

**Parallel Session 8: The role of books and literature in public communication of science**

**READING AND SCIENCE PROGRAM: STORYTELLING WITH THE OSWALDO CRUZ FOUNDATION'S RESEARCHES**

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**Abstract**

This work discusses the participation of researchers in the Reading and Science Program in the Museum of Life. Integrating part of the Oswaldo Cruz Foundation (Fiocruz), in Rio de Janeiro, the museum has as its aim to inform and educate people in science, health and technology in a playful and interactive way. The Program proposition of work is based on the articulation between literature for children and young people and science departing from themes related to health and environment, which are contemplated by the institution. Our study is based on interviews which were conducted with researchers, on the questions that arise during the debate with the visiting audience and on observations made by the team. From the accomplished analysis, we searched for comprehending how this program can contribute to the popularization of science.

**Key Words:** Literature, Popularization, Science Museums

**Text**

The Reading and Science Program proposition starts from the initiative of the Education in Science Center at the Museum of Life interested in sensitizing and founding the professional team in the museum for the development of activities which are aimed at the promotion of reading. The guiding principle of the activities is related to the possibility of articulating literature, science and daily life departing from themes that are more closely related to our institution's general contents – science, health and technology.

In this work, we will discuss the reading practices and its interface with the educational field and scientific diffusion for, then, presenting an exploratory study

on the participation of Fiocruz's researchers in the monthly event *Storytellers in the Museum of Life*. We tried to comprehend the researcher's perceptions and attribution of meanings in relation to the proposition of articulation between literature for children and young people and science.

The monthly event counts on a group of storytellers that approach the approached theme; the contribution of a researcher who brings the account of his daily work; followed by a moment of debate with the participation of all the people who are present. The public on weekends is really diverse.

The close link between reading and social participation was reaffirmed by the educator Paulo Freire in the Brazilian Third Reading Congress, held in 1981. According to him, reading is a knowledge process and a creating act. Thus, promoting reading is being able to share with the other not only the aesthetic and affective aspects of the taste for reading, but also acting in an active way in the development of cognitive aspects which are related to knowledge, allowing the development of criticism and analysis ability.

Currently, in the educational field, the concern with reading and the reader's education has been expressed through studies which approach the knowledge involved in the daily act of teaching and learning, the multiple languages that permeate the reading practices and the different dimensions that act in the diffusion of literature and the education of its audience, among others, (Lajolo, 2002; Paiva, 2003; Soares, 2003).

In our investigations we discussed aspects like: What is the profile of the researcher who participates in the storytellers event? Which are this researcher's expectations in relation to this proposition? Which resources does he use in his narrative? How does the researcher evaluate his own participation in the activity?

Our study was based in the qualitative approach. As research subjects, we identified those Fiocruz's researchers who participated in the monthly events in the period from 2001 to 2002. Thus, from the seventeen professionals who were invited, we interviewed thirteen researchers using a semi-structured interview script as a research tool.

Based on the interview analysis, we observed that the moment of presentation to the audience generates great expectations in the researcher. At first, some of them planned a lecture, but after some preparatory meetings with the team, they decided for a more informal presentation. Most of the researchers used different kinds of languages in their communication with the audience. Thus, other resources were incorporated to the verbal narrative: images – slides, OHP transparencies, photographs, video snippets; sounds – sounds and music; text – explanatory leaflets, books, primers; specimen samples – samples of insect, periwinkle and medicinal plants collections; reference objects – indigenous, childish and recyclable objects; and even the use of dramatization of different situations and special clothing.

In relation to the subjects, we make evident that even those who perform their work taking into account the production and circulation of knowledge, affirm that scientific diffusion is still in its beginning. As to the museum's role, they highlight the aspects of education and science and health diffusion as part of their mission, besides the importance of including nearby communities in the discussions. Most of the interviewees claimed ignoring other activities involving storytellers and scientific diffusion. We observe that although many interviewees expressed their concern about the dismythification of science, the academic language was present in their communication, which made the audience's comprehension difficult. The subjects considered the fact of talking to a heterogeneous audience as a challenge, but it was also a rich experience as it favored the dialogue with visitors, enlarging the population's access to scientific information.

Our study has showed that the researchers who participated in the Reading and Science Program comprehend the museum's role as an important social space for scientific diffusion practices. In this context, the proposed activity enables the visitors to relate science aspects with their daily life, also collaborating with the democratization of scientific knowledge. This work has also signaled that the enlargement of the identified themes can be really positive, as we could embrace themes which are suggested by the visitors themselves. We also believe that this activity can be developed with the school audience.

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**H.G. WELLS' SCIENCE FICTION AND SCIENCE COMMUNICATION**

**LA CIENCIA FICCIÓN DE H.G. WELLS Y LA COMUNICACIÓN DE LA CIENCIA**

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**Abstract**

The aim of this communication is to expound connections between science fiction literature and popularization of science through H. G. Wells' storytelling, a good example of vulgarization of Science installed in our popular culture. His short fiction stories display strategies of scientific representation, use of jargon, a variety of scientists' depictions, etc. Reliable scientific information is mixed up with pseudoscientific contents and explanations, extrapolations, and so on. Wellsian literary purposes aimed to think over science social consequences. Wells' objective was to explore beyond boundaries of his time scientific knowledge, halfway between blind enthusiasm and gloomy portraits of science and technology.

**Key Words:** science fiction, popularization

**Text**

Context: Wells is considered one of the founders of science fiction. The readers' demand for scientific information, mass media and a literary formula –between adventures and detective story– were essential for the success and spreading of these popular romances. Scientific degree in Biology, teacher of that subject and admirer of Charles Lyell and Thomas Huxley, Wells wanted to honor them in his literary work, as well as focus this on science. Furthermore, his involvement on social and politics affairs is reflected on the plots of his stories. Nonetheless, he was influenced by social Darwinism, and used this theory to criticize Victorian English Society.

Objective: The objective has been to analyze how is represented science in Wellsian stories and which strategies and elements are recognized as popularization ones. On the one hand, Science is mainly portrayed by the use of technical vocabulary and explanations based on scientific elements or extrapolations. On the other hand, Wells foresaw early Philosophy of

Technology: social and political reflections about science and technology are depicted through speculative narrations and dystopia formulas. He aimed to make the reader aware of the pervasive consequences and social misuse of science and technology.

Methods: The method has been the analysis of Wells's selection of plays, approaching from the philosophy of science and technology (scientific and technological culture), and studies of popularization and perception of science.

Results: Reading some Wells' works is remarkable the knowledge he had about subjects as biology, chemistry or physics. He seemed to be more concern with depicting negative aspects of Science (misleading objectives, ambitions, bad behaviour of scientists, potential risks, threats to the society and human beings). A polarization of attitudes towards science is frequent in science fiction, however Wells cannot be considered ingenuous.

As a man educated on science, Wells managed to introduce a commendable representation of scientific activity such as researching tasks, social and political handicaps, moral objections, *ethos* of the scientific community, accurate use of scientific concepts, use of reliable scientific sources. On the other hand, he revealed misleading scientific practices, specially through the scientists depictions.

According to Haynes (1994), there are seven stereotypes of scientists, some of them are represented by Wells: the mad, inhuman –Dr. Moreau–, noble and altruist –Ponderevo–, adventurer –the Time Traveller–, helpless –Griffin. These are not fixed archetypes: characters' evolution illustrates complex context of science, i.e. Ponderevo's story and bourgeois economical ambition.

Conclusions: Wells combined fiction, scientific fashion theories and non-scientific elements in a successful literary formula seemingly credible. He was careful about the image of science in his stories, but speculative ideas are often presented as scientific arguments.

Nowadays there are popular images of scientists based on Wellsian characters and their behaviour. Many Wellsian professionals of science depict a pessimistic view of science and technology. Each story shatter the confidence on science, but on the other hand, eventually there is no substitute for rationalism and scientific method: superstition, magic, economical pressures or religion among others, are defeated in Wellsian stories (Skal, 1998).

Wells' concern is with the social, political, human and biological aspects of scientific and technological development. Controversial issues, such as eugenics, animals' experimentation, working conditions, natural selection applied to society, scientist's ethics, and so on, are thematized in Wellsian romances. Wells thinks over possible pervasive consequences of science, but his apparently negative vision is not a plain pessimistic one. He always felt confident about science and, far away from a blind enthusiasm, his dystopias and gloomy portraits of the future were metaphorically pieces of advice, just in order to involving reader in the commitment of a control over science and technology (Elias, 1998).

To sum up, Wellsian scientific romances are an excellent instrument for spreading scientific culture, and for arousing curiosity and interest for science. There lurk some risks for a proper communication of science. Although the popular images and stereotypes this genre have created, it offers sources for improving scientific culture, not only by the specific contents but also by the reader's criticism and comparison with real scientific ideas (i.e. pointing out the groundless ideas or extrapolations). Furthermore, science fiction is a popular way of communicating ideas about science and technology –a popular philosophy– and how they affect society and human beings.

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## **Parallel Session 8: The role of books and literature in public communication of science**

### **SCIENCE, BOOKS AND SOCIETY**

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#### **Abstract**

The presentation will outline the European Commission's views on the role of books and literature in the context of the science and society issues. In 2001 the European Commission took an important initiative to stimulate a change in the relationship between science and society, as to reflect the new issues, new fields and new questions that accompany recent scientific and technological developments. Against this background, the publication strategy of the European Commission and concrete examples will be presented.

**Key words:** Science and society, books

#### **Text**

In December 2001 the European Commission proposed and decided to implement a "Science and Society Action Plan". The Commission document set out a new strategy to make science more accessible to European citizens, and 38 actions have been identified as to achieve this objective.

The activities described in the Action Plan are now conducted in close cooperation with all the Member States, and - beyond Europe - with third countries and international organisations. Numerous players are involved: local and regional public authorities, the general public, civil society, industry, etc.

The Commission acts here as a catalyst. It was made clear from the outset that significant results can be expected only if Member States themselves make an all-out effort in a joint, coordinated approach with the Commission.

At the dawn of the 21st century, as the economic integration of an enlarging European Union becomes a tangible reality, our society is faced with the challenge of finding its proper place in a world shaken by economic and political turbulence. Examples abound to show that knowledge, in particular science, technology and innovation, are indispensable to meet this challenge.

However, there are indications that the immense potential of our achievements is out of step with European citizens' current needs and aspirations, such as peace, jobs, security and sustainable development of the planet.

The 2001 and 2003 Eurobarometer Surveys (two opinion polls "[Europeans, science and technology](#)") were conducted at the Commission's request in the fifteen Member States between 10 May and 15 June 2001, and in the ten new

Member States plus Romania, Bulgaria and Turkey in November 2002) of European attitudes to science gives a mixed picture, ranging from confidence and hope to lack of interest in scientific activities or even fears regarding some of their impacts.

80 % of Europeans believe that science will one day conquer diseases such as cancer or AIDS, and scientists enjoy a high level of public confidence, to the extent that 72% of the respondents said they would like politicians more frequently to use expert advice in making their choices. Despite these expectations and the climate of confidence, the same survey also shows that Europe's citizens do not always have a very positive perception of science and technology, and that science is remote for some sections of the population.

Industrial hazards and ethical issues are widely highlighted in the media, raising questions and reinforcing the public's desire for progress to be more closely monitored. Some people feel that science and technology are changing their lives too quickly.

Although progress has been made, too many stereotypes still keep women out of science and deprive it of the diversity sorely needed for a more harmonious contribution to political, social and economic life.

Young people, moreover, no longer find studying science and scientific careers sufficiently attractive. Together with demographic trends, this potentially affects the labour market where industry has difficulties in recruiting the engineers and scientists needed.

Europe would therefore gain by assembling in a Community framework the efforts deployed in the Member States to improve the European public's ability to assess the scientific and technological issues of the day, and to motivate them to become more involved in science.

Against this background, the Commission's action plan presents 38 actions designed to:

- Promote scientific and education culture in Europe
- Bring science policies closer to citizens
- Put responsible science at the heart of policy making

The proposed action plan marked the beginning of a long process, the objective of which is to change the relationship between science and society. Some of the activities are very long term - e.g. in the field of education - while others, such as conferences, are ad hoc.

The European Commission has also set out an ambitious strategy to accompany the implementation of the Action Plan through information and communication activities. A new "Science and society" Directorate has been created within its Directorate-General for Research, now consisting of 6 Units: Strategy and policy, Scientific advice and governance, Ethics and science, Women and science, Information and communication, Education and science.

The European Commission is also committed to help EU-funded projects better communicate and disseminate their research results. It draws in

particular the attention of participants in FP6-funded projects on the fact that they can no longer ignore the ‘public communication’ dimension of their activity and that they are also in an excellent position to improve the image of science and technology among a broad public. Exposing non-specialists to the results of research work helps to improve their understanding of scientific and technological developments and stimulate public debate on important issues, which not only meets a very real social need but also contributes to the success of RTD policy.

Last but not least, publications (hard copies and electronic) have an important role to play. The European Commission’s Research Directorate-General (DG) publishes about 500 publications per year, with a total print-run of over 2.5 million copies. The presentation will outline the Research DG’s publication strategy in this respect and give examples of publications:

Promoting scientific awareness of the public about European research and science and society issues (Fig. 1)

Stimulating public debate about scientific issues

Contributing to science and society issues (e.g. Eurobarometer surveys).

**Figure 1**

**RTD info**  
Magazine for European Research

- 85,000 copies
- Internet and printed
- 600,000 readers in 140+ countries
- 4 languages: DE, EN, ES, FR
- 3-monthly
- « Service to the citizens »

RTD info [http://europa.eu.int/comm/research/rtdinfo\\_en.html](http://europa.eu.int/comm/research/rtdinfo_en.html)

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**NEW WAYS OF COMMUNICATION IN POPULAR SCIENCE  
MAGAZINES.**

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Quo magazine has already celebrated its 100th issue introducing a very special way of making scientific divulgation, with a personal view about communicating science differently from the traditional path. When it came to the market in 1995 there was no precedent in the Spanish media. Divulgation magazines had a classical layout presenting topics and developing them. They did not take advantage of new computing capabilities applied to magazine edition, such as illustration and images modification applications. The coming out of Quo magazine represented a new point of view for many other graphic magazines in Spain, not only for those dedicated to divulgation; and this new point of view made them change their criteria because of its success.

Although Quo dealt with many the same topics than others in the market, the way it treated them had an innovative planing. The main topic for issue Nr 1 was instinct behaviors in human beings. Nevertheless, the study was completeley original, since the headline was: "The animal inside us". It was explained graphically by a man face with a magnifying glass making its eye bigger. Into the lens one could see the eye of a wild feline. It must be taken into consideration that it was technically a milestone for the time being, that image modifying programs were at their starting point then and that both the idea and its making out were really amazing.

This is only an example of the turning of the screw that Quo was supposed to be given from the very beginning, which endowed it with an uncommon personality that is still mantaining through its seven years of existence.

Precisely, this singular case is specially significant because of this dialog, whose headline is: "Scientific Knoledge and Cultural Diversity". As I see it, cultural diversity means not only the acceptance of more or less "exotic" cultural traces to the eyes of the Western world, but the singular way we manage all issues related to them. I assume here The word "culture" in another broader meaning than is usually accepted. Through science is already known that cultural traces of an species could become genetic as time goes by, thanks to evolution. With the necessary careful consideration, different points of view can lead to its incorporation to daily practise of communication on science, even to cause a "cultural swing". This has been the big goal of Quo.

Which are the basis of this diversity? Apart from the graphic advances and he new point of view dealing with classical scientific divulgation topics.

Quo has its own developing charateristics. In detail, they are:

-The playful side of news, which had never been used in written scientific divulgation, i. e.: topic: Pollution caused by the Prestige, delisted in the "Passtimes" section of the magazine, which headline was: "This is not a game". We proposed home experiments, guess what games, etc., to make comprehensible the consequences of pollution due to hydrocarbon. Another example: we show a series of images: "We Explore the Rarest Planet". In the first six pages amazing images of vulcanology, gravity, temperature can be seen... Which planet are we in? Is a question for the reader to be answered: The Earth.

-Interactivity. Communication among Quo and its readers can be called, at least, as surprising. Usually, no less than three contests are proposed in every issue of our magazine, all related to science. There is a whole section (called "Quonnected") made in a big part by readers who send their questions and quizzes, their solutions to every proposal and challenge. The response has been amazing: readers have sent papyroflexia objects, a home-made plane, a raw egg by mail, a boat made out of clay and ears made out of almost anything (to celebrate the anniversary of Van Gogh). The answer is massive: readers invade the redaction of Quo with their inventions and proposals.

-Sense of humor and irony. This is a really important aspect of Quo.

Scientific divulgation is usually considered a boring and erudite matter. Just the opposite for a lot of topics, we think at Quo. A recently published article (May 2004) is about ants. Instead of treating the matter in a traditional way, we called it: "The Working Class", illustrated with an image of an ant with a red helmet. Information about ant-hill organization appears like a hierarchical organigram: enterprise, activity, staff... The product manager is the queen, whose personal particulars can be seen, her productivity ratio, her salary, the duration of her contract, etc.

Therefore, you can explain a very serious scientific topic on a humorous basis.

-Seriousness in contents. Quo has been awarded with the recognition of such prestigious prizes as Boehringer, Casa de las Ciencias de A Coruña and Oncology Association. Rigour is that assured in the magazine. Quo reporters are specialised in every branch of science they write of, which has led to be considered as a very prestigious magazine. Quo attends congresses and discussion forums about science and divulgation and it gives its peculiar vision in courses about scientific press.

Thanks to all that, one can conclude by saying that Quo has become a reference in Spanish scientific divulgation and an example of "cultural diversity" on topic treatment.

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### **WHY THERE ARE NO PROFESSIONAL POPULAR SCIENCE BOOK AUTHORS IN CHINA**

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There are no full-time professional popular science book authors in China. To investigate the reasons behind this anomaly, we interviewed several authors and publishers in China. Remedies are proposed. A way out is to increase dramatically the sale of popular science books through their use in the teaching of science in high schools and the universities. The findings and lessons are also relevant to other parts of the world.

**Key Words:** popular science books, teaching science courses, China

#### **Text**

##### **1. Introduction**

Popular science (PS) books have a long history in existence (Gregory and Miller 1998). They are a neglected tool in the science education of students and ordinary citizens (Lam 2001). PS books are unique among the science media.

- (1) They are available in every bookstore in every town, unlike the technical science books which are available in special book stores in a university town.
- (2) Many of the PS books are written by the pioneers themselves, Nobel laureates, or very gifted science writers who could be journalists or other scientists.
- (3) These books are affordable to almost everybody (about 20 yuans in China, and 15 dollars for a paperback in USA).
- (4) These books are the places to learn how research was actually done and discovery were made in very recent times.
- (5) These books, at least in the USA and for the majority of them, contain no equations and are easy and very entertaining to read.

To ensure the continuous appearance of new and good PS books, a large number of competent authors are called for.

## 2. Popular science book authors in china

China is a country of 1.3 billion in population. Yet, there is not a single *full-time* professional PS book author in this vast country. This is in contrast to the case in literature, because China does have professional writers who can support themselves by publishing novels. And this is not due to lack of support from the Chinese government. In fact, the Chinese government recognizes science and technology as an important pillar in raising the living standard of its population and the economic well being of the country as a whole. Two years ago, China passed the laws that protect and encourage science population at every level of government (Popular Science Press 2002).

In the years from 1949 to about 25 years ago, before the market economy was introduced every writer in China was government employed. The government at that time saw the need to support full-time novelists, but not full-time PS book writers. Obviously in China (and everywhere else in the world) PS books are not deemed to be equally important as literary books.

These days, when market economy is in place, and self-employed literary writers do exist, we still see no full-time PS book authors in China, self employed or government employed. Why?

To find out we interviewed a number of PS book authors and publishers in China. We are told that:

- (1) Science popularization is considered lower in status compared to science research or teaching.
- (2) Work in science popularization is not counted in job evaluations in many places.
- (3) Lack of systematic and large-scale government effort or plan to train PS professionals.
- (4) Insufficient income to support free-lance full-time PS writers.

While points (1) and (2) are definitely true in almost every other country, some countries are doing something to tackle point (3), while point (4) is not true at least in the USA.

Point (4) is particularly interesting. With such a large population in China, how can this happen? These days, an average PS book in China sells less than 5,000 copies. (There are exceptions. For example, *The Complete Book of Raising Pigs* did sell 3 million copies.)

## 3. What can be done

To address point (4) in China, here are some recommendations.

- (1) The government could extend the new policy of supporting literary book projects to PS books, too. That is, prospective authors can apply for a grant to write a particular PS book.
- (2) In every science funding agency, for example, the Chinese National Natural Science Foundation, a new division of funding should be set up to support PS activities, including book writing.

- (3) In major research institutes, such as those in the Chinese Academy of Sciences, one-year visiting positions for prospective writers could be established, enabling them to observe the research in action, learn about major research findings, and discuss with the experts and perhaps even collaborate with them to write PS books.
- (4) Most importantly, to guarantee that PS books will be sold in large quantities in the immediate future, all science teachers in high schools and universities should incorporate the use of PS books in their classes. It is done by offering the students extra credit if they buy a PS book, read it and write a brief report. This is a sure way to excite the students in science and to enlarge their knowledge base. (For more details, see Lam 2001.)
- (5) Since natural science forms the basis of all social sciences (Lam 2002, Wilson 1998), and science and literature are equally important in shaping modern lives, the time has come to include several PS books—such as James Watson’s *The Double Helix*—into the list of required readings in the general education of every student in every university.

For points (1)-(3), the prospective authors may come from any source, such as from magazines and newspapers. Naturally, points (4) and (5) are equally applicable to other countries.

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**FRANKENSTEIN BY MARY SHELLEY: SCIENCE, ITS MYTHS AND ITS MONSTERS**

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**Abstract**

We discuss the trajectory of public acceptance of the novel *Frankenstein*. We centered ourselves in the mythic stature reached by the creature and in its role in the popularization of the work. We start from the idea that the novel's great success was due to the public interest in the monster, and the fact that the work turns to the recreation of life, aspect that historically arises strong interest by equalizing men and gods. We also observe that the *Frankenstein* creature produces interest by the fact that it brings up questions about the individual, his individuality and relations with the other.

**Key Words:** Scientific Diffusion, Science Fiction

**Text**

The fact that techno-scientific development has continuously generated hopes and apprehensions in eastern societies is not new. From the 19th century on, this process has made many futurist predictions become part of the daily life of great population contingents. In this context, it emerged the literary genre that later became acknowledged as science fiction. After all, according to Isaac Asimov's definition, science fiction is the line of literature that deals with men's answers to the changes that occurred in the level of science and technology" (Asimov, 1984:146).

Inaugurating science fiction as a literary style, *Frankenstein* brought to public keen criticism to the pretension of knowledge without frontiers or ethic limitations, violently questioning men's excessive ambition – value which is more and more encouraged by the ascending bourgeois society. Although the work is characterized as a rejection to these values, such criticism shows itself as addressed to a determined kind of knowledge and to a way of its practices organization: it is at the same time a lampoon against the illicit manipulation of nature, and a criticism to the fact that the science of that time was an exclusive prerogative of the masculine sphere (Rocque e Teixeira, 2001).

All this critical potential existent in *Frankenstein*, has not become old over the course of time. On the contrary, it has gained body as the work was reinvented in other media – mainly by the cinema – with the simplification of the original

story, which little by little would be transformed into a horror tale that has as its protagonist a monstrous creature. Today, the quick development of biological sciences, especially genetics, makes the human mind surmise more the possibility of one day science having total power to recreate life in a laboratory. In this context, the Frankenstein myth shows itself even stronger.

The valorization of Shelley's work should also be seen by the strength of the being she created through Victor's hands. The creature seems to have own life, excelling himself in front of the rest of the novel. It is related to the monster category itself, whose existence, real or imaginary, invites us to reflect on human's limitations, or in a last analysis, on our own conception of subjectivity.

In the context of decay of the Cartesian singular reason and ascension of multiple and fragmentary subjectivity, monsters become the source of great interest while their existence addresses to the particularity of our subjectivity statute. This way, they lead us to think the question of alterity, because when certainties about the centralization of the individual vanish, more and more the other – the different one – has its social place rethought. Such aspect goes beyond the limits of academic reflection, touching the general public. The other's place, or condition, and its human or monstrous classification are in the heart of the super valorization of the character created by Victor Frankenstein.

As it is the representation of the different, the abominable, and also the socially unacceptable, the monster allows the formation of an identity, and the creation of a collection of signs that distinguish what is wanted as human from the monstrous and from a group of norms that indicate what is acceptable or abject (Cohen, 2000).. In our case, Shelley and Victor's monster brings within himself another fear, thus in front of his creator's human identity he demands his own identity, independently, his reason of existing – which can be seen in the fact that he asks his creator to create a partner for him as well.

Claiming for their rights, the monsters show themselves as even more threatening, as they leave in the air the fact that the differences between human and monstrous are arbitrary and fluid, related to moments and spaces. After all, monsters are a cultural creation totally related to our way of seeing ourselves and the other, and there resides much of our attraction to these figures.

Incited to write Frankenstein by a competition with a group of friends about who could write the best ghost story, Mary Shelley may have never dreamt about being capable of writing a story which over the course of time would achieve such notoriety. It is as if the monster had obtained more than the acknowledgement he demanded from his creator. Sprung up almost two hundred years ago, he continues to inhabit the anguish and dreams of our post-modern world, incorporating controversies over the ethic limits of science and knowledge in a general way, making us continuously rethink the relation of these limits with the complex questions of alterity and tolerance and the responsibility of the whole society in these imperative questions.

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**Parallel Session 8: The role of books and literature in public communication of science**

**FACT VIA FICTION  
STORIES THAT COMMUNICATE SCIENCE**

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**Abstract**

In this research I propose that narratives represent an alternative means to communicate scientific ideas to society. In a previous study (presented in Cape Town, South Africa 2002 PCST-7), I obtained information about the effect of factual and narrative formats on people's memory and learning. In order to achieve a better understanding of the differences between these two kinds of written information, it was necessary to extend the study both in sample size and in time scale. In this paper I report the results of a follow-up study. The results suggest that, for science communication concerns, both text forms can be considered equally effective in conveying scientific knowledge.

**Key Words:** Science, Communication and Narratives

**Text**

**Introduction**

A fundamental task for science communication is to produce materials that are not only understood by the general public, but also remembered in the long-term as a part of the learning process. There is evidence from memory studies suggesting that narratives represent a good recall device and a learning aid (Sternberg, 2003).

Here I will suggest that literature is an alternative and effective media to teach science as Gough (1993), Appelbaum (1995) and Weaver (1999) propose. In a broader sense, those narratives represent an important means for science communication to transmit and recreate information in an accurate, memorable and enjoyable way.

In a previous study, I obtained information about the effect of factual and narrative formats on people's memory and learning (two measures in time), as well as about the way people organise information when retelling stories (Negrete, 2002 and Negrete, 2003). In order to achieve a better understanding of the differences between factual and narrative formats, it was necessary to extend the study both in sample size and in time scale. In this paper I report the results of a follow up study that I carried out with a larger sample and a third measure in time.

**Objectives**

To evaluate the ability of fictional narratives (short stories) in communicating scientific ideas.

To investigate the extent to which people can understand, apply and remember scientific knowledge included in a short story in comparison to traditional factual texts.

### Methods

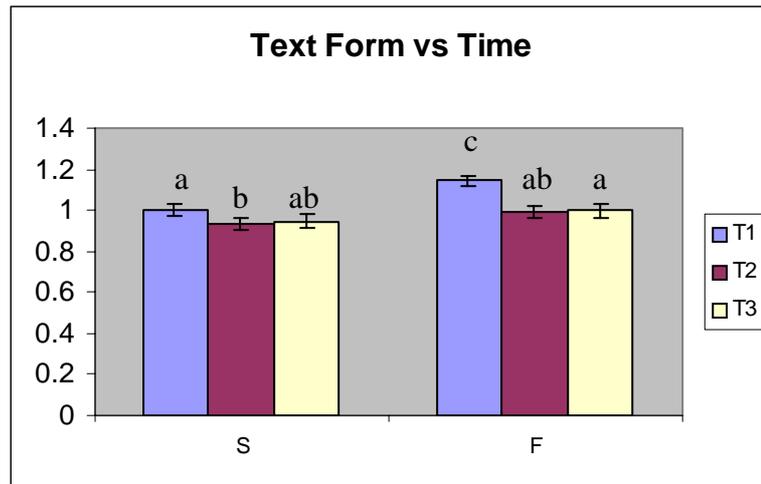
Two stories with scientific content (Nitrogen by Primo Levi, and The Crabs Take Over The Island by Anatoly Dnieprov) were adapted (1500 words each) to enable the participants to read them and complete two questionnaires about them in an hour session. The study included a contrast between factual and narrative scientific information and compared the extent to which the information was remembered at three different times (immediately after reading, two weeks and a month later). A group of 52 undergraduate students participated in the test.

In the creation of this study, four forms of question were included: multiple choice (identify), straightforward and open-ended questions (remember), questions to recount the stories or the lists of facts (retell), and questions where the participant was expected to produce a solution for a particular problem mentioned in a hypothetical situation (contextualise). A combination of measurements of explicit and implicit memory provided a learning measure and therefore an estimator of science communication success.

In order to perform a comparison between factual and narrative information, I extracted from each story a list of all the scientific facts mentioned. In this way all the scientific information included in it was transformed to individual sentences that mention these facts in a plain textbook style and isolated from the story (the extreme opposite of narrative form). Questionnaires were applied to assess the scientific information remember and understood. A statistical test was carried out to compare the performance of the two groups (rm-ANOVA).

### Results and Discussion

Particularly relevant for this study was that the interaction between Time (session 1,2 and 3) and Text Form (narrative and factual) was significant ( $f=5.67$ ;  $p<0.002$ ). The effect of Time is different depending on the Text Form. T1 and T3 in the narrative group are not statistically different to T3 in the factual group. T2 in the narrative group is not statistically different from T2 in the factual group and that T2 and T3 in factual group are not statistically different. This indicated that performance on T1 for the factual group was better than in the narrative group but in T2 and T3 there were no statistical differences in performance between groups (Figure 1).



**Figure 1.** Differences in performance between narrative (S) and factual (F) groups over time (T1, T2 and T3). Different letters indicate significant differences (HSD  $p < 0.05$ ).

This study suggested that, independently of the memory task, factual information is better remembered immediately after a reading compared to narrative one. However, as time goes by, there is no statistical difference in the amount of scientific information retained. Consequently, it is possible to conclude that, in the long term, both text forms are equally effective in conveying scientific knowledge.

The results also suggest that factual information deteriorates at a faster rate than the narrative format. It is plausible that differences are due to the fact that narrative information provides numerous aids for storing and retrieving information from memory. It therefore prevails longer than information that does not include mnemonic devices.

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