

# COMMUNICATION OF SCIENCE AND SOCIAL INCLUSION

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*The growing importance of the relationship between science and social life (day-to-day life, public opinion, decision-making) demands a review of the strategies and mechanisms of the popularisation of science and technology.*

*This article discusses the validity of the traditional objectives of this activity and the importance of increasing the effort to include a greater number of social sectors.*

*La creciente importancia de la relación entre ciencia y vida social (vida cotidiana, opinión pública, toma de decisiones) hace obligatoria una revisión de las estrategias y mecanismos de divulgación pública de la ciencia y la tecnología. Este artículo discute la validez de los objetivos tradicionalmente trazados en esta actividad y la importancia de ampliar el esfuerzo para incluir al mayor número de sectores sociales.*

**T**he Institute for Geoscientific, Mineral-Environmental and Nuclear Research and Information, Ingeominas, called a press conference in September 1985. The experts discussed the activity in the interior of the Arenas volcano, on the same mountain that gives rise to the impressive Nevado del Ruiz snow-covered peak. Few journalists attended. The following day, only one of the media outlets mentioned, on a buried page, something of what was said at the press conference. A few weeks later, on the night of 13 November, the heat of the volcano melted the snow, leading to the rivers bursting their banks and carrying away everything in their paths. The avalanche hit with full force a town of some 40,000 inhabitants, covering it completely. It was the middle of the night and very few had time to reach high ground. More than 20,000 people died (65 % of that year's deaths due to natural disasters).<sup>1</sup> A further 20,000 were injured. The drama was told in the headlines of much of the media, including the international ones. How could this have happened?, the journalists asked. "We warned you", replied the Ingeominas researchers. But no journalist had understood the magnitude of the information they were being given at that press conference. The people were not informed, nor did the decision makers take

preventive measures and the Armero disaster lives on in the memory of all Colombians.

Of course, the scientists were not very explicit; there was a chance that the volcano could awaken, but it wasn't certain. Science is not always categorical. Scientists are not always clear. Journalists do not always give the important things priority. And the results, at least in the case of Armero, could have been avoided or at least mitigated.

The process which makes it possible to get science from a transmitter to a receiver seems simple enough: you start with someone who has the knowledge (scientists, engineers, legislators or decision makers in the field of science, users of the knowledge, etc.), use a transmission channel and reach a receiver.

But the story is not that simple. Is this transmitter aware of the right of the people to be informed? Does she or he know what the public expect to receive? And is the channel used the most appropriate? Are those receiving the information equipped to understand it? Furthermore, the process does not end with the receiver; the impact of that message must generate a reaction in order for the process to be dynamic and really instructive.

Studies carried out in countries like the UK, the US, Spain and Colombia to measure the public's per-

ception of science conclude that it is necessary to continue with the effort, to change strategies, initiate new plans for popularising science so that the general public accepts, consumes, understands and makes viable the use of this new knowledge in day-to-day life.

The problem is that there is no «general public», as a public which is the object of the science message. To believe this is to dream and this may be part of the problem. The wide variety of cultures, problems, languages and interests, requires that we think of specific groups which must be studied independently in order to determine their level of knowledge, their behaviours, attitudes and requirements, and thus act in consequence. “The public” has not been studied sufficiently by the transmitters and, hence, the activities are often not really effective. This is one of the enormous gaps in the process of the communication of science.<sup>2</sup>

«Getting scientific thought to form part of the intellectual arsenal of each individual, i.e., of the general culture», says Lilliam Álvarez in her document *Las políticas cubanas en el fortalecimiento de una cultura general integral, basada en el desarrollo del conocimiento, la ciencia y la tecnología*,<sup>3</sup> «is quite an ambitious goal, though achievable if it becomes an item on the agenda of international bodies, government policies and civil society in general».

Perhaps it is impossible to embrace all the groups which form a part of humankind. Designing the different strategies to bring to everyone a message which generates not only new information, but new knowledge its uptake by society would be an endless task.

The transmitters tend to think, unconsciously, that the receiver is like them and only rarely to they identify a target public to address themselves to. Rarer still are the occasions when that target public is a marginalized group, such as those displaced by violence,

people with seeing limitations, indigenous populations, those living in absolute poverty, the illiterate, etc.

Including these groups, forgotten in one way or another, is the challenge of a fair and democratic communication of science, of a true social policy.

## The importance of the message

«Different conceptions of *the public* lead to different strategies for public understanding of science, just as different conceptions of *understanding* lead to different assessments of the efficacy of the strategies.»<sup>4</sup> It is thus imperative that we review the entire process of the communication of science and to this end,

the question would be: What do we seek? To generate a culture which is capable of receiving, understanding, processing and using scientific information, or delivering content on science and technology?

There is a big difference. In the document *Ciencia, tecnología y sociedad: algunas reflexiones*,<sup>5</sup> the authors write:

«What to teach? What is the knowledge that should be transmitted in the knowledge society?

This has led to the question why teach? It would seem that the consensus has adopted the principle that, in the knowledge society, it is necessary to educate for change, to maintain the permanent capacity to learn. The challenge of ‘education for life’, from pre-school to the different modes of ongoing education, is to create conditions for identifying problems and alternative solutions to them».

If what we seek is a true social change that allows for a fairer and more equitable society, more conducive to providing opportunities for the intellectual enrichment of all its members, education bears a grave responsibility. It is not about solving the problem just of coverage, but of quality. «Education from the cradle



to the grave», said the Colombian Nobel Literature laureate Gabriel García Márquez, «non-conforming and reflexive, which inspires us to a new way of thinking and incites us to discover who we are in a society that loves itself more; that takes greatest advantage of our tireless creativity and conceives and ethic –and perhaps an aesthetic– for our boundless and legitimate desire to outdo ourselves. An education that integrates science and the arts in the family chest (...).»<sup>6</sup>

Thus, education should be thought of as a permanent activity, experienced in the street, in meetings where dialogue is shared with other citizens, in the cinema, in visits to places of knowledge, such as botanic gardens and museums, in family strolls. Finally, it becomes an attitude towards life.

Generating a scientific culture, then, goes beyond the mere transmission of results and advances of science. It has to do with the development of capacities inherent to human and social development: with analysis, creativity, constructive criticism, group work, synthesis, adaptation to the changes we face daily, evolution and looking toward the consequences of our thoughts and actions, communication for cultural enrichment, generation of added value thanks to knowledge, to permanent interest.

It has to do with teaching to think. And in this regard, scientific thinking and the scientific method contribute significantly.

### **The communication channels and the audiences**

The forms of science communication best known and most used by popularisers are science journalism, science fairs (perhaps one of the most traditional forms in Latin America), science theatres, museums and

interactive centres, consensus conferences, talks, papers, exhibitions, etc.

But there are infinite possibilities for media and channels for popularising science, technology, knowledge. Opting to improve teaching of the sciences from the earliest school years is one of the aspects which has caught the attention of governments and international organisations and which different support programmes point to. Children and young people in general do not see science as a life option because the medium used by teachers has perhaps not been the most seductive.

If in formal education –that which is taught in approved educational establishments– the situation is not the greatest, the same is true of informal education.

This translates into activities whose aim is to complement, update, supplement knowledge and train without being subject to the educational system,<sup>7</sup> such as science and technology museums and interactive centres. The instruments for measuring the impact these mechanisms can have on their users are still highly precarious and it is difficult to make categorical statements about the positive, neutral or negative influence they may generate in their visitors.

In informal education which, according to the Colombian Education Act, refers to all knowledge acquired freely and spontaneously, through people, entities, mass media, traditions and customs, it is even harder to what attitudes it generates in the receiving public.

Besides, even if we did know the effects of the activities through any of these three forms of bringing knowledge to the people, there are groups which will always be excluded: We cannot assume that all children and young people in developing countries have access to formal education. In fact, according to current





UNICEF figures, 121 million children throughout the world do not enjoy the right to education.

Furthermore, how many of the world's citizens have the capacity to access spaces such as museums and interactive centres, where these exist? How many of them have access to quality communications media with a significant content of scientific information?

The excluded population is immense and it is utopian to talk of informing and training the whole of society with science and technology content. One excluded group, for example, is the political class, the class that must make decisions. And a big problem is the fact that many of the subjects these people have to deal with and discuss are related to science.<sup>8</sup>

In a recent interview in Bogotá, for the Colombian news agency, Agencia de Noticias de Ciencia y Tecnología de Colombia, NOTICyT, the executive director of the Third World Academy of Sciences, TWAS, Mohamed H.A. Hassan, said that even within the group of politicians, there are three categories: ministers and maximum authorities on science and technology, who are convinced of the importance of the popularisation of science; presidents and leaders who, one way or another, are aware of this importance but find it hard to turn this conviction into actions (in the case of Armero, if the authorities had heeded the warnings and advice of the scientific community, the outcome would have been different); and the finance ministers, who are definitely not sensitive to the matter, nor do they understand its importance, but are the ones wielding the cheque-book.<sup>9</sup>

## Communicate to democratise

The work of the science communicator does not end with the transmission of the message. Do we know our audience? Do they understand our message? What do they understand by science? Are the current forms of communicating science really helping the audience to use it in the best possible way? How is this new knowledge adapting to their daily life? How can the population influence matters of scientific policy? What is the relationship between science, daily life, public opinion and decision making?

The permanent study of our audiences immediately means a greater chance of success in the process of communication of science. According to Alfredo Valdivieso, director of FUNDACYT, in Ecuador, in order to make the message effective, three studies are necessary:<sup>10</sup>

- Study of the audience, prior to preparation of materials, in order to determine the knowledge, attitudes and practices of the target population.
- Study to validate the communication materials. This is used once the material has been produced and is tried as a «finished product» under certain parameters.
- Study of the impact of the communication. Following the mass dissemination of the material, a study is carried out under the «interception method», in order to discover its impact on the primary and secondary audiences.

Thus, with the target public identified, the science populariser faces two challenges: knowing what to inform about and how to do it. The first people to dare to communicate science were the scientists themselves, precisely because science is constructed socially: the popularisation of science is part of the production of scientific knowledge. Remember Galileo, at the dawn of science communication, who was responsible for popularising the heliocentric theories of Copernicus. His great sin was precisely telling the world of the results of his colleagues research.

But today, it is the popularisers –if we turn it into a profession– who are in charge of communicating science to the different publics. These popularisers may come from a background related to the natural or social sciences, such as social communicators or journalists. What is required of them is that they be professionals in the process of popularisation.

Science can solve problems, and responding to this requirement among different groups and cultures can become a useful and attractive way of popularising knowledge. The truth, as expressed by the physicist Hassan in the aforementioned interview, is that «if the population can see for itself that curing disease, saving the environment, having drinking water, can be



achieved thanks to the work of scientists, both in basic and social sciences, it will be convinced that the researchers play an important role. It is necessary to persuade with facts. This is a very important component, as well as investing in good brains, well-trained people, talented scientists».

One of the great problems of popularising science, which has prevented its reaching the vast majority of the population, is the lack of permanence in the activities which are promoted. Initiatives are started and die due to lack of explicit policies which allow for the survival of those which really achieve their goals.

### **Towards a policy of social appropriation of science and technology**

Social policies, in any area, must take into account the specific characteristics of the different groups they seek to reach, and in the case of science, the goal is ambitious.

For some years, the OAS has advanced the project *Hemispheric cooperation and Development of Scientific and Technological Policy*, which includes five components, one of which is the popularisation of science. It ultimately seeks to consolidate hemispheric policies in science and technology. This programme has already begun and we will see some results soon.<sup>11</sup>

The Convenio Andrés Bello also proposes a similar project, with the participation of member countries and other countries of the region, to propose a common plan for the popularisation and social appropriation of science and technology.

In Colombia, in the framework of the *II Foro Internacional Conciencia Abierta, por una Cultura de Ciencia, Tecnología e Innovación en la Sociedad (2<sup>nd</sup> International Open Conscience Forum, for a Culture of Science, Technology and Innovation in Society)*, the participating countries<sup>12</sup> had the opportunity to work on an initial approach to the subject. Colombia, through its science and technology body, the Instituto Colombiano para el Desarrollo de la Ciencia y la Tecnología, Francisco José de Caldas, Colciencias, presented a preliminary document with its proposal of a policy for

the social appropriation of knowledge, a novel initiative due to its unique status in the region.<sup>13</sup>

In general terms and despite the fact that the legislations of several of these countries contemplate in some way the need to «guarantee access by all sectors of society to scientific and technological knowledge, under equal terms and opportunities»<sup>14</sup> or to «motivate the generation, use, dissemination and application of quality and innovative scientific and technological knowledge which is culturally, socially and environmentally sustainable»<sup>15</sup> or to «popularise the results of scientific research projects and promote their transfer to the production sector and to society in general in order to optimise their use and achievements»<sup>16</sup> it is only in recent years that the region has begun to think of the need to provide a legal framework for the public appropriation of knowledge, unlike countries such as India, the US and the UK, which began to consider how much society was committed to science and how much it understood it in the middle of the 20<sup>th</sup> century.

Knowing much about science does not mean understanding science. This is why it is important to teach people to understand the content of information rather than data and facts. This contradicts somewhat the traditional concept of journalism, for example, but is a new way of approaching the trade of the journalist or, in general, the science populariser.

According to John Durant: «the public needs more than mere factual knowledge...; and it needs more than idealistic images of *the scientific attitude* and *the scientific method*. What it needs, surely, is a feel for the way that the social system of science actually works to deliver what is usually reliable knowledge about the natural world».<sup>17</sup>

As José Manuel Báez, director of Programmes and Studies of the *Fundación Española para la Ciencia y la Tecnología* (Spanish Foundation for Science and Technology, FECYT), would say, it's about «dialogue between science and society», which may result in the combination of different activities, framed within plans, policies or programmes which give it meaning and direction for achieving that objective. ¶

## Notes and references

- 1 JOSÉ EDUARDO RUEDA ENCISO: «The Armero avalanche, November 13, 1985», *Revista Credencial Historia* 1999 (sep).
- 2 Gregory J., Miller S.: *Science in Public, Communication, Cultura and Credibility*, Plenum Press, New York, 1998: 8.
- 3 Submitted at the II Foro Conciencia Abierta, por una Cultura de Ciencia, Tecnología e Innovación en la Sociedad, Bogotá, Colombia, 24 to 26 March, 2004.
- 4 Op. cit Gregory J., Miller S.,<sup>2</sup> p. 95.
- 5 Document prepared by Jorge Ahumada and Francisco Miranda, for the Organisation of American States, OAS in October 2003.
- 6 *Colombia: al filo de la oportunidad*, Report by the Misión de Ciencia, Educación y Desarrollo, Vol. 1. Presidencia de la República – Colciencias – Consejería Presidencial para el Desarrollo Institucional – Tercer Mundo Editores, Bogotá, 1996: 56.
- 7 Colombian General Education Act, Act 115, 1994.
- 8 Op. cit Gregory J., Miller S.,<sup>2</sup> p. 14.
- 9 NOTICyT (circular No. 11), Week 22 to 28 April, 2004.
- 10 Speech by Alfredo Valdivieso Gangotena, executive director of the Fundación para la Ciencia y la Tecnología, FUNDACYT, Ecuador, during the II Conciencia Abierta Forum, Bogotá, Colombia, 24 to 26 March 2004.
- 11 During the Third Summit of the Americas in Quebec, Canada, in 2001, the member countries concluded that there was a need to «promote the popularisation of science and technology necessary to advance the establishment and consolidation of a scientific culture in the region; and stimulate the development of science and technology for regional connectivity through information and communications technologies essential for building knowledge-based societies».
- 12 Bolivia, Colombia, Costa Rica, Cuba, Ecuador, Spain, India, Mexico, Panama, Paraguay, Peru and Venezuela.
- 13 See Web page [www.maloka.org](http://www.maloka.org).
- 14 Article 24 of Bolivian Law 2209 on the Promotion of Science, Technology and Innovation in «Bolivian Report on Policies of Social Appropriation and Popularisation of Science and Technology» presented by Patricia Escobar at the II Foro Conciencia Abierta, Bogotá, Colombia, 24 to 26 March 2004.
- 15 Paraguayan Law 2279 of 2003. Speech by Luis Alberto Lima, president of the National Council of Science and Technology of the Republic of Paraguay during the II Foro Conciencia Abierta, Bogotá, Colombia, 24 to 26 March 2004.
- 16 Speech by Alfredo Valdivieso Gangotena, executive director of the Fundación para la Ciencia y la Tecnología, FUNDACYT, Ecuador during the II Foro Conciencia Abierta, Bogotá, Colombia, 24 to 26 March 2004.
- 17 Op. cit Gregory J., Miller S.,<sup>2</sup> p. 91.