3th International Conference on Public Communication of Science and Technology
(PCST), Montreal,Canada,10-13 April,1994

THE CHALLENGE OF SCIENCE COMMUNICATION IN MEXICO

Patricia Magaña, César Carrillo, Ruán Almeida,
Silvia Torres and Alba Rojo,
Faculty of Sciences UNAM, Mexico

Let us begin this work by referring to a tale by Agusto Monterroso. The story begins when Fray Bartolome Arrazola, a missionary in Guatemala gets lost in the middle of the tropical forest. He had lived there for three years, and sat down to peacefully wait for his death. He fell sleep and when he woke up he found himself surrounded by natives who were trying to sacrifice him in a shrine. In his despair, he remembered an eclipse would occur that day. He tried to make use of this knowledge to fool his oppressors and save his life.

"If you kill me," he said, "I will make the sun disappear and darkness will come."

The natives stared at him while Fray Bartolome, surprised by their incredulous look but confident, saw them discussing the point. Two hours later, Fray Bartolome's heart was bleeding in the stone for sacrifices, under the dim sunlight during the eclipse. At the same time, a native was saying without hesitation, each one of the days when eclipses would occur.

The Mayan astronomers had predicted and archived this information without any help from Aristotle. This story then, describes a drama that is still lived in many countries of the Third World. This drama is the clash of two cultures. In this case, the Spanish and the Mayan culture. The former as precise and complete as the latter, which allowed the survival of these two groups in different environments. However, one culture defeated the other one, eliminating the vast knowledge accumulated over the centuries.

The Spanish conquistadors were convinced that their religion and knowledge were real. This prevented them from understanding the cosmovision of the natives of the New World. Communication between these cultures never occured and therefore the generation of a new culture in harmony with the environment was

impossible. In this story of Monterroso the conquistadors are defeated. In reality however they win, and violently impose their religion, their knowledge, their production techniques, etc. in summary their civilization.

The destruction of temples, idols and the burning of manuscripts represented the solution that conquistadors found to the problem of the clash of the two cultures.

The writing of the western history has followed the positivistic scheme. According to this, the new world had to go through "animism", "metaphysics" and all what is considered prescientific knowledge to finally arrive at "objective science". In this scheme, Third World countries have to give up their superstitions and receive the knowledge of modern science which is, according to this theory, superior. This formulation implies that science and technology develop by themselves, independently of natural, historical and social conditions. Science is always described as independent from culture itself, as if it had its own logic. In this context technology is seen as a way of solving problems, of providing wealth, and as fuel for progress. However this scheme is not always right. Let us analyze, for instance, the case of the so-called "green revolution" in Mexico.

A few decades ago, the Rockefeller Foundation claimed that the end of hunger around the world was near. They had discovered a new variety of highly productive seeds which could assimilate nutrients in a better way, resulting in a larger number of grains per plant which could in turn, result in higher productivity of up to three crops per year. With this in mind, new seeds of corn, wheat and rice were introduced in Mexico in the forties.

The problem however, was that these new varieties of seeds required large amounts of fertilizers, pesticides, lots of water and special tools and machinery to grow, seldom available in a country like Mexico. This, along with the susceptibility of these seeds to become plagued and their high costs, made it almost impossible for most Mexicans to have access to the green revolution.

Whenever implemented, the green revolution had negative consequences in Mexico. The land of campesinos was taken away from them and given back to the landlords. Displaced peasants began to migrate to the big cities. The environment was severely damaged by the overuse of pesticides, along with the

impoverishment of soils and disappearance of native species. In summary, the green revolution was a miserable failure for most Mexicans. The hunger problem was not solved and the land owners, along with the big corporations, benefited.

Why did not anybody think of the ecological and social impact of this revolution? Why did not anybody consider the particular social and cultural characteristics of Mexico?

This also seems to be the case of biotechnology proposed once again as the solution for hunger in the world. Technocrats and politicians make promises without a previous analysis of the impact of such technologies in Third World countries, in contrast with the developed countries where such issues are discussed.

This problem is aggravated because scientists in the Third World in general, hardly establish a real communication with experts in other areas, to examine a scientific problem. Scientists are considered experts in a particular field of knowledge. Their decisions should not be refuted by others, particularly say a simple citizen who lives in the area where a nuclear generator or a waste disposal plant are about to be build. Such lack of communication between these scientists and citizens of the community is considered normal. As shown by Jurgën Habermas, it is through technology that most people relate to scientific knowledge. Generally, technology spreads around the world even before the scientific knowledge that originated it. This is particularly true in the Third World countries.

Science Communication in Mexico: History

In Mexico, several cultural groups exist, most of which are formed by poor and sometimes uneducated people. These people are governed by an elite mostly educated in other countries, which imposes their ideas by manipulating information using the media. These ideas do not necessarily fit in the reality of our country but are nonetheless accepted, due to misinformation.

We consider that most science communicators in Mexico have not taken into account our vast historical and cultural background. The scheme they have in mind has almost always been one corresponding to scientific research. This means that what they have done so far is related to simple information of the so-called

"scientific discoveries". The idea behind this model of science communication is: informing about recent developments in science around the world, and about the applications of technology in developed countries. Such style of communication suggests that science should be done in the same way as in these countries in order to be successful.

In general, Mexican scientists play the role of science communicators. They are involved in projects to write books, journals and magazines in this field. Most of them do it as social work or service to the community, only in their spare time, considering they are the only ones who can talk about science. As a consequence, their work does not include the elements that professional communicators or journalists can provide. In addition, work in science communication is not considered as valuable as that of science itself.

Only a few journalists have tried to write about science due to the fact they are considered not knowledgeable enough by scientists. Therefore there are no professionals and very few people have really got involved in this field.

Besides, for typical Mexican officers in charge of cultural activities science does not really exist. The time given for science communication in the media is minimum. For those who control money for scientific projects, science and technology are worthwhile if they result in an application. For them, science communication is useless in a country where most scientific products come from abroad.

On the contrary, from our point of view, science communication is very important. Our project involves the edition of a magazine and we will discuss some of the difficulties in this activity in Mexico.

Books, bookstores and reading habits in Mexico

In Mexico the publication of scientific books and journals may be analyzed in the framework of any other publications i.e., with economic and technological problems.

There are only around 400 bookstores in our country to serve a population of more than 80,000,000 Mexicans. 20% of this population corresponds to young people in

schools and only about 2% of these young people (320,000) are constant readers. (Table 1 and 2)

Table 1

COUNTRY	NUMBER OF BOOKSTORES
United States	25,000
England	20,000
France	15,000
Mexico	400

Table 2

COUNTRY	NUMBER OF BOOKSTORES PER INHABITANTS
Spain	1/5,000
Argentina	1/13,000
Mexico	1/200,000

(Taken from *La Jornada*, December 1993, and *Libros de Mexico*, 1987, 1988, 1990)

With respect to libraries, from 1980 to 1991 the total number of libraries in Mexico, public and private, grew from 2,389 to 8,181. This growth is mainly related to the increase in public libraries since it is only the government which can afford the investment.

The development of the editorial industry in Mexico is meager not only because of the economic problems, but also because of the poor reading habits, the growing dependency on television and the difficulties to write, publish and distribute books and magazines. However this is not only a characteristic of Mexico. Similar problems occur in other countries.

Most of the people can not afford to buy books. They do it only when necessary, for school or professional activities. Besides this economic problem, the Mexican population is not used to reading. It can be said that Mexicans do not read unless it

is absolutely necessary. Various estimates suggest that Mexicans read half a book per year.

Surprisingly enough, Mexican publishers of comics and weekly magazines are among the most active in Latin America. Since 1987, between 1,200 and 1,500 magazines per month are usually offered at the news stand. Comics and magazines for women are particularly successful. Although young people are the majority in Mexico, only a few magazines are aimed for them. They are basically related to show business. Although relatively expensive, they are pretty successful. On the other hand, cultural and political magazines have a long tradition in Mexico. Some of them have been internationally recognized for their quality. However, only a small group understands the ideas and opinions expressed in these publications. In general, these magazines do not consider science as a cultural element, and rarely publish articles in this field.

With the support of universities and research institutes, efforts to publish magazines on science communication have resulted in four or five magazines. The National Council for Science and Technology produces two magazines, one of them for science communication for scientists and another one for the general public. To a large extent, the guideline of these two magazines follows government policies and criteria.

A science communication magazine

CIENCIAS magazine was founded in 1982 as a small project of a group of students of physics of the school of sciences in the National University of Mexico. In the beginning, only 2,000 issues were printed. We now print 5,000. CIENCIAS was aimed at university students, professionals, researchers and teachers who make use of scientific information in their courses. These groups may be considered only a small fraction of the population however, they constitute the link for scientific information to reach a more general public. Sometimes CIENCIAS does not require this link, because the articles may be understood by anybody.

The philosophy behind our work is to create a space for several ways of thought to be expressed, as long as they constitute a serious source of information. We believe that our duty as scientists is not only in the labs but also as science communicators.

We consider that Mexican scientists should communicate their work to a more general audience to make them understand the value of their work. This does not necessarily require a technical description of their research, but at times it is enough to express their points of view on certain issues, based on their experience and knowledge. Scientists have a lot to say about problems in our society, and we think CIENCIAS constitutes a good means to communicate their opinion. We think these opinions should come from a range of professionals in different fields of knowledge, including science and humanities. The contribution of each one of them becomes an integrated statement that CIENCIAS presents to the public.

We, the editors of CIENCIAS, are originally biologists. However we have acquired experience in editorial work through practice. We have tried to make CIENCIAS not only an instrument for analysis and discussion but overall, a tool to spread information. We stress this fact because in Mexico, manipulation of information is a main problem. It is enough to look back at some events in the past, which have not been properly presented. Such is the case of the earthquake in 1985, elections in 1988, pollution in Mexico City or the most recent event in the state of Chiapas. In each case, only a partial and biassed description of such problems has been presented by Mexican media to the public opinion in Mexico and abroad. It is hard to believe that some information and pictures about these problems have been shown only in other countries while Mexicans barely know of their existence. In CIENCIAS, we believe that the opinion of scientists and other professionals may provide a critical analysis about some of these issues following the logic used in their activities.

To give you a better idea of the objectives of this editorial project, we will mention some topics we have discussed in recent years.

An issue of real concern is AIDS. In 1987, we published an article about the origins of this pandemic disease and how it has spread around the world. We consider writing about this problem is really important since in Mexico there are many wrong ideas about it. AIDS has been considered a kind of satanic curse for the world. In 1990, we published an essay to provide clear information on how this contagious disease has grown. In this way, we intend to dismiss speculations and false ideas about AIDS. In the following issue, we wrote an article about condoms,

right when in Mexico certain groups initiated campaigns to remove information about condoms and the word was forbidden on radio and TV. Since then, we have paid special attention to this topic. The first issue of this year was dedicated to present a recent and general view on how the AIDS virus spreads, including a description of its characteristics in the Mexican population. In addition, we examined the present state of the research related to this pandemic disease and the problems associated with the development of a vaccine to prevent it.

A major problem in Mexico City are the high levels of pollution and the lack of reliable information about it. In Mexico City the high concentration of pollutants exceeds by far the limits set by other cities around the world and still, the authorities try to minimize the impact of pollutants on health.

We have published several articles to clarify some aspects of this problem. We have presented analyses and figures to show how serious it is.

Problems were also observed when cholera spread in our country in 1991. During this period, information was meager and little was said on the origins of cholera. We published various articles on this topic.

In 1992, the question about abortion was raised in Mexico. Various groups proposed making abortion legal. We then published a series of articles about this topic. Our point and those of scientists who collaborated with us, was that although science provides elements to understand the biological process of the growth of human beings, it is incapable of giving a final answer to whether abortion is legal or not. We believe it is important that a science communication magazine analyse the limits of action of scientific activity, and show where the fields of action of other professional activities begins. We consider abortion a personal decision that depends on the ideas and ethics of each individual. For this reason, we complemented our analysis on abortion by asking a rabbi and a thomist philosopher to collaborate with us by expressing their points of view.

Another major problem in our country is the use of natural resources. Biological diversity in Mexico is one of the richest on earth. Conservation of this diversity should be our priority. Everyday more and more scientists focus their efforts to study Mexican biological diversity. It is important to make the people conscious

about this richness and the threats that many different species of plants and animals face. By publishing a series of articles on history, ethnicity, biology and ecology we have tried to present ways in which this biodiversity may be conserved.

On the other hand, spreading information about old and present knowledge in the native groups of Mexico has been a major task for us. We believe this is important not only to maintain their cultures, but also to use their knowledge since it sometimes becomes solutions to some of the regional problems we have. Such is the case of problems on conservation and the use of natural resources.

Since 1988, we have also published texts on prehispanic astronomy, botany, cartography, metallurgy, etc.

In addition to these subjects, we have also been interested in problems on history and philosophy of science, that are important to understand the development of this activity. We have discussed such topics as the nuclear threat, arms proliferation, alternative technologies, biomedicine, agriculture, education, fractals, chaos, seismology, quantum mechanics, pain, dreams, sexuality and a series of topics of general interest. These articles constitute a complement in the education of the students or may simply be considered as leisure reading. Such is the case of texts on ecology of dragons or evolution of mermaids.

Summary and conclusions

On the basis of our working experience, we have tried to characterize the main problems on science communication in Mexico. They can be summarized as follows:

- Modern science shows a tendency to be confined to specific areas of knowledge.
- Such specialization is greater every day, leading to a fragmentation of knowledge.
- Scientific knowledge is highly hierarchical leading to a tremendous gap between experts and the general public.

- Most people relate to science through technology.
- Most scientific research is developed in First World countries, which aggravates the problems previously described in countries like Mexico with poor scientific and technological development.
- In our country technology is adopted without considering traditional knowledge and national culture.
- There is a major education problem, bad reading habits and strong control of information.

On the basis of this, we consider that science communication in Mexico should have the following characteristics:

1. It should provide an integrated view of how science relates to natural and social problems. This view will emerge from the various points of view of professionals in the fields of knowledge.
2. It should provide the general public information for the analysis to shorten the gaps between experts and them.
3. It should present a description of scientific and technological development in a social context. This description should include its impact on the culture of the different groups that live in our country.
4. It should lead critical analysis about the ethical, political, ecological and social implications of the introduction of new technologies.
5. It should provide important conceptual elements in the education of young people (evolutive theories, origin of life, cosmology, etc.)
6. It should strengthen the image of science communicators as important elements in the cultural life of our country.

To reach these goals, much work is necessary. This includes looking for interesting and accessible ways to attract the attention of the general public. We believe that

by following this guideline, we can contribute to the incorporation of science in our cultural life, and to the development of a well-informed society.

Bibliography

CIENCIAS, Revista de difusión, 1-33, 1982-1993, Nos. especiales 1-7, 1984-1993.

Habermas, J., La ciencia y la técnica como ideología, 1968.

Monterroso, A., Obra completa, 1983.

Moore, F. y J. Collins, Comer es primero, Siglo XXI, 1977.

Pacey, A., La cultura de la tecnología, Fondo de Cultura Económica, 1990.

Roqueplo, P., El reparto del saber, ciencia, cultura, divulgación, Edit. Gedisa, 1983.

Acknowledgments

The authors wish to thank Victor Magaña for his help with the translation of this paper.