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Science policy

Between popularization and engagement : Possible roles of the Ruđer Bošković Institute in science communication

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Abstract

The need to communicate science has always existed. Through time and the changes of the protagonists of science in the public, from scientists-politicians, via scientists-popularisers, to science-communicators (Bauer, 2011), the realisation of science communication went through many changes. The publics for science have also changed. In the past, the audience for science shared the optimism and enthusiasm for science with scientists. Today, the audience is split into several different audiences. They share a similar latent interest for and more reserved expectations from science and technology and their applications (e.g. Eurobarometer, 2010, Eurobarometer, 2005). More critical science journalists appeared, who do not simply mediate the priorities and attitudes of scientific community. Nevertheless, the journalists and scientists still have a 'shared culture' and cooperate in communication with the audiences. In this paper, I will discuss different models of science communication, from continuum to participation. I will show how the science-public relationship evolved and how the new paradigm has taken place, although the science-public relationship is still conceptualised, even among young scientists, mainly according to the often criticised 'deficit' model preumptions (Miller et al., 2009). I will also discuss the context of science communication today, with the emphasis on the differences between European Union average and Croatia. Finally, I will argue that science today should be more communicated than popularized and that genuine communication is also the task of scientific institutions such as the Ruđer Bošković Instutute.

THE CIRCUMSTANCES FOR A SCIENCE IN THE PUBLIC

Scientific interest in audiences for science has existed since 1950s, starting with the National Science Foundation's research in the United States, and followed by similar surveys in Europe. Eurobarometer surveys investigate the knowledge of, expectations from, and attitudes toward science and technology among EU citizens, but they also include Switzerland, Iceland and Norway as European Free Trade Association members, and Croatia and Turkey as candidate members. Croatia is included in the latest Eurobarometer *(1)* and was also included in the previous Eurobarometer of 2005.

According to the Eurobarometer 340, average European citizens show a latent interest in science, more than in sport or politics, in their

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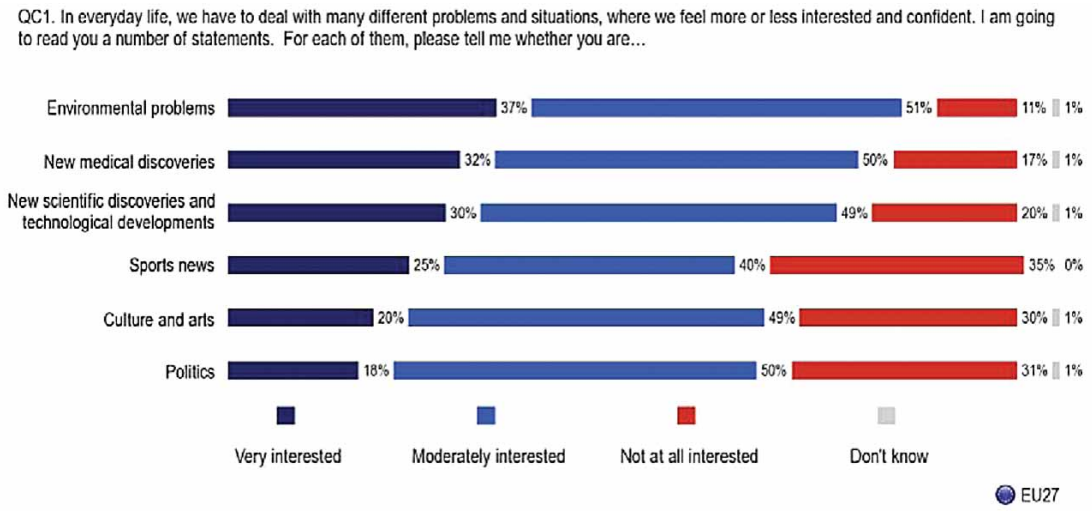

Figure 1. *Interested in daily issues.*

everyday life, as shown in the Figure 1. At the same time there is room for communicating science to the public, because they do not feel well informed about scientific and technological discoveries. This is shown in Figure 2.

The latest Eurobarometer determined a growing confidence in scientists, compared to the previous survey of 2005, particularly those who work for universities and public institutes, to explain new scientific ideas and technological achievements and the impact of science on society, as shown in Figure 3. At the same time, average Europeans are not so confident that journalists are those who could explain the impact of science on society, and this confidence is decreasing. The same can be said of writers and intellectuals. Less trusted are representatives of different religions, military, industry and politicians.

However, the audiences for science are not uncritical toward scientists, particularly with regard to the industrial investment in scientific and technological research, specialised character of scientific research and the lack of broader perspective and understanding. 56% of EU citizens think that because of dependence on industrial money, scientists are no longer in position to tell the truth about controversial issues. Half the respondents believe that private funding of research jeopardises our ability to fully understand. 47% of Europeans believe that scientists are not able to look at the problems from a wider perspective, due to their specialisations. 37% of them believe that today the problems we are confronted with are too complex even for scientists and that they are no longer able to understand them. Croatian citizens are even more critical in this respect, as we can see from Figure 3.

Active interest in science is less that than proclaimed one, and only 9% of Europeans attend public meetings or debates about science and only 13% sign petitions on matters such as nuclear power, biotechnology or environment. Compared to 2005, optimism about science is declining. Nowadays 66% of respondents totally agree that science and technology make our life healthier, eas-

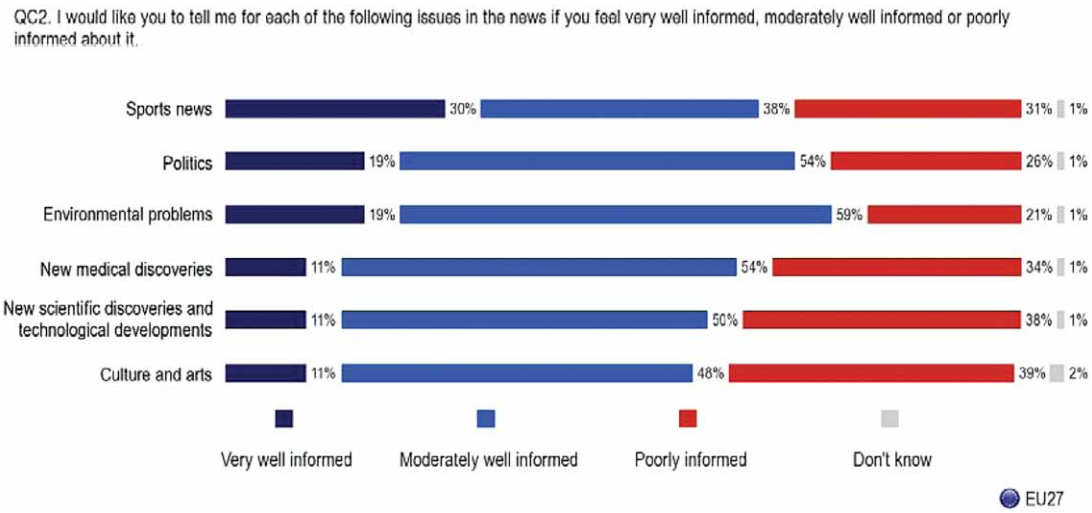

Figure 2. *Informed about daily issues.*

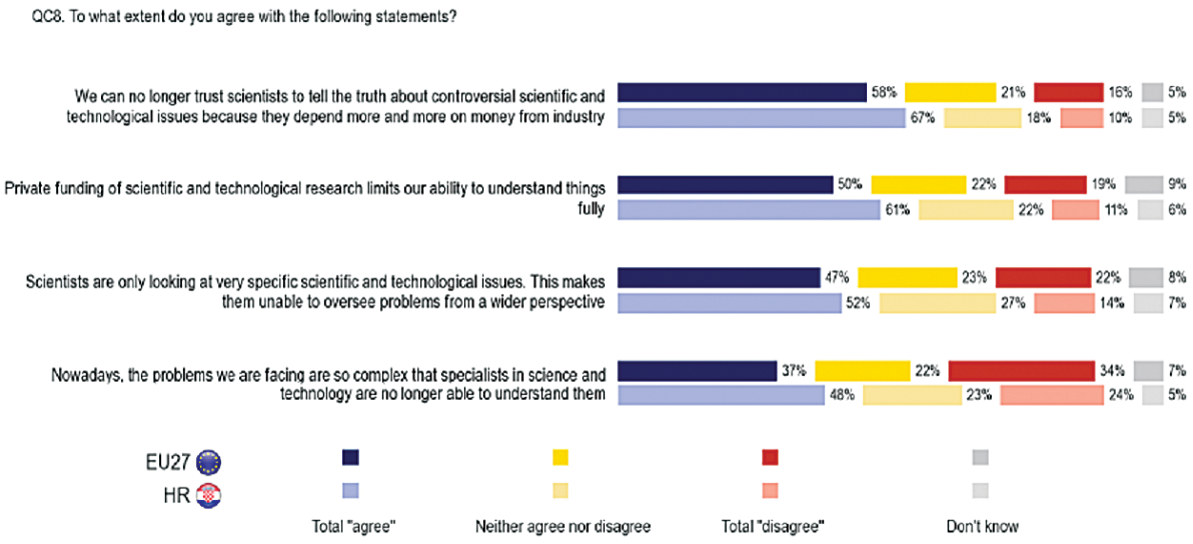

Figure 3. *Image of science and technology.*

ier and more comfortable, compared to 78% of respondents in 2005. On average Croats are, according to the Eurobarometer surveys, more critical, but at the same time have higher expectations of science. 43% of Croats, compared to 33% of EU citizens think that in their everyday life it is not important to know about science, although 33% of Croats compared to 22% of EU citizens believe that science and technology can resolve out any problem, as shown in Figures.

62% of Croats, compared to 53% of EU citizens think that scientists posses knowledge that makes them dangerous. There are few possible explanations for that. One of my hypotheses, that has to be tested, is that Croats do not have trust in the mechanisms of social control, possibly in general and not only in scientific and technological matters. This could be the result of a political culture and mentality. Another possible explanation is that surveys such as Eurobarometer can tell us more about the general »political sophistication« than maybe attitudes about science *(2)*.

MODELS OF SCIENCE COMMUNICATION

Science finds it's route to the public in many ways, and there are several patterns, or models that are most frequent and described by theoreticians of science communication. We will focus our attention to 2 basic models.

The usual way of going public with new scientific and technological discoveries is a process which includes three different spheres: science, public and the media in between. Something is done in the laboratory, which is communicated within scientific community in work-

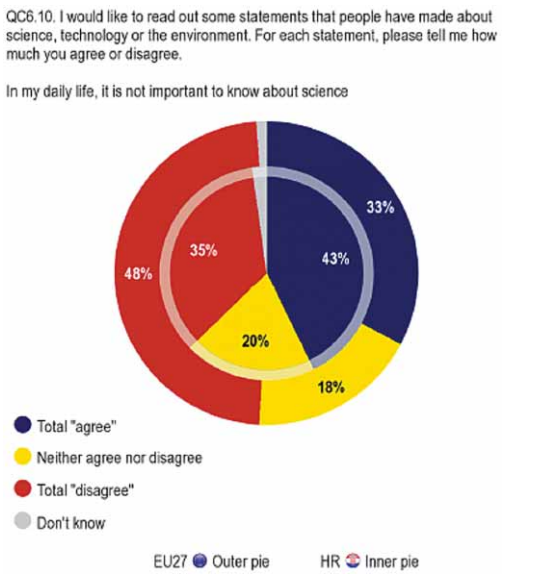

Figure 4. *Importance of science in daily life.*

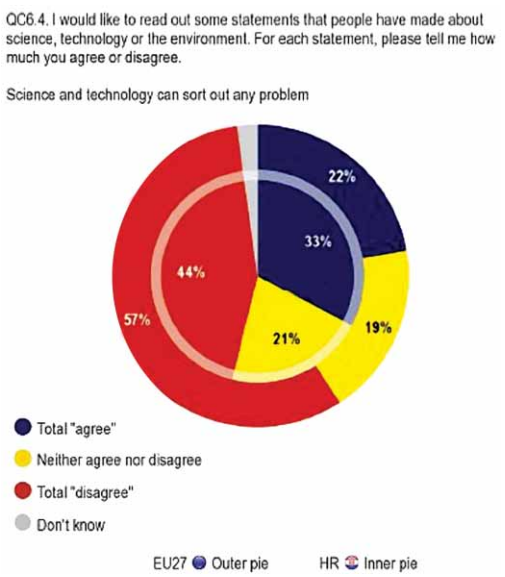

Figure 5. *Expectations from science.*

shops, lectures, conferences or elsewhere between the experts. It then goes through the validation and peer reviewing process and is published in scientific literature. After that the media 'cover' it and via mass media it reaches the public sphere. This process, as presented in Figure 6, is linear and in continuum, and the three spheres; science, media and public, are divided *(3, 4)*.

But, it is not necessary to follow this 'clean' process, as if there are no other possible routes. There are many examples in which the authors of the scientific information simply skip some steps and change the process. This is the case of 'science in the making' *(5),* e.g. space missions or 'discoveries' which have not yet been published, but for some reasons the authors decided to go in public. For example, Croatian scientists sometimes also decide to take the initiative and provoke media attention to communicate something that was still in the process or was not validated by another laboratory *(6)*. In this concept of multi directional two-ways communication, with many subjects who send and receive the information, developed by Bruce Lewenstein, the media has a central place, due to its effectiveness. The media are the most frequent source of information about science and technology *(7, 8)*.

Public interest in science is not constant; it is dynamic and depends on many factors: scientific production, science and society interface, the development of the media or inner media logic etc. Media have a central role in science communication and the public interest, as Bauer shows, can be measured by the media attention (see Bauer, 2011). He analysed the public attention to science in the past 2 centuries and showed that it appears in waves and not in cycles. He detects few periods of »secular waves of science news«: between 1842 and 1878, between 1908 and 1928, from 1950 to 1966 and the last one started in 1990s and is still present *(9)*.

In our analysis of the Croatian oldest popular science magazine Priroda, which is celebrating its 100th anniversary and continuous publishing in 2011, we showed similar pattern: the attention dedicated to Darwinism from 1811 to 2008 was not cyclical but in waves, and sometimes coincided with certain events within and outside science. At the same time, Priroda completely ignored some, in this respect very important events *(10)*, as showed in Figure 6.

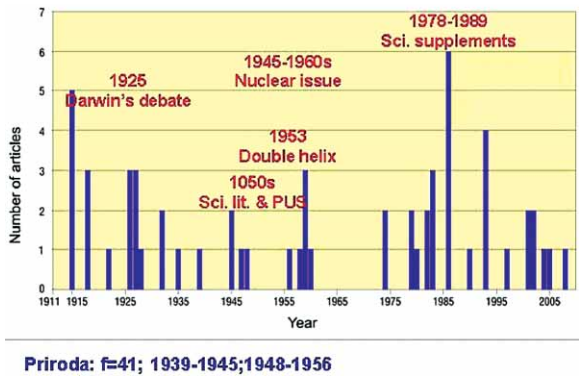

Figure 6. *Magazine Priroda and the coverage of Darwinism. Adapted fro, Jergović and Juračić, 2008 (10).*

For example, there was no articles during or after big Darwin's debate and the so called Monkey trial 1925, the discovery of the structure of DNA, the high interest for the public science started from 1950s, or the increased media attention to science and the appearance of science supplements to the newspaper from 1978 to 1989. We focused on the coverage of Darwinism because of the immense importance of Darwin, his support in establishing Croatian Natural Science Society and the importance his theory on the new paradigm of science which intended to be introduced in Croatian Society at that time by the Croatian Natural Science Society and its popular science magazine Priroda. We discovered few big gaps in the coverage of Darwinism: between 1960 and 1974; 1939 and 1945; and 1948 and 1956.

The public attention for science can be associated with some factors, such as new media appearance, e.g. radio in 1920s, TV in 1950s or internet in the 1990s, or with the actors of science communication *(9, 11)*. There is no doubt that media shape not only the public communication and image of science, but also science and scientific production, and there is numerous empirical data supporting this idea *(11)*. The idea that different actors of science communication make news waves is at the moment only hypothetical. Nevertheless, the waves of public attention seem to be carried by new actors and the increased public attention coincides with the appearance of new protagonists of science in the public; from scientists-politicians in the mid 1900s via scientists-cum-popularisers in early 20th century, science communicators in the 1950s and science journalists and critical scientist journalists in 1970s and 1980s, to the professional Public Relation officers of today *(9)*.

SCIENTISTS IN THE PUBLIC

In the public sphere scientists can play many roles, such as popularisers, communicators of scientific expertise, science communication experts or science politicians. We will focus here on the roles in which scientists communicate to or with the public. Science popularisation has a long tradition, but in the early 20th century researchers actively started to communicate science in popular science books or in the media. They were publicly active in order to raise interest for science among non experts, or in order to mobilise the public in social or political issues *(12)*. Popularizing science also has a role in communication of science to scientists from other disciplines, as Gregory and Miller *(13)* pointed out. Scientists can gain public visibility and science popularisation can therefore influence scientific career not only in financial terms in the case of already established scientists, but also the careers of young researchers *(14)*.

Science popularisers and the communicators of scientific expertise differ according to the type of audience they reach, scientific knowledge and their approach to the audience, as Hans Peter Peters argues *(11)*. Popular-

TABLE 1

Popularisers and public experts. Adapted from: Peters, 2008:131–146

	Audiences	Approach	Knowledge
Popularisers	attentive to science	science-focused	abstract
		social reconstruction of scientific knowledge	specialised
Communicators of scientific expertise	general	problem-oriented	concrete, in the context, practical
		explanation and solution of non-scientific knowledge	inter/pluri disciplinary
			general expertise and experience
		defined in relation to social problems	

isation is public reconstruction of science per se; research projects, theories, and scientific and technological discoveries and achievements. Popularisers are addressing the audience already attentive to science.

Pubic experts or communicators of scientific expertise give advice and help in the decision-making process with their knowledge, ability to relate different kinds of expertise, deal with the problems and see them from wider perspective. Their expertise has to be concrete and within the context. It is defined »by its reference to social problems, decision-making and action« *(11)*.

But both popularisers and communicators, or the mediators between them and the audience, journalists, are not simply »translating« scientific knowledge when going public. The linear model, if we look at it more carefully, as shown in Figure 7, includes not only transfer, but recontextualisation; selection of information, simplification, description, use of metaphors and comparisons to make unfamiliar and complex notions more familiar and understandable. In this process hypothetical turns into definite, and uncertainties become certainties. Occasionally, hype and false promises can also be present, not only made by media professionals, but also by scientists *(6, 10)*.

Massimiano Bucchi differentiates between 3 basic models of communicating science to the public: deficit, dialogue and participation. They have different aims, emphasis and ideological contexts, and they also have different communicational patterns *(4)*. The deficit model is one way, top down, and assumes the state of the deficit of knowledge in the public, and therefore of positive attitudes toward science. The public needs to posses certain level of factual knowledge in order to be able to appreciate more the outcomes of science. As Bauer, Allum and Miller (2007) argue, this model is based on the wrong presumption that knowledge is in positive correlation with positive attitudes; there is the relationship between knowledge and the quality of attitudes (the more we know, more fixed our attitudes are), and thus, there is a positive correlation between knowledge and negative attitudes towards controversial issues. Brossard *et al. (15)* show that there is no correlation between attitudes and knowledge if there are strong beliefs, such as religious. Nevertheless, the deficit model is still the usual way in which researchers and young researchers too, conceptualise the relationship between science and the lay public *(16)*. Communication pattern here is transfer and popularization of knowledge. Since all discussions and decisions are made in the scientific community, the ideological context is technocracy and scientism. This model is often associated with the notion of scientific literacy in the US, and public understanding of science in the UK.

Soon it became clear that there is another kind of deficit, the lack of scientific understanding of public. With the aim of discussing implications of research, the dialogue model was established via consultation and negotiation. This model presumes that there is a dialogue, two-way communication and interaction, and the ideology behind it is that of social responsibility and culture.

TABLE 2

A multi-model framework of science communication (adapted from Trench 2006)

Communnication model	*Emphasis*	*Dominant versions in science communication*	*Aims*	*Ideological contexts*
Transfer Popularisation One-way, one-time	Content	Deficit	Transferring knowledge	Scientism Technocracy Rhetoric of the knowledge economy
Consultation Negotiation Two-way, iterative	Context	Dialogue	Discussing implications of research	Social responsibility Culture
Knowledge co-production, deviation Multi-directional, open-ended	Content and context	Participation	Setting the aims, shaping the agenda of research	Civic science Democracy

The problem was that the dialogu here was conceptualised as the discussion in which both sides, scientific community and the audiences, were talking, although one side was supposed to listen: the audience. The famous GM Nation Debate in the UK in 2003 at which the Government did not wish to hear the scepticism of the audiences, concluded that dialogue should continue until the right answer and consensus is achieved *(2)*.

Apparently for democratic, civic science another communication model is needed: a participation, open-ended, multidirectional (model), in which co-production decides on the conclusion. The emphasis is on content and context and the aim is to shape the agenda of research and set the aims via participation of the lay public. This is shown in Table 2.

CONCLUSION

Science is presented to the public often in times of crisis, conflict, risk and uncertainty when the pure transfer of scientific knowledge is not enough. Even when science is 'good news' like in the case of the media coverage of the discovery of the mechanism of the recovery of bacteria Deinococcus radiodurans or phylostratigraphy approach to uncover the genomic history, both at the Ruđer Bošković Institute, it is not enough to simply 'translate' or transfer scientific information, as shown by Jergović and Juračić *(5)*. The audience for science has mixed feelings about the outcome of scientific research and the ability of scientists to understand problems fully and to see issues from a wider perspectives than their own specialisation, particularly with regard to the new circumstances for scientific and technological research and the possible influences on it and on the communication of scientific results in science and in the public. Therefore, science should be communicated and not only popularised, and emphasis of communication should be the goal of the public activities of scientific institutions such as the Ruđer Bošković Institute.

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