Soma Rédey

Science for the Public – The Dimensions of Science Communication

Abstract

In my report I would like to emphasize the importance of science communication, and give an account of its possible forms. There are several arguments confirming that there is a lack of relevant approaches in the recent use of this factor. In the first part of my essay I would like to identify and characterize the possible forms and the philosophy of communication I am concerned with. With the help of these factors, it will be possible to point to the aspects I am missing in recent ways of the information-flow. Only with the help of these characters will it be possible to reveal the reasons: why do we find, even today, a relevant gap between sciences and the surrounding public, society.

Keywords: science communication, publicity of sciences, gap between science and society.

Introduction

In 17th century England, Robert Boyle was one of the first scientists who applied experimental methods to prove his hypotheses. He believed that people will trust in a new invention if it was made visible for the audience. He invited witnesses into his laboratory, and explained the scientific achievements in front of the participants. According to Boyle's philosophy, an experiment was certified if the participant stakeholders believed what they saw, and they could confirm the authenticity of the experimental method. Boyle was convinced that his visual experiments created new knowledge not only for the audience but also for a wider social sphere[1]. During the same period, an equally important factor made itself felt: the first issues of regularly published scientific papers came out in France and in the United Kingdom.

Probably the most important effect of these new elements (visual experiments with witnesses, science papers) was that science (and scientific life in general) started to play a more relevant role as a new agent in society, and could become more familiar to people in a wider community of the Western societies.

[1] On the basis of SHAPIN – SCHAFFER 1985. Leviathan and the Air Pump. Princeton University Press

Although communicative factors have increased from the beginning of the 17th century to involve an almost uncountable number of magazines, and new channels of media should open up even more possibilities, we still can feel a mistrust in sciences on behalf of the public. In the next part of my work I would like to find the reasons why we have to speak about a gap between science and society.

One of these factors is in connection with possible fallacies around scientific facts. In the following case study we can see the social surroundings of a scientific development, where misunderstood information caused distrust in science among the people.

The University of Lancaster in England made a research study[2] of the public reception of genetically modified (GM) foods in England in the 1990s. The case study focused on public behavior, especially on the reasons of people's rejective attitude towards the newly developed GM foods. Why did they refuse these agricultural and food-industrial products? And at the same time, why did they accept some new technologies as the achievements of other fields in life[3]? As one of the conclusions, the authors mentioned interesting consequences about the components of the observed trust: when science (or applied technology in practice) is happening in front of us (that is, the final consumers), when it has publicity, and people can receive enough information on the new product from many different channels and at different levels of the research process, then they will be able to show the expected trust. On the other hand, if the technology is unclear to them (as a result of bad communication or misused and belated information flow), the final constitution of the product will provoke distrust and refusal in the public.

This case can help us to realize that applied science should not be separated from the social surroundings. I believe that communication flow should play an important role in bringing scientific knowledge closer to us, and it can bridge the triangle of public, media and sciences.

Communicating Sciences

The Actors of Science Communication

According to some contemporary researchers (T. W. Burns, Greg Myers, Massimiano Bucchi), we can recognize and define the actors of the process called science communication. If we take a look on this problem, we can easily divide these participants into two groups in general. The members of the public sphere constitute one of them, and the specialists and professionals of scientific life the other. We can come closer to these groups if we define their members more closely.

[2] GROVE-WHITE – MACHAGHTEN 2000. Wising Up – The public and new technologies. Lancaster University

[3] The authors emphasized here the increasing role of new information technology products: the growing number of cellular phones for instance. See Wising Up – pp. 31.

In a kind of simple definition, we can call every person in society a member of the general public. However, this whould be an excessive definition, so we have to find a finer determination for this company. Depending on the level of a specific scientific knowledge, we can categorize these persons by these levels: ranging from the both uninterested and uninformed agents up to the well-informed participants, there should be several sub-groups in this category. We should not forget that this whole group is a heterogeneous and multifaced company, composed of individual characters. So here, it is difficult to talk about „average public knowledge".

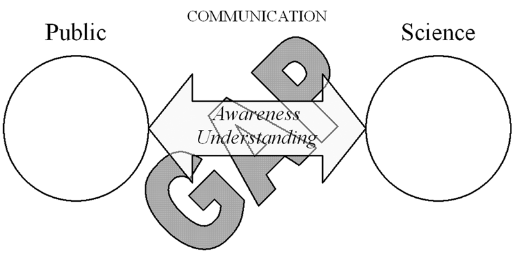
To define the dimension of „professional participants", Burns uses the expression „pure scientists"[4]. To account for the possibility of gathering knowledge about the world, he enlarges the group and adds new co-participants to this company. Scientific scholars as well as science related persons (like mathematicians, engineers etc.) constitute this division. In a more general point of view, all the participants are directly or indirectly involved in science. According to Burns, all the scientists, researchers, engineers or science students in a direct and the sponsors or promoters of science in an indirect connection with the sciences belong here.

At this point we are able to realize that there is a notable gap between these two parts. Henceforth I would like to come closer to this gap by analyzing it and I would like to find the bridge somehow to span this distance.

The Dimensions of Connection Points

At this point we face three new categories determining these relations: the functions of awareness, understanding and communication[5]. By the function of awareness we mean the conscious behaving either on the side of the less involved in sciences or much more on the side of scientists. To find the above-mentioned connection, it is fundamental not to be ignorant of something new and unexpected[6].

Figure 1. *The sensible distance between science and public*



[4] See Burns et al. 2003. Science communication: a contemporary definition. In Public Understanding of Science 12., pp. 183–202.

[5] According to Burns (2003).

[6] Merton uses the definiton of organized scepticism for the same behaviour. See Merton 1968. Social Theory and Social Structure. New York: The Free Press.

A more „touchable" dimension of the relationship is related to the problem of understanding. This specific question is in tight cohesion with the question of trust. For instance in the case of nuclear researches, scientists and engineers have to secure that the environment is safe from the aspect of the public. If people lose their trust because of some unpredictable risk, this should cause a specific kind of misunderstanding about that particular case of the nuclear power plant, but it also can lead to mistrust of the whole sphere of nuclear researches in a more general way. We do not have to look on this concept as an exact factor, rather, we can see it as a developing comprehension of some knowledge, action or process, based on commonly accepted principles.

The communication factor should also have a complex definition. To have a general view on this element, we can differentiate here at least two distinct models. The linear process of communication is a simple and evident one, where information flows in only one direction, from the sender to the receiver through a medium (we can call this information transfer). Another aspect of communication is the diffusive model. This is a multiple but more effective process, where information is dispersed widely and participants on the receiver side just let the knowledge soak in.

The Reflections

Steven Shapin defined the above-mentioned linear dimension of the communication process as the „Canonical account"[7]. In the setting of this one-way information flow, a third circle of participant elements has to be defined: the communicator, namely the media (or the science journalist in general). The task of this third element of the communication flow is to make the scientific achievements more relevant, accessible and consumable for the public. This is necessary because science becomes too complicated to understand for the general public. There were many scholars who criticized this kind of conception, because of its simplicity and its low effectiveness.

Greg Myers, an American scholar of English language and media, is one of the critics. In his work he emphasizes the different levels of communication[8]. In his view, there have to be different science discourses. One of them is the „insider" conversation, among the scientists and within the scientific institutions. The other is the discussion among non-scientists; these are the „outsiders". The question is the way that this knowledge is streaming: is it an obvious one-way knowledge flow from the insiders to the outsiders, or does there exist a „dialogue" where both sides can react? Myers is dealing with a new factor called science popularization. This should be achieved only by the mentioned interactions between sciences and the public. The essence of his argument is that we have to divide the audience (the

[7] SHAPIN 1990. Science and the public. In Companion to the History of Modern Science edited by R. C. Olby, London: Routledge.

[8] MYERS 2003. Discourse studies of scientific popularization: questioning the boundaries. In Discourse Studies Vol. 5., pp. 265–279.

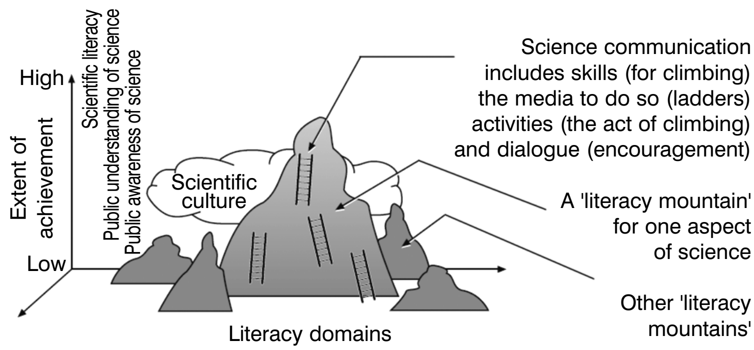
information receivers) into two groups: the experts and the lays. Here, the experts should be the specialists of science, with a high level of knowledge in a rather limited field of specialization. On the other hand, there should be the non-professionals with lower-level but rather wide-ranging basic knowledge. Myers emphasizes the importance of the realization that members of the public have their own persuasive resources, and they provide their own sorts of challenges to an argument. This existing knowledge enables reactions and interaction between the two fields.

Offering a contemporary definition of science communication, the above cited Terry Burns, a scholar in Newcastle, Australia also reflects on the public understanding of sciences[9]. He adds the „contextual approach” to Shapin's „canonical account”. This idea does not originate from him, since many scholars (like Latour or Pinch) formulated it decades ago, perceiving the asymmetry in current knowledge flow. According to this point of view, interaction was needed between science and its public, where cognitive communication implied an active public. Burns restates the definition: a complex agent is needed, with all the personal responses and reflections. He proposes a five-element (AEIOU) theory, where the public has the following main factors:

- awareness,
- enjoyment (science as an entertainment or art),
- the interest of science and its communication,
- the opinions involved in science related attitudes,
- and the understanding of science.

To illustrate his concept, he compares the whole process of science communication to the mountain climbing. With the help of all the mentioned elements (as the skills for climbing), it should be possible to promote communication. In his model, the altitude of the different mountains symbolizes the complexity of scientific literacy. There are several help-factors (like ladders for climbing): useful communicating elements, education courses, professional conferences or scientific journals. His model reflects very efficiently on the complexity of scientific communication and on the need for active public participation in an effective and interactive scientific dialogue.

Figure 2. *The skills of science communication as a mountain climbing process by Burns*



[9] Burns et al. 2003. Science communication. In Public Understanding of Science 12., pp. 183–202.

Massimiano Bucchi, an Italian researcher of sociology and history of sciences at the University of Trento, emphasizes also the alternative possibilities in science communication[10]. He turns back to Shapin's canonical account, as did the other scholars, and phrases its weak points. According to Bucchi's argument, he is emphasizing the linguistic translation in the process of knowledge flow from the scientist to the public. He calls the third person of the procedure (the media) the interpreter and turns the problem of science communication into a „mere matter of linguistic competence"[11]. Instead of the linear model of communication transfer, where the receiver's behavior is rather passive, and it is sharply bounded from the information holder specialists, he formulates a solution involving a so-called communication continuum. He identifies the communication forms in four main stages, where science is disseminated widely and the discourse is continuous from the narrowest level to the most extensive stages.

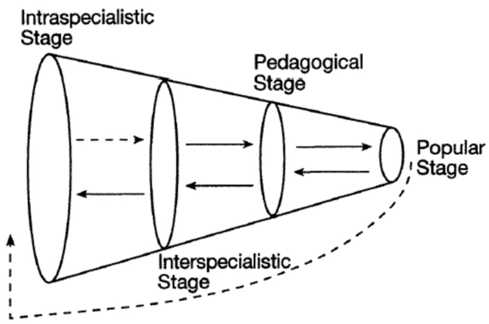
- The highest dimension is the intraspecialistic stage. This should be the communicating level among the specialists in the same specific research field (for instance, an article in a scientific journal).

- The next stage is the interspecialistic level, where the discussions are between researchers of the same discipline, but on different topics. These should be the interdisciplinary articles in scientific papers.

- On the pedagogical stage the theories are already developed and consolidated. Here the paradigms are presented in full, and the emphasis is on the historical perspective.

- The popular stage, the most specific one includes articles about sciences in the daily press and the „amateur science" of TV science documentaries. They present science mostly with a greater amount of metaphorical images and in articles eliciting prominent attention.

Figure 3. *The continuity model of science communication according to M. Bucchi*



[10] Bucchi 1996. When scientists turn to the public: alternative routes in science communication. In Public Understanding of Sciences 5., pp. 375–394.
[11] Bucchi (1996) pp. 376.

Conclusions

We are able to understand the different dimensions and elements of the process of science communication. Although it is almost impossible to define all the influential factors of the procedure, we could see many approaches in this field. In this framework, we are able to locate the different participants of a scientific argument (according to their level of specific knowledge), and we are also able to see the difficulties of the process of information flow. The effectiveness and success of the process depend on the receiver on one hand: the more effectively he or she uses the abilities, the higher he or she can „climb on the mountain of knowledge”. It is also the responsibility of the experts to disseminate science continuously on the other side: two-way information flow is needed at all the specific levels of audiences. Science can be well dispersed only if the scientist turns with trust to the public too.

Finally, I would like to emphasize an idea that should be a useful method in the process of building scientific knowledge. As we have seen, there is another influential factor on the public side: it is easier to achieve trust in sciences if they are made visual. I believe that this trust can be achieved if recent science (the research processes as well as the final inventions) is given publicity. As it happened in 17th Century England, where Robert Boyle could prove his experiments in front of witnesses, there was not only knowledge but also trust created in the audience. Since science started to appear in a visible manner, it also came closer to its social background. If this missing trust is built in a wider public, it will be possible to satrt bridging the above mentioned gap.

One of these trust-creating visual possibilities should be achieved with sufficient use of movies in cinemas. David A. Kriby[12] deals with the concept of fictional motion pictures as tools for science communication[13], where science consultants play an important role in building the knowledge given by the science-movies. I think that this should be a possible alternative route for science to meet its environment (the general public), and for knowledge to be widely dispersed without any direct connections. On this point of science popularization, the quality and the category of the movie should be a further question: what the audience should take as truth and believe in.

[12] A scholar of science communication and fiction at Cornell University, New York.

[13] Kirby 2003. Science consultants, fictional films, and scientific practice. In Social Studies of Science 33/2., pp. 231–268.

REFERENCES:

BURNS, Terry W. – O'CONNOR D. John – STOCKLMAYER Susan M. 2003. Science communication: a contemporary definition. Public *Understanding of Science* 12.

BUCCHI, Massimiano 1996. When scientists turn to the public: alternative routes in science communication. Public *Understanding of Science* 5.

KIRBY, David A. 2003. Science consultants, fictional films, and scientific practice. *Social Studies of Science* 33/2.

MCCLELLAN III., James E. 1999. *Science and Technology in World History*. London: The John Hopkins University Press.

MERTON, Robert K. 1968. *Social Theory and Social Structure*. New York: The Free Press.

MYERS, Greg 2003. Discourse studies of scientific popularization: questioning the boundaries. *Discourse Studies* 5.

GROVE-WHITE, Robin – MACNAGHTEN, Phil – WYNNE, Briann 2000. Wising Up – *The public and new technologies*. Lancaster University.

SHAPIN, Steven 1990. Science and the public. In R. C. Olby (ed.) *Companion to the History of Modern Science*. London: Routledge.

SHAPIN, Steven – SCHAFFER, Simon 1985. *Leviathan and the Air Pump.* Princeton: Princeton University Press.