	2.18

Source: WMA.

noting that around 19% of the websites offer the possibility of online queries and that 31.7% have a restricted zone for health professionals, although still only in 61 cases (because they are intranets or because they believe that the content might be misinterpreted by non-professional users). Access to a restricted zone is provided via payment in the

case of fifteen websites (in many cases resulting from training activities).

Finally, we have also looked at the languages used by the accredited websites, as shown in table 6. These data show, on the one hand, that the number of websites with Catalan as one of their languages total 28.22% of the accredited websites and this can be related to the fact that the initiative is promoted by the Official College of Physicians of Barcelona, one of the professionals colleges with the largest number of members in Spain. On the other hand, we also observe that Spanish is used on 435 websites (95.18% of all the websites) and we can relate this to the large presence of this language on the internet and the large number of potential users throughout the world at whom the content is aimed. It should also be noted that Catalan is used exclusively on 17 of the websites and that no website uses Catalan and English as its two languages. We should also note that English is present on a fifth of the websites.

Conclusions

The effort made by the different independent institutions, governments and the European Union to offer proposals and solutions to improve the quality of content and websites with health information is patent. Some authors have questioned the actual usefulness of accreditation systems, due to different problems that have still not been properly evaluated. One of the problems proposed lies in the fact that individual users do not recognise the meaning of the seals or codes of conduct or are unaware of which aspects are being certified on the websites. It has also been suggested that these users do not have the necessary time nor do they dedicate the effort expected of them to understand or use the tools that the different quality initiatives are offering them. This aspect is still a relatively unknown issue and a challenge for researchers and those in charge of public health, requiring studies to investigate further the use and veritable usefulness of these initiatives for the population at large.

The quality and future effectiveness of certification for health-related websites may depend on the use of new technological resources, including a new generation of intelligent tools offered by the internet. The semantic website

Table 5. The targets for accredited websites

Audience	No. websites	% of 457
Adults: patients and/or users	242	52.95
Specialist doctors	240	52.51
Family doctors/GPs	172	37.63
Other health professionals	168	36.76
Medical students	156	34.13
Researchers	121	26.47
Children and teenagers: patients and/or users	49	10.72

Source: WMA.

Table 6. Languages present on WMA accredited websites

Languages	No. websites	%
Spanish	284	62.14
Spanish - Catalan	67	14.66
Spanish - English	39	8.53
Catalan	17	3.71
Catalan - Spanish - English	45	9.84
English	5	1.09

Source: WMA.

understood as an extension of the current concept of website is providing the possibility to structure information to a greater extent, producing relations between resources and content in order to improve interoperability between people and machines. Semantic websites and automated monitoring, applied to the initiatives that are reviewing content and the description the characteristics of health-related websites, may constitute an interesting contribution that provides users with greater knowledge of the type of infor-

mation they are accessing, so that this information may be used by search engines that better understand what users are really looking for and they will obtain more thorough, descriptive and detailed information on the content of websites that have been searched.

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Science and technology on Catalan area television

Gemma Revuelta and Marzia Mazzonetto

■ *The role of the media and especially of television is vital in acquiring new knowledge related to science and technology, although there is little presence of this kind of content when compared with other current issues. This article provides the preliminary findings of a study carried out by the Observatory of Scientific Communication of the Pompeu Fabra University, requested by the CAC, which has analysed the science and technology content broadcast by Catalan area television and its typology.*

Keywords

Scientific communication, mass media, television, content analysis, social perception of science

Introduction

Science and technology constitute fundamental pillars for the development of contemporary society. In the specific case of Catalonia, over the last few decades the confirmation of this situation has led to great efforts being made to improve the infrastructures and working conditions in the area of research, development and innovation (RDI). Notwithstanding this, merely promoting science is not enough to guarantee a society's progress if an adequate level of understanding is not also achieved on the part of the population. For this reason, and with the aim of encouraging citizens with more decision-making capacity, 2007 was declared the Year of Science, first in Barcelona and afterwards in Catalonia and in the rest of Spain. Encouraged by this programme, throughout the year hundreds of entities organised a large number of activities (in Barcelona alone it is calculated that more than one million people took part in these activities).

On the other hand, when studying how citizens acquire new knowledge of science and technology (S&T), of note is the key role played by the media. In fact, television is the main channel of information for the public at large, as is continuously concluded in various studies on the social perception of science. Of these, of particular note in our area are the Science and Technology Euro-barometers of the European Commission, as well as the studies coordinated by the Spanish Foundation for Science and Technology.

Notwithstanding this, in contrast to this fundamental role of television, when the S&T content in TV news or general programming has been analysed, one of the most disappointing conclusions is that it is scarcely present compared with the space occupied by other news areas, such as politics, sports or events (B. Leon 2006; S. de Cheveigné 2006; S. de Cheveigné and E. Veron 1996).

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In short, we are faced with increasingly more effort being made to disseminate scientific information on the part of administrations and RDI centres, television's potentially central role as the main means of information for the population, and a paradoxical shortage of science on this medium, at least in the news programmes.

Given this situation, and on the request of the Consell de l'Audiovisual de Catalunya (CAC), a team from the Observatory of Scientific Communication of Pompeu Fabra University (OCC) set up a study to analyse more extensively the science and technology content on television stations covering Catalonia and its typology. The findings from the first part of this study constitute the basis of this article.

Theoretical framework

A review of the existing literature revealed that the analysis of science and technology (S&T) on television is a relatively recent and undeveloped area. Because of this scarcity of literature, on designing our study it was therefore necessary to look for more general theoretical references.

Consequently, in the more generalist framework of television studies we have taken into account, among others, the critical focus of Briton John Fiske concerning the role of the economic and cultural aspects in TV production and how it is received by the audience (J. Fiske 1987; J. Fiske and J. Hartley 1989). Also of value have been the multidisciplinary instruments for the qualitative analysis of media produced by the Dane Klaus Jensen (K. Jensen and N. Jankowski 1993) and the instruments of quantitative analysis developed, among others, by the Italians Francesco Casetti and Federico di Chio (F. Casetti and F. di Chio 1999), which have been used to produce and study the database on the TV programmes.

For their part, studies on the relationship between S&T and television published to date have focused particularly on quantitative aspects. Firstly, we should note the research coordinated by Bienvenido León, lecturer at Navarre University, on the S&T content in five European countries: France, Italy, Germany, the United Kingdom and Spain (B. León 2006). This research, which was carried out in 2003, concluded that the news on science, technology, health and the environment accounted for a low percentage of all items

broadcast in news programmes (specifically 8.1%, with half of this percentage dedicated to health). And this proportion was much smaller than that for other subjects, such as politics (16.8%), sport (16.8%) or events (12.5%).

A few years earlier, in a study carried out in 8 European countries (and in which a team from the OCC-UPF took part, among other research groups and centres), the structures of S&T news items were analysed, broadcast by TV channels during the month of October 1994. Of the 69 most notable news items from this period, there was great variability in the origin of the news item depending on the country concerned. In fact, only one news item coincided in all countries on the same day and in the same time slot. This was information concerning the oil spill at Usinsk, to the south of the Arctic Circle. This news item was broadcast in a similar way in all the countries and even the images were the same. These were images provided by an ecologist group with an effective communications mechanism. The impact of this mechanism became very clear, especially when compared with the great variability found in the rest of the news items. The study also revealed that news items tended to be more local than international. Suzanne de Cheveigné, researcher from the SHADYC centre (sociology, history, anthropology and cultural dynamics) of the French CNRS, has gathered together in-depth findings from this study and adds to our knowledge of S&T on television in her work (S. de Cheveigné 2006; S. de Cheveigné and E. Veron 1996).

Objectives

The overall objective of this study was to analyse the science and technology content (S&T) in television programming for the Catalan area and to study how this content is handled by the different TV formats (especially in news programmes, specialist science and magazine programmes).

In the first part of the study, the specific objectives set were: to measure the relative weight of S&T compared with other news areas and to analyse how television treated S&T topics in terms of distribution of information by area and sub-area, sources of information (including not only the representation of each sector but also the participation of women as a source of information), geographic origin, the focus of

the news item, etc. We also wished to know whether the fact that 2007 was the Year of Science might be reflected in the data obtained by our study (particularly in terms of an increase in the volume of information or specific references to activities carried out as part of the Year of Science).

In a second part (currently underway), the study pursues another four specific objectives: to analyse the presence of science carried out in Catalonia, gender representation, to study the comprehensibility and discourse in information and a specific study of programmes specialising in science broadcast for the area of Catalonia.

This article summarises the findings from the first part of the study.

Methodology and sample

The periods of study were the second quarter of 2006 and of 2007 (hereinafter 2Q-2006 and 2Q-2007). A comparison between the two quarters has allowed us to analyse the potential impact of the Year of Science 2007. Moreover, these are “regular” quarters in the sense that they do not coincide with any great events in the area of science that might have biased the results in one direction or another. In fact, during the period studied, the only event that partially affected local TV programming for a few days were the municipal elections in Catalonia in the month of May 2007.

The sample was made up of the following three kinds of elements:

- A database containing the news items on science and technology broadcast in the midday or evening news programmes (either) provided by the CAC, corresponding to the period under study and on the following four channels: TV3, TVE a Catalunya, 8tv and Barcelona TV. The database contained information on the time of the broadcast, the duration and the headline for the news item.
- The programming grids provided by the CAC for the channels (TV3, K3/33, 8tv and Barcelona TV, in this case) corresponding to the period under study. These grids contain information on the planned programmes. In some cases, the information was very detailed (TV3, K3/33) including, for example, the name of the guests on a specific programme, the title and a brief summary of a

film, etc. In other cases (8tv and BTV), the information was much less, which restricted the search for S&T content on these channels.

- A sample of the different recordings: news, specialist science programmes (*Redes* - La 2, *Einstein a la platja* - Barcelona TV and *El environment* - TV3), magazine programmes (*Els matins* - TV3), etc.

Based on the elements provided by the CAC (news database, programming grids and recordings), two new databases were created specifically for this study: one for news programmes and another for the general programming grids. In the first database, each record corresponded to a news item talking about S&T. In the second, each record corresponded to a programme or part of a programme of any journalistic genre (except for news) that dealt with S&T.

The analysis of the presence of S&T in the news and in general programming, as well as the impact of the Year of Science 2007, was quantified in terms of the number of items (or records in the databases) and the broadcasting times, to be compared with other areas.

In order to analyse the S&T content, the distribution was studied according to themes and sub-themes, sources of information (by sector and by gender), geographic origin and the focus of the news item.

- The **themes** were divided into “science and technology” (including scientific advances in general and bioethics, both in Spain and abroad), “environment” (including information talking about natural phenomena, pollution, ecology, forest fires, eclipses, pandemics, etc. happening around the world) and “health” (referring to news items that talked about illnesses, drugs, addictions, intoxications, food safety, healthy habits, government actions regarding health issues, etc.).
- Given that the themes were so broad, the categories used to classify the more specific **sub-themes** were as follows: “biomedicine” (biotechnology, cloning, stem cells, pharmacogenetics, etc.), “psychology and mental health”, “medicine and health” (this category excludes news items related to biomedicine and psychology and mental health), “nature and biology”, “environment” (excluding those of nature and biology), information and communication technologies or ICTs, “technologies”

(excluding ICTs), “astronomy”, “exact sciences” and “other disciplines”.

- The **focus** refers to the specific emphasis of the news item on one aspect or another of the information. So the news items were grouped according to five categories of focus: “research” (when the news item focused principally on research and advances in scientific knowledge), “policy” (when the content was related to specific policies and announcements related to the management of science, health and/or the environment), “controversy” (debates between different groups or opinions), “risk” (when emphasis was placed on information regarding the risks resulting from exposure to certain factors, be it to health or the environment) and “catastrophe” (this group included information on large-scale natural or artificial phenomena regarding their consequences: earthquakes, hurricanes, etc.)
- For their part, the **sources of information** were grouped according to the following categories: “scientific and academic sector”, “administration”, “medical sector”, “civil associations”, “industrial sector” and “museums and science centres”. Data was also gathered regarding whether the source of the information was male or female.
- To analyse the **territorial origin** of the news items, these were grouped into three categories: “Catalonia”, “state” and “abroad”.

Science, little presence as news

The most constant observation in all phases of this study was the limited space dedicated by television to information on science and technology. The journalistic genre where this stands out most evidently is that of the news. On average, news dedicated 1.7% of the total time to items about science or technology, environment or health (Table 1).

Notwithstanding this, based on the data provided by the Content Analysis unit of the CAC, on comparing the percentage of time dedicated to S&T in the news programmes of the four channels (TV3, TVE a Catalunya, 8tv and Barcelona TV) during the second quarter of 2006 (2Q-2006) and of 2007 (2Q-2007), a rising trend could be observed. In 2007, on most channels the number of news items on S&T

rose in comparison with the same period in 2006: on TV3 this went from 1.20% to 1.71%; on TVE a Catalunya from 1.61% to 1.83%; on BTV from 1.43% to 1.45%.

The only channel with a reduction was 8tv, which went from 2.28% in 2Q-2006 to 1.91% in 2Q-2007. This is partially influenced by the high percentage of time (if compared with the average) that this channel in particular dedicated in 2Q-2006 to news about the “environment” (4.40%), in dealing with numerous events, most of a catastrophic nature, which affected different zones in the world, such as floods (in Europe and the United States), earthquakes (Iran and Indonesia) and volcanic eruptions (Japan and Peru), as well as threats, both local and state-wide, due to the rise in temperatures and the lack of rain.

In spite of the increase in news items on S&T observed in 2007 in comparison with 2006, the news items of the later year rarely referred specifically to the celebration of the Year of Science 2007. Specifically, only five from more than 1,200 news items analysed in the news programme sample were related to events from the Year of Science programme (including the announcement of the celebration and some prior exhibitions that took place in 2006 and not in 2007).

Environment and health, the most newsworthy

Evaluating the data as a whole from the news programmes on the four channels, the subjects that received most attention were those of the “environment” (2.52% of the total time occupied by the news) and “health” (1.60% of the total); in last place was the category of “science and technology” with 0.94% of the news.

Regarding the time that each channel dedicates to information, of note is the fact that 8tv is the channel that dedicates most time to news on S&T: 2.10%. The other channels analysed dedicate, respectively, 1.72% on TVE a Catalunya, 1.49% on TV3 and 1.44% on Barcelona TV.

Subdividing the broad themes into more specific sub-themes, the news was distributed as follows: medicine and health (n = 399), environment (n = 271), nature and biology (n = 215), technologies (n = 67), biomedicine (n = 49), TIC (n = 39), astronomy (n = 22), psychology and health mental (n = 17), exact sciences (n = 14) and other disciplines (n = 3).

Different focus of news by theme

A study of the distribution of focus for news items on science and technology broadcast by the news programmes of the sample has provided information on how the news items are handled or focused according to each theme.

In 29% of the news items, what is fundamentally emphasised are aspects related to “research”. 25% place more emphasis on aspects of “scientific and/or medical policy”. 22% focus more on information related to certain “risks”. 16% don’t talk about risks but of “catastrophes”. And in 8% of the cases the news items are from the focus of “controversy”.

The results obtained in cross referencing these data with that of the news distribution in the three broad themes – “science and technology”, “environment” and “health” – have been represented in figure 1. Most of the news on the “environment” is located in the focus categories of “risk” and “catastrophe” (news items such as “The little rainfall in April

and May has increased precautions concerning water consumption”, “The high concentration of pollen in the atmosphere will lead to a lot of allergy cases this year” and “World alert on the impact of climate change”, “A strong earthquake on the Indonesian island of Java has caused more than three thousand deaths”).

On the other hand, most of the news items on health were in the category of “policy” (“Together with Berlin, Barcelona will manage the first European stem cell register”, “Spain has become the fourth state in Europe to approve therapeutic cloning”) and “research” (“First simultaneous heart and lung transplant in Catalonia”, “Babies aged under 6 months distinguish by facial gesture between people talking to them in English or French”).

Finally, the news items dedicated to “science and technology” are mostly of a “research” type focus (“A craft from the European Space Agency has reached Venus for the first time”, “A group of scientists has detected a focus of contamination in the high mountain lakes of Aragon”).

Table 1. Percentage of time dedicated to the news on S&T compared with the total time of news programmes

Theme:		Science and technology	Environment	Health	Average percentage per channel
Channels:					
TV3	2Q-06	0.50	2.04	1.25	1.49
	2Q-07	0.94	2.42	1.78	
TVE a Catalunya	2Q-06	0.43	2.65	1.76	1.72
	2Q-07	0.97	2.62	1.89	
8tv	2Q-06	0.29	4.40	2.15	2.10
	2Q-07	1.96	2.14	1.63	
BTV	2Q-06	0.92	2.24	1.12	1.44
	2Q-07	1.48	1.62	1.24	
Average percentage per theme		0.94	2.52	1.60	

Source: author, based on data provided by the CAC.

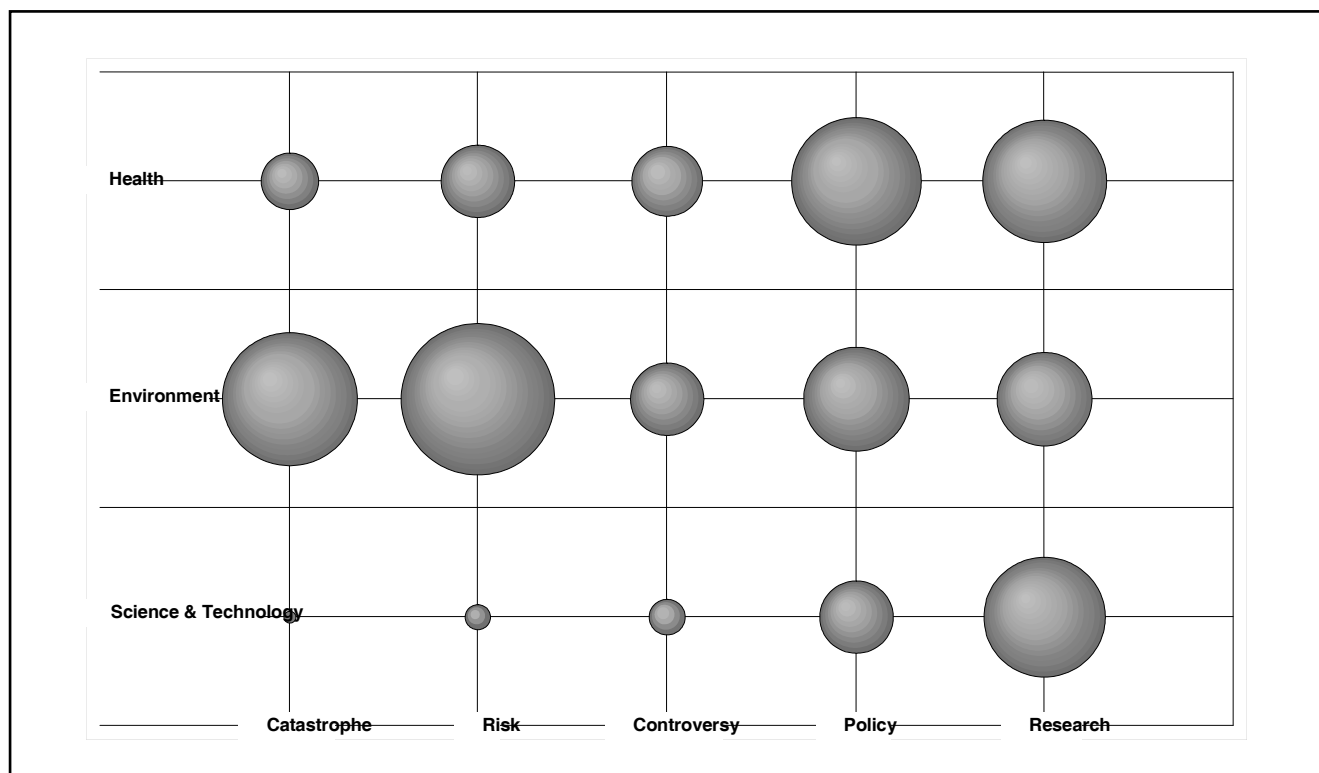
In other words, and as can be seen in figure 1, news items on health are fundamentally presented from a dual perspective in which issues of health policy and research predominate, with little presence of information on risks for health, controversy or situations of a catastrophic nature that affect health. On the other hand, information on environmental issues is presented by highlighting aspects of catastrophe and risk, with information on policies and research being secondary and with little information on the possible controversies that exist. Finally, news items on science and technology are totally different in nature: in this case, the information focuses on announcing advances in research and, secondly but at some distance, information related to scientific policy. The other three types of focus (controversy, risk and catastrophe) are practically non-existent.

Origin of the information: sources and territory

With regard to the study of the sources of information, among those news items where it has been possible to identify the origin apart from the owner (70% of the cases), the most present sectors are medical and administration, followed closely by the scientific and academic sector.

The news items with the medical sector as their main source of information focus fundamentally on the following subjects: success achieved by medical personnel pioneering therapies and advances in the area of research (“Dermatologists from Hospital Clínic have carried out a new study that facilitates the early detection of skin cancer”, “French surgeons commemorate the success of restorative surgery with a view to a second operation in China”), the holding of conferences or seminars on different health issues (“Celebration of the World Day Without Tobacco with

Figure 1. Distribution of the number of records on science and technology, environment and health, by news item focus



Source: author.

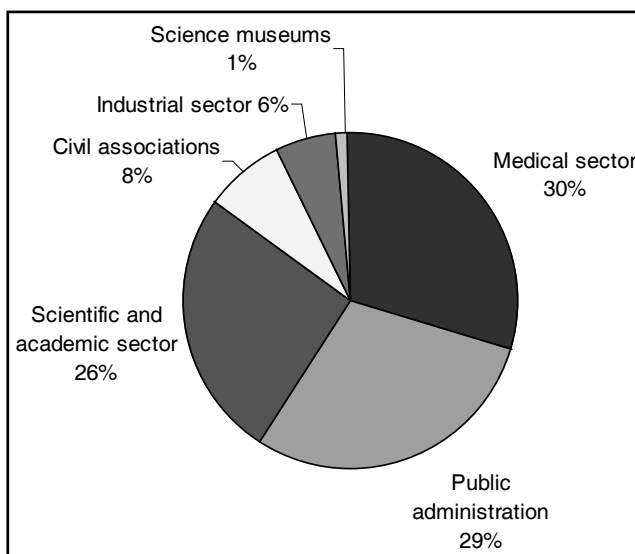
free treatments for giving up smoking”, “Celebration of the World Blood Donation Day, when it is reported that the number of donations has grown at the same rate as the population”) and, finally, controversies or problems resulting from the health system itself (“Paediatricians demonstrate in Barcelona against the Health Department’s plan to reorganise paediatrics”, and “20% of resident doctors in the Vall d’Hebron are foreigners because of the prestige of practical medical training in Catalonia”).

The news items whose main source of information are public administrations and institutions focus on information on public policies related to scientific research, health and preventing pollution provided by local authorities (“The department for Telecommunications and Information Society of the Generalitat is promoting training courses on new technologies”, “The Department of the Environment will extend the protected zones within the Natura 2000 European network”, “The Spanish parliament has approved the new medication act”) and international sources (“UNESCO is promoting a campaign in educational centres to raise awareness of the socially-aware use of water”, “Water resources are not within reach of everyone, according to a United Nations report”).

Close behind comes the third most mentioned sector, namely the scientific and academic sector (26%). In this case, the specific content of information is on discoveries and advances in research, development and innovation (“A team of European astronomers has discovered a planet very similar to Earth outside the solar system that might contain liquid water”, “A study carried out by European researchers reveals that aerosols for cleaning might cause respiratory problems or asthma”), conferences and congresses (“Celebration of the Spanish Computing Olympics at the UPC in Barcelona”) and institutional news items (“Inauguration of the Biomedical Research Park in Barcelona”).

On the other hand, civil associations are mentioned as a source of information in 8% of the news items on S&T. This is information on local initiatives or debates on controversial subjects (“Greenpeace denounces the illegal fishing of tuna”, “UNICEF is starting a campaign demanding the involvement of governments in the fight against the AIDS pandemic”). The industrial sector is mentioned in 6% of the news items, especially related to innovation, inventions or institutional news (“A company in Reus has invented the first

Figure 2. Distribution of the number of news items by the sector to which their sources of information belong



Source: author.

domestic security robot in the world”). Finally, science museums are mentioned in 1% of the news items.

Regarding the territory where the news item takes place, Catalonia is the most represented area, with 49% of the news focusing specifically on this territory. For its part, 35% of the cases are about international news items and 16% are from Spain.

Science “pushes in” to general programming

On average, the content on science and technology take up a higher percentage of general programming of the four channels analysed (TV3, K3/33, 8tv and BTV) in terms of the number of programmes or sections of programmes (records in our database) than news programmes. Specifically, this percentage was 9%, obtained from the programming grids provided by the TV channels themselves to the CAC, excluding only news programmes, which were analysed independently.

It can also be noted that the channels analysed dedicate different percentages of general programming to S&T content. So, including information on the weather, K3/33 dedi-

cated on average almost 20% of the total of its programming to S&T, while on TV3 this percentage is 10%. At the other extreme, BTV dedicated 4.2% of its total and 8tv, 1.7%. Notwithstanding this, this last observation must be taken with caution as the grids sent by 8tv and BTV had less detailed information than those from TV3 and K3/33 and this often made it impossible to know the content of programmes (e.g. while the autonomous community channels provided the title of films in their programming, in the case of BTV and 8tv this information was missing). This has meant that these channels are underrepresented in the overall calculation.

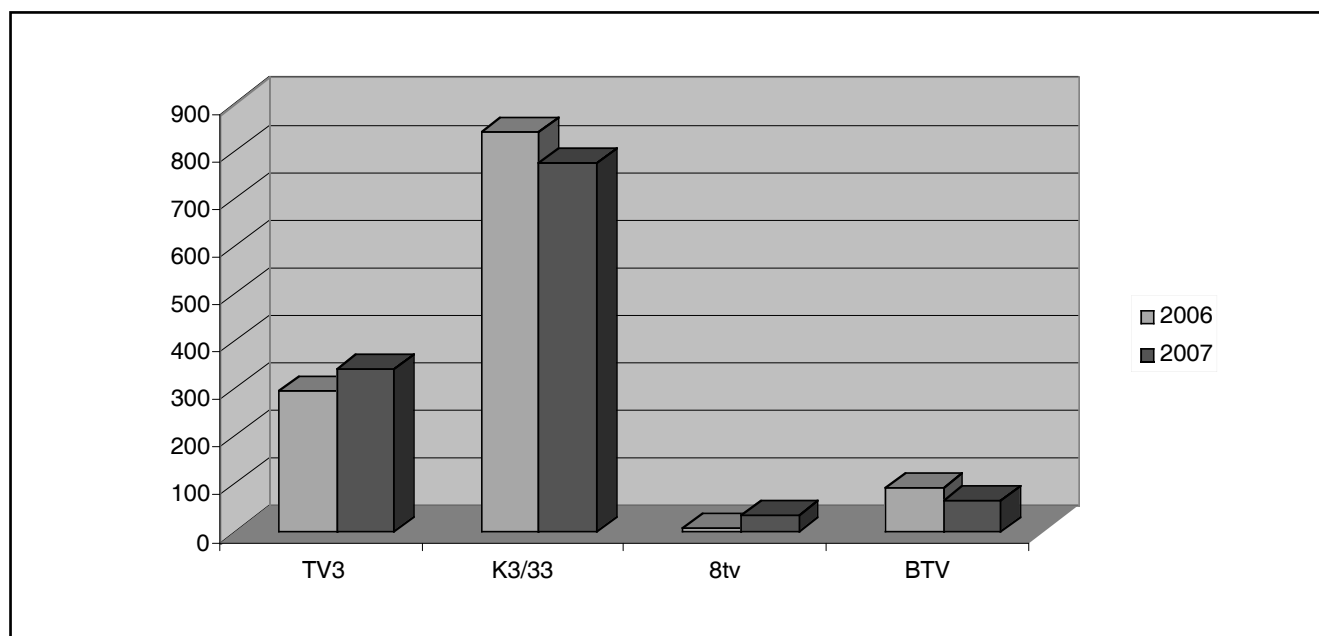
In comparing the number of records accumulated in the second quarter of 2007 with those from 2006, we can see that these fell by 0.5%. This variation, although minimal, contrasts with that corresponding to news programmes, where we can clearly see a rise in S&T content from one year to another. Also in this case there are differences between channels: K3/33 has been characterised by a re-

duction in the records of 7.6% between 2006 and 2007, while on TV3 the records rose by 13%. In this last case, in order to analyse correctly the data, the records had to be excluded that corresponded to information on the weather, as sometimes this was within the news programmes and sometimes separate (i.e. sometimes it is counted as independent records and sometime it isn't included in the calculation).

An analysis of the distribution of S&T content according to journalistic genre has shown that this type of content is presented to viewers primarily via "cultural and documentary" programmes (54%). The distribution by other journalistic genres is as follows: "infoshow/magazine", 10%; "weather information", 9%; "children's programmes", 9%; "news programmes", 8%; "series", 7%; "fiction" less than 3%, and "show" and "sports" less than 1%.

Also in this case, the distribution of records has been influenced by the characteristics defining the style of each

Figure 3. Breakdown of the number of records on S&T in the general programming grids by channel and quarter analysed (*)



Source: author.

(*) It should be noted that the programming grids sent by TV3 and K3/33 were much more detailed than those from 8tv and BTV, which has meant that the two latter channels are underrepresented.

broadcaster. For example, on K3/33 most of the programmes with S&T content are cultural and/or documentaries (*Quèquicom*, *Món salvatge*, *Thalassa*, *El jardí vivent*, etc.) or children's programmes (the cartoons on *Club Súper3* and *3x1.cat*). On the other hand, on TV3 the scientific content is distributed more uniformly among the different journalistic genres: most is found in "infoshow/magazine" type programmes (*Els matins*, *El club*, *TVíst*) and "news programmes" (*El environment*, *30 minuts*, *Ve de gust!*), secondly in "series" (*Star Trek Voyager*, *Around the World in 80 Days*, *Strong Medicine*) and, lastly, "fiction" films (*Anthrax*, *Matrix*, *Epicenter*), "children's programmes" and "cultural/documentary" programmes (*3.0*, *Tot un món*). In the part of Barcelona TV and 8tv's programming that has been possible to analyse, S&T is present in some cultural programmes (*Einstein a la platja* and *Tic Tac Web*), in the information on the weather and in some fiction films.

Some of the channels analysed have specialist S&T programmes. This is the case of *Quèquicom* on K3/33 and *Einstein a la platja* on BTV. On other occasions, these specialist programmes focus on more specific issues, such as the environment or nature. This is the case, for example, of the programme *El medi ambient* on TV3, and *Thalassa* and *Món salvatge* on K3/33. We should remember that, at the time of writing this article, the second part of our study, which includes a specific analysis of specialist programmes, has still not been finished.

An analysis of the distribution of records by geographic origin has revealed that 49.5% of the total programmes with S&T content were produced in Catalonia, 1.8% in Spain and 48.7% in the rest of the world. 30.7% of the total records last between 50 and 60 minutes (especially cultural/documentary programmes). 28.6% between 25 and 35 minutes (cultural programmes and sections of magazine programmes). 10% of the records last between 10 and 20 minutes (news and children's programmes) and 3% of the total last 5 minutes or less (in most cases information on the weather). Remember that each record corresponds to a programme or section of a programme (in the case that information from the programming grid or that contained on the channel's website has allowed us to identify the content of the different sections in a programme, especially in magazine and information type programmes).

Regarding the question of gender, the study has detected

that not only are most of the experts interviewed or taking part in different ways in the programmes speaking at some point on S&T subjects are men (82.1%), but also most of the presenters of these programmes are male (81.3%).

Nature, meteorology and health, the greatest presence in general programming

"Nature" is the area of interest most frequently covered (34%) among the records that go to make up the percentage of general programming that Catalan TV channels dedicate to S&T. The habits, lives and characteristics of animal species, ecology and natural catastrophes are among the most frequent themes in this area, especially covered in documentaries, in cultural programmes and cartoons. In second place comes "meteorology" (27%, in most cases brief programmes with information on the weather that accompany news programmes) and, in third place, the area of "medicine", biomedicine and quality of life (15%). This is a broad area, which more specifically includes, as the most frequent sub-theme, what we have called "medicine and quality of life" (especially issues to do with food, sexuality, some illnesses such as cancer, AIDS or heart problems and the health system itself). Secondly, by order of frequency, also included in the general programming are the sub-themes of "biomedicine" (transgenics, stem cells, genetics, cloning, assisted reproduction) and "psychology and health mental" (mental illness, addition to alcohol or drugs, social relations). The area of "medicine and quality of life" is present in several journalistic genres: it is the topic of debate in magazine programmes, as well as the context for series and films. The issues that go to make up the sub-theme of "biomedicine" and that, in general, are related to genetics and biotechnologies are also the source of inspiration for some of the films broadcast during the period of study.

Closely following medicine comes the "environment" (12%), including themes such as the lack of water, energy resources, conservation of land, climate change, pollution and global warming.

4% of the records deal with themes of "science fiction" or "information and communication technologies or ICTs", while 2% of the records are taken up with "exact sciences" and "other technologies".

Science and technology in a magazine programme

While carrying out the project, the role of non-specialist programmes in transmitting scientific and technological information aroused particular interest. In other words, although S&T information is not very abundant in news programmes, and specialist programmes are not very abundant either, it is true that magazine type programmes often deal with issues related to these subjects.

Specifically, we analysed the magazine programme *Els matins*, broadcast live from Monday to Friday, from 8 am to 1 pm by TV3. The programme is mostly dedicated to analysing political happenings and local news, is directed by Josep Cuní and presented by himself and also by Helena Garcia Melero – until February 2007 – and afterwards by Lúdia Heredia.

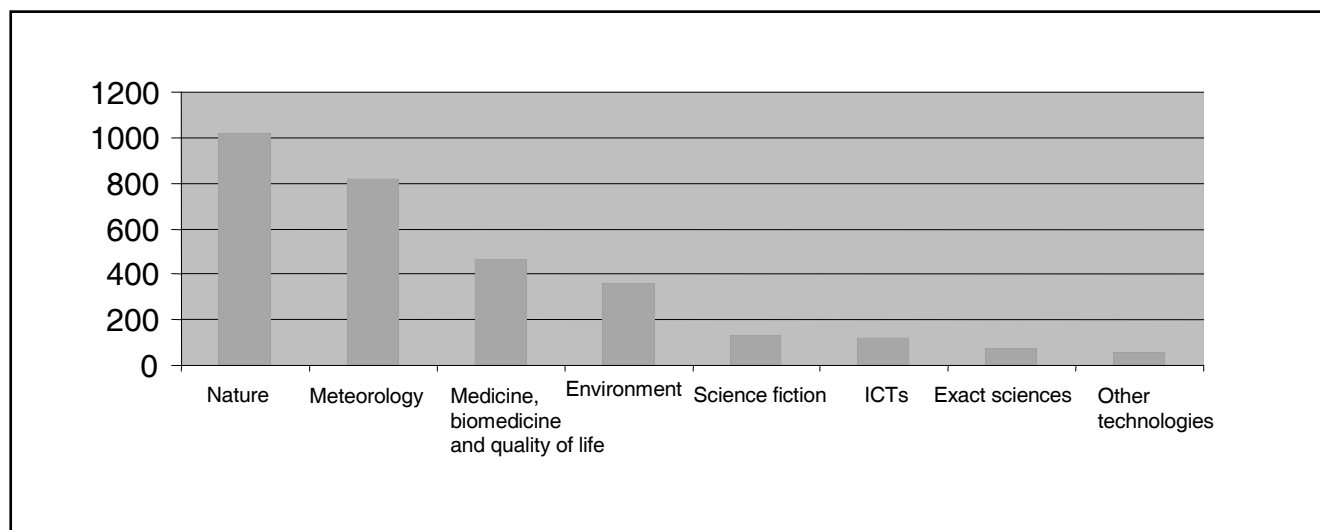
A sample of fifteen episodes was selected using the method of the week constructed between the total chapters broadcast in the period of study. Of these fifteen episodes, thirteen had at least one interview, debate, talk or face to face on themes of science, medicine, environment and/or technology. In this case, the most recurrent areas of interest were also “medicine and quality of life” and that of the “environment”.

The most important characteristic of the programme, in addition to its special attention on current scientific themes, consists of the wide range of people that take part in the debates most of the time. In the episodes analysed, debates were detected with up to ten people for the different sectors involved. This is the case, for example, of a debate on maternity (5 May 2006), in which seven mothers took part (worker, single adoptive, etc.), two representatives from civil associations and a gynaecologist. And the debate on recycling, with the participation of a scientist, two politicians, four citizens and three representatives from public institutions. In other words, in this kind of television format the sources of information do not only come from the area of science, medicine or administration but citizens themselves clearly take part in the debate, thereby bringing this format closer to the audience. This emphasis on proximity is also to be found in the themes chosen, which are everyday contemporary issues.

Conclusions

Firstly, as happened with earlier studies carried out in other geographical areas, our study concludes that the presence

Figure 4. Breakdown of the number of records by area of interest



Source: author.

of S&T content on news programmes on Catalan television channels is very limited in terms of the percentage of time dedicated to this area. Notwithstanding this, it is interesting to observe a significant rise in this percentage in the second quarter of 2007 compared with the same period in 2006. This observation, which might be due at first to the effect of the Year of Science 2007, is not entirely clear, as the number of news items that talked about activities as part of this cultural programme throughout 2007 is too small to justify the rise. On the other hand, the general programming has no increase when comparing 2007 to 2006, and we have even found a decrease, although this is not significant.

A new contribution provided by our study has been the analysis of the focus of news items according to the theme being covered. The focus on catastrophes surrounding information on the environment, with little concern for research or policies in this area, contrasts with the treatment given to news on science and technology, practically centred on talking about advances and achievements of research, a focus also of the news items on health, and sharing a great degree of interest, in this case, with information on health policies.

The study of the general programming by the geographical origin of the information, the formats in which it appears as well as the distribution of the “actors” has also been very valuable to understanding how the social representation of S&T is constructed. So research has allowed us to verify that, on the channels studied, the Catalan area dominates the territorial representation and, in second place, the international area, with a much smaller proportion coming from the rest of Spain.

Regarding the formats in which it is more usual to find S&T content, the study has confirmed that this depends very much on the channel. The clearest case is that of the autonomous community channels: while S&T appears particularly in cultural and documentary programmes on K3/33, on TV3 we might say that it “pushes in” throughout the programme, from magazine and news type programmes to films, cartoons and children’s programmes.

By gender, the study shows that women are not very visible, with less than one woman for every four men, both among the people interviewed and also among those presenting or directing the programmes that talk about S&T.

By sector, the most represented when talking about S&T

were the medical sector, administrations and the scientific sector, in this order, followed by the industrial sector, civil associations and science museums. This distribution, which is very similar in the news programmes, is significantly different in the magazine type programmes, where we see a greater representation of citizens and other groups. These data suggest that magazine programmes talk about S&T issues in a less technical format, closer to the audience and probably less “rigid”. But it is important to note that, in this format, the S&T content focuses more on the environment and medicine and quality of life, which are more familiar and everyday issues. It would be good to continue studying the role of this kind of programme in transmitting and receiving scientific information on the part of the public given that, to date, analyses have focused particularly on specialist or news programmes.

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Popularising science and technology on generalist radio

Maria Gutiérrez

■ *This article aims to show the impact of science and technology on the programming of Spanish and Catalan generalist radio. Based on an analysis of the programmes offered, we can determine the programming strategies applied at each broadcaster and/or channel and its treatment. Surely the homogenising trend of generalist programming is damaging the presence of this kind of specialist content, although the possibility of listening to the live programme online or downloading it as a podcast opens up new perspectives for the popularisation of science and technology.*

Keywords

Generalist radio, popularisation of science.

Introduction

The main consequence of the high degree of homogenisation on Catalan and Spanish generalist radio is the limited presence achieved by specialist content. This circumstance logically affects the popularisation of science and technology, although other causes can also be noted as a result of their own idiosyncrasies, such as the complexity of the issues likely to be covered and the essential training in this area that journalists must have in order to handle such themes.

In spite of the difficulties, scientific work has a social dimension that is fundamentally manifested in its application because research, in any sphere, looks to facilitate and improve the life of individuals and their environment. That is why broadcasters sometimes report on scientific discoveries in their radio news programmes or main news services and even might decide to extend this coverage to larger magazine programmes. In this way, what is new in this field is given the same journalistic treatment as political or economic news, i.e. the most outstanding facts are reported on from time to time. This action takes place within a context of the journalistic treatment of news that, as such, is governed by production criteria that are difficult to make compatible with the standards ruling the world of science. Popularisation requires the application of programme-based strategies that ensure science and technology are regularly present on the programming grids.

In order to produce this article, an analysis has been carried out of the programmes on offer that focus on issues of a scientific or technological nature on generalist Catalan radio stations (Catalunya Ràdio, COMRàdio, RAC1 and RNE-Ràdio 4) and also on Spanish radio stations separate local services (COPE, Onda Cero, Onda Rambla Punto

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Radio and SER) during the 2006-2007 season.¹ In the case of Spanish channels, broadcasts in MW and FM have been studied, given that other research has shown that radio broadcasters with two frequencies can present differentiated proposals on each, especially when broadcasting local programmes.

The objective of the analysis has been to determine the presence and treatment of this kind of content in the form of programme. The existence has also been taken into account of special sections in some magazine programmes that, although few in number, reveal different *modus* of approaching science and technology. At the same time, the information and availability has been studied of this kind of programme on the broadcasters' websites. In this way, we have studied the interest of generalist radio in this kind of content, the kind of journalistic treatment it receives and also some perspectives for the future.

Programming strategies

The role of generalist radio is fundamental for popularising science and technology, areas that affect citizens' lives in many different ways. Meeting the demands of a broad audience by offering a wide range of subjects based on the premise of general interest is the essence of their programming. However, the heterogeneity caused by the involvement of very different sectors in terms of interests and expectations can end up displacing subjects that, in spite of their interest to society, require listeners to have basic knowledge and journalists a high degree of specialisation.

In the 2006-2007 season, science and technology were tackled in specialist programmes on these areas and in fixed news sections, which do not enjoy a particularly outstanding presence in the generalist programmes offered overall. Certainly, they are less represented than other subjects, such as leisure, culture and style.

There are few programmes that opt to include and highlight fixed sections. But different ways are observed of tackling the issues:

- Training. The connection with the latest issues is the excuse to investigate any question and to highlight its influence on everyday life. This is the main argument of *Bocins de ciència* and *Dimarts ciència*. Both sections have the collaboration of specialists.
- Information. The latest research is the context for producing *Avances científicos* and *El CSIC en la SER*. In the first case, research is chosen while, in the second, a summary is provided of the week of the *Centro Superior de Investigaciones Científicas* (Higher Scientific Research Centre).

What is surprising, however, is the limited incidence of science on programmes specialising in health, given the close relationship between research and medicine. This situation ends up turning the specialist news programme *La salud en la SER*, into an exception. However, the absence of scientific and technological issues in these programmes is not only to be seen in the lack of fixed sections but also in the low presence of one-off information on congresses and research (GUTIÉRREZ, M.; HUERTAS, A. 2005).²

As shown in tables 1 and 2, the production of content concerning the world of science and technology is quite unequal in generalist radio programmes as a whole. Unlike other also minority subjects, programmes dedicated to spreading scientific knowledge and work are mostly located on public radio. Their presence on private radio is low and, in the season studied, was limited to one specific channel. Regarding the subjects covered within the programmes on offer, a certain balance is observed between a restricted conception, that would fundamentally focus on experimental and natural sciences, and a broader conception, which would add computing and telecommunications but which still seems reticent to integrate social and human sciences

1 The radio season does not correspond to a calendar year, as it starts in September and ends approximately in July the following year. The rest of the time summer programming is offered.

2 GUTIÉRREZ, M.; HUERTAS, A. *Presència i tractament del contingut sobre la salut en la programació de la ràdio generalista*. Research financed by the CAC. Available at <<http://www.cac.cat>>

Table 1. List of programmes specialising in science and technology. 2006-2007 season

Broadcaster	Programme	Main subject	Day and time broadcast	Coverage
Catalunya Ràdio	<i>L'internauta</i>	Internet	Saturday*:13.00 to 14.00	Catalonia
COMRàdio	<i>La Malla Ràdio</i>	Internet	Tuesday to Friday: 00.00 to 01.00	Catalonia
Ràdio 4	<i>L'observatori</i>	Science and technology	Tuesday: 20.00 to 21.00	Catalonia
Ràdio 4	<i>Què està passant? Versió 4.0</i>	Internet	Monday to Friday: 17.00 to 18.00	Catalonia
Ràdio 4	<i>Efectes positius</i>	Health and environment	Monday to Friday **: 11:00 to 12:00	Catalonia
Ràdio 4	<i>L'altra ràdio</i>	Radio and technology	Monday: 00.00 to 01.00	Catalonia
Radio 1	<i>El sueño de Arquímedes</i>	Science and technology	Sunday: 15.00 to 16.00	Spain
Radio 1	<i>Reserva natural</i>	Environment	Friday: 12.00 to 13.00	Spain
SER FM/OM	<i>La hora del siglo XXI</i>	Science and technology	Sunday: 07.30 to 08.00	Spain
SER FM/OM	<i>Ser digital</i>	Internet	Saturday: 16.00 to 16.30	Spain

* This programme is repeated on Sunday in the early hours of the morning (05.00 to 06.00).

** This programme forms part of the broadcaster's strategy to repeat programmes in the early morning slot (02.00 to 03.00) during this season.

Source: author.

Table 2. List of fixed news sections on science and technology. 2006-2007 season

Broadcaster	Programme	Section	Day and time broadcast / coverage
Catalunya Ràdio	<i>El Cafè de la República</i>	<i>Dimarts ciència</i>	Tuesday: 21.00 to 23.00 / Catalonia
	<i>Geografia humana</i>	<i>Bocins de ciència</i>	Monday and Sunday: 03.00 to 05.00 / Catalonia
SER FM/OM	<i>La salud en la Ser</i>	<i>Avances científicos</i>	Saturday: 16.30 to 17.00 / Spain
	<i>Ser curiosos</i>	<i>El CSIC en la SER</i>	Saturday: 04.00 to 06.00 / Spain

Source: author.

in the area of scientific communication.³ Certainly, its representation in this kind of programme is almost anecdotal.

The single-theme presentation is the dominant trend in treating science and technology on generalist radio, leading to an increase in some subjects to the detriment of others. It has also been observed that the programme genre of information has become the most suitable context for developing issues that are tackled in these products, given their complexity and the rigour with which they must be treated. With regard to its treatment, scientific knowledge is shown from its most practical perspective, i.e. highlighting its effect on everyday life in the short or long-term. Moreover, this media view re-establishes the researcher's role in society at the same time as highlighting the importance of investment in research.

Regarding location on the programming grids, a weekly frequency is the tendency followed by most broadcasters in the 2006-2007 season. However, with regard to the day and time of the broadcast, variety is the general tone, as the offer is distributed unequally throughout the week and this rules out direct competition.

The commitment of Catalan public radio to science and technology

In the 2006-2007 season, Catalan public radio was the one that dedicated most space to programming with this kind of content on its grids. Out of all the programmes offered on Spanish generalist radio, public stations also show their interest in these issues, while in private radio only the SER channel seems to be interested. This strategy is also the same in the case of special sections.

The fact that most programmes dedicated to science and technology belong to public radio is a circumstance that is difficult to appreciate in other kinds of subjects, such as travel, the rural world and health, mostly present on generalist radio. Even in the case of content on health, research

applied to medicine is relegated to second place to the dissemination of guidelines regarding the prevention and curing of illnesses, the main objective of this kind of programme. So scientific research and science popularisation are content that is generally assumed by public broadcasters, as found by the analysis of the radio programmes offered.

However, what might be the factors leading to this situation? On the one hand, commitment to society, given their public service nature and, on the other hand, the complexity of the subjects tackled that require specialist journalists acting as mediators, making the subjects more attractive and helping people to understand them. The first of these elements noted does not necessarily need to figure among the principles supporting the programming grids of private broadcasters, while the second is basically a question of profitability in terms of audience. In other words, the return on the investment required to have specialist professionals, via an increase in audience, is surely not immediate, and this is the fundamental goal of private radio.

Given these premises, the question is why does the channel SER, leader in audience ratings in Spain, have a different strategy? Based on the data provided by table 1, we can see that the programmes it offers focusing on scientific and technology content do not benefit from a time slot when a large number of listeners can congregate, a situation that extends to the fixed news sections. Profitability in these terms is therefore not the cause. Probably, the reasons can essentially be found in a structure and organisation based on the comprehensive management of content, which benefits programming as a whole. So specialist journalists take part both in the main news services and also direct and present a news report on science and technology.⁴

Regarding Catalan public radio, Ràdio 4 is the leading broadcaster in science and technology content. It has the largest number of programmes and subjects, while Catalunya Ràdio and COMRàdio limit their production to

3 HERNANDO CUADRO, L. A.; HERNANDO GARCÍA-CERVIGÓN, A. (2006) *Lengua y comunicación en el discurso periodístico de divulgación científica y tecnológica*. Madrid: Ed. Fragua.

4 This is the case of Javier Gregori, director and presenter of *La hora del siglo XXI*.

technology and specifically to those applied to the internet. However, the high index of programmes on Ràdio 4 contrasts with the crisis that, due to the restructuring of RTVE, impregnated the design of the programming grid for the 2006-2007 season. *Enigmes i misteris* disappeared, while *L'observatori* and *L'altra ràdio* were maintained and new programmes *Efectes positius* and *Què està passant? Versió 4.0* appeared, these two broadcast from Monday to Friday.

So, Ràdio 4 reacted by applying an alternative competitive strategy, increasing the production and realisation of content that, although present in the programming of other Catalan public radio stations, did not enjoy a significant presence. We should also add that this strategy continued to be applied in the 2007-2008 season. Quite the opposite to Radio 1 that, also affected by the restructuring, has transferred *Reserva natural* to the grid of Radio 5, a news broadcaster and has ended the production of new editions of *El sueño de Arquímedes*, keeping those programmes already broadcast as repeats on Radio Exterior de España and on the internet. Consequently, programmes of a scientific or technological nature have disappeared from the generalist programming of the RNE radio group at a state level.

Themes represented and their treatment

From the point of view of content, an analysis of the season 2006-2007 shows that content has been integrated within generalist radio programming grids via four different types of theme: internet, science and technology, environment and radio and technology. Each of these has its own particular case.

- **Internet.** All the Catalan public broadcasters, together with SER, have programming centred on communication technologies, emphasising particularly the internet and its environment. Apart from more technological issues, social aspects are also covered, either from the point of view of digital users and also via debate and reflection on the effects of digital technology. With the exception of *Què està passant? Versió 4.0*, constructed based on a more extensive treatment, the rest of the programmes

are defined as specialist news. With regard to format, *L'internauta*⁵ opts for single-themed conversations, investigating and reflecting, based on a specific issue, the strengths and weaknesses of the internet, while *La Malla ràdio* and *Ser digital* are structured as magazine programmes with differentiated sections. On these two programmes research is present when digital technology is the theme or when technology has been fundamental in developing a project in another scientific area. With this treatment, the role of communication technologies is highlighted and, specifically, the internet in scientific and social development. The approach of *Què està passant? Versió 4.0* is different to that of the other programmes, as it includes the perspective of leisure in the use of the internet.

- **Science and technology.** The three programmes that go to make up this area are based on the genre of information, each edition offering news from the week and investigating some more specific issues via interviews and reports. In all three programmes, the approach to the world of science and technology is focused on the consequences and benefits of the research presented for the individual and society. Moreover, information is provided on scientific work that has just started but that is of great interest due to the future repercussions of its conclusions. It should be noted that the approximate duration of these research projects figures among the data provided, an important aspect for the audience to understand the rigour of scientific method. It is quite habitual for researchers to be present connected with research centres and Spanish or Catalan universities as a source of information, explaining the nature of their projects or as a specialist helping people to understand some of the most outstanding scientific news of the week. Finally, but rather exceptionally, we should also mention the inclusion in *El sueño de Arquímedes* of a fiction, at the end of the programme, that adds a humorous note by recreating an impossible experiment or the process of creating a fantastic piece of machinery.
- **Environment.** From different but not contradictory points

5 *L'internauta* was born in 1995 thanks to the idea of journalist Jordi Vendrell. It is the first radio programme in Spain on the internet.

of view, nature becomes the backbone of the two programmes offered. *Efectes positius* is based on the proposal that the planet's health benefits its inhabitants and it therefore stresses the connection between wellbeing and the environment. *Reserva natural* emphasises the supervision and care of the countryside, asking questions that range from botany to gardening.

- **Radio and technology.** *L'altra ràdio*⁶ is the only programme that, based on radio, covers the area of telecommunications and audiovisual culture. From this perspective, radio broadcasting is observed from different angles, such as radio hams, history, weekly news and new breakthroughs in technology.

Producing content

Any specialised area at least requires the presence of a specifically trained journalist to produce the information, a process that involves the selection and treatment of the news items. Scientific and technology content does not escape this consideration. Firstly, their complexity can hinder comprehension on the part of listeners. Secondly, only training in scientific communication provides the tools to evaluate the social dimension of a scientific discovery, thereby avoiding sensationalism and also alarmism. In this respect, we cannot forget that generalist radio approaches the scientific area to tackle issues mostly related more or less directly to health and the environment, both subjects of maximum interest for individuals.

Another important aspect is the knowledge that a science journalist must have of the sources of information, essential to interpreting the facts from a researcher's perspective. In

this kind of information, professional rigour is the best method to avoid speculation. Consequently, a journalist must know the peculiarities of scientific production to understand that the significance of research findings being published in the journal *Nature* or *Science* is, transferred to journalism, the same as a news item being published by the BBC, CNN or *The New York Times* (ELÍAS, C. 2008, 89). Obviously, having a good agenda of good quality contacts enhances the quality of the subjects presented and their credibility.

Far from describing the curriculums of those in charge of the radio programmes described, an interesting relationship can be observed between their training and the kind of programme they direct.⁷ From this perspective, the categories of "science and technology" and "radio and technology" have professionals that, apart from their extensive careers as scientific popularisers, also have university degrees related to this field, as graduates in physics or technical engineers in telecommunications.⁸ With regard to the "internet", apart from an almost exclusive dedication to this subject as journalists, creators and managers of portals have also been found.⁹ In the case of the "environment", specialisation comes basically from continued journalistic work in this area.

Although the training of journalists is important, a connection with the scientific and technological world is a factor that must be taken into account when managing content. An analysis of the 2006-2007 season shows the presence of institutions and entities related to science and/or technology that have established various lines of collaboration with some of the broadcasters involved. These agreements naturally facilitate the production of the programmes as, on the one hand, they have provided their

⁶ *L'altra ràdio* started in the 1982-1983 season, broadcast by Ràdio 4. In season 2006-2007, the Catalan Federation of Telecom Installation Companies (FECEMINTE) gave it an award for having popularised the subject. For more information, visit <<http://www.altraradio.cat/>>.

⁷ These data come basically from the information provided by the broadcasters' websites.

⁸ Ángel Rodríguez (*El sueño de Arquímedes* on Radio 1) is a physicist, as well as a scientific populariser. Cinto Niqui (*L'altra ràdio* on Ràdio 4) is a technical engineer in telecommunications, specialising in image and sound.

⁹ Mònica Lòpez (*Digitals* on COMRàdio) is in charge of the section of the same name for the e-zine www.laMalla.net. Vicent Partal (*L'internauta* on Catalunya Ràdio) created in 1994 the first news system on the internet entitled *El Temps Online* and is currently director of *Vilaweb*.

own themes and, on the other, they have ensured the participation of involved and hyper-specialised sources of information.

In some cases, these contributions are made due to the desire of the institutions and centres to disseminate the projects and activities they are carrying out. The most paradigmatic case is that of *L'altra ràdio*, which enjoys, thanks to this formula, a significant and broad range of permanent collaborators closely related to radio broadcasting, such as the Catalan Association of Distance Learning, Xenomedia, the Association of Radio Listeners of Barcelona, among others. With regard to the programme *L'observatori*, participation has been achieved via an agreement with Barcelona University (UB). An analysis of the programme shows the UB's participation in most of the issues covered: projects, congresses, seminars, etc. as, logically, the sources of information in general come from the university itself. Another model is the programme *Ser curiosos*, which has signed an agreement with the CSIC (Higher Centre of Scientific Research) for its communication department to produce a section summarising the week's activities and looking into some of them by interviewing a researcher involved.¹⁰ Another form of collaboration is that represented by *La Malla Ràdio*, a radio version of the "Digitals" section of the online newspaper www.lamalla.net, via Xarxa Audio-visual Local (XAL), a public body created by the authority for the province of Barcelona. With this strategy, the broadcaster places its facilities at the disposal of a production team, while the electronic publication is responsible for managing the content.

Profitability in audience terms: new ways of consuming radio

Spanish and Catalan generalist radio are still building their programming grids based on two or three genres structured around long-lasting programmes combining different themes. This strategy, as has been mentioned, leaves little

space free for other, more specialised types of proposal that, with an attractive treatment, might awaken interest in different kinds of target. However, analogue radio broadcasting in residual time slots limits their impact, although, due to their characteristics, congregating a large number of listeners does not figure among their main objectives.

These current circumstances on analogue radio are changing with the development of the digital environment that, among others, is altering the relationship between broadcaster and listener. The use of an *a la carte* system that enables the personalised management of reception depending on the particular interests of the audience is merely the first step. Naturally, this new form of broadcasting content broadens the radius of coverage of any product, to date limited by the broadcaster's licence and the power of radio masts. That is why an analysis of what is on offer on the radio must increasingly analyse what is also available on the internet.

With regard to the specialist content in science and technology analysed and its availability online, all can be received live or online. This characteristic is common to all the broadcasters studied. However, the offer is more limited with regard to podcasts and *a la carte* radio.

Although Ràdio 4 is the broadcaster with the largest range of programmes on scientific and technological subjects, it is also the least developed in terms of online dissemination. The critical situation experienced by the broadcaster throughout the 2006-2007 season has undoubtedly influenced the development of its corporate website. One year later, Ràdio 4 continues to work on improving its resources online and, at present, listeners can have a podcast of *Què està passant? Versió 4.0* and *L'altra ràdio*. For the latter, users can also access it via its own website.¹¹ The circumstances affecting *La hora del siglo XXI* are different. Although it has its own broadcasting and production team, it does not figure as a programme on the channel's grid but appears as a space within the news programme *Matinal SER* at the weekend. This connection turns it into a section of a news programme that, as such,

¹⁰ For more information see <http://www.csic.es/csic_ser.do>

¹¹ <<http://www.altraradio.cat/>>. Consulted 7/10/2008.

Table 3. Radio programmes specialising in science and technology with podcast edition. 2006-2007 season

Broadcaster	Programme	Podcast	Other information
Catalunya Ràdio	<i>L'internauta</i>	www.catràdio.com	Programme description
COMRàdio	<i>La Malla Ràdio*</i>	www.comràdio.com	Programme description
Ràdio 4	<i>L'observatori</i>	-	Programme description
Ràdio 4	<i>Què està passant? Versió 4.0</i>	-	Programme description
Ràdio 4	<i>Efectes positius</i>	-	Programme description
Ràdio 4	<i>L'altra ràdio</i>	-	Programme description
		www.altraràdio.cat	Programme description and other documentation. Has internal and external links.
Radio 1	<i>El sueño de Arquímedes</i>	www.rne.es	Programme description
Radio 1	<i>Reserva natural</i>	www.rne.es	Programme description
SER FM/OM	<i>La hora del siglo XXI</i>	-	Programme description
SER FM/OM	<i>Ser digital</i>	www.cadenaser.com	Programme description

* At www.lamalla.net you can find the subjects presented on the radio programme with a different audio treatment and complementary written information.

Source: author.

does not form part of the podcasts offered.

The rest of the programmes can be downloaded as a podcast via the corporate websites that also offer a general description of the programme's characteristics. Other types of exploitation are therefore omitted, such as complementary information for the issues dealt with in each programme, drawing up a list of external links, among others. With regard to the sections, the situation basically depends on the strategy applied by the broadcaster. For example, the special sections on Catalunya Ràdio can be downloaded independently once the radio programme they belong to has been accessed. Regarding those of the channel SER, the mechanism is different in each case, as

while *La salud en la SER* is offered as a podcast, the programme *Ser curiosos* isn't. Its section, the result of an agreement with the CSIC (Higher Centre of Scientific Research) can be downloaded from its website, which has a section called *El CSIC a la SER*.¹²

Without doubt, the possibility for listeners to get the programme or even a section and to listen to it when they want widens the radius of action of the broadcaster in many respects. Firstly, it makes available those programmes that, due to the time they are broadcast, may be inconvenient to listen to. In this respect, the corporate website should allow simple access to content with suitable indications and precise information, a situation that is not always the case.

¹² Available at <http://csic.es/csic_ser.do> Consulted 17/03/2008.

Secondly the investment in producing specialist programmes can be recovered based on the impact on the internet, although, at present, there is no homogenised system to measure audiences that can be used to evaluate the use made of *a la carte* radio on the internet. Thirdly, online radio can facilitate the inclusion of listeners who, *a priori* would not be interested in tuning in to listen, such as young people.

Some final considerations

The popularisation of science and technology must be framed within the sphere of public service, as its activities have a very direct effect on people and the planet. We should highlight the role played by Catalan public radio but we must also continue to insist on the consequences of the digital environment on media consumption habits. In this respect, public radio must apply programming strategies that not only allow the inclusion of products designed for broadcasting this kind of content but also they must be available *a la carte*.

The signing of agreements with research entities and centres obviously facilitates content production. However, even in these cases broadcasters must make sure of maximum profits. This seems difficult based on their current location on the programming grid. It is therefore necessary to demand the exploitation of podcasts, an ideal method to avoid the tyranny of timings and frequencies that make it difficult to hear these programmes. But moreover, and with the objective of training and interesting the listener, advantage must be taken of the internet's possibilities to produce complementary information in other formats.

Although it is true that the presence of programmes specialising in scientific and technological content is limited in the programmes offered by generalist radio, there is even less attention paid to human and social sciences. This consolidates the idea that only subjects related to pure and experimental science warrant the title of 'science', apart from technology. Research into aspects related to the social dimension of individuals deserves media attention via its natural inclusion in the programmes offered to popularise science and technology.

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Independent television production in Catalonia in a changing market

David Fernández Quijada

- *The aim of this article is to analyse, from the point of view of the industry, the situation of independent television production in Catalonia in the seasons 2004/2005 and 2005/2006. In the second of these seasons, two new television channels appeared that have had a vital effect on the demand for independent production, from which Catalan companies benefit directly. The article reviews the volume of independent production in Catalonia and the turnover of the main companies, as well as the presence of media groups in this area. Finally, the main markets for this production are analysed, as well as the role played by Televisió de Catalunya within this context.*

Keywords

Independent production, structure of the audiovisual system, cultural industries.

The growth experienced over the last few years by the audiovisual industry has been parallel to the rise in the number of companies involved and their diversification. One of the fields where this expansion has been most clearly reflected is in production for television. The market for independent production largely depends on the status and evolution of TV channels. Consequently, 2005 seemed to be a good time: in July, the Spanish government was changing the conditions for granting a licence for a state-wide analogue channel to Sogecable¹ and an extremely subscriber-only channel like Canal + was going to broadcast openly under the brand of Cuatro. At the same time, the same government opened the door to a new state-wide analogue channel (in spite of coverage problems) which it awarded² before the end of the year to Gestora de Inversiones Audiovisuales La Sexta, operating since then under the commercial name of laSexta. All these concessions were also reflected in the corresponding map of terrestrial digital television or TDT.

This change in the conditions of the Spanish market led to an immediate rise in demand for independent production

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1 Resolution of 29 July 2005, of the Secretary of State for Telecommunications and for the Information Society, publishing the Agreement of the Council of Ministers of 29 July 2005, amending the licence contract with Sogecable, S.A. for the provision of the public service of television (Official State Journal no. 181 of 30 July 2005).

2 Resolution of 30 November 2005, of the Secretary of State for Telecommunications and for the Information Society, publishing the Agreement of the Council of Ministers of 25 November 2005, resolving the public tender for awarding a licence to operate the public service of television under the regime of open broadcasting, held by the Agreement of the Council of Ministers of 29 July 2005 (Official State Journal no. 301 of 17 December 2005).

from the channels, in either of the two types of production available (Bustamante 1999): 'associated production' between channel and producers, which delivers a finished product to the former based on established conditions, and 'financed production', i.e. the producer makes use of the infrastructures, technical resources and largely also the human resources of the television channel in question. This definition of independent production excludes spheres such as telefilms, considered as co-production.

This article takes a preliminary look at the main Catalan producers for television based on data on independent production in television channels covering Spain and also those covering the autonomous regions, provided in the annual reports of the Audiovisual Communication Studies Office (GECA in Spanish).³ Data are used from the seasons 2004/2005 (Pérez Ornia 2006) and 2005/2006 (Pérez Ornia 2007), excluding re-broadcasts, allowing us to evaluate how the appearance of these companies has affected Catalan producers. They are therefore characterised based on the volume of hours of production, while data have also been obtained from the commercial Register⁴ on turnover and the degree of independence. Finally, the main markets for these companies are determined, relating the producers and the buyers via a social network analysis (SNA). The text concludes with a review of the role played by Televisió de Catalunya (TVC) as the main television company in Catalonia.

Supply and suppliers

An analysis of the two seasons under study shows significant presence of Catalan producers in the Spanish TV market. In 2004/2005, 24 companies (14.37% of the total) produced 2,487.93 hours (13.79%). One year later, 36

producers (20.34%) were responsible for 3,208.33 hours (16.52%) (Table 1). We can therefore see a quantitative jump in the presence of Catalan firms in the sector: the number of producers grows by 50% and hours produced by 28.95%, a much larger increase than perceived in general in the Spanish market, with growth rates of 5.99% in the number of producers (from 167 to 177) and of 7.83% in the volume of hours (from 18,043.11 to 19,455.42). It is no exaggeration to classify this increase as spectacular, verified by a third measurement: the number of programmes in which Catalan producers were involved grew by 58.41% and went from 56.5 to 89.5.

An analysis of the data provides a result of a total of 42 different producers, of which only 18 appear in both seasons. Variety is the dominant feature of this list, made up basically of small producers and, to a lesser extent, by larger companies, of note being Gestmusic and Mediapro, which together produced more than half the total hours: 58.10% in 2004/2005 and 53.37% one year later. They also lead the field in terms of number of programmes, as the former totalled 13 in 2004/2005 and 11 the following season, while Mediapro went from 8 to 21, a growth of 162.5% which is largely related to the 10 programmes it produced for laSexta, in which it holds an interest. By number of programmes, in season 2004/2005 there is another shareholder from the same channel at the top of the ranking, El Terrat (4.5), as well as Cromosoma (4) and La Productora (3). One year later, after Mediapro and Gestmusic, come El Terrat (8), La Productora (5), Media 3.14 (5), Cromosoma (3), Diagonal TV (3) and Aruba (3).

If the sector is evaluated in terms of operating income (Table 2), no significant changes are noted between the main companies. In 2006, Mediapro exceeded 200 million euros in turnover but, in its case, it's difficult to know what

3 GECA's data come from the measurements of Taylor Nelson Sofres and refer to programmes broadcast between 06.30 and 02.30, including container programmes and excluding those lasting less than fifteen minutes. GECA also obtains information on producers concerning the allocation of each programme. As a reliability test, the data for Televisió de Catalunya have been compared with the information provided annually by the channel in its annual report. Some of the programmes mentioned by GECA do not appear on TVC's lists but the number of independently produced programmes listed by TVC is still higher than those listed by GECA. In any case, this is the only source available that allows us to make comparisons within the context of Spain. The information provided based on these data must therefore not be read in terms of absolute numbers but as trends.

4 The commercial Register was accessed via the Iberian balance sheets analysis system (SABI in Spanish) of Bureau van Dijk.

Table 1. Catalan producers by market share

2004/2005					2005/2006				
Producer	No.	Hours	%		Producer	No.	Hours	%	
Gestmusic	13	790,48	31,77	1	Gestmusic	11	869,08	27,09	
Mediapro	8	655,18	26,33	2	Mediapro	21	843,27	26,28	
El Terrat	4,5	229,12	9,21	3	El Terrat	8	276,42	8,62	
Diagonal TV	2	126,77	5,10	4	Diagonal TV	3	276,15	8,61	
Somos Som	2	94,32	3,79	5	Aruba	3	157,63	4,91	
Cromosoma	4	89,32	3,59	6	La Productora	5	111,72	3,48	
Produccions Quart	1	84,33	3,39	7	Notro Films	2,5	99,23	3,09	
La Productora	3	60,55	2,43	8	Produccions Quart	1	91,60	2,86	
Rumbo Sur	1	56,90	2,29	9	Media 3.14	5	88,03	2,74	
Multimedia Lua	1	56,85	2,29	10	Turruá Llacer	1	48,50	1,51	
Selectavisión	1	54,92	2,21	11	Cromosoma	3	45,07	1,40	
Drimtim	1	44,93	1,81	12	Benece Produccions	2	38,37	1,20	
Benece Produccions	0,5	30,00	1,21	13	Rumbo Sur	1	36,52	1,14	
Media 3.14	2	17,58	0,71	14	D'Ocon Films	2	24,95	0,78	
Arriska S.L.	1	15,08	0,61	15	Triacom	1	21,68	0,68	
Ovideo TV	1	15,03	0,60	16	Rodar y Rodar	1	19,62	0,61	
Centre Promotor de l'Imatge	2	14,70	0,59	17	Paral·lel 40	1	19,35	0,60	
Trivideo	2	9,78	0,39	18	Somos Som	1	18,40	0,57	
Companyia T de Teatre	1	9,68	0,39	19	Arriska	1	16,08	0,50	
Aurea Documentary	2	7,15	0,29	20	Companyia T de Teat re	1	15,07	0,47	
DTV	1	6,92	0,28	21	Neptuno Films	1	13,42	0,42	
L'Avern	1	6,67	0,27	22	On TV	1	12,77	0,40	
LUK	1	6,48	0,26	23	Sargantana Voladora	2	9,83	0,31	
Paral·lel 40	0,5	5,17	0,21	24	Sagrera TV	1	9,03	0,28	
				25	M.I.C.	1	8,58	0,27	
				26	Fair Play	1	7,70	0,24	
				27	Trivideo	1	5,37	0,17	
				28	Cancuca	0,5	5,32	0,17	
				29	Veranda TV	0,5	5,32	0,17	
				30	Selectavisión	1	3,20	0,10	
				31	Utopic TV	1	2,52	0,08	
				32	L'Avern	1	2,37	0,07	
				33	Sofa Experience	1	2,23	0,07	
				34	Aurea Documentary	1	1,40	0,04	
				35	Bausan Films	0,5	1,28	0,04	
				36	Porta Gaset	0,5	1,28	0,04	
TOTAL	56,5	2.487,90	100		TOTAL	89,5	3.208,33	100	

Source: author, produced from GECA data.

part of this total corresponds to the production of TV programmes, as the same company carries out many different activities related to audiovisuals. In any case, it and Gestmusic once again lead the field, with a rising income, particularly substantial in the case of Mediapro, which between 2005 and 2006 almost quadrupled its revenue. To these figures we must also add those of its subsidiaries, some of which (Diagonal TV and Ovideo TV) also appear among the top earners. Once again the figures for El Terrat are also of note, tripling its income between 2004 and 2005.

With regard to the location of all this production, most of the producers identified have their offices in the city of Barcelona. In general, those outside the city itself are located within the metropolitan area. The most significant are Mediapro and Media 3.14, located in the Imagina building in Esplugues de Llobregat (just outside the city of Barcelona), where the company of Alfons Arús also has its head offices, Aruba Producciones. This building, which concentrates a large number of audiovisual firms, among others the TV channel laSexta, is very near to the facilities of TVC in Sant Joan Despí and the old studios of Mediapark, in an area where DTV had its head offices and where some of the programmes by other producers were recorded, of the importance of Gestmusic

and El Terrat, for example. Other companies are further away and have their offices in La Roca del Vallès (Utopic TV) or Terrassa (Neptuno Films). Only one, Porta Gaset, was located outside the province of Barcelona, specifically in Lleida.

A truly independent sector?

Generically, we talk about independent production because it is understood that it is an activity separate from the subsequent dissemination carried out by the TV channels. In many cases, however, we should be more precise with our use of adjectives, as it could lead to confusion. Firstly, because independence is relative when producers are vertically integrated with TV channels, as is the case in Catalonia with Mediapro and El Terrat, shareholders in laSexta. Secondly, because independence from a TV channel does not automatically grant autonomy for the producer, which in many cases defines its strategy in line with the media group it belongs to. In the Catalan case, various examples can be detected:

- The group Imagina, created from the merger between Grupo Árbol and Mediapro, is present via five different

Table 2. Main Catalan producers by volume of turnover (millions of euros)

No.	Producer	Legal name	2004	2005	2006
1	Mediapro	Mediaproducción S.L.	48,78	55,48	204,02
2	Gestmusic	Gestmusic Endemol S.A.	53,79	62,25	73,56
3	El Terrat	El Terrat de Produccions S.L.	11,57	33,12	37,15
4	Notro Films	Notro Films S.L.	0,21	4,17	20,01
5	Diagonal TV	Diagonal Televisió S.A.	9,06	12,80	17,23
6	Ovideo TV	Ovideo TV S.A.	16,80	13,62	16,05
7	LUK	LUK Internacional S.A.	13,28	8,25	9,82
8	On TV	Zeta Audiovisual S.A.	0,00	4,92	7,91
9	Cromosoma	Cromosoma S.A.	9,75	7,74	6,06
10	Drimtim	Drimtim Entertainment S.L.	0,14	2,44	5,84

Source: author, produced from SABI data.

producers:

- Mediapro: the parent company, and dedicated to different activities in the field of audiovisuals, it was the second producer in number of hours broadcast, almost 1,500, with a total of 25 different programmes on 9 different TV channels.
- Media 3.14: totalled more than 100 hours in the two seasons, although its presence was quantitatively greater in the second season, especially as a supplier for Cuatro with programmes such as *Callejeros*, *Cuarto milenio*, *El especialista* and *Benidorm*.
- Ovideo TV: only appeared in the first season analysed, responsible for 15 hours of a single programme, *La memòria dels cargols* (TV3).
- Trivideo: another fifteen hours throughout both seasons and two programmes, *Mira i voràs* (Punt 2) and *Trilita* (TV3).
- Triacom: 10% owned by Mediapro, it appears on the lists for season 2005/2006 as responsible for *Cuina x solters* (TV3).
- Endemol: the leading independent European producer, of Dutch origin, controlled during the two seasons under study by the Spanish group Telefónica and currently owned by a consortium made up of the Italian company Mediaset, its Spanish subsidiary Telecinco, the bank Goldman Sachs and the company Cyrté, in which one of its founders participates, John de Mol.⁵ In Catalonia it had two subsidiaries, Gestmusic Endemol and Diagonal TV:
 - Gestmusic: leader in volume of hours produced during 2004/2005 and 2005/2006, with more than 1,600 shared among eight channels. Notable audience rating successes with *Operación Triunfo* (Telecinco), *Crónicas marcianas* (Telecinco), *Mira quién baila* (La Primera) and, in the Catalan area, *Veterinaria* (TV3).
 - Diagonal TV: 65% owned by Endemol, for the two seasons under study it produced more than 400 hours of programmes, such as *Ventdelplà* (TV3), *Amar en tiempos revueltos* (La Primera) and *De moda*, a series whose production also involved other channels that broadcast the programme, such as Canal 9, Telemadrid and ETB2.
- Grupo Zeta: one of the most important Catalan media groups, it has an audiovisual subsidiary, Zeta Audiovisual, which in the field of production operates under the commercial name of On TV. Its position was highly minority, as it only appeared in the second season analysed, producing a single programme, *Tele Objetivo* (La Primera), with a total duration of 12 hours.
- Lavinia: the group presided over by Antoni Esteve controls La Productora (now rechristened as Lavinia Productora), thereby starting operations in the areas of technology for television, local television services, auxiliary services, interactive communication, etc. All its productions were broadcast by Televisió de Catalunya (TVC), such as *La cuina de l'Isma* and *Sexes*.
- Boomerang TV: over the last few years this company, based in Madrid, has become one of the main producers in Spain via its parent company and a series of subsidiaries that it has gradually set up on the basis of a strategy of regionalisation, via which it has established itself in several autonomous regions, such as Catalonia, in this case with Veranda TV, a company founded in 2006 and which, in that year, participated in the production of *Polònia* (TV3) together with Can Cuca.
- Edipresse: via its Spanish subsidiary, Edipresse Hymssa, this Swiss group had a holding in the producer Multimedia Lua, presided over by Manuel Campo Vidal. This producer was responsible for the programme *Generación XXI* broadcast by several autonomous channels. At the time this study ended, at the end of 2006, the merger between Edipresse Hymssa and the publishing group RBA had also affected its control over Multimedia Lua,

5 "Telefónica vende Endemol al consorcio de Mediaset por 2.629 millones", *El País*, 14 May 2007.

<http://www.elpais.com/articulo/economia/Telefonica/vende/Endemol/consorcio/Mediaset/2629/millones/elpepueco/20070514elpepueco_5/Tes> (last consulted: 10 June 2008).

6 "RBA y Edipresse se unen para crear el mayor grupo de revistas de España", *El Mundo*, 28 November 2006.

<<http://www.elmundo.es/elmundo/2006/11/27/comunicacion/1164650586.html>> [last consulted: 14 June 2008].

which passed into the hands of the new company.⁶

To these media groups we should also add a seventh, Vértice 360^o: born at the end of 2006 (and therefore after the data in our analysis) around the telecom and IT group Avanzit. This company controlled the Barcelona producer Notro Films, which appeared in the second season analysed with almost 100 hours of content broadcast.

In total, in 2004/2005 the Catalan producers belonging to media groups produced 1,732.22 hours, or 69.62%. In the following season, the number of hours increased to 2,233.39, accounting for 69.61%, which did not include the percentage of Notro Films, as it was not a formal part of a group at that time. So the market share available for producers organically independent from groups remained at around 30%.

In spite of this significant presence, most of the producers identified are really independent and go to make up a sector that could be characterised by its atomisation. The great exception to this rule is El Terrat, ranked among the most important producers in Catalonia (and in Spain as a whole) without compromising its independence in terms of share ownership.

The markets for Catalan production

The ranking of channels buying from Catalan independent production varies quite a lot between 2004/2005 and 2005/2006, the season in which the two new companies appearing on the free-to-view Spanish TV scene became important, Cuatro and laSexta (Table 3).

In both seasons, a great demand can be observed on the part of state-wide television companies, especially Telecinco and Antena 3 TV in the first season and Cuatro and La Primera in the second. TV3 remains in third position in number of hours but leads in number of programmes, which rises almost 50% between the two years (from 19 to 28). As already mentioned, the growth in the number of total hours is very large (727.02) but it is a lower figure than the 986.38 hours broadcast by the two new channels on the market, Cuatro and laSexta. In their first (incomplete) season, they already accounted for 30.68% of all Catalan independent production.

The appearance of these two companies involved significant reductions in the number of hours (and slightly in the number of programmes, from 13 to 11) bought by Telecinco and Antena 3 TV, who stopped broadcasting 239.99 and 205.17 hours respectively, with percentage losses of 44.59% and 48.93% compared with the volume for 2004/2005. In absolute figures, however, the biggest loss was for Canal Sur, which in 2004/2005 was the fourth buyer with 344.93 hours corresponding to three different programmes (*Me lo dices o me lo cuentas*, by El Terrat, *Generación XXI* by Multimedia Lua and especially *Andalucía directo* by Mediapro) and which didn't broadcast a single minute of Catalan production in the following season. In general, losses can be seen in sales to autonomous community TV channels outside Catalonia, among which only Castile-La Mancha Televisión (CMT) increases, while other clients such as Canal Sur Televisión, Televisión de Galicia and Televisión de Canarias disappear.

Apart from the new buyers, on the positive side for producers we must also count the rise in hours broadcast by La Primera and TV3. The former rose 463.18 hours, totalling 609 (+317.64%) and the latter rose 174.73 hours, totalling 545.93 (+47.07%).

If we group together the markets for Catalan independent productions, we can see that most are concentrated in state-wide television companies: 50.94% in the first season and 71.50% in the second (graph 1). TVC broadcast around a fifth of the total production, while the different autonomous community markets (those of autonomous public TV channels belonging to FORTA) fell drastically in the second season, analysed both in terms of volume and in the number of channels. If in 2004/2005 Catalan productions were premiered on 9 TV channels from 7 different autonomous communities, in 2005/2006 this figure fell to 5 channels from 4 communities. In terms of percentage of hours, this goes from 30.20% to 7.40%, approximately one quarter.

A more accurate analysis of the data is provided by the social network analysis (SNA) methodology, which attempts to establish relations between different elements of a system. In this case, Catalan producers and television companies at the level of state and autonomous region. With the UCINET 6 programs (Borgatti, Everett, Freeman, 2002) and based on the specifications contained in Fernández Quijada (2007), first a matrix of independent producers and TV

Table 3. Destination of Catalan independent production

2004/2005				2005/2006				
Channels	No.	Hours	%		Channels	No.	Hours	%
Telecinco	5	538.17	21.63	1	Cuatro	14	630.28	19.60
Antena 3 TV	8	419.30	16.85	2	TVE-1	9	609	18.94
TV3	19	371.20	14.92	3	TV3	28	545.93	16.98
Canal Sur	3	344.93	13.86	4	laSexta	12	356.10	11.08
CMT	2	184.68	7.42	5	Telecinco	6	298.18	9.27
La 2	6	164.12	6.60	6	Antena 3 TV	5	214.13	6.66
TVE-1	4	145.82	5.86	7	La 2	6	192.72	5.99
K3/33	4	98.02	3.94	8	CMT	2	192	5.97
Punt 2	3	57.47	2.31	9	K3/33	11	131.15	4.08
ETB2	2	40.98	1.65	10	Punt 2	2	16.17	0.50
TV Canaria	2	34.13	1.37	11	Canal 9	2	13.77	0.43
ETB1	1	31.13	1.25	12	ETB1	1	9.72	0.30
Telemadrid	2	27.78	1.12	13	Telemadrid	1	5.77	0.18
Canal 9	1	19.42	0.78	14				
Televisión de Galicia	2	10.75	0.43	15				
TOTAL		2,487.90	100		TOTAL		3,214.92	100

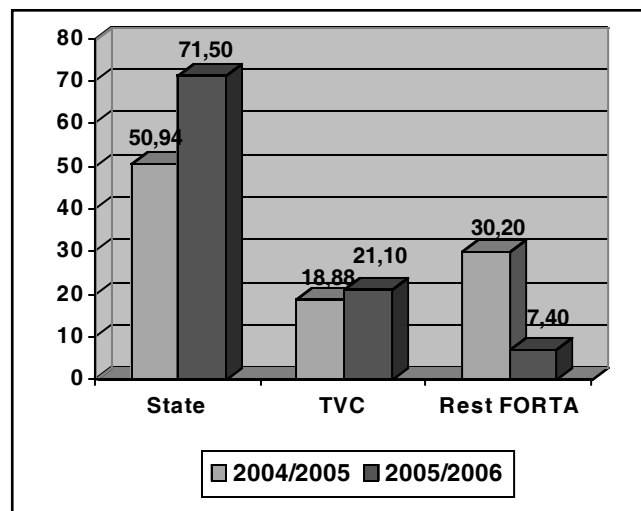
Source: author, produced from SABI and GECA data.

companies was constructed in order to graphically represent the whole of the system via sociograms.

The SNA of Catalan producers and their clients was quite complex for season 2004/2005, with a formation we might call a mesh (Figure 1). A significant group of producers was observed that depends on TV3, but the system as a whole was quite complex due to the relatively high number of parties involved and their network of relations. In total, there were 9 producers with no kind of link with TVC and depending totally on external markets, while another 6 worked there but not exclusively. A star-shape formation around TV3 was detected, typical of high dependence situations. In fact, there were 6 producers that only worked for the first Catalan autonomous community channel and three more did so exclusively for K3/33. The most diversified companies were Gestmusic and Mediapro, which worked for six and seven different channels, respectively.

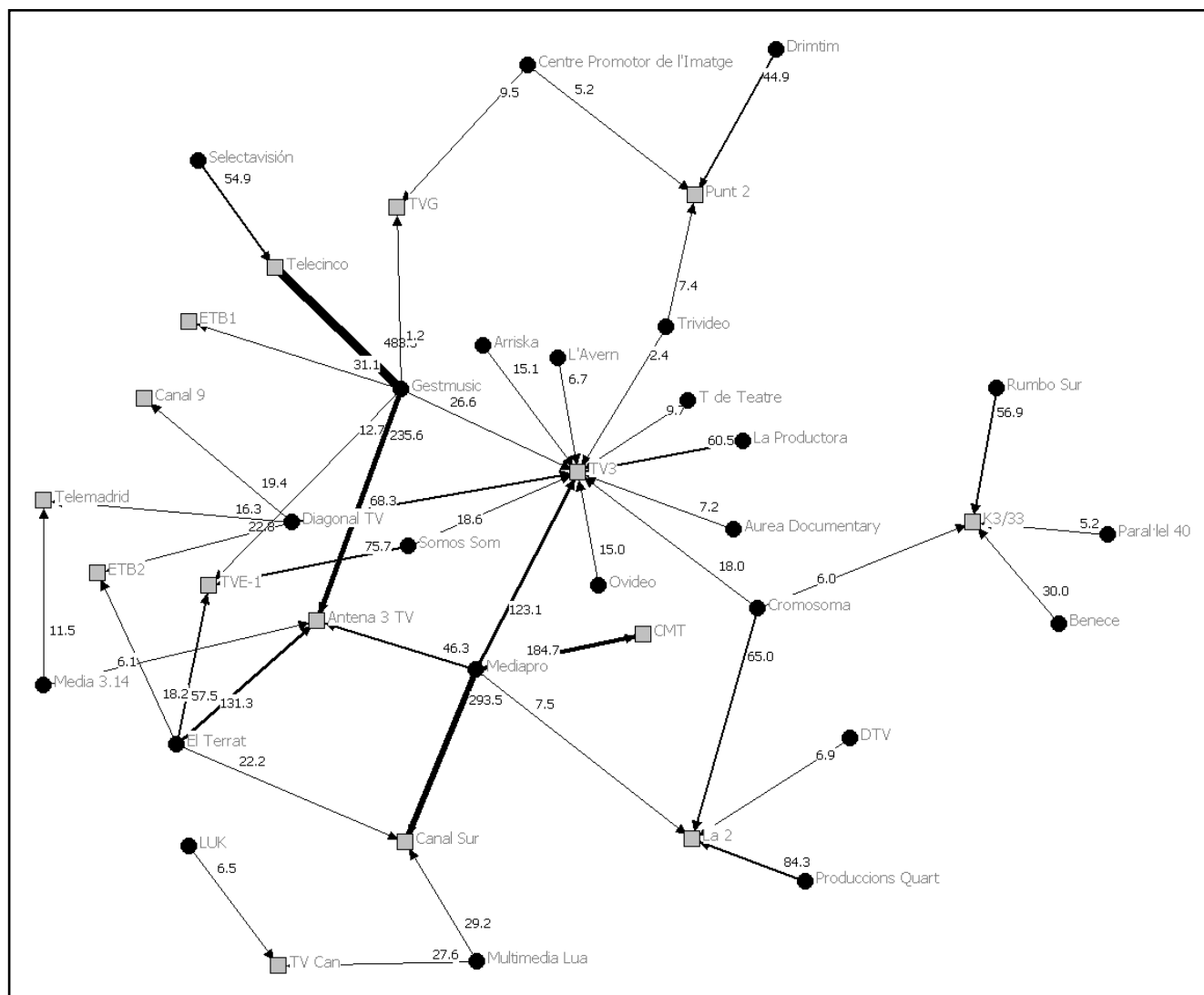
In the 2005/2006 season, the diagram of relations between producers and channels acquires a greater degree of

Graph 1. Destination of Catalan independent production



Source: author.

Figure 1. Circulation of Catalan independent production (2004/2005, in hours)



Source: author, based on GECA data.

complexity due to the increase in the number of parties involved (Figure 2). The star formation around TV3 is much clearer due to the rise in the number of suppliers for the Catalan public channel: 12 producers worked only for this broadcaster.

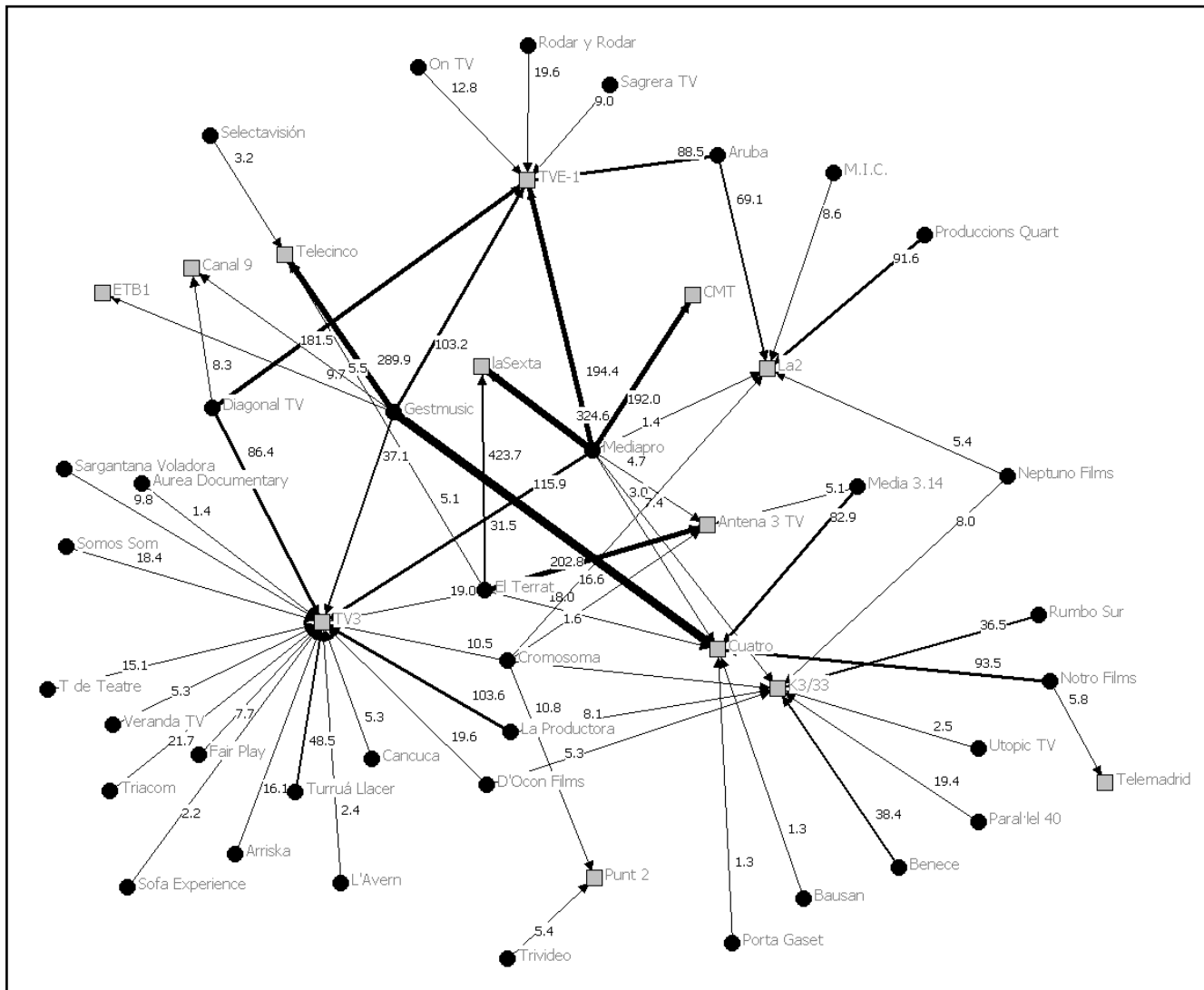
The two most active companies are once again Mediapro, with 8 different clients, and Gestmusic, with 6. Together with Diagonal TV, Cromosoma and El Terrat go to make up the core of the system of producers, as they have the most diversified client portfolio, as reflected in their central position in the figure. With regard to the two new TV channels,

opposite behaviours can be observed. In spite of the high volume of hours bought, laSexta only buys from Mediapro and El Terrat, which form part of its shareholders. Cuatro, on the other hand, bought from a total of 7 Catalan producers.

The role of Televisió de Catalunya

In Spain as a whole, the different public TV channels from the autonomous communities usually provide the basic support for regional broadcasting (Fernández Quijada 2007).

Figure 2. Circulation of Catalan independent production (2005/2006, in hours)



(TV3), while the remaining 99.50% went to Catalan producers.

There are two significant explanations among all those possible for the problems encountered by producers from other autonomous communities in accessing the TVC market. Firstly, the existence of a robust autonomous industry that makes it difficult for other regions to break in. Secondly, the use of Catalan as the language in all TVC broadcasts represents a barrier for some producers outside Catalan-speaking areas.

In any case, the importance of TVC for Catalan producers is related to the number of programmes rather than the volume of hours, as it is the channel that works with the most autonomous community producers: 15 in 2004/2005 and 24 in 2005/2006.

Conclusions

The sector of independent TV production in Catalonia is dynamic and growing. Catalan companies have made the most of the arrival of two new free-to-view TV channels, significantly increasing their sales in the first season of operation for these channels. There are also negative aspects, such as the attitude of laSexta, which focuses its associated production policy on producers that form part of its group, with few exceptions in Spain as a whole.

Also evident in this initial interpretation of the data from the season 2005/2006 is the ground that Catalan companies have lost in other spheres, especially in the different autonomous community TV channels apart from TVC: the closeness of local producers, which are developing in all communities and whose only market, in many cases, is their own region, has led to a rise in competition that, for the moment, Catalan audiovisual businessmen have suffered from.

In fact, this is what is happening with TVC. Its associated production volume is small compared with other Spanish channels but it favours producers from its own region, in some cases leading to excessive dependence on a single client. In any case, TVC's support for the industry requires a further study that also includes support for the film industry or the new windows and technologies that permit digitalisation (Prado and Fernández 2006). The role played by the large groups in configuring the independent production

market should also be studied. Lastly, the trend to create media groups is becoming more acute, a fact that, together with the little regulatory clarity for the area of independent production, has allowed them to take up positions at a time when the sector seems to be reaching maturity. The trend towards concentration is a fertile area in this context, as can be deduced from the position in Catalonia of Mediapro or Endemol, companies that hold an interest in broadcasting via laSexta and Telecinco. In any case, we would also need to see how much of the market remains for truly independent producers.

The upcoming terrestrial digital television represents a source of concern but also of hope for many of these businesses. The number of potential clients will multiply but, at the same time, fragmentation will probably lead to a reduction in the budgets available. In this respect, having good access to the state market, which is able to pay a higher price for its programmes, would be a good asset for companies.

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New interactive advertising formats on television. A proposal for their analysis and classification

Laura Aymerich

■ *This article investigates the area of interactive advertising on television, an emerging phenomenon that has not been extensively explored by the literature and with significant potential for development. The findings provided are based on those obtained as part of the research entitled “New advertising formats on interactive television” (Aymerich 2007), developing and validating a number of parameters to analyse the products of interactive advertising on television, as well as a proposal for classifying the main formats of interactive advertising on television in today’s market. By applying these parameters, we can classify the different products of interactive advertising within this typology. Both the analysis and the typology proposed become useful instruments that are applicable to research into interactive advertising products on television. Finally, the main supports are investigated, as well as the placement of interactive advertising and also its key marketing goals.*

Keywords

Interactive advertising, interactive television, interactivity, advertising formats

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Introduction

The progressive digitalisation of the television system involves a series of gradual transformations in the industry. Interactive television, with its corresponding applications, is one of the most remarkable and promising advances of this new panorama that is currently being configured.

The possibilities of dialogue between transmitter and user and the enhanced participation facilitated by this new concept of television are also reflected in advertising, which attempts to encourage closer, more individualised and participative advertising through developing interactive applications.

The development of interactive advertising is recent and mostly concentrated on the internet. However, thanks to the implementation of digital systems such as cable, satellite and TDT, among others, this new concept of participative advertising is showing increasing interest in being implemented in the area of television as well. Platforms such as Sky in the United Kingdom have shown great interest in strengthening new types of interactive advertising. We only need to mention, by way of example, that in January 2005 the interactive campaigns broadcast on Sky broke the record for platform presence, accounting for close to 10% of all advertising campaigns broadcast on this platform (Skymedia 2007).

This article proposes, firstly, to contribute to clarifying the main concepts related to interactive advertising in the area of television through their definition. The transformations occurring in the field of television over the last few years have helped, at the same time and subsequently, to the proliferation of new concepts related to these new systems, applications and ways of relating to television and advertising, and have often led to significant confusion. One of the main difficulties involved in classifying the non-conventional

advertising on television, which includes interactive advertising, is the lack of any clear differentiation between formats, the lack of terminological definition for these types of advertising and the existence of terminology exempt from systematic scientific criteria (Farré and Fernández 2005).

Secondly, the article also proposes a series of analytical parameters applicable to an analysis of the products of interactive advertising present on today's market, which might be of great use in carrying out related research. The parameters presented were previously tested and validated as part of the research entitled "New advertising formats in interactive television" (Aymerich 2007).

These parameters allow us to classify the different products within a typology that is made up of the main formats of interactive advertising present on the market. This typology, which establishes four different formats according to whether the products have certain characteristics deriving from these parameters, is described at the end of the article. The typology presented takes as its reference the products of interactive advertising developed on the English market, one of the leading countries in developing and implementing this kind of applications in Europe. The typology was also established and validated during the aforementioned research (Aymerich 2007).

The concept of interactivity

The mass media have traditionally been associated with a vertical, unidirectional and hierarchical broadcasting model (Prado *et al.* 2006). The inversion of these structures via a balancing between transmitter and receiver is reflected in the concept of interactivity, and the strengthening of horizontal communication and user participation in the communication process can also be attributed to this.

The perspective of communication defines interactivity as the reciprocal relationship produced between two different poles that take part in the communicative process. The user can start a process of interaction either with the system, the services, content or applications or it can be interaction, via the system, between different users or between the transmitter and receiver.

When we apply the adjective 'interactive' to a medium, our aim is fundamentally to emphasise the possibility of two-

directional communication and therefore the receiver's possibility to participate and act within the communicative process, something which supposes a change in role, obtaining a more active function in the communication process and which, in the specific area of television, goes from being a mere TV viewer to a user. This increasingly important role that must be assumed by the receiver, and which is made clear in the name of "interactive media" applied to the new digital media, is one of the most important characteristics of the new television era.

Interactive television

Classifying television as interactive is a way of showing a qualitative difference to traditional television. Interactive television should not be interpreted as in opposition to traditional television but as an added value to the television we know.

The early experiences of television interactivity were carried out on analogue TV. However, the switchover to digital is expected to enhance the medium's interactive capacity, fundamentally by implementing a return path for receivers.

Interactive television is therefore television that offers users the chance to act on the system or on the content with the aim of establishing a dialogue that involves carrying out actions on the part of the two poles involved in the communicative process. In practice, this mutual action is translated into an alteration of the normal flow of television on the part of the viewer, either by modifying the content (for example by modifying the camera angle in a football game) or in an exchange of information (for example, pushing the red button during a game show that offers this possibility); or, outside the television flow, by accessing applications for interactive services (for example, consulting the electronic programme guide, accessing a 'walled garden' or playing an interactive game).

Going back to the essence of dialogue proposed in our definition of interactivity, we can state that television becomes interactive when it allows the user to maintain a reciprocal relationship or one of dialogue.

The main characteristics presented by interactive television can be summarised as follows:

- It adds value to traditional television.
- It produces a relationship of dialogue between the two poles (transmitter and receiver) and the medium's hierarchical relationship is softened.
- During the process of interaction, the TV viewer adopts an active role, in contrast to the passive role assumed when consuming this medium.
- The active role adopted by TV viewers turns them into real "users".
- Users acquire more power of decision and control over the communicative process.
- Interaction is produced at an individual level, involving a higher degree of personalisation in consuming television.

We should point out that these facets are only revealed during the process of interaction, since "interactivity does not eliminate passive reception entirely but arranges, at a variable pace, active moments (choice, performances) and passive moments (viewing)" (Prado 1987). However, although we must admit that, right now, the possibilities of interaction expected of television are still very small and we are therefore referring to a medium that continues to be fundamentally one-directional, as the capacities of the television system improve, its two-directional nature is likely to get stronger or, put another way, television will become more interactive.

Interactive advertising on television

The appearance of interactive advertising on television can be interpreted as the result of the coming together and contribution of two industries:

- Conventional **television** advertising, principally TV spots, which have taken on new interactive applications with optional access.
- **Internet** advertising, especial integrated formats. The incorporation into television of advertising formats that are normally used on the internet, such as banners, results largely in what we recognise as interactive advertising on television.

The new applications of interactive advertising for television combine the strong points of both media – TV and

internet – integrating the wide range, relevance and impact of television on the one hand, with the direct and focused response of internet advertising on the other (Gawlinski 2003).

In general, we can describe interactive advertising as that which offers users the possibility but does not force them to establish a dialogue with the advertiser. We should note that, in this case, the concept of advertiser is used by extension, in order to emphasise the concept of user that interacts with an organisation that is promoting its product or service. However, we must point out that interaction really occurs with the application of interactive advertising and that only in a few cases does this process end with interaction with the advertiser per se, mostly tending to offer a response indirectly and *a posteriori*.

Interactive advertising on television establishes a kind of information that is more specific, focused and personalised than advertising in its traditional form (TV commercials) and facilitates the exchange of information between user and advertiser, be it through response mechanisms provided by the application (e.g. the user can ask for more information and receives a response *a posteriori*), by consulting the material contained in an application (e.g. the user can ask to see a video of the product included in the application) or in those cases where the advertiser can extract information from the interaction process followed by the user while consulting the advertising application (e.g. recording the internet surfing carried out by the user during the interaction).

Criteria to analyse products of interactive advertising on television

Our proposal analyses the products of interactive advertising based on four broad dimensions that reflect, on the one hand, the characteristics of the object as an interactive product (dimensions and degree of interactivity) and, on the other hand, the characteristics of this as an advertising product (key marketing goals and conceptual and design elements), these aspects being the most relevant for an analysis in order to subsequently classify the different products by format type.

In turn, these dimensions are subdivided into specific characteristics applicable particularly to the analysis of

interactive advertising products. The four dimensions with their respective subdivisions are applicable to any product of these characteristics, while the specific characteristics can be modified as the market evolves.

In this way, we obtain the following general parameters, subdivisions and practical applications of the analysis for products of interactive advertising on television:

1. DIMENSIONS OF INTERACTIVITY

Determined by the following factors:

- a) **Capacity to manipulate the product**
 - i) The user is allowed to modify content or production
 - ii) It's not possible to modify content or product
- b) **Extent of surfing**
 - i) Quantity of options on a screen
 - (1) There is a screen menu
 - (2) There is no menu
 - ii) Quantity of screens
 - (1) No screens (only boxes)
 - (2) From one to three
 - (3) More than three
 - iii) Type of surfing
 - (1) Lineal
 - (2) Non-lineal
- c) **Exchange of information**
 - i) Degree of information that can be entered by users into the system via the application
 - (1) Data entry
 - ii) System's or transmitter's capacity to respond to users
 - (1) Immediate response via the same system
 - (2) Response *a posteriori*
 - (a) Via the same system
 - (b) Via other means (telephone, email, etc.)
- d) **Degree of immersion**
 - i) Exit the television flow
 - ii) Partial/total continuity
 - (1) Image contact is maintained
 - (2) Sound contact is maintained
 - (3) Image and sound contact is maintained
- e) **Degree of personalisation** (determined according to capacity to manipulate the product and broadcaster's response capacity):
 - i) High (manipulation and immediate exchange of information)

- ii) Medium (manipulation or immediate exchange of information)
- iii) Low (response *a posteriori*)

2. TYPE OF INTERACTIVITY

- a) **Real interactivity**
- b) **Perceived interactivity**
 - i) Local interaction
 - ii) Interaction with the broadcaster's platform

3. KEY MARKETING GOALS

- a) **Provide information about the product or service**
- b) **Raise awareness of or remind about a brand**
- c) **Persuade potential consumers**
- d) **Branding**
- e) **Response capacity**

4. CONCEPTUAL AND DESIGN ELEMENTS

- a) **Constitutive elements**
 - i) Text
 - ii) Graphics
 - iii) Static image
 - iv) Audio
 - v) Video
- b) **RCD displacement mechanisms (*Remote Control Device*)**
 - i) Arrows
 - ii) Colours
 - iii) Numbers
 - iv) Other buttons (*back up, select...*)

Applying these analytical parameters to an interactive advertising product on the market should allow us to classify it within one of the four main formats of interactive advertising presented in the next section.

Main formats of interactive advertising on television

The products of interactive advertising currently found in the digital television market can be classified into four broad formats:

- **DAL** (*dedicated advertiser location*)
- **Mini-DAL**
- **Microsite**
- **Impulse response**

The classification proposed takes as its reference the products of interactive advertising currently seen on the English market. The defining characteristics of each of these formats are determined according to the analytical dimensions described in the previous section and that establish, on the one hand, a series of common characteristics and, on the other, a series of distinctive features.¹

Common characteristics

It should be noted that the state of development of these applications is still quite embryonic. The interactive possibilities are small and, although there is a certain exchange of information between transmitter and receiver (all the formats usually contain the possibility of the user entering data), there is little room for manipulation or action for the user. Moreover, the response does not occur in real time but involves either preconceived or *a posteriori* responses. Interactivity is also of a perceived type (not real), in interaction with the broadcasting platform. In all cases, the device used to interact with the product is the remote control and most displacements are made via the arrows, colours and other buttons (OK, etc.); the letters and numbers on the control are also used to complete the boxes on the request for information.

Differential characteristics and description of the formats

- **DAL and mini-DAL:** exclusive advertising spaces, which you must exit the television flow to access. Generally, they are accessed optionally from a TV commercial including the DAL/mini-DAL as an annex. The application is accessed by pressing the interactive button on the control when an interaction icon appears on the screen. A DAL can also be accessed from a banner on an interactive service. The appearance of these applications is similar to that of a DVD menu, where the user surfs via the remote control.
 - **DAL:** the DAL is a format with extensive surfing possibilities, whose most relevant characteristics are the inclusion of a menu with different onscreen options, allowing non-lineal surfing and a very high

degree of immersion, as the user must leave the television flow during the query. With regard to the conceptual and design elements, in addition to text, graphics and images, this format also supports quarter screen video material and animation. As well as consulting information on the product, users can also see trailers, play games, listen to music... and they can change it into the only format that allows the exchange of information via the same system and immediately (although at a very elementary level), and can therefore offer a level of personalisation that is slightly higher than the rest of the formats. This system also allows the gathering of user data in order to offer more information, brochures, etc. The DAL is the most complex format to produce and the most costly, especially in broadcasting terms.

- **Mini-DAL:** the mini-DAL is a reduced version of the DAL. It is different from the DAL insofar as the surfing is less extensive: no menu, with a lower number of screens and lineal surfing. Mini-DALs do not usually allow the exchange of information with an immediate response via the same system. Neither do they have the possibility to include video material.
- **Microsite and impulse response:** these last two formats are characterised by allowing continuity (visual and aural) with the television flow while the interaction lasts. They are simple formats, aimed principally at encouraging a response from the user and with an absolutely lineal type of surfing. The response mechanisms can even include the entry of new data that ask the user for information. As in the case of the mini-DAL, these are formats in which the advertiser's response is exclusively *a posteriori*.
 - **Microsite:** the space of a microsite has quite a limited range of surfing. Generally, a background is presented that allows the integration of text and graphics, occupying three quarters of the screen (with the television programme remaining on the other quarter). This background functions as a poster with the brand's logo and a description of the product in question, and remains while the surfing lasts, during

¹ For a more detailed view of the characteristics of the different formats, consult table 1.

Table 1. Characteristics of the main formats of TV interactive advertising (I)

CHARACTERISTICS			FORMAT			
DIMENSION OF INTERACTIVITY	Capacity to manipulate the product	Users can modify or produce content	DAL	Mini-DAL	Microsite	Impulse response
Degree of surfing		There is a menu or different options on screen	X			
		Quantity of screens				X
		No screens (only boxes)				
		1 to 3		X	X	
		More than 3	X			
		Type of surfing	X			
		Non-linear				
		Lineal		X	X	X
		Entering data		X	X	X
		Immediate response via same system		X		
Information exchange		Response <i>a posteriori</i>				
		Via the same system				
		By other means (telephone, email, etc.)	X	X	X	X
Degree of immersion		Exit the television flow	X	X		
		Partial continuity			X	X
		Contact is maintained with image			X	X
Degree of personalisation		Contact is maintained with sound			X	X
		High (manipulation and exchange of information immediately)				
		Medium (manipulation or exchange of information immediately)	X			
		Low (response <i>a posteriori</i>)		X	X	X

Source: Aymerich, 2007.

Table 1. Characteristics of the main formats of TV interactive advertising (II)

CHARACTERISTICS			FORMAT			
TYPE OF INTERACTIVITY	Real interactivity		DAL	Mini-DAL	Microsite	Impulse response
KEY MARKETING OBJECTIVES	Perceived interactivity	Local interaction				
		Interaction with the broadcasting platform	X	X	X	X
	Provide information about product or service		X	X	X	X
	Raise awareness of or remind about a brand		X	X	X	X
	Persuade potential consumer		X	X	X	X
CONCEPTUAL AND DESIGN ELEMENTS	Branding		XX X	XX	X	X
	Response capacity		X	X	XX	XX X
	Constitutive elements	Text	X	X	X	X
		Graphics	X	X	X	
		Static image	X	X	X	
		Audio	X	X		
		Video	X			
	Elements of the remote control used during the interaction process	Arrows	X	X	X	X
		Colours	X	X		
		Letters and/or numbers	X	X	X	X
		Other buttons (OK, back up, etc.)	X	X	X	X

Source: Aymerich, 2007.

which time the user provides different data in order to receive future information. Access to this space is by pressing the interactive button on the remote control, at the time when the interactive icon appears while a commercial is being broadcast. One evolved variant of the microsite is the 'enhanced microsite' (Channel4Sales 2007). This format is different from the microsite in that a menu can be included of up to four options, enabling the user to move around the screen and therefore surf non-linearly.

- **Impulse response:** this is a relatively simple and economical advertising format to produce, without screens and only with textual elements, superimposed over the television programme in such a way that, due to its small size, users can continue their normal viewing while the interaction lasts, the TV programme continuing on the complete screen. This is essentially a response mechanism. By pressing the red button when the interaction icon appears in the commercial, the user can ask for samples, information, brochures, etc., providing the advertiser with his or her data (e.g. email address). It is quite normal for this format to also include some questions related to the consumer's habits or interests, asked at the time when the user requests a sample or additional information.

Supports and placement of interactive advertising

Interactive television enables a wider range to place advertising than the one we are familiar with for conventional television. In addition to TV commercials, the interactive advertising formats can also be placed in various applications. The main media for interactive advertising applications on television are:

- **TV commercials:** When a commercial or spot includes the possibility of accessing an advertising application, it becomes an interactive advertisement. Interactive commercials can be consumed either traditionally, i.e. via lineal consumption, or interactively by accessing an interactive application designed especially for this purpose. People are normally made aware of the existence of the interactive application by an interaction icon

superimposed over the images, which remains until the end of the commercial. This invites users to press the interactive button on the remote control in order to access the interactive application, which takes the form of one of the advertising formats described previously.

- **Interactive sponsoring for programmes:** A television programme can have interactive sponsorship by, for example, superimposing an interaction icon at some time in the programme which leads to an interactive advertising application.
- **Electronic Programme Guides or EPGs:** EPGs are one of the interactive applications most widely employed by users. EPGs can include banners or active buttons to access the interactive advertising application.
- **Digital teletext services:** Some platforms have opted to maintain this service, a modernised version of the classic teletext. These services usually offer the chance to insert banners, which lead to an interactive application placed in a text page. On the Sky platform (Skyinteractive 2007), the advertising modality known as 'jump to text' leads to a teletext page when the interactive button is pressed. Digital teletext also allows page sponsorships.
- **Walled garden:** These are groups of interactive services from different companies provided by the operator. These interactive pages basically include two kinds of interactive advertising: banners and buttons, which lead to an interactive advertising application, and interstitials, also known as 'splash screens', a format mostly present on the internet consisting of a full-page advert that appears when you go from one page to another, without it having to be requested by the user. Advertising on these spaces can also be presented by sponsoring a page or section.
- **Other interactive applications:** Interactive services such as **games** pages are often used as a medium to insert advertising, either in the form of a banner or, very often, via sponsorship.
- **Video on demand (VOD):** VOD is a medium with a lot of potential for developing highly personalised advertising of particularly long duration (telescoping ads, films produced by the advertiser, etc.) which the user requests voluntarily.

The objectives of interactive advertising

Interactive advertising allows much deeper communication between advertiser and user. The fact that a TV viewer opts to interact with an advertiser already supposes a more prolonged contact with the brand than that achieved with a conventional TV commercial. This deepening, moreover, is achieved in a way that is not imposed, as it is the viewers themselves who choose to press the red button or not, something which supposes that contact is only established between receiver and advertiser when there is real interest in the product or service on the part of the potential consumer.

In addition to the objectives of traditional advertising, namely:

- provide information on a product or service
- raise brand awareness
- persuade potential consumers

Interactive advertising also aims to achieve two further marketing goals (Interactive Digital Sales 2007):

- branding
- response capacity

By branding we mean the process of creating value for the brand. The more prolonged relationship established by the user with the advertiser while surfing through an interactive spot familiarises the user with the brand and brings him or her closer to the product or service by providing the user with more complete information than what would normally be obtained via a conventional commercial. DAL and, to a lesser extent, mini-DAL are the two formats aimed principally at achieving this goal. DAL is a format that allows extensive and detailed information to be provided on the product or service. In addition to including sections with information on the product or service and video demos, it often includes added value services such as the chance to request a test car, to get the CD of an ad's soundtrack, take part in a short interactive game, etc. with the aim of giving the brand a good image. The main purpose of DALs is therefore not to gather information and data on the user but to enhance the brand's value.

With regard to response capacity, interactive advertisements make it possible for the advertiser and potential consumer to interact. Interactive advertising formats contain

simple question-answer mechanisms so that users can request, for example, information on the product or service via the interactive advertisement. These mechanisms are not usually of the immediate response type. The most usual process is that users provide their personal details (email, address, telephone number, etc.) so that the advertiser can contact them afterwards. Microsites and impulse response principally aim to achieve this objective. They are formats designed basically as mechanisms to exchange information and data between the advertiser and the user. The advertiser uses the hook of a free sample, providing a brochure, etc. to obtain information on the user's profile and interests.

Conclusions

Interactive advertising on television is an emerging phenomenon in the TV market with significant potential resulting from the digital switchover of the medium.

The newness of the object of study requires, on the one hand, a typology that allows us to classify the different products of interactive advertising currently on the market and, on the other hand, analytical parameters to determine the characteristics that go to make up these products. The aim throughout this article has been to answer these essential questions.

The analytical proposal presented has five broad dimensions or parameters that go to make up a television advertising product with interactive characteristics. These parameters are: *a)* dimensions of interactivity, *b)* type of interactivity, *c)* key marketing objectives, *d)* advertising formats of influence and *e)* conceptual and design elements. The application of these dimensions, broken down into verifiable characteristics for the different products found in interactive advertising, results in a series of characteristics common to all products (which help define the concept of advertising format on TV) and a series of aspects inherent to each of the formats (which help to define its specific profile).

We need to remember that we are studying an object that is constantly transforming and is still at a highly embryonic stage. For this reason, the parameters proposed are flexible and adaptable depending on the natural evolution of these products.

The article proposes a typology for the products of interactive advertising that differentiates between four main formats: DAL, mini-DAL, microsite and impulse response. The different products of interactive advertising present on the current TV market can be classified according to this typology with the help of the analytical parameters proposed.

These interactive advertising products have broad possibilities with regard to access and media placement. In addition to being accessible from traditional commercials with this potential, links to these applications can also be found via the interactive sponsorship of programmes, an electronic programme guide (EPG), in walled gardens, games and via video on demand (VOD), among the main options.

On the other hand, this kind of interactive advertising application is aimed particularly at contributing to two marketing objectives: branding and response capacity. In addition to pursuing the traditional objectives of advertising, advertisers also hope to strengthen these two facets of marketing in particular by using some kind of interactive advertising. Branding is achieved with the more prolonged relationship between user and brand and by offering added value services. And response capacity, understood as the creation of dialogue between user and advertiser to achieve greater personalisation and brand proximity, is possible in most applications of this type.

Interactive advertising on television is a phenomenon that, today, is in an embryonic state. However, the desire for constant innovation that characterises advertising, as well as the facilities provided by the switchover to digital television, are enough to revolutionise the panorama of television advertising in the near future. This article hopes to have contributed to the study of a phenomenon that requires greater attention on the part of the academic world, and also hopes that the typology and analytical parameters proposed are useful and applicable as a basis for future research.

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Critical Book Review

The United States, seen and transformed by a TV channel

HILMES, M. (ed.) *NBC: America's Network*. 1st ed. Berkeley: University of California Press, 2007, 364 p.

ISBN 978-0-520-25081-9

By Concepción Cascajosa Virino, assistant lecturer at the Department of Journalism and Audiovisual Communication at the Carlos III University of Madrid

It is very significant that the first letter in the name of the NBC channel (the National Broadcasting Company) should refer to the concept of nation. The idea of grouping together radio stations from one end of the United States to the other to broadcast in a chain (and thereby constitute a network) was one of the key mechanisms in structuring a still young country, wrapped up in local issues and, at that time, with a certain tendency towards isolationism. The NBC, which was a radio channel when it was founded in 1919 and, as from the forties, a television channel, would reflect the country's tribulations during the convulsive decades to come. If we also add the channel's dominance over TV programming and the fact that, until recently, it has always been associated with the most prestigious products, it seems fully justified for Michele Hilmes to have chosen NBC as the institution that allows us to best examine the history of broadcasting in the United States. Michele Hilmes is a lecturer at the University of Wisconsin-Madison and has emerged over the last two decades as one of the essential authors writing about the history of mass communication. Among her publications, particularly of note are the following: *Hollywood and Broadcasting: From Radio to Cable* (1990) and *Only Connect: A Cultural History of US Broadcasting* (2001), as well as the edition of *The Television History Book* (2003) for the British Film Institute.

NBC: America's Network is along the lines of other research that has adopted an institutional point of view to trace the development of the TV industry, but this book's most relevant contribution is that it focuses on a single company. The main risk of this choice – offering a biased view of a complex industrial fabric – is overcome thanks to two elements. Firstly, due to the representative nature of NBC's contribution to the history of broadcasting in the United States. In this way, establishing an albeit partial identification between both is useful in order to verify that the key to success in US television has been to build stable structures that, by themselves, have driven renewal based on creativity. Secondly, the different essays that go to make up this collective and multidisciplinary work aim to investigate highly diverse aspects of the areas of industry, technology, society, culture and scheduling, but in no case is the aim to establish a traditional history. The milestones, significant exceptions and processes of change that have characterised NBC's history form the main interest of this book.

This analysis is carried out via eighteen essays divided into four chronological stages: the birth of broadcasting between 1919 and 1938, the transitional decades from radio to television between 1938 and 1960, the consolidation of the large network system between 1960 and 1985, and the digital age, from 1985 to the present day. Of particular note in the first section is the contribution by Michele Hilmes herself, dealing with the founding of the channel from the perspective of North American capitalism's particular notion of public service. At this time, the broadcasting of commercial radio programmes was not considered to be incompatible with the production of cultural and civic-based pieces that would bring prestige on the channel and the brands advertising on it. The essays that go to make up this first section analyse NBC's relations with the trade unions

and corporations within the context of the Great Depression, the competition with its rival CBS and the controversial public interest programme *America's Town Meeting of the Air*. Approaches of an institutional nature predominate in the second section of the book, with texts dedicated to governmental actions to control the channel's monopolistic tendencies, relations with advertising agencies, the development of new production models with Hollywood and policies to encourage the integration of Afro-American workers. The most revealing contribution is by David Weinstein, who analyses how NBC ignored the genocide of the Jews in Hitler's Germany with the approval of the channel's president, David Sarnoff, a Jewish émigré. Even after the country had entered the Second World War, the desire to protect the channel from political debate led to content denouncing anti-Semitism being very rare.

The third section of *NBC: America's Network* chooses to look at the representative TV genres, with case studies on the documentary within the context of the Cold War, political satire and children's programming, as well as a look at the gestation of the significant science fiction series *Star Trek*. Within the context of the new social trends in the seventies, in her essay Elana Levine describes NBC's failure to handle the inclusion of women in work, homosexuality and teenage sexuality in its fictional programmes in an adult way. The channel's decline in this period became the perfect context for the Amanda Lotz's essay that starts the last section of the book, on the famous programming strategy of the former producer Grant Tinker with whom NBC, thanks to programmes such as *Hill Street Blues*, became the leading exponent of quality television in the eighties. After other chapters on NBC's position as a leading conglomerate in North American media and the new programming strategies given the challenges of new technologies, Michele Hilmes and Shawn VanCour conclude by highlighting the difficulties of writing the history of the mass media and the possibilities offered for outlining the cultural history of the United States. Without doubt, this last aspect serves as the ideology to the book itself in terms of its content, which analyses the evolution of a country from the point of view of two media, radio and television; media which must necessarily be a reflection of this evolution.

An analysis of television in Spain from the private sector

CENTRO INTERNACIONAL DE LAS EMPRESAS DE COMUNICACIÓN (coord.). *La televisión en España: informe 2007*. (Television in Spain: 2007 report) Barcelona: Ediciones Deusto, 2007. 283 p.

ISBN: 9788423426072

By Loreto Corredoira i Alfonso, full lecturer in Information Law of the Complutense University of Madrid

From four years ago up to 2007, the Union of Associated Commercial Television Companies (UTECA in Spanish) used to publish two annual reports on the private television sector in Spain. One of a legal nature, directed by professor Santiago Muñoz Machado, and another economic, by Luis Jiménez, partner in Deloitte and in charge of the media industry in Spain and Europe.

The novelty of the work we are reviewing lies not only in the fact that it unifies these two studies but also extends and frames them within the coordinates with which we must judge the *status quaestionis* of a medium or of any economic situation, i.e. the television market, demand, advertising, content or positioning strategies.

This is not a market or audience study in vogue, nor merely a monograph defending the interests of the UTECA audiovisual industries, but rather both these objectives are exceeded thanks to the scientific and editorial direction of the International Centre of Communication Companies (CIEC in Spanish), an initiative of IESE Business School and of the Communication Faculty of Navarre.

The perspective proposed by CIEC and the report's coordinators (Juan Pablo Artero, José Ignacio Bel, Alfonso Sánchez-Tabernero and Juan Manuel de Toro) is, as stated by Ignacio Bel in the introduction, "the need to analyse the situation further and, based on this, to establish proposals for the future that allow us to rationalise this activity as far as possible, in which the co-existence of the public and the private is required, based on mutual respect and especially on the subsidiary function of the state in a free market society such as that of our Constitution" (page 7).

Without doubt, this book contains the claims of associated private television companies (the six free national channels: Antena 3 TV, Telecinco, Cuatro, Veo TV, Net TV and laSex-

ta) and defends the elimination of barriers to advertising competition in the implementation of TDT and within the legal framework. All without losing sight of private television's main rival in terms of audience and particularly advertising: public television. Not only RTVE's two public channels but also the public channels of the autonomous regions, which in 2006 totalled 38% of the audience share.

The main aim of this book is to provide a study of the economics and content of open and free private television. It also provides a legal analysis of the regulation of private television in Spain in 2007, and particularly focuses on the evolution of legislation and the functioning of bills, as well as the implementation of legislation affecting this sector, and is completed with a series of articles and reports on positioning strategies, audience fragmentation and new types of television business.

The first two chapters analyse the current types of television channels, of note being the figures for the main TV landmarks in Spain, as well as a study of digital television platforms: satellite, cable, TDT, ADSL and mobile TDT. The television offered by telecom operators (Jazztel TV, Imagenio and Orange) adds a new business model that "telecos" are fighting to extend within the sphere of mobility, i.e. the idea of an operator that also distributes content.

Opposing this is the radio broadcasting model, which is the "media" model in which the media rather than operators prevail, and is the option chosen by the Impulse plan to promote the implementation of TDT, with the approval of the television companies.

Television consumption is also studied in depth with data cross-referenced from different sources (TN Sofres, Carat, INE) which the authors used to obtain the profile of age groups and timebands for television. The main observations are: the consumption of generalist TV accounts for almost 50% of the whole audience, two points more than in 1997. TVE is the television company that has lost the most ground, together with La 2, benefitting new operators (laSexta, Cuatro and others). Another clear idea that seems to denote a trend: the only target age group that is falling and leaving television is young people; children from 4 to 12 by 12% and those aged from 13 to 24 by 9%.

As a complement, in this book there are also two chapters by renowned authors in the area of information law (such as Leopoldo Abad), audiovisual ethics (such as Mónica

Codina), and experts in the news business. Of all these, I should like to highlight that of lecturers Mercedes Medina and Mónica Herrero, who introduce the strategic challenges for leadership in the audiovisual industry. For them “the initiative for content seems to continue to lie with the channels, which have found in mobiles and the internet another medium in which to disseminate their programmes while there is no other content provider to take over this leadership. There are possibilities to exploit the same content from the conventional programming grid on other media. This successful content coincides with content that triumphs on commercial channels. However, the internet, mobiles or other media allow value added content to be developed that is received only on these media and not on television” (page 265).

This context of the immediate future of television (with a place for IPTV, DVR and web TV) is also that used by the European Commission in the directive that was finally passed on 29 November 2007, after this report was published. That day in Strasbourg, the new directive was passed that has replaced the one from 1997. Its classic name of Television without Frontiers has become the Audiovisual Media Services Directive. ‘Audiovisual’ and not ‘Television’, so that non-linear services, i.e. those that don’t “broadcast” or “push” content to viewers, have now become a part of the audiovisual panorama.

As indicated at the beginning by the coordinators, this book does not take the place of other, long-standing and high quality industry reports produced in Spain but certainly, from my point of view, there is no other as complete from the point of view of private television, especially when there are only two years to go before the digital switchover.

Communications theories in Spain

GARCÍA JIMÉNEZ, L. *Las teorías de la comunicación en España: un mapa sobre el territorio de nuestra investigación (1980-2006)*. (Communication theories in Spain: a map of the territory of our research). Madrid: Editorial Tecnos, 2007. 311 p.

ISBN: 978-84-309-4654-9

By Miquel Rodrigo Alsina, professor of Communication Theory at the Pompeu Fabra University.

A little over a quarter of a century ago, communication studies achieved university rank in Spain, specifically in the 1971-1972 academic year. Since then, and especially as from the nineties, doctoral theses and specialist publications have proliferated spectacularly, especially in university centres. That's why, today, we can state that there is enough critical mass for communication research to start to demand to be included within social sciences and humanities. When we talk of critical mass, perhaps it would be clearer to employ a metaphor other than the usual one, different from that of physics, as it is not a question of achieving a nuclear chain reaction. Critical mass might be the demonstrations held by cyclists in order to claim a greater presence of bicycles in towns and cities (social sciences and humanities). In view of the dominance on the road of motor vehicles (sociology, history, economics, etc.), cyclists band together to take over the streets. This sense of critical mass was coined in the nineties by the North American George Bliss, to name a phenomenon he had observed in China. There, at crossroads without any traffic lights, cyclists gradually gather until there are enough of them to cross without risk. In this respect, the volume of research per se is significant, and perhaps the time has come for communication researchers to unite and act in order to take over the streets from social sciences and humanities.

So, beyond the mistrust that can still be seen today in other social sciences, communication sciences in Spain have reached adulthood. However, to acquire public visibility, these lists of major events need some milestones. The work of Dr. Leonarda García Jiménez *Las teorías de la comunicación en España: un mapa sobre el territorio de nuestra investigación (1980-2006)* undoubtedly fulfils this function in the history of Spanish research, because it holds

up a mirror to us and makes us aware of who we are and what we are like. This detailed and in-depth research is an undeniable opportunity.

Any reader who wishes to know the status of communication research in Spain can find their answer in this book. One of its key characteristics, as you will observe, is the thoroughness of the author's work. So the first part of the book, entitled "Epistemological and contextual keys to communication theories" presents to the reader, exhaustively, all the steps necessary to define the discipline. In the first chapter, which corresponds to this part, the object of study of communication research is defined, already is a considerable ontological challenge in itself. In the second chapter, the author provides her epistemological choice, in favour of communicology. Although this concept is not defended in the book (which, we must say in passing, has not had the success it deserves), the disciplinary order of communication theories is proposed. To end this first part, the third chapter contextualises communication within the characteristics of today's society. I would like to focus briefly on this chapter, because I believe it is of singular importance. The contextualisation of the social reality in which research is framed is fundamental, which basically gives meaning to communication studies. The importance of communication and information has never been as widely accepted as it is today. As highlighted in this chapter, the centrality of media communication in our society is unquestionable. There is great social consensus that we live in a society of communication and information. But the importance of this reality does not have, as its logical correlation, the prioritisation in research programmes to develop and innovate this object of study. This contradiction is one of the difficulties that communication research must face.

In the second part of this book, the question of "Communication theories in Spain: who we are, where we come from and where we are going" is tackled. The title cannot be more explicit. In this part, first I would like to highlight the large amount of information the author has processed, ordered and systemised. Secondly, we must recognise that this classification provides us with a highly complete map of Spanish research. This proposed classification is minutely detailed in the fourth chapter. Chapter five explains the results of the aforementioned classification: an X-ray of Spanish research, the most exact that has been carried out

to date. So we discover not only the main trends but also the most notorious weaknesses, such as the little international presence of Spanish research. The last chapter in this second part has the added value of asking the authors of Spanish research about their perception of the state of affairs for their own activity. So, via the Delphi method, a selection of researchers are consulted concerning the situation of Spanish research. This self-recognition is fundamental in order for the discipline to achieve scientific recognition. There seems to be agreement that communication studies have become institutionalised and that this has consolidated the field of research. The existence of communication faculties, a large number of research studies, plus publication of work on the subject, etc. leads us to think that enough critical mass has been produced to demand greater recognition among social sciences and humanities. Although we must accept that, for this reason, we must continue working and at an even better standard, and particularly publish in those media with greater international impact. Undoubtedly it is not a question of propitiating a confrontation between disciplines, but rather of claiming a space next to other disciplines of social sciences, such as political science, sociology, etc. and human sciences (history, anthropology, etc.).

To do so, two of the endogenous problems of the discipline in Spain must be overcome: the lack of a well-defined identity and little reflection on the current state of affairs. The first task (which, as I have pointed, is also tackled by this book) makes consensus necessary of the epistemic community of communication sciences, while the second already has an inevitable milestone in the work by Dr. Leonarda García Jiménez. So, the first step has already been taken: it's a question of continuing to encourage high quality research and to continue critically analysing such production. Another of the milestones that must be taken into account is the setting up of the Spanish Association of Communication Researchers at a recent congress at the start of 2008. So the epistemic community is starting to organise itself.

It is very probable that, if communication sciences manage to overcome their own internal deficiencies (definition of identity, more exchange, encouraging collective efforts, etc.) they will be able to project the results obtained. In other words, by overcoming their own limitations, they will be recognised by other disciplines. There is no doubt that this

last step must be preceded by dialogue with the rest of the social sciences, which is a new challenge that communication sciences must conquer. One last note concerning this aspect: the recognition of communication as a science is not for the sake of purely vain self-admiration but the conviction underlying this initiative, namely that the advancement of scientific knowledge is accumulative and that this advancement comes about by confronting old and new contributions. And the history of science has shown us that these initiatives to accumulate, to confront, to exchange, principally occur via shared platforms, via a common space that, in our case, is personified in communication theories. That is why we need to know where we are starting from and what we are like, and hence the importance of this book.

A global focus for the history, present and future of the advertising industry

TUNGATE, M. *Adland: A Global History Of Advertising*. London, Philadelphia: Kogan Page, 2007, 278 p. ISBN: 978-0749448370

By Francisco J. Pérez Latre, lecturer at the Faculty of Communication of University of Navarra

With *Adland: A Global History of Advertising*, Mark Tungate has written a necessary book that follows the line of two books that are now a classic but a little old: *The Mirror Makers* by Stephen Fox (1984) and *Madison Avenue USA* by Mayer (1958). Fox and Mayer wrote the history of the advertising profession and its advances up to the sixties. But the history needed to be updated and also extended. Tungate is the author of important books such as *Fashion Brands: Branding Style from Armani to Zara* (2005) and *Media Monoliths: How Great Media Brands Thrive and Survive* (2004). This time, he converses with the key names of advertising business and identifies, with excellent prose, the stages, patterns and processes of the industry.

As the author explains, the advertising profession has become global. New York and London continue to be emblematic cities but we should also note the advances made by places such as Paris and Milan, or emerging creative centres such as Brazil. This is an important value in the work by Tungate: given the predominantly Anglo-Saxon nature of the best books in this field, *Adland* explores how the profession has developed in a truly international way, as corresponds the profile of a Brit living in Paris.

The book takes us from New York and London, capitals *par excellence* of the profession, not only to Paris, Milan and Brazil but also to Argentina, Japan, China, South Africa and Spain, among others. Pages 219 and 220 explain, for example, that the Argentinians value advertising very highly. In that country, fans sing advertising slogans in their football stadiums and TV sitcoms include words from the most popular ads of the time. With observations of this nature, Tungate gradually introduces the reader to the impact of advertising on different cultures.

It couldn't have been published at a better time. The fragmentation of advertising and the digital paradigm, with the changes caused in TV audiences, threatens the con-

ventions of advertising business and raises numerous questions among academics and professionals. Moreover, we are living within a general context of economic crisis that in 2008 and particularly in 2009 will become, according to the experts, an advertising crisis. In such a setting, it is valuable to look at the past and to analyse the distinctive features of a business that has undergone other crises and has gradually established itself until becoming an industry that, as told by Tungate, has a world turnover of around 400,000 million dollars.

The book embarks upon its subject by presenting the slightly excessive party atmosphere of a worldwide agency at the Cannes advertising festival, which allows us to ask a classic question: is advertising show business? From here, it goes on to explain the problems of effectiveness in advertising and mentions, quite rightly, the book by Briggs and Stuart (*What Sticks*), which estimates the percentage of advertising spend that is completely wasted at 37%. Apart from the tendency towards frivolity, arbitrariness and squandering that may exist in the business, Tungate realises that the best professionals have always kept an eye on effectiveness, following a tradition that perhaps has its most valuable landmarks in the great advertising figures of Claude Hopkins and, some decades later, David Ogilvy and Rosser Reeves, with their 'unique selling proposition'. In this way, the reader is introduced to the debate (classic in advertising) between hard and soft sell, between effectiveness and intuition, sales and brand image as predominant considerations.

Although the book's main value is perhaps the interviews with professionals as outstanding as Jean-Marie Dru, Maurice Lévy, Phil Dusenberry, John Hegarty and Martin Sorrell, Tungate explores subjects that will interest researchers of the profession, such as the creative climate of Manhattan in the fifties or London in the eighties, with the creative explosion of Saatchi and Saatchi; the relevant contribution of advertising to popular culture, the wave of acquisitions and mergers of agencies that revolutionised the industry as from the eighties, and the influence of the internet crisis of 2000 on advertising business. Tungate also focuses on the apogee of media buying firms, and dedicates a chapter to the advertising agency of the future.

Tungate presents the great creative names and attempts to introduce the reader to a business and an art based on

talent, the source of creativity, impact and also of many headaches. Tungate perfectly understands the creative personality that means the business has been marked by what is called “creative revolutionaries” such as Bill Bernbach (probably the most influential of all) and George Lois.

The author also draws a valuable map of the five large global companies in the industry and their owners as from page 164. His description of Omnicom, WPP, Interpublic, Publicis and Havas is particularly useful in explaining the recent development of firms that we define as “mega advertising groups”. Dentsu and Hakuhodo, the two large Japanese agencies, are also the object of an analysis that provides insight into the advertising environment of Japan, the second largest advertising market in the world.

This is a book of great interest for academics and professionals from the industry, with space even for the battle for creative supremacy between Barcelona and Madrid (pages 225 onwards). It has a journalistic focus in the noblest sense of the term and the author displays a most praiseworthy precision. The book boasts an agile, flowing style and that is why researchers will find, among these lines, clues to be able to investigate various issues. *Adland* will be a vital starting point for analysing the evolution and future of the advertising industry.

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Book Review

ELÍAS, C. *Fundamentos de periodismo científico y divulgación mediática*

Madrid: Alianza Editorial, 2008, 240 pages.

ISBN: 978-84-206-8418-5



Carlos Elías, lecturer in specialised journalism and science journalist, has produced the first manual in Spanish on science journalism representing the points of view of journalists, scientists and social studies. Designed as a manual for the subject of science communication / science journalism and adapted to the Euro-

pean Higher Education Area, this entertaining book is not only aimed at journalism students but also at people from the natural sciences, engineering, social sciences or humanities. The book's chapters range from an introduction to science as an object of information to a rigorous description of the sources in science journalism (with special chapters dedicated to scientific journals and the internet) and editing techniques in science journalism, as well as analysing the journalistic genres applied to scientific information, the media formats of scientific information (printed press, digital press, radio and television) and ends with a chapter dedicated entirely to science journalism as a profession.

MASSARANI, L.; POLINO, C. *Ciencia en los medios masivos: los desafíos y la evaluación del periodismo científico en Iberoamérica*

Bolivia: 2008, 128 pages. ISBN: 84-96023-60-5



This volume is a collection of the Ibero-american seminars on *Science in the mass media: the challenges and an evaluation of science journalism in Latin America* held in Bolivia from 30 July to 3 August 2007. These seminars aimed to evaluate the situation of science journalism in Latin America, analyse the main challenges for science journalism from a theoretical and practical perspective and develop strategies to improve its quality. So this volume represents the press, television, radio and internet. In the section "Artículos" (Articles), we find the contributions made by researchers and professionals of science communication that tackle topics such as the theory and practice of science journalism, health research in newspapers in Latin America, journalistic discourse on science and technology, evaluations of the popularisation of science and the role of the scientific communicator. In the section "Testimonios" (Eye Witness Accounts) there are comments by participants in the seminars on science journalism in Guatemala, the challenges of science journalism in Colombia, Chile, Bolivia, Uruguay, Brazil, Argentina and science journalism on the radio. This is an interesting study on the current state of affairs of science journalism in Latin America.

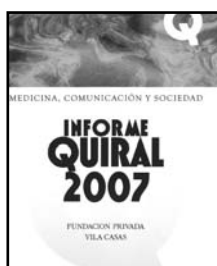
Version available online:

<http://www.oei.es/salactsi/libro_periodismo_cientifico.pdf>

PROYECTO QUIRAL. *Medicina, comunicación y sociedad. Informe Quiral 2007*

Barcelona: Rubes Editorial, SL, 2008, 144 pages.

ISBN: 978-84-497-0133-7



The *Informe Quiral* is an annual study carried out by the Vila Casas Private Foundation and the Observatory of Scientific Communication of Pompeu Fabra University, which since 1997 revises how journalism covers health in the Spanish press by analysing the most outstanding themes and the

journalistic treatment and sources of information. In the latest *Informe*, a total of 12,048 texts are analysed on health and medicine, published throughout 2007 in the five most widely sold newspapers in Spain: *El País*, *El Mundo*, *ABC*, *La Vanguardia* and *El Periódico de Catalunya*. Regarding the previous year, the study shows an increase in the journalistic coverage of health topics and a consolidation or birth of spaces dedicated specifically to this area. This latest edition analyses in depth the treatment of the press in four cases: the debate arising in the media in view of the detentions made in various abortion clinics, the limits in communication techniques to raise the awareness of the population regarding a health topic and the repercussions of vaccines against malaria and the human papillomavirus. In short, the *Informe Quiral* is an essential tool for consultation regarding the state of information on health and biomedicine published in the press.

Version available online:

<<http://www.fundacionvilacasas.com/informequiralc.htm>>

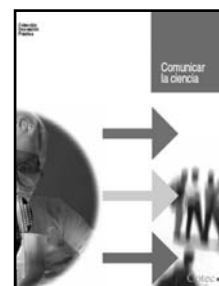
MARTÍNEZ SÁEZ, L. A. *Comunicar la ciencia*

Madrid: Fundación Cotec para la Innovación Tecnológica, 2006, 218 pages.

ISBN: 84-95336-67-7

The title of this volume, *Comunicar la ciencia* (Communicating science) already implies the action of popularising, of transmitting scientific knowledge. In this book, the Cotec Foundation reviews the popularisation and dissemination of scientific and technological knowledge by analysing the role of the communication

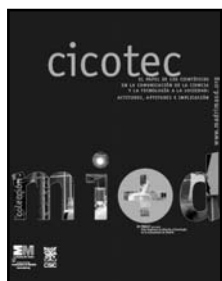
offices of research centres and researchers in science communication. It does so by giving guidelines to improve the performance of the popularisation and dissemination of science and technology, aimed at the actions required and the most suitable language to make scientific knowledge comprehensible and to improve the performance of the popularisation of science in constructing the society of knowledge. The study describes the general process of communication and its application to science, analysing the environment in which scientific and technological communication has to move. It also describes the main reasons why both universities and research centres have to communicate, giving guidelines on how to organise and manage communication and the internal and external challenges to be met by a communication department. The study concludes with an epilogue with a summary of the document in the form of myths that must be destroyed in the communication of science.



Version available online:

<<http://www.oei.es/salactsi/comunicarlaciencia.pdf>>

MARTÍN SEMPÉR, M. J.; REY ROCHA, J. *Cicotec. El papel de los científicos en la comunicación de la ciencia y la tecnología a la sociedad: actitudes, aptitudes e implicación* Madrid: D. G. Universidades e Investigación, Consejo Superior de Investigaciones Científicas, 2007, 138 pages.



In view of the lack of attention paid by the scientific community to the popularisation of its research in the media, this manual tackles the role of scientists in the communication of science and technology in society. The study analyses the motivations of scientists to popularise science, the importance of their participation in communicating science and technology to the public at large and proposes strategies and actions to encourage and improve the communication of science (increased funding, institutional recognition, involving the media). For the authors, rather than forcing scientists to take part in activities to communicate science to the public (recommendations in the United Kingdom by the Wolfendale Committee, 1995), it is more important to encourage, motivate and help scientists to become involved in the institutional collaboration of activities to popularise and communicate science to the public.

Version available online:

<http://digital.csic.es/bitstream/10261/1616/1/30_Papel.pdf>

HERNANDO CUADRADO, L. A.; HERNANDO GARCÍA-CERVIGÓN, A. *Lengua y comunicación en el discurso periodístico de divulgación científica y tecnológica* Madrid: Editorial Fragua, 2006, 150 pages. ISBN: 978-84-707-4193-7

Hernando Cuadrado and Hernando García-Cervigón have analysed the treatment received by the Spanish language in popularising scientific and technological themes in the media. The book is divided into three sections: the first, introductory, on journalism and the popularisation of science and technology, analyses the sources of information and how science and technology are treated in the media. The second part covers the linguistic configuration of the discourse when popularising science and technology, studying the elements of this journalistic discourse, with a section dedicated to the role of new technologies. The third part is composed of the authors' analysis of discourse when popularising science and technology and journalistic genres, and it concentrates on the treatment of language and style in journalistic genres.



Other books

ALCÍBAR, M. *Comunicar la ciencia. La clonación como debate periodístico*. Madrid: Consejo Superior de Investigaciones Científicas, 2007, 286 pages.

ISBN: 978-84-000-8580-3

CHENG, D.; CLAESSENS, M.; GASCOIGNE, T.; METCALFE, J.; SCHIELE, B; SHI, S. (ed.). *Communicating Science in Social Contexts*. New models, new practices. Springer, 2008, 322 pages. ISBN: 978-1-4020-8597-0

TRENCH, B.; BUCHI, M. (ed.). *Handbook of Public Communication of Science and Technology*. Routledge, 2008, 288 pages. ISBN: 978-0-415-38617-3

Journal Review

Trípodos. Ciència i mitjans de comunicació

Barcelona: Universitat Ramon Llull.

No. 22, 2008.

ISSN: 1138 -3305



The latest issue of the digital journal published by the Blanquerna Faculty of Communication Sciences (Ramon Llull University) tackles the relationship between science and the media and the difficulties encountered in popularising science. A total of nine articles go to make up this issue on a single theme, among which we can

find an article by Santiago Ramentol on the problems of communication in the scientific community. In “Estimular la demanda” (Stimulating demand), Javier Sampedro talks of the responsibility of the scientific communicator to make science more accessible. On the other hand, Vladimir de Semir denounces the trivialisation of science news and the dumbing down of knowledge. Romà Guardiet analyses the role of metaphor when explaining scientific processes and concepts in an accessible way. The article by Lluís Reales makes a series of proposals to bring science closer to society, based on the hypothesis that a learned society is a great democratic asset. The little visibility of women as a source of information when communicating science is denounced in the article by Gemma Revuelta. Other articles in the journal tackle the role of science museums as a means of communication and their contribution to democratising knowledge, the scientific method and citizen intuition, and of the importance of science and technology in society and the lack of interest shown by the media.

Version available online:

<<http://www.tripodos.com/>>

Quaderns de la Fundació Dr. Antoni Esteve.

Debates sobre periodismo científico. Expectativas y desencantos acerca de la clonación terapéutica en los medios de comunicación

Barcelona: Fundació Dr. Antoni Esteve.

No. 12, 2007.

ISBN: 978-84-936144-2-3

This edition of the *Quaderns de la Fundació Dr. Antoni Esteve* contains the contributions made in the Foundation's third debate on science journalism, concerning how science is popularised in the media. From the area of communication, the journal has the collaboration of journalists Hugo Cerdà, who claims the need for



more verification on the part of journalists; Enrique Coperías, who demands more scientists in the media in order to excite the audience; Pablo Francescutti, who warns of the growing politicisation of science journalism; and Joaquim Elcacho, who alerts us to the need for a more rigorous and profound science journalism. From the area of science, Jaume Baguñà denounces the lack of diversity in the sources used in science journalism; Acaimo González-Reyes claims that popularisation is one of the obligations of scientists; Francisco Murillo suggests that journalists are not interested in science but in news; and Francesca Vidal believes that more self-criticism would be useful in the media. The *Quaderns* also contains a selection of articles on therapeutic cloning that have appeared in different international newspapers.

Quaderns de la Fundació Dr. Antoni Esteve.
La ciencia en los medios de comunicación. 25 años de contribuciones de Vladimir de Semir

Barcelona: Fundació Dr. Antoni Esteve.
No. 11, 2007. ISBN: 978-84-935465-8-8



Commemorating the 25 years since the creation of the now disappeared science supplement of *La Vanguardia*, number 11 of the *Quaderns de la Fundació Dr. Antoni Esteve* contains 42 of the most representative articles by Vladimir de Semir over the last 25 years. Among these arti-

cles, particularly of note is one on the difficulties in popularising scientific topics among the public at large (“Divulgar ciencia, equilibrio entre rigor y comprensión” - Popularising science, balance between rigour and comprehension); the article “Saber i quart poder” (Knowing and the fourth power), a critique of the lack of rigour, sensationalism and dumbing down of the media; “¿Qué hechos merecen ser noticia?” (What facts deserve to be news?), denouncing the competition between scientific topics to occupy space in the media, something which leads to journalists abusing their more spectacular aspects, and “La dérive du journalisme scientifique. De l'acculturation à la déculturation”, which deals with the challenges that should be tackled by science journalism. We also find a study of the treatment given by the printed press to a specific case in “Las noticias sobre el cáncer en los medios de comunicación escrita” (The news on cancer in the printed media) and the article “Scientific Journalism: Problems and Perspectives”, where the author underlines the importance of scientific information in the media. In total, a homage to the veteran journalist and educator.

<http://www.upf.edu/pcstacademy/_docs/200710_25anys.pdf>

Journal of Health Communication:
International Perspectives

Londres: Taylor & Francis Group, LLC.
Vol. 13, no. 6, September 2008.
ISSN: 1081-0730

This latest issue of the *Journal of Health Communication* has a total of six articles dedicated to the communication of health, of which we would like to highlight two. In “News Coverage of Cancer in the United States: A National Sample of Newspapers, Television and Magazines”, Michael D. Slater, in collaboration



with other researchers, analyses the content of the treatment of news of cancer in the media. It concludes that the incidence of lung cancer in mortality is underrepresented and that the effects of breast cancer are overrepresented. The article “Can Movie Theater Advertisements Promote Health Behaviors? Evaluation of a Flu Vaccination Pilot Campaign” analyses the influence of advertising campaigns in cinemas to promote healthy behaviours and reaches the conclusion that advertising in cinemas is a highly effective means to communicate health.

Journal of Science Communication

Itàlia: SISSA, Scuola Internazionale Superiore di Studi Avanzati.

Vol. 7, no. 2, June 2008.

ISSN 1824-2049



In the latest JCOM published from Trieste (Italy), by the SISSA-Media-

Lab, we find a collection of articles of an academic-essayist nature on various topics but always related to science communication. This latest issue, with an editorial by Pietro Greco on the weight of cultural values when constructing images of science, of note are articles such as the one by Chandra Mohan, offering us an experienced view of the uses of scientific information in India, attempting to destroy the myth that the rural world is not interested in this kind of information. Also of great interest is the article by Shineha, Hibino and Kato, presenting an analysis of the media coverage of the debate concerning "genetic manipulation" in Japan. Along similar lines with cases by country, we find a review of a Dutch science communication campaign and, on the other hand, the rest of the articles deal with topics that are more across the board, such as the use of so-called web 2.0 instruments with regard to the scientific community, as well as other reflections on the future of scientific papers, the so-called e-science, the debate on intellectual copyright licences and scientific progress, among others.

Version available online:

<<http://jcom.sissa.it/>>

Science Communication

Londres-Thousand Oaks, CA: Sage.

Vol. 30, no. 1, September 2008.

ISSN: 1075-5470

This issue of the journal *Science Communication* tackles various topics from its area of interest, starting with the article by Calvo and Pardo, analysing the competition between biotechnology and religious beliefs when establishing the media focus concerning the moral status of the embryo frame, within the context of

the debate on stem cell research. The second article in the journal, by Illman and Clark, presents a study of the visibility of scientific investigation in several research centres of the U.S. National Science Foundation, where a certain lack of visibility is observed of the authors and the institutional origin of the scientific findings that are news in the media. Continuing with the coverage of "controversial" themes in the media, we find an article by Clarke on the media biases concerning the controversy regarding cases of autism and the application of vaccination programmes for children, and the journal continues with a study by Tanner, Duhe, Evans and Condrasky, analysing the evolution of a pilot programme to raise awareness of healthy nutritional habits in children and measures the effectiveness of this by observing the changes in habits of children once they arrive home. Apart from the book review, the journal concludes with a more theoretical article by Powell and Colin on the degree of citizen engagement in science and technology and how to improve it.



Website Review

Observatori Comunicació i Salut (OCS)

<<http://www.portalcomunicacion.com/ocs/cat/index.asp>>

Via the Portal de la Comunicació (Incom – UAB) we can access the Observatori Comunicació i Salut (Observatory of Communication and Health or OCS in Catalan) which, since 2005, has studied health-related communication regarding three aspects: communication between subjects, communication between institutions and subjects, and the analysis of social-health information transmitted by the mass media. The OCS's lines of research are, among others, the influence of marketing and advertising on behaviour and living habits, relations between public and private institutions and the mass media, an analysis of how health is treated in the media, journalism specialised in health-related areas and the role of the internet in the area of health. The portal has a wide range of services as well as access to research and activities carried out by the OCS, a bibliography, online documents, links, an agenda of activities related to communication and health, etc.

Observatori de la Comunicació Científica (OCC)

<<http://www.upf.edu/occ/>>

The Observatori de la Comunicació Científica (Observatory of Scientific Communication) is a special research centre linked to the Department of Journalism and Audiovisual Communication of the Pompeu Fabra University (UPF), created in 1994 by a joint initiative between the Department of Universities, Research and the Information Society of the Catalan government and the UPF. The OCC specialises in the study and analysis of the transmission of scientific, medical and technological knowledge to society. The OCC's main areas of research are crisis communication, scientific communication and knowledge representation, journalism specialised in science and technology, the evaluation of the quality of biomedical information, participation in the International Network of Discourse Studies and the strategies and new products to popularise science and technology.

Associació Catalana de Comunicació Científica (ACCC) <<http://www.accc.cat/>>

The Associació Catalana de Comunicació Científica (Catalan Association of Scientific Communication) was created in 1990 as a professional body to bring together scientific communicators, specialised journalists, scientists, popularisers and editors in the Catalan area interested in communicating scientific information in the media. Among its objectives is that of promoting, disseminating, extending and improving scientific communication, emphasising the social and political aspects of scientific information, facilitating the continued training of its associates and encouraging debate and self-criticism among communicators of science, technology and innovation. By means of its website we can access publications, links to other associations, applications for awards for popularising scientific research, courses, conferences, activities, directories (of members, of scientific, environmental and health communication).

Associació Espanyola de Comunicació Científica (AECC) <<http://www.aecomunicacioncientifica.org/>>

The Asociación Española de Comunicación Científica (Spanish Association of Scientific Communication) was created in 1975. One of its aims is to promote scientific journalism and communication in Spain, Europe and Latin America, promote the presence of scientific information in the media, stimulate the training of journalists and of communicators, safeguard the independence and objectivity of content and free speech and facilitate dialogue and relations with sources of information. It covers journalists and communicators from the fields of science, technology, health and the environment. It organises seminars, colloquia, courses and meetings between journalists and scientists with the aim of dealing with contemporary scientific themes. On its website we can find a list of European universities offering scientific journalism studies and forums on themes on the communication of science, technology, health and environment.

European Association of Science Journalists' Associations (Eusja) <<http://www.eusja.org/>>

The European Union of Science Journalists' Associations (Eusja) was set up in 1971 and currently represents 27 science journalism associations from 25 European countries. It acts as a network between science journalists throughout Europe with the aim of facilitating meetings, promoting discussions on topics related to science journalism and open up a forum to extend the coverage of European science. Its website provides access to websites of allied associations, to various reports by the Association, newsletters and detailed information on announcements for congresses and conferences related to science journalism.

American Association for the Advancement of Science <<http://www.aaas.org/aboutaaas/>>

The American Association for the Advancement of Science (AAAS) is an international organisation dedicated to advancing science around the world by serving as an educator, leader, spokesperson and professional association. It also publishes the journal *Science*, as well as many scientific newsletters, books and reports. Founded in 1848, the AAAS has 262 affiliated societies and academies of science. Its mission is to advance science and serve society through initiatives in science policy, international programmes, science education and more. Some of its objectives are to enhance communication among scientists and the public, promote and defend the integrity of science and its use, foster education in science and technology and increase public engagement with science and technology. On its portal we can find a link to "Communicating science: tools for scientists and engineers", which provides resources to communicate research to the public via the media.

C4. Consell Català de Comunicació Científica <<http://www.cquatrecat.cat/>>

The mission of the Consell Català de Comunicació Científica (Catalan Council of Scientific Communication) is to "contribute to the incursion of science into popular culture, inspiring and generating significant impacts that encourage solid opinion and a critical spirit among citizens. The aim is to promote innovative initiatives and, at the same time, bring together those being carried out to make Catalonia an international benchmark in the public comprehension of science". On its website we can find information on how it operates and its members, as well as a number of resources.

World Federation of Science Journalists (WFSJ) <<http://www.wfsj.org/index.php>>

The World Federation of Science Journalists (WFSJ) is a non-profit organisation created in 2002 representing 37 associations of science and technology journalists from Africa, the Americas, the Asia-Pacific, Europe and the Middle East. Its objective is to further science journalism as a bridge between science, scientists and the public, improve the quality of science reporting, promote standards and support science and technology journalists worldwide. On its website we can find information on the latest advances and trends in science journalism. It also provides extensive information on science journalism congresses, books, documents, online resources, grant and award applications and offers the first online course on science journalism.

Servicio de Información y Noticias Científicas (SINC) <<http://www.plataformasinc.es/>>

By the Fundación Española para la Ciencia y la Tecnología (Spanish Foundation for Science and Technology or FECYT) and an institutional result of the Year of Science, in December 2007 the SINC was created to manage and produce science news aimed at the media, the science community and citizens. Its website, constructed using freeware tools, is a source of resources on scientific communication divided into basic areas of knowledge as p.e. natural sciences, biomedicine and health or mathematics. Although this website has been recently created, it is one of the most complete institutions initiatives on this area in Spain.

Instituto de Comunicação e Informação Científica e Tecnológica em Saúde (ICICT) <<http://www.cict.fiocruz.br/>>

The Brazilian Instituto de Comunicação e Informação Científica e Tecnológica em Saúde (Institute of Communication and Scientific and Technological Information in Health) comes historically from the Superintendência de Informação Científica. It defines itself as a scientific-technical unit of the Osvaldo Cruz Foundation that develops strategies and carries out actions to extend the field of scientific information, communication, science, technology and health with the aim of strengthening the free access to scientific knowledge in Brazil and in other Portuguese-speaking countries. On its website we can find access to journals, to virtual libraries on health, information systems and the generation of indicators developed by the ICICT itself, etc.

Conseil Supérieur de l'Audiovisuel (CSA)

<<http://www.csa.fr>>

The portal of the French regulatory authority contains documents, studies and decisions on science in the media. So we can find a study carried out by the Council itself on scientific broadcasts on French television ("Science et télévision: état des lieux") where it is verified that strictly scientific broadcasts are minimal and that on TV news scientific topics are presented quickly and schematically. Another study on the dissemination of documentaries on national channels has shown an increase in this genre in programming and also that scientific documentaries are more present on public channels, while the private channels prioritise topics on modern life and the economy. Regarding media literacy, we find an intervention on the role of the media (television and radio) on information and education of citizens regarding subjects of bioscience ("Biosciences, éducation du citoyen, information: le rôle des médias").

Consell de l'Audiovisual de Catalunya (CAC)

<<http://www.cac.cat>>

The website of the Consell de l'Audiovisual de Catalunya (Catalan Audiovisual Council) includes a series of documents related to the treatment of different scientific and health-related topics in the media. Among others, we can find a study on *La ciència als espais de televisió infantil* (Science on children's television), with a diagnosis of the kind of science shown on children's television on the Spanish and Catalan TV channels in Catalonia. Another study, *Publicitat audiovisual i trastorns del comportament alimentari* (Audiovisual advertising and food behaviour disorders) analyses the decoding and interpretation by children of TV stimuli and advertising and the repercussion on everyday actions, especially eating patterns and the possibility of developing food disorders. On health we can also find *Comunicación y alegaciones de salud en los lácteos funcionales: análisis de casos de la comunicación* (Communication and health claims in functional dairy products: analysis of communication cases), which analyses the corporate websites and TV adverts promoting functional dairy products and analyses the claims used to promote them. Finally, *Presència i tractament del contingut sobre salut en la programació de la ràdio generalista* (Presence and treatment of health-related content in generalist radio programming) analyses the presence of health-related themes and how they are treated on the programming of generalist radio stations in Catalonia during the 2004/2005 season.

Consejo Audiovisual de Andalucía (CAA)

***Recomendaciones sobre la comunicación social de la ciencia y la tecnología (divulgación científica) en los medios audiovisuales* (Recommendations on the social communication of science and technology (popularising science) in audiovisual media)**

<<http://www.consejoaudiovisualdeandalucia.es>>

Due to the celebration in 2007 of the Year of Science, the Consejo Audiovisual de Andalucía (Audiovisual Council of Andalusia) produced a series of recommendations on the social communication of science and technology aimed at the audiovisual operators of Andalusia. These recommendations involve all society, especially families and their aim is to establish principles and criteria for the social communication of science and contribute to improving the audiovisual system. The sixteen recommendations are divided into four sections. The first one is aimed at the different actors, who are asked to encourage the communication of science and technology across the board and also to encourage criticism and help society follow science, as well as helping to remove the digital divide. The second section deals with programming and recommends to increase the quality of programmes, find new formats and promote debate programmes on science and technology. The third one recommends avoiding the presence of programmes or content that offer a distorted idea of science and to include the gender perspective in science and technology. Finally, recommendations are also made on the appropriate languages for communicating science to citizens.

Science and Environment Communication Section of ECREA **<<http://www.scienv-com.eu/>>**

The Science and Environment Communication Section of ECREA (European Communication Research and Education Association) seeks to foster a strong and dynamic research network in the area of science and environment communication. It is an interdisciplinary section that, broadly and without limitations, aims to focus on the study of media representations of science and the environment; political and commercial discourse on the environment; communication and scientific governance; public engagement with science and the environment; and interactive communication of research-based knowledge. On its website there are news items from the Section, such as annual reports, news on meetings and international congresses and links to other related websites. It is an academic meeting point for the area of environment and science communication in Europe.

Portal de la Comunicació. Lección del portal:
“Hacia un nuevo contrato entre ciencia y sociedad: el papel de la comunicación científica”
(Towards a new contract between science and society: the role of scientific communication)

<http://www.portalcomunicacion.com/cat/n_aab_lec_1.asp?id_llico=32>

Within the online articles we can find on the communication portal of the Autonomous University of Barcelona (UAB), it is worth highlighting this “Portal Lesson” by Victòria Mendizábal, within the context of the Observatory of Communication and Health of the same university, which we have mentioned before. In this lesson, the researcher from the Observatory for Scientific Communication of the Pompeu Fabra University (UPF) attempts to summarise the great challenges facing a society as technological as our own, with a view to accurately disseminating scientific knowledge so as not to violate the principles of free, transparent communication required in all democratic societies. Of note is the critical reflection regarding the apparent perfection that generally surrounds scientific knowledge, as well as propositions regarding the figure of “scientific communicator” as an actor presented as necessary within this situation, once the dimensions of scientific communication in social organisation have been analysed.

Colexio Profesional Xornalistas de Galicia (CPXG)
<<http://www.xornalistas.com>>

The portal of the Colexio Profesional de Xornalistas de Galicia (Professional College of Journalists of Galicia) provides access to the minutes of the first Communication and Science Forum that took place in September 2007 in Santiago de Compostela where the role of scientific communication in today’s society was debated. This document contains the contributions made by the speakers on information and knowledge, the social perception of science, relations between journalists and scientists, different aspects of scientific information, how the content is treated, and the relationship between the internet and scientific information, among others.

Sopa de ciencias

<<http://www.sopadeciencias.es>>

Sopa de ciencias (Science soup) is a blog created by Elena Sanz (science journalist) and Patricia Vicente (graphic designer), presented as a blog to share “plates loaded up with information, ideas, notes and reflections related to the world of science and communication”. It is really interesting to find in the blogosphere sites such as this one, where we can access announcements for courses, congresses, exhibitions, grants and awards, articles from a post dedicated to the technology used in the last Olympics in Beijing to an article dedicated to vestigial organs, information on various projects and other resources.

Other websites of interest:

Association of Health Care Journalists (AHCJ)

<<http://www.healthjournalism.org>>

European Science Communication Network (ESConet)

<<http://www.esconet.org/>>

Intute: Health and Life Sciences (Psci-com)

<<http://www.intute.ac.uk/healthandlifesciences/psicom/>>

Public Communication of Science and Technology (PCST)

<<http://www.upf.edu/pcstacademy/>>

Science Journalism Research Group

<<http://www.sciencejournalism.net/>>

Society of Environmental Journalists

<<http://www.sej.org/>>

Yale Climate Media Forum

<<http://www.yaleclimatemediaforum.org/>>

Fundació Catalana per a la Recerca i la Innovació

<<http://www.fcr.es/>>

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