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Science and Media

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The title of this chapter imposes a need to define two notions that are by no means explicit. In the Anglo-Saxon literature, the term 'science' is understood as mathematical and natural science, subject to falsification (Popper, Kuhn). In the German tradition, science (*Wissenschaft*) is understood wider, also including humanities and social sciences. I will consider the term 'science' very widely, covering all descriptive and normative disciplines, such as, for example, pedagogy and law.

In turn, the equivocal notion 'media' refers to the means of communication that are used to provide intended information to any group of people. Hence, according to this interpretation, the notion 'media' covers both a daily newspaper or television broadcasts and professional literature, which - if regarded as a scientist's field of research - often doesn't fall within the scope of the notion 'media'. Depending on the historical context, the type of communication, and hence its size, vary. During their lifetime, the works of ancient philosophers or physicians were only accessible to a select number of persons or groups, whereas nowadays the mass media make it possible to access millions, or even billions of people. An example is the yearly Oscar awards ceremony, which is broadcast to more than 150 countries.

Publications as a basic medium in science

I venture the opinion that without media, the progress of science would be more arduous since, in addition to culture and civilisation's other products, such as architecture, tools and works of art, they enable achievements and experiences to be passed on, not only to people alive today, but also to future generations.

Without historically analysing the relationship between science and the media, I would like to draw attention to the fact that as civilisation progressed, the scope of media interaction increased, hence changing the media's impact on the development and promotion of science. The most natural form of media, which is used by scientists irrespective of their

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specializations, is the publication of their scientific output in professional journals and in monographs. Depending on the language as well as these publications' status (the type of journal and the publisher's reputation), their range is local or international, as numerous publications in English are. In my discipline, *i.e.* psychology, about 95% of articles and books are published in English. Here the role of the media is already evident, since outstanding research achievements reported only in local journals or in less known languages, do not circulate in global science. The Nobel Prize winner Ivan Pavlov and one of his Polish followers, Jerzy Konorski, contributed significantly to the development of knowledge of conditioned reflexes and learning, mainly due to their discoveries being published in English. There are many examples of outstanding achievements that, due to the language unknown to others or social isolation, were not made available to mankind in the period when they were produced, but only many years later when others, making use of global media, published identical or similar research results. A case in point is the law of genetics, discovered in 1866 by the Czech monk Gregor Mendl. It became part of the science world 30 years later when Correns, Tschermak and de Vries rediscovered regularities that had been stated by Mendl. Obviously, it is due to the lack of media that a certain discovery was not always appreciated and used.

Mass media as a tool for popularising science

In this chapter, the emphasis is on the role of media in science but does not include the circulation of professional literature. I particularly refer to the mass media in the form of popular science magazines (weekly, monthly, and quarterly), popular science books, radio, television, daily newspaper, and the internet. Generally speaking their function consists of informing a wider audience about the results of research conducted in laboratories, libraries or under natural conditions (*e.g.* archaeology), but also of delivering knowledge that enables citizens of various educational levels to comprehend complex phenomena that occur in the environment.

Making generally complex discoveries and research achievements available to a wider audience through the mass media - with a view to the object of, but also the method of research - requires extraordinary qualifications and abilities which researchers rarely possess. Journalists and editors, very often with an education pertaining to biology, chemistry, physics, humanities or social sciences, are specialised in this field. They popularise a specific field of science, the knowledge of which they acquired through accomplished studies or their own explorations. The ability to convey research achievements or scientific information to laymen generally requires changing the language of communication from a hermetic - known only to a narrow group of specialists dealing with the phenomenon under study - one to an ordinary, freely comprehensible language. Analogies, metaphors, photographs, TV or other everyday media tools, or appealing to the experiences of readers and viewers are the most frequently used ways of passing on discoveries and research achievements. Typical sources of currently 'hot' scientific discoveries in nearly all disciplines are the widely-circulated weekly research journals known to most of us: *Science* published in the USA and *Nature* in the United Kingdom. They also appear on-line before the printed version is published. They are mainly used by researchers within various specialisation fields (for example, the impact factor of the weekly 'Nature' exceeds 30!). But they also constitute the basis for the popularisation of sciences, for transferring discoveries and achievements into language comprehensible to laymen and therefore readily distributable to the mass media.

Scientific information as conveyed by journalists and editors is guided by certain rules. The crux is: the more widespread the media are, the more modest the information is. This seems logical when one considers that, for instance, in a popular science book or journal much space has to be devoted to the description of the discovered phenomenon or laws and in a language that is suited to educated readers. However, in the daily press, which is directed to thousands and sometimes millions of people, the same scientific information will be considerably simplified. Here, as in TV or radio broadcasts, other rules apply. They may be characterised as follows. First, as a rule, scientific information is concise. Exceptions are newspapers, TV or radio programmes in which a special time and place are devoted to science. Second, scientific information passed on to a very wide population takes the intellectual capabilities and limitations of the audience or readers (*e.g.*, only elementary education) into account. It must therefore be necessarily geared toward the language and the images that the reader or audience uses. Third, in order to encourage a reader, listener or viewer to receive the information on research achievements, journalists and editors emphasise what is attractive, what surprises, shocks, and threatens. This may cause a communication that is quite contrary to a scientist's intention of, and sometimes simply untrue.

Let me here use an example of a scientific discovery from my research field that was reported several years ago in the Polish daily press and which illustrates all three features typical of the mass media. In 1995, Robert Plomin and his collaborators at the University of London published an article in the professional journal *Intelligence* in which they stated that one of the 100 DNA markers applied in their study (the marker which determines the functioning of the hippocampus - locus EST00083) differentiated the groups that were characterised by three different levels of intelligence as measured by the Wechsler Intelligence Test (IQ = 82, 105 and 130). On the basis of this study, they concluded that the results received by means of the technique known as QTL (quantitative trait loci) explained less than two percent of the intergroup differences in IQ. In Poland, several daily newspapers published short information pieces under the headings: "The intelligence gene has been discovered", and "The gene responsible for human intelligence has been identified". Obviously, nothing of the kind had happened.

First, the method used by these researchers was based on the assumption that traits, including intelligence, have a quantitative distribution and that poligenic effects additively and interchangeably determine the variance of those traits. Therefore this method, based on quantitative statistics, does not enable the identification of a single gene responsible for the phenomenon under study. Second, the Wechsler Test measures only selected aspects of what we call intelligence. Third, the DNA marker explains only a marginal part (below 2%) of differences in IQ between the three groups.

Benefits and disadvantages of the popularisation of science

As far as the relations between science and the media are concerned, the question of the benefits that may be derived from the popularisation of science arises. Simultaneously, however, the contrary question, whether the popularisation of a complex field as research activity, which involves the highest creative and mental powers, is not detrimental to science itself and whether it does not create a false image of science, too emerges. Moreover, one could also ask whether the popularisation of science in the media does not result in undesirable social phenomena.

A scientific discovery that does not leave a scientist's laboratory or research field, often remains in oblivion. Thanks to the media, mainly in the form of articles in professional journals (printed or online), the discovery becomes a science component at a national, continental or the global level.

However, those popularising science (in Poland, this is zealously done by Wiktor Niedzicki) stress that science is a 'merchandise' like other products in every day use, and should therefore be sold profitably. This is further emphasised by the media directed at the wide population of persons representing institutions that decide, or participate in the decision process on the distribution of research funds. To a great extent their role consists of presenting the discovery or achievement in an attractive and favourable manner. In this regard, applied sciences are more favourably situated than basic sciences, given their closer association with the economy, education or health. Regarding the former, a reader, listener or viewer directly notices the advantages that are derived from a scientific discovery. The transposition of a discovery or of achievements in basic sciences into every day benefits is also not uncommon, but as a rule is slow. Furthermore, the practical benefits are rather indirect - through the utilisation of this discovery by the applied sciences. The history of the atom's discovery exemplifies this. For many years physicists and chemists' basic research focussed on the 'atom' concept, its features and structure. Without this research it would be difficult to imagine the use of nuclear energy, which, thanks to applied research, is widely used in many branches of the present day economy. Research discoveries and achievements that are passed on through the media to other persons or institutions as a merchandise of some kind (depending on who the recipient of such information is), may play a different role, some of which will be mentioned.

A discovery, acknowledged by specialists from the same field, disseminated by the media in a way enabling researchers from other scientific disciplines to understand it (the journals *Science* and *Nature* serve this purpose, among others) contributes to the development of a common language between researchers within various disciplines as well as for interdisciplinary research endeavours. A discovery, passed on in a form that clarifies its potential benefits for industry or other branches of the national economy, may find sponsors for scientific research among the representatives of those branches. In numerous countries this constitutes the main source of research funding. In the Polish budget, the outlay for science amounts to only about 0.32% GDP, but only an equal proportion comes from private sources.

Research achievements popularised in the media on a large scale sometimes stimulate parliamentarians to support the funding of science, which is reflected in preferences for those disciplines in which discoveries are spectacular and serve society's economic, social and cultural development. If science has a strong position in a given country and there is an awareness that it contributes to the prosperity and the high level of culture and technology (which, due to media such as daily newspapers, radio and television news, almost all citizens discover), this is sometimes even used by politicians. Sometimes political parties too use the need for an even higher level of science funding as one of their election slogans. A party winning an election on the back of such slogans, is somehow obliged to finance scientific research significantly afterwards.

Popularising science in an attractive way exerts considerable influence on young people's educational preferences. Numerous countries (including Poland) do not needlessly organise various kinds of science festivals in spring and summer, but strive to stimulate students' interest in a given discipline or field of knowledge. It is not uncommon for a single discovery, presented in an eye-catching way, to ignite a passion that could be decisive in the choice of further education. The media have a particular role in the popularisation of discoveries and scientific achievements that, on the whole, consists of providing recipients with knowledge that will enable them to comprehend the reality that is being researched. Sometimes it is difficult for the public to absorb new discoveries because they do not correspond to earlier experiences and with the image of the world as it exists in the individual's mind. Here the media's educational role is irreplaceable. An example of this is that today, due to the media, most educated people understand genetic engineering and its social and economic consequences. The dissemination of a concrete discovery or scientific achievement is conducive to a researcher or discoverer's popularity. Apart from the prestige and respect, this popularity may enable financial support of his/her research work. Here, however, it is easy to contravene propriety. Mass media representatives eagerly use such 'popular' personalities to present views and pronounce judgements on others, thus conveying their own ideas by manipulating these scientists' authority. Presumably each of us can list scientists in his/her discipline who are eventually convinced that they are experts in almost all fields of science due to media manipulation. By becoming involved in this kind of media endeavour, they diminish their status as a specialist among their peers, despite their contribution to the discipline's development. Involving media in the popularisation of science does not always bring social benefits. The previously mentioned anecdote regarding the discovery of the gene responsible for intelligence illustrates this point of view. By erroneously proclaiming that intelligence is determined by genes, leads society to treat intelligence as a trait that, once determined, does not change, therefore being responsible for many failures to certain individuals. Teachers quite often have this attitude and explain pupils' failures by referring to their unsatisfactory IQ level.

As already mentioned, among media representatives, particularly those engaged in propagating science in the mass media, there is a somewhat justifiable tendency to proclaim those passages in the information on research achievements that are most drastic and shocking: thus evoking fear, threat or frustration. Such information most frequently catches a recipient's eye and ear. There are numerous examples of the dissemination of research on carcinogenic elements and products that were not replicated in other laboratories but which, thanks to the mass media, evoked negative attitudes towards these products. The disseminated news about the carcinogenic properties of tomatoes some years ago, is a case in point. But also when the authenticity of discoveries is beyond any doubt, the mass media first of all stress whatever is most drastic. The information on the lethal properties of prions, the infective factors that transmit certain diseases of the central nervous system (*e.g.* Creutzfeldt-Jacob's disease), although real, was announced in such a way that it evoked panic and mortal fear in the communities. Meanwhile, the probability of this disease affecting an individual is thousands or even millions of times lower than that of dying in car crash.

Finally, I would once again like to refer to an example from research on intelligence: a seemingly innocent discovery, in this case by Cyril Burt, a scientist who was rewarded by the Queen of England with a knighthood and who conducted his research between the 30s and 40s of the previous century. Due to its dissemination in the mass media, Burt's work caused far-reaching social hardships. However, the mass media as such were not to be blamed, although they became instrumental in the dissemination of, in a sense, faked data. On the basis of research results based on a behaviour-genetic paradigm which consisted of comparing the IQ of pairs of identical twins raised separately with pairs of similar twins brought up together, Burt arrived at the conclusion that genetic factors are responsible for 88% of the individual differences in intelligence, while the environment is only responsible for 12%. Since pairs of identical twins raised separately are very rarely found, Burt's co-workers used fictitious figures for those twin pairs. This case was one of the greatest science scandals of the 20th century. For our deliberations it is important to note that this scientist's research results, highly esteemed in his country, were so widely publicised in newspapers that they consequently influenced England's education policy. Based on Burt's view that individual differences in intelligence are first of all determined genetically and that the environment only has a marginal influence on the development of intelligence, the educational authorities introduced the so-called 'criterion 11.5' into the educational system. In keeping with this policy, intelligence and scholastic achievement tests were administered to children at the age of 10:6 - 11:6 years. Based on the results of these tests, children were separated and sent to appropriate schools. 20% of the pupils who had the best results were admitted to schools for an academic education. However, the remaining 80% were sent to schools that did not allow, or sometimes even hindered, further academic education. This system, introduced in the 40s of the last century, was in force for approximately 20 years!

Conclusion

To conclude, in the deliberations on the links between science and the media, I tried to present a variety of possible relationships, taking the specificity of science itself and the types of media involved in the transmission of research achievements and discoveries into account. It was emphasised that the development of science is difficult without the media's involvement and that the benefits from this involvement are manifold. But media may also lead to a depreciation of science by simplifying or distorting research results. Very often, however, it is not only the media that should be blamed for the dissemination of detrimental information. Researchers who themselves motivate the media to sometimes disseminate spectacular, but not sufficiently verified and confirmed findings, contribute to this. The social consequences of contravening propriety in the interaction of science and the media can be serious.