Science, the public and the media – views from everywhere

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1) Relationships between science and the public

The poster, which shows the old Albert Einstein with his violin case standing in front of Marilyn Monroe seated on a park bench in the pale moonlight, triggers an involuntary reaction in our minds, almost like a picture puzzle. Are we amused or irritated by the discrepancy between the intellectual crankiness of the professor and the 'sex appeal' of the movie star? Are we reluctant to imagine Einstein becoming romantically involved with a sex-bomb? The relationship of science towards pop- or mass-culture and thus to the public in media democracies (represented here by Marilyn) is awkward (although Einstein himself was – exceptional for scientists – a media icon). It does not comply with the relationship of science in the feudal society of the 17th and 18th centuries which was characterized by irreverent submissiveness and the courting for the attention of the ruling class. Nor does it comply with the relationship of science in the bourgeois society of the 19th and early 20th centuries in which the bourgeoisie, anxious for knowledge, was able to participate in the progresses of research with the help of their popularizers. The decisive change in the relationship between science and the public began when modern science could be considered as fully differentiated, i.e. since scientific communication was closed to the outside and became self-referential. Science was financially and institutionally dependent on state and society from the beginning, but this dependency has changed in its character. On the one hand, the contents of science are no longer derived from everyday experience but constituted in the disciplinary communication processes in highly specialized languages no longer understandable to the lay public. On the other hand, modern societies have developed into mass-democracies in which the addressees of scientific knowledge and appeals to fund research are no longer merely the educated, but the entire electorate for which the politicians have to legitimize their policies.

The electorate, i.e. the general public, does not necessarily have a genuine interest in education and enlightenment, but first of all a pragmatic interest in the results of research with regard to its practical needs. Science's promise for progress has created expectations and demands, and the world is permeated by science and technology in a way that it is impossible to go through life without using scientific knowledge.

The public of mass-democracies is almost exclusively represented and continually updated by the media. Everything we know about the world, and thus about science, we know through the media (Luhmann). Due to the central standing of the media in the public discourse and in determining the political agenda, the primary interest in this essay is the role of the media in the communication with science. Since the relationship between science and the public is one of mutual dependency, it is necessary to look at the respective perceptions. How do science and the public perceive each other, what kind of expectations do they have of each other? How do they attempt to realize these expectations and what are the consequences of those attempts? The repercussions of the mutual perceptions on science proper, the attempted adaptations as far as science is concerned, are called 'medialization'.

In the following I will concentrate 1) on some examples of perceptions of science held by the public, 2) on particular examples of perceptions and attempts by science to influence the public, and, finally, on some aspects of the effects these attempts (may) have on science itself.

2) Science in the perception of the public

One source of perceptions of science held by the public are opinion polls. Various surveys have all come to the conclusion that trust in institutions in a given population is generally decreasing, but that of all institutions science is regarded as the most trust-worthy. This also holds for international comparison, for example between the USA and Germany (Peters et. al.) or the EU countries. The general finding, however, is of little significance as further inquiries quickly show. For example, it can be observed that the interest in science and technology increases with age and length of education. On the other hand only a third of the population feel that they are informed with regard to science. The highest interest is in medicine and environment because these fields are of direct concern to people. Optimism regarding the role of science can thus be found especially in the healing of diseases and relief of every day life (80.5%; 70.7%). The consideration of advantages and disadvantages of science, however, leads to a slightly positive result (50.4%). In the regularly EU-conducted survey it is striking that the answers are dependent on the level of education but also differ considerably between individual countries. Here, it is assumed that there is a relationship between the predominant values and the attitudes towards science. The originally assumed simple relationship between state of knowledge and positive attitude towards science is not as simple as it was thought to be. The analogous

relationship between level of industrialization of a country and positive attitude does not fit either. It is rather the case that the positive attitudes and expectations regarding science can especially be found in countries that are in an early stage of industrialization (for example, in the East European countries). In contrast, scepticism, critique and lack of interest are more prominent in highly industrialized countries. Even in this pattern there are unexplained differences since, for example, the Danes are much more optimistic than the Germans even though the degree of industrialization is practically the same in both countries. In addition, the attitude is dependent on concrete occasions, i.e. on the kind of question asked. Thus, 88% of Cypriots consider gene manipulated food as dangerous, but only 30% in the Netherlands do (EU Barometer 2006). Meanwhile it is doubted that there is a widespread anti-science and anti-technology attitude in Germany. Rather, this notion is presumed to be a construct of the political discussion of the 1980s (vgl. z.B.Kistler 2005; Renn 2005).

Observers agree that the perception of science in the public is difficult to grasp by these kinds of surveys. However, as a general conclusion it can be said that the attitudes are the more ambivalent, based on experience and interests, the more concrete the occasions or themes are, not least because abstract science does not interest the majority of the public.

A similar picture emerges when the questions are aimed at the perception of scientists. Here the ambivalence towards the institution of science complies with the stereotypization of its protagonists. The "Draw-A-Scientist"-tests, first conducted in 1957 by Margaret Mead with high-school pupils in America, revealed aside from the widely shared descriptions (the scientist is a man, wearing a white garment, glasses, having a beard or is unshaven etc.) an ambivalent perception of negative as well as positive images. In contrast to the negative images, which also have a stronger presence, the positive images are without any relation to the career dreams of the children (Mead/Metraux 1957). The DAST-research has shown the amazing stability of the stereotype which is already developed in elementary school. Later, it changes towards a more positive one only if higher levels of education are attained (NSB 2002: chap. 7). More recent research on stereotypes of scientists came to the same conclusion. They are still perceived as an elitist group obsessed with their work, as older men who do not have a family, are intelligent and of cool rationality whose work is often dangerous and bound to fail (Vilchez-Gonzalez/Palacios 2006: 241; Schibeci 1986).

A second source for the perception of science in the public are the popular entertainment media, in particular motion pictures and comics. It can be assumed that they reproduce

and strengthen the clichés and biases held by the public. In fact motion pictures represent stereotypes which can be traced to the myths of antiquity, such as the legend of Prometheus, and which have been handed down by literature. The alchemist *Doctor Faustus* is the archetype, followed by literary figures such as *Dr. Frankenstein*, the first of the mad scientists, as well as *Dr. Jekyll* and *Mr. Hyde*, *Dr. Moreau*, *Dr. Caligari* and others. They all have the strongest of all myths in common: the creation of artificial life. "The achievement of the mechanical creation of human life - or even of life at all - looks like a culmination of the acquisition of knowledge and the power that this knowledge brings. Most societies have set definite limits to this extension of human knowledge; modern Western society has been distinguished in trying to obliterate this limit. But the old limits still exert their power and arouse a certain dread of what will be found beyond these limits" (Back 1995, 328).

This ambivalence towards science and technology can also be traced to comic books. Even the funny/satirical animal stories (Donald Duck) describe, aside from the promises, the cases of failure of the engineer/technician who loses control over his inventions. The often unnecessary complicated inventions of Gyro Gearloose are contrasted with the down-to-earth and nature-loving character of Grandma Duck who finds natural sciences to be "unnatural" (Kagelmann 1975: 125). The technical progress seems too complicated, the visions of a future over-technologized world are ambivalent, if not negative (Weingart 2008).

The representation of science in the popular entertainment media, thus, indeed shows the same stereotypes and ambivalences that were revealed by the DAS-tests. In the surveys they are indirectly mirrored with the different attitudes toward science as an abstract institution (or the scientist as a job) and vis à vis concrete research or techniques.

A different form of perception is revealed when observing the reports on science, in particular reports on special fields of research or techniques, by the mass media. With the emergence of professional science journalism the presentation of science has developed to specialized editorial departments within the mass media.

The media do not primarily report about science for reasons of enlightenment as the popularizers had done. The public they address is also no longer comprised of the "educated of all classes seeking the truth" but an audience the media envisions solely from viewer and reader analyses. The media, i.e. concretely the editors and journalists, construct an audience for themselves according to the conceptions available to them. For this audience they only report about science if the contents under consideration have news

value in the sense of the media's selection criteria. The only goal is to achieve maximum attention as this determines the income from advertisements on which the media depend as commercial enterprises. This, in turn, has an effect on the representation and ultimately on the perception of science in the public: Representations of science by the media stick to the predominant dramaturgical formats with regard to narrative, temporal and visual design (Donges/Imhof 2001, 123).

This is exactly the basis of the tensions between science and the media and contributes to the recurrent conflicts between scientists and their mediators. The media representation with its tendency to dramatize and even sensationalize contradicts the scientists' self-perception of integrity which is the source of scientific credibility. In media reporting science, despite its ubiquity, appears to the public as a strange world about which it is easy to create clichés and myths.

The mass media perceive their environment highly selectively. This selectivity is not accidental but systematically structured by the so-called news values: actuality, controversies and conflicts, experience through local connection, every-day experience and others are such news values. Having this in mind, science is a very awkward topic for media coverage.

Despite differences in the media coverage of different cases, there are also important similarities. This concerns first and foremost the patterns of reception, i.e. the way how scientific themes become news and what kind of attention they receive from the media. Medical themes dominate and are followed by themes of natural sciences and technology (Stamm 1995, Stuber 1995). Gene technology and space technology are of interest while nanotechnology rather seems to be a passing trend theme (Piel 2004). Relevance for every day life and a local/regional reference are also news values in the media coverage of science. This also holds for catastrophes, which receive the most attention, as was the case in the 1980s and 1990s with the accident at Tschernobyl and the Challenger explosion (vgl. Beste 1989, Guha 1989, Agazzi 1995).

For a long time themes from the classic natural sciences such as chemistry and physics, which did not have a connection to every day life, were regarded as being of minor importance. This has changed in the past years. There is a recent boom regarding media coverage of science documented by the emergence of popular 'knowledge' or 'science' journals in the print media and related formats on television. This renewed interest of the media correlates with an intensified research on patterns of media coverage motivated by its significance for the legitimation of science. A study on science journals in 1997 and

1998 revealed that natural sciences (43%) were treated before medicine (25%), technology (13.2%), humanities (7.1%), and social sciences (3.8%) (Scholz/Göpfert 1998; Hömberg/Yankers 2000). Most of the journals reported themes which had entertainment value. Statements by the editors on the goals and principles for production of TV-magazines are especially revealing. The criteria for choosing themes: "…fascinating phenomena of nature (volcanoes, tsunamis)…newest discoveries of science and technology (nanotechnology)…also every day themes such as water and coffee which we "often observe from surprising perspectives" (Grebe, Quarks & Co); "…themes have to be entertaining and fit into our program, i.e. even the false answers have to come across optically well, too (Klophaus, 'Clever' SAT 1). Regarding the concepts of the shows it is stated: "To present science competently and entertaining without being too serious. Here, we always seek the most exciting way to present the topic" (Grebe, Quarks & Co); "'Clever' is 'science comedy' and purposefully not a common science show…an entertainment show…without the seriousness of schools…We want to make people have fun with knowledge without doing any overkill" (Klophaus, Clever, SAT 1).[1] The connecting of scientific content with entertainment, also called infotainment or edutainment, is a fairly recent development in science journalism and seems to be a result of the inevitable rejection of intellectual efforts by the broad audience. Many professional observers find this acceptable and only few point out that these shows do not contribute to increasing the capability of using critique, also with regard to science. The potentially progressive reports, which focus on the workings of science and its protagonists and could give insight into the production of knowledge, make use of the more accessible modus of biographies of scientists with a tendency towards hagiography.

As expected, the stereotypes presented in the surveys and popular entertainment media can also be found in the news media. Marcelle LaFollette has condensed the stereotypes in her extensive study on images the US public has of science: the *magician*, the rational and efficient *expert*, the *creator* and *destroyer* (from 1930 onward particularly associated with the physicist who is assumed to be responsible for positive and negative effects), as well as the *hero* who combines optimism in the future with an insatiable thirst for discovery (LaFollette 1990, Ch. 6). Thus, the media reproduce the same stereotypes which can already be found in the literature of the 18th and 19th centuries and the creations of the pop culture of the 20th century. They share the 'image of difference' (LaFollette 1990, 76).

[1] All quotations in *attempto* 19, 2005.

The ‘myth of being different’ creates admiration, respect, trust, and fear at the same time and supports the social distance of science regarding societal responsibility.

One important function of the media is to produce discourses which deal with controversial research or techniques that can, during the discourse, be “embedded” into society (Weingart et. al. 2007). Topics differ in the degree to which they are controversial. These differences can be traced to the implications which they have for the dominant interests and values just like the different levels of attention for various disciplines or research areas. The rosters of perception are only more differentiated when dealing with specific research topics. They can be classified as scientific, political, economic and ethical or legal interpretations (Schäfer 2007, 79ff; Schäfer 2008, 212). The discussion about stem cells has because of its ethical and legal implications received an unusually extensive and polarized media attention involving many actors. Human genome research, in contrast, was received in an almost equally extensive and pluralistic but largely uncontroversial discussion. Neutrino research, finally, has received only scant attention which was constrained to the science pages and completely uncontroversial (Schäfer 2008). The examples for all three cases could be multiplied. Often it can be foretold already in the initial phase if a research area will trigger a public controversy or not. If such a controversy begins it can be predicted that the media will stage-manage it. Thus, science enjoys media attention not least because of its irritating effects (again one aspect of ambivalence!). Not only controversial discussions in the media public are being represented but also the controversies within science itself. The inner scientific discussions about open questions and uncertainties which are completely normal in the research process are interpreted by the media as conflict which reflects the inability and lack of sound judgement on the part of the scientists. They typically do not differentiate between scientific ‘mainstream’ and marginal groups of ‘dissenters’. In the case of anthropogenic climate change, for example, the media weigh all positions represented in science as equal. “The more intensive reporting about anthropogenic climate change, the more unequivocal the warnings of a catastrophe, the more interesting the ‘sceptical positions’ represented by the media become. This pattern of media reporting is consistent with the theory about news value. It is irrelevant to the media if the weights between the scientists who believe climate change to be proven and the sceptics who doubt it are unequal. For the media dissent as such is worth reporting. Presenting the internal

discussion is in accordance with the news value of polarization" (Weingart et al. 2007, 18).

To the outside, in public perception, an image of helplessness and strife is portrayed while inside science the research process takes its evolutionary course. But a specific pattern of media reporting is associated with this form of perception. The media take on the role of a distanced observer who regards the discussion among the scientists from a supposedly neutral perspective. Communication scientists speak of 'frames' in which the discussions are interpreted. In the concrete case the uncertainties of climate research are emphasized, in addition an ironical distance to the semantics of catastrophes (including that of the media themselves!) is taken, and the constellation of interests behind the climate change hysteria is revealed. The disturbing consequence of this perception of the scientific discussion is that science as an institution is attributed a self-interest in dramatizing research results. An exemplary commentary in a German newspaper read: "An alliance of 'concerned scientists', media representatives, special interest groups and politicians fuels fears about the implications of the greenhouse effect. They all seem to believe in the benefits of such fears. The concerned scientists finally come out of their boring laboratories and bathe in the sun of nationwide attention. The media love exciting horror stories because they fascinate the public and promise attention and success. Politicians use the attention thus created, find voters and solidify their positions" (Die Welt, 05-11-1993).

3) The public in the perception of science

Meanwhile scientists, science administrators and science policymakers are no longer unaffected by the ways how the media and the public perceive them. They adapt to the permanent observation by the media and, following the logic of the increasingly important presentation on the 'front stage', try to influence it to their own benefit, to anticipate controversies and resistances, and to pursue 'public relations' in the traditional sense. With this we are on the side of science perceiving the public. Just like the media construct their publics and their image of science the protagonists of science construct an image of the public to which they want to present themselves.

In order to see how science perceives the public one only has to look at how scientists and politicians of science articulate their fear of losing approval of the public and how they try to regain lost support. Scientists' constructions of the public have changed significantly in the past three to four decades. In particular, natural scientists and engineers in the 1960s and 70s still had a strong elitist image of their own role towards the public. In this image

there was no space for the public as having a democratic legitimation to participate in decisions on the implementation of riskful technologies. Since the controversies about nuclear power, the scientists and politicians of science involved had to learn that such demands could be iterated with regard to all new branches of research and the introduction of new technologies as soon as they give reason for assuming risk. It is then unimportant whether these assumptions are justified from the perspective of the scientists. Today it is almost unthinkable that a scientist, even if he has that conviction, characterizes the people as "irrational." This form of distance, if not disdain of the public on the part of scientists can be traced fairly exactly to the time since the development of quantum mechanics until the early 1970s. It is explained by the ultimate abstraction of physics in conjunction with its commanding lead role in the development of nuclear key technologies during this period (Bensaude-Vincent 2001).

Since then the political context has changed fundamentally, and at the same time the life sciences have assumed the lead function in technological development. The process of science discovering a democratic mass public has taken a long time and has still not been completed. When American politicians and their western allies were shocked by the launch of the Soviet satellite 'Sputnik,' they called for an educational program which was aimed at improving the scientific knowledge of their respective populations and thereby increase the probability of similar achievements by their own, still to be trained, scientists. The problem was, in fact, the relatively small number of students in the natural and technological sciences. The program had the immediate objective to increase the 'scientific literacy' (the scientific education) in order to raise student enrolment in these fields and gain public approval for generous funding of space research. Only later did it occur to the instigators of the program that it made the 'core curriculum' of the sciences the only referent with no regard to the everyday interests of the public. The program „Public Understanding of Science", which was first started in England and the USA, shares the same philosophy: that the addressed public should 'understand' the contents of science, which science views as relevant and communicable.

The propagandists of science have only realized the paternalist implications of these programs recently which led to a change in PR-strategies and to a new construction of the public. Thus, PUS in England and the USA became 'public engagement in science and technology,' and in Germany 'Wissenschaft im Dialog' (Science in Dialogue). With this rhetorical shift the new character of the public was recognized, though without being mentioned in more detail. It is a democratic public which has its own interests and values

and is not to be told by scientists which innovations it should approve of. This change of mind is, however, still half-hearted. Larger programs such as the German 'Jahre der Wissenschaft' are, as respective evaluations have emphasized repeatedly, aimed at an unspecific public and have unspecific goals. Ostensibly the goal is to arouse the public's interest in science, lastly with the hope to gain general consent to growing science budgets. Alongside there is also the motive to close the widening gap of scientific-technical student enrolment (Weingart et al., 2007b).

One of the reasons for the wasteful character of these campaigns is that these programs are not conceptualized by scientists alone but by advertising agencies. This means that the public constructed by scientists is now replaced by a public of science constructed by PR-specialists. Consequently, the methods and instruments that characterize the programs are those of the advertising industry. It is the public of 'events' and marketing, the success of the programs is measured in numbers of people who have been 'reached,' anywhere from 5000 to half a million. They are indicators of success for the advertisement of goods of mass consumption. It remains unclear what the lasting effects will be with regard to changes of attitude and behaviour, as for example the choice of studies by youths. The longer term effects of the much smaller programs of cooperation between scientists and teachers, which are aimed at pupils, are rather sobering. The suggested involvement of the public by terms such as 'engagement' and 'dialogue' is thus first and foremost rhetorical. Visitors of 'space centers' and 'open days of research' or the audience of science shows are, of course, not really involved in a dialogue on funding particular research programs. Even participants of 'round tables' or consensus conferences, who literally converse with scientists, do not have anything to do with the political decisions regarding the research. Their involvement is merely as a voter, and thus indirect.

4) **Will science be medialized?**

The described development of the communication between science and the public shows that science, as an institution, has adapted to the public of mass (media) democracies. There are good reasons why science did and still does this, albeit reluctantly. The apparent elitism of individual researchers is only the appearance of a societal characteristic: science is a differentiated social system. This means that, first of all, scientists communicate with each other. They have to do so if they want to successfully produce new knowledge and be recognized for it by their colleagues. This internal communication is so efficient only because it is highly specialized and has created languages for each discipline and even

individual fields of research. It is as such the mechanism of the distribution of the crucial reward in science, i.e. reputation. By attributing competent collegial recognition to certain discoveries and truth claims their authors are allowed to accumulate social capital and rise in the internal hierarchy thus created by this communication. The communication with the public, on the other hand, is not only obstructive in terms of time spent but also involves the 'wrong' (lay) audience. Because of lack of specialized training it is incompetent to participate in the evaluation of disciplinary knowledge claims. It is therefore disreputable in science, even though it is not uncommon, to address the broad public, for example the media, when dealing with solving controversies within science. Questions of truth cannot be solved by taking a vote.[2]

The conditions of a science secluded from the public, however, do not hold anymore. On the one hand, science has become a topic for the media. Like other societal themes, science is under the media's constant observation because new discoveries such as the human genome, dramatic scenarios such as anthropogenic climate change, or scandals such as various cases of fraud, all have a high news value. On the other hand, it has become a mantra of science policy to ask scientists to report about their work in the media, and thus make science in general as well as their respective disciplines and institutions more attractive. In some institutions such an "outreach"-activity has already become a criterion for evaluations. In addition, universities meanwhile have created their own PR-departments. They produce increasingly expensive journals and send them to each other and the media as advertising material, demanding scientists to provide material. The outer appearances already share the jargon of the industry. The 'science of the public' is therefore, in contrast to its predecessors, characterized by a smaller distance to its public. It constitutes its audience by following the laws of media communication while, to say it with exaggeration, contents merely play a secondary role.

This development can be called the medialization of science. Medialization is supposed to mean that a particular system (here: science) orients itself to the operational logic of the media. Here it is useful to differentiate between the representation and the production of knowledge (Rödder 2008). A comparably innocuous consequence is that the representation of science is (to some growing share) carried out in the same media forms as all other media communications. Thus, it is subject to the same conditions, i.e. the competition for attention as well as its rapid decline, and it risks to be viewed as 'interested' communications that cannot claim higher credibility. A less innocuous

[2] On cases of scientists turning to the public cf. Bucchi 1996.

consequence of medialization would be that the presentation of science has effects on the production of scientific knowledge. This is the case when research priorities are determined – against the better judgement of the scientists – by the popularity value communicated into politics because politicians expect a higher approval from the electorate.[3] It is also the case when teaching positions at the university are awarded because of media fame gained through a television show instead of achievements recognized within the scientific community (Weingart, Pansegrau 1999). In this still hypothetical case, scientific and media communication would compete with each other, and science's monopoly of truth would be crowded out by the media's monopoly of attention. This, then, would be tantamount to the replacement of scientific reputation, instrumental for the guidance of research, by prominence in the media. The forms of representing science have undoubtedly become medialized, but the effects on the production of knowledge are still unclear. First empirical studies show that the differentiation of science is not reversed, as the radical medialization thesis suggests. Rather, scientists' views of themselves are differentiated with regard to the representation in the public. Aside from the classic type of scientist who is only focused on his work and avoids any kind of contact with the public, one can find scientists who instrumentalize the public in different ways. They may do this for the interest of science in general, for their own convictions, or for carrying out certain directions of research (Rödder 2008). Furthermore, medialization is restricted to certain fields of research and to discoveries of research that are of particular interest to the media (Schäfer 2008). The media communicate the interests of politics and the economy and constitute the framework of conditions under which science has to operate. This framework has become narrower and, thus, the necessary measures of adaptation have become more complex. What this ultimately means for the achievements of science, its reliability and our trust in science is not yet foreseeable.

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[3] This is, of course, not to say that the public does not have a legitimate claim to determine priorities of publicly funded research, although its involvement will depend to some extent on expert advice.

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