

Executive summary

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ROLE OF SCIENTISTS
IN THE PUBLIC COMMUNICATION
OF SCIENCE AND TECHNOLOGY:
ATTITUDES, APTITUDES AND ENGAGEMENT

Introduction

Scientists are undoubtedly an important link in the chain of science communication and the transmission of scientific knowledge. However, few studies have examined aspects related with the role of the scientific community in disseminating science, scientists' patterns of communication with the public, or their behavioral patterns and motivations for participating in science dissemination activities. Until now, studies have centered mainly on the role of different institutional and professional groups as promoters and transmitters involved in public communication of science and technology (PCST) activities, e.g., science museums, mass media, journalists, science writers, and others.

In this connection the Group for Scientific Activity Studies of the Spanish Council for Scientific Research (*Grupo de Estudios de la Actividad Científica* del Consejo Superior de Investigaciones Científicas, CSIC) has carried out research centered on the participation of scientists in the communication of science and technology to the public.

Within the framework of this research, underwritten by the C4M Project, we prepared a report titled "Scientific culture and the communication of science in the Community of Madrid. A study to encourage participation by scientists in PCST activities" (*Cultura Científica y Comunicación de la Ciencia en la Comunidad de Madrid. Un estudio para incentivar la participación de los científicos en las actividades de divulgación científica*), in collaboration with researchers from the Institutional Delegation of the CSIC in the Community of Madrid, and from the School of Sciences of the University of Alcalá*.

The aim of this publication is twofold. First, we wish to communicate the most relevant results and conclusions from the aforementioned study. Second, we wish to help establish the importance of science and technology communication to society for efforts to bring science and society together.

* The study was carried out within the framework of two research projects financed by the Dirección General de Investigación de la Comunidad de Madrid (General Directorate for Research, Community of Madrid):

- Project 06/0076/2003: Science Culture and the Communication of Science in the Community of Madrid. A study to promote participation by scientists in science communication activities (*Cultura Científica y Comunicación de la Ciencia en la Comunidad de Madrid. Un estudio para incentivar la participación de los científicos en actividades de divulgación científica*) (C4M_CSIC).
- Project 06/HSE/0399/2004: Science Culture and the Communication of Science in the Community of Madrid. A study to promote participation by university professors in science communication activities (*Cultura Científica y Comunicación de la Ciencia en la Comunidad de Madrid. Un estudio para incentivar la participación del profesorado universitario en actividades de divulgación científica*) (C4M_UNIV).



er, as well as the important role that scientists are called upon to perform in this process.

This book contains a synthesis of the results of the study, and summarizes the most relevant aspects of the two research projects that have been completed to date, with emphasis on the similarities and differences between the two collectives we analyzed (university professors and CSIC staff members). The main conclusions are also reported.

Objective

The research line that forms the framework for this study aims to investigate the extent to which researchers act as social agents involved in knowledge dissemination, and their attitudes toward PCST. In addition, this research aims to help increase our knowledge and appreciation of the human, social and intellectual capital represented by scientists working in the Community of Madrid who are interested in the communication of science and technology to the public.

The *specific objectives* of the study were as follows:

- To define the personal and professional profile of scientists who have participated in science communication activities connected with the Madrid Science Fair
- To identify the motivations that led them to take part in these activities
- To determine the incentives which could help to encourage scientists to get actively involved in PCST tasks
- To propose strategies and actions that help promote and enhance participation

Methodology

The study was based on personal interviews with members of two groups of scientists who took part in the fair: CSIC staff members and professors from public universities located in the Community of Madrid. Opinions were also solicited from university managers (mainly vice-chancellors) who coordinated and organized the participation of their university as part of the duties associated with their administrative post.

The interviews were designed to obtain information about the following:

- a. Individuals' professional and personal profile.
- b. Size and composition of the research group that participating individuals belonged to.
- c. Number of times the individual had participated in the Madrid Science Fair.
- d. Participation in other PCST activities.



- e. Willingness to engage in PCST activities at schools.
- f. Researcher's views on the following:
 - f.1. Motivations that led to the decision to participate in the fair.
 - f.2. Public's interest in their exhibit.
 - f.3. Usefulness of participation to the public, themselves, their research group, their institution, and research in their discipline in Spain.
 - f.4. Benefits of participation.
 - f.5. Principal problems and limitations encountered during preparation for and participation in the fair.
- g. Opinions regarding the motives that lead colleagues not to participate in the fair.
- h. Views on different initiatives to promote frequent participation by scientists in PCST activities.

Key findings

1. Four out of every five CSIC researchers and university professors who had taken part in the Madrid Science Fair often participated in other PCST activities. Young scientists, mainly predoctoral fellows at the CSIC, participated in these activities less often than senior scientists did.
2. Most scientists interviewed were willing to go to schools to carry out PCST activities based on their science fair exhibit or on a similar activity. Their willingness to participate in these educational activities can be considered an indicator of their interest in PCST, specifically in activities targeted at children and young adults.
3. Most of the scientists interviewed claimed to feel fairly or highly motivated to take part in the fair because they wished to awaken the public's interest in or enthusiasm for science, and to raise the public's level of science education.
4. Scientists were also highly motivated to participate in the fair in order to increase public recognition and appreciation of what scientists do, and to promote the center where they worked.
5. Most scientist judged the public's interest in their fair exhibit to be favorable. The percentage of individuals who perceived fairly or very high interest in their research on the part of the public was 60% among tenured professors and 70% among contract professors at universities, and around 80% among senior and predoctoral CSIC researchers. The perceived usefulness to the public of their participation was slightly lower; about 60% of all participants considered their participation to be fairly or very useful, and this perception was reported by 80% of the predoctoral fellows.



6. The wish to increase public recognition and appreciation of scientists' work was considered an important motivation by more than three fourths of the CSIC researchers who participated in the fair, and by 70% of the predoctoral fellows. Among university professors the figures were similar although slightly lower among both tenured (66%) and contract professors (55%). This motivation may be weaker among university professors because at least part of their work (teaching) is already adequately recognized and appreciated by society.
7. The wish to promote or increase the visibility of their institution or center served as an important motivating factor in both groups, especially for university professors. The desire to draw attention to the university seems to have been satisfied in light of the finding that professors from all professional categories and branches of teaching noted that their participation in the fair was useful mainly for their institution.
8. The sense of duty was an important motivation for four out every five CSIC researchers and for three out of every five full professors. Almost half of the contract professors and somewhat more than one third of the predoctoral CSIC fellows mentioned the sense of duty as an important motivation to take part in the fair.
9. The scientists we interviewed admitted that in general, their participation in the fair had a limited effect on their own prospects for professional advancement, professional or academic recognition, or professional prestige. The effect of participating in the fair on their salary or the number of days of paid vacation was negligible, although these forms of compensation were of limited importance for most of the participants interviewed.
10. Both university professors and CSIC researchers felt that the main reason their colleagues did not get involved in the fair was because this activity, like PCST activities in general, was little appreciated or recognized. Lack of time was mentioned by all groups as the main obstacle to participation.
11. In general, those interviewed said that the tangible benefits of taking part in the fair were negligible. Most felt they had obtained little recognition for their participation, and even fewer benefits in terms of economic reward, promotion, or increased professional prestige. The most notable benefits from participating in the fair, according to the scientists we interviewed, were mainly personal in nature. In this connection, what scientists most appreciated was the pleasure and personal satisfaction of participating.
12. Among the initiatives proposed to encourage scientists to participate in PCST activities, the option considered most helpful was the suggestion that public communication of science and technology be considered a factor to be taken into account in evaluations of scientific activity.



Involvement of interviewed scientists in public communication of science and technology activities

Among all scientists who took part in the fair, those who participated most often in PCST activities were CSIC staff researchers and university professors. Almost 60% of the predoctoral fellows had never taken part previously in other PCST activities apart from the fair.

The limited participation of young predoctoral scientists in PCST activities may reflect, in part, their limited opportunities to do so. First, predoctoral fellows spend almost all of their time performing work that will lead to their doctoral degree and thus to opportunities to apply for a permanent post. Second, their autonomy regarding participation in these activities, as well as their decision-making powers, are limited. In this connection it is significant that 86% of the CSIC predoctoral fellows took part in the fair because they were asked to do so by someone else, usually the director of their research group.

Participants' willingness to carry out PCST activities based on their fair exhibit or on similar activities at schools was another factor we inquired about which may reflect interest in public communication of science and technology, particularly that aimed at children and young adults. Most (80%) of the CSIC staff members and more than two thirds of the university professors indicated they were willing to carry PCST activities at schools.

Another part of our study was aimed at determining what portion of scientists who took part in the fair participated regularly in PCST activities, i.e., people who had made these part of their usual activities. With regard to institutional activities, the degree of participation of tenured and contract professors was similar, whereas among CSIC participants the portion of predoctoral fellows who took part in such activities was much lower than the percentage of tenured researchers. With regard to individual actions such as articles in science books and magazines, lectures, or participation in roundtable discussions, CSIC researchers clearly outnumbered tenured university professors. Predoctoral fellows rarely, if ever, participated in such individual efforts.

One out of every five CSIC researchers, and slightly more than one out of every ten university professors, participated regularly in specialized training courses for primary and secondary school teachers.

Finally, the results show that scientists rarely appear in the mass media (press, radio and television).

Scientists' motivation for participating in the Madrid Science Fair

Our study shows that the scientists we interviewed expressed a high level of concern about and indeed commitment to science communication, public understanding of science, and the pub-



lic's level of science education. Most claimed to be fairly or highly motivated to participate in the fair, because of their desire *to arouse and increase the public's interest in and enthusiasm for science, and to increase the public's level of science education.*

In addition to these motivations, the interviewees also rated highly two similar motives: *to increase the public's recognition and appreciation of what scientists do, and to promote their institution.*

Scientists generally judged their participation in the fair to have awakened the public's interest. The perception that they had awakened visitors' interest fairly or very effectively was more frequent among CSIC researchers (82%) than among tenured university professors (68.7%). On the other end of the spectrum, we found that in both groups one in every ten interviewees considered their activity had attracted little interest on the public's part. These negative perceptions were rare among contract professors and were not reported by any of the predoctoral fellows.

Regarding scientists' perception of their usefulness to the public, 64% of the CSIC researchers and 58% of the tenured university professors judged their demonstrations of part of their daily research activities to be fairly or very useful to visitors. In general, among all groups of participating scientists, the motivation to awaken the public's interest in and enthusiasm for science was rated more highly than the perceived interest their research awakened in the public, and this latter in turn was rated more highly than the usefulness of their fair exhibit to the public.

The desire to *increase the public's recognition and appreciation of scientists' work* was considered fairly or very important by more than three fourths of the CSIC research staff members, and by 70% of the predoctoral fellows. The figures for university professors were slightly lower both among tenured (66%) and contract professors (55%).

Promoting their institution or center was an important motivation for all four groups, and was especially important among university researchers. Within each institution (national research council or university), this motivation was ranked similarly by tenured and temporary staff members. However, this reason for participating in the fair was not a motivation, or was only a weak motive, for slightly more than one fifth of the predoctoral fellows. The desire to promote universities appears to have been satisfied: professors regardless of their academic rank or branch of teaching noted that their participation in the fair was useful mainly for their institution.

Scientists are aware of the importance of communicating science to the public, but that does not necessarily mean that they accept this task as part of their regular activities or feel they should play a major role in it. The *sense of duty* was a motivation considered fairly or very important by four out of every five CSIC researchers, and by three out of every five tenured university professors. Among researchers who had not yet attained a permanent position, this motivation was important for almost half of the contract professors and for 36% of the predoctoral fellows. Of note was that one out of every five predoctoral fellows indicated that a sense of duty was not a motivation for participating in the fair, whereas among contract professors only one in ten expressed this view.



The predoctoral fellows' attitude toward sense of duty is not surprising in view of the fact that their main responsibility is, as noted above, working toward their doctoral degree, writing their thesis, and obtaining academic merits in order to compete for a permanent research post. Public communication of science and technology activities make no contribution toward these merits.

Factors that may make scientists reluctant to get involved in public communication of science and technology activities

According to the interviewees, the main reason why their colleagues (at both universities and national research council centers) did not get involved in the fair was because the *participation was little recognized or appreciated*. This observation was felt to apply to PCST activities in general, which respondents felt were not valued as contributions to teaching or research activities. This reason was mentioned by 64% of the professors and by almost three fourths of the CSIC scientists.

Ranked second in importance among the reasons for not taking part in the fair was *lack of time*. All scientists interviewed, regardless of their professional rank, knowledge area or type of institution, seemed to concur that heavy workloads left little or no time to take part in PCST activities.

The third reason in order of importance was *lack of interest*, which was mentioned by both professors and national research council employees. This reason was especially important for contract professors and CSIC researchers.

Initiatives for creating incentives to participate

Among the initiatives proposed to encourage scientist to participate in PCST activities, the most highly ranked was *consideration of PCST as a factor to be taken into account in evaluations of scientific activity*. Almost half of the tenured professors and national research council scientists felt that to increase the involvement of the scientific community in the public communication of science and technology, this activity should receive due consideration in evaluations of scientific activity. For university managers, due consideration would constitute, along with *explicit recognition by the institution*, one of the most important initiatives toward fomenting, in quantitative and qualitative terms, the participation of professors in PCST activities.

Economic compensation was another action that participants felt could foment the participation of scientists in PCST activities. Temporary staff members (predoctoral fellows and contract professors) were more likely to rate this option highly than were tenured staff members. In fact, substantially more contract professors rated this measure as fairly or highly useful than did tenured



professors (70% vs. 54%, respectively), and the difference between tenured and nontenured CSIC participants was even larger (59% predoctoral fellows vs. 38% staff researchers).

Explicit recognition by the institution, either verbally or by other means, was rated fairly or highly important by 69% of the CSIC researchers and 61% of the tenured professors. Slightly more than half of the contract professors and half of the predoctoral fellows considered this measure fairly or very important.

Turning to what we call organizational initiatives, *increasing the financial support* available for preparing and carrying out PCST activities was rated highly as a means to encourage scientists' participation in these activities. This opinion was shared by about two thirds of the tenured university professors (67%) and CSIC staff researchers (60%), by 57% of the contract professors, and by slightly more than 40% of the predoctoral fellows.

Involving the media was rated favorably by somewhat more than half of the university professors and CSIC staff researchers, and by a higher percentage (70%) of predoctoral fellows, albeit with some reservations.

Implications

The scientists who took part in this study represent an invaluable source of human capital at their institutions. Their views and experiences should be considered when institutions set out to design PCST strategies aimed particularly at children and young adults. In European Union countries, these age groups currently receive special attention through efforts to foment actions that bring them in closer contact with the world of science. Awakening their interest in science is an objective which, in the medium and long term, will make it possible to ensure that Spanish society attains a suitable level of science education. The scientific community as a group should realize the importance of reporting their research not only to their peers, but also to society as a whole. Accepting this responsibility involves inculcating a concern for public science education into scientists in training, who should in turn receive unconditional support from their supervisors whenever an opportunity arises to participate in PCST activities.

Efforts to foment scientists' participation in PCST in general, and in science fairs in particular, should be directed not only toward recruiting able and motivated individuals, but also toward maintaining the interest and motivation of those who have previously participated in such activities. These latter individuals should be considered not only as a valuable source of human and intellectual capital for such activities, but also as a group of particular importance whose interests and experience constitute an excellent catalyst for recruiting new science communicators.

Professional recognition for PCST activities may serve as a stimulus for scientists to take their commitment to society and their mentoring of scientists in training more seriously. Moreover, aca-



demographic recognition for young scientists would serve as a stimulus for their twofold task of acquiring their own training and informing the public about their research.

To foment the participation of researchers in this type of activity, it is fundamental for the scientific community to raise PCST to the category of a “scientific activity”, and to consider the communication of research results to society as one of a scientist’s customary obligations. But the task of communicating science to the public should not hinge exclusively on motivating scientists. To create a favorable environment for PCST, scientists must perceive support from the scientific community for their efforts to communicate science, receive appropriate institutional recognition, and be assured the necessary funding that will enable them to prepare activities that most effectively portray their research to the public.

Finally, we wish to emphasize an issue that we feel is of crucial importance, lying as it does at the center of the problem and constituting the frame of reference for any action intended to enhance and foment scientists’ participation in the Madrid Science Fair, and more generally, in public communication of science and technology. At issue is the dichotomy between *requiring* versus *creating awareness, motivating, and facilitating*. In some countries initiatives have been set in motion to “require” scientists to participate in activities involving communication of science and technology to the public. We feel that actions aimed at fomenting participation in these activities should rather be seen in a positive light as efforts to *favor and facilitate*, in other words, to generate opportunities, rather than obligations or additional, possibly undesired, responsibilities. Toward this end it is fundamental to ensure institutional support, as shown by the case of the Spanish national research council CSIC and some of the universities that took part in the present study.

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