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## 6. Repercussions of media coverage on science? A critical assessment of a popular thesis

**Abstract:** The topic of this paper is the relationship between journalism and science. In order to describe a potentially relevant dynamic in this relationship, the German sociologist of science Peter Weingart proposed the term "medialization." It describes phenomena of change within science, such as the oversimplification or exaggeration of research findings, which are associated with an increased need for public attention within science. This concept focuses on the repercussions of journalism on science. Inscribed in the term is the assumption that journalism potentially has great social significance. At the very least, journalism, or the mass media it dominates, is thought to influence processes of change within science. The paper aims to assess the social impact of science reporting in order to plausibilize the significance of the role played by journalism. This is based on recent, partly unpublished empirical findings by a German-French DFG/ANR project, which relate to the ability of journalism to focus public attention on scientific events and actors. The results are essentially negative, in the sense that journalism hardly, or at best only very sporadically, succeeds in focusing public attention on individual scientific events or actors. Based on the journalism's very limited performance in this regard, we consider it implausible that journalism could be as significant a factor as the concept of medialization indicates.

**Keywords:** medialization, science journalism, media coverage of science

### 1 Introduction: Contours of the relationship between science and the public

Diagnoses of the relationship between science and the mass media overwhelmingly emphasize the difference between the two. They assume a clear boundary between science and journalism. A scientific sphere that produces reliable knowledge is contrasted with a journalistic one that conveys or is supposed to convey this knowledge to a large audience (Nielsen, 2009). This act of mediation

is seen as deficient and finds expression in corresponding metaphors. There is talk of a gulf, fences, barriers, the relationship is like that of oil and water, etc. (Peters, 2013).

There is no lack of examples to confirm this view. Public communication embeds scientific results, expert opinions, interpretations or even methodological practices in social contexts where they sometimes generate an echo that makes scientists shudder because it seems distorted and/or irrational to them. In Germany, thousands take to the streets to prevent experiments on macaques or the sowing of genetically modified potatoes. Researchers, laboratories, fields have to be protected by the police. On the American stock exchange, Monsanto's share prices collapse. It was found that BT corn can harm butterfly larvae (Scheufele, 2013). In Germany, individual scientists, such as the virologist Alexander Kekulé during the Corona crisis, or the historian Daniel Goldhagen, become media stars with "fans," although these scientists have not yet distinguished themselves in research, to say the least (Weingart & Pansegrau, 1999). In the yellow press, a study praising chocolate as a slimming agent makes world news, although it is just flimflam (Bohannon et al., 2015) etc.

The emphasis on a distance between the two spheres, however, highlights a supposedly relevant social problem and thus arouses interest, especially within academia, but also in politics. It might be debatable whether one should go as far as Hartz and Chappell who, in 1997, saw the supposed divide between science and journalism as a "threat to the American future" (Peters, 2013).

Problems are well suited to arouse interest. The more plausible and disturbing they are, the more demand for solutions they create. Barriers have to be overcome; fences have to be torn down. In any case, the competing interpretation, no less plausible, that there is no problem, that public conflicts about science, truth, and rationality are inevitable consequences of science entering the public sphere, does not seem to have found widespread acceptance (Kohring, 2005).

Accordingly, numerous initiatives all over the world have addressed the distance, the gaps and barriers. To the extent that these initiatives referred to journalism, as in Germany from about 1988 onwards, they aimed to overcome the supposed gap with a kind of partnership between science and journalism that would serve to convey science to the public in an accurate and competent way (Lehmkuhl, 2012; Peters et al., 2020). How successful these initiatives have been is difficult to judge. At the very least, in Germany and other European countries, as well as in the USA previously, a relatively small group of journalists has gradually emerged that specializes in science. It shares scientific values (Nielsen, 2009) and has developed professional standards that differ from those of other

journalists, making scientific reputation, for example, a criterion for selecting scientific experts (Lehmkuhl & Leidecker-Sandmann, 2019).

However, the formation of a professionalized group of science journalists and the establishment of improved reporting standards has not changed the dominant, deficit-oriented view of journalism. Objectively, this group may be too small for that. But even systematic empirical analyses, which have never really been able to convincingly substantiate the alarming talk of a large gap or barrier between the two spheres, have done little to change this. The results of scientist surveys, conducted since the seventies, can be cited as an example. While they do not indicate a completely conflict-free relationship, they do not uncover unbridgeable barriers either. All in all, the relationship appears to be fairly harmonious (Peters, 2013).

A theoretically relatively elaborate perspective on the relationship between science and journalism is the concept of the "medialization of science." It assumes a clearly definable boundary between science and journalism. Unlike a "gap" or "barrier," medialization does not fundamentally make a qualitative statement about the relationship. Instead, this concept focuses on the repercussions of journalism on science. Inscribed in the term is the assumption that journalism potentially has great social significance. At the very least, journalism, or the mass media it dominates, is thought to influence processes of change within science. In the context of the medialization thesis it is nevertheless necessary to mention the deficit-oriented view of journalism in order to make plausible what its social and scientific relevance is based on.

As early as 1963, Jürgen Habermas speculated that the repercussions of journalistic reporting could be useful thanks to their wide dissemination: socially and scientifically highly relevant new findings would not disappear into hyper-specialized attention niches from which they would emerge, if at all, only after a considerable delay. Preventing the flow of scientific communication from drying up across specialization boundaries (Habermas, 1969) would only be achieved in some cases by long diversions via readily understandable reconstruction. However, the medialization thesis gains its "charm" primarily from the fact that such feedback is not welcomed as desirable but, on the contrary, is seen as alarming or at least disturbing (Corsi, 2005; Franzen, 2011, 2012; Weingart, 2012). In this respect, this thesis directly follows the dominant perspective in science communication research.

The aim of this article is to stimulate reflection on potential repercussions of journalism on science starting with one of the prerequisites of medialization, the great social significance of journalism. Our focus is on the performance of journalism in focusing public attention on science. This perspective is essential in the

context of the medialization hypothesis because it has so far remained largely unclear whether the social significance of journalism is genuinely as great as the term medialization implies.

To this end, we will proceed as follows: Firstly, we will sketch the theoretical foundations of the concept relatively briefly. Secondly, describing individual cases, we will highlight the difficulties inherent in this concept from the point of view of empirical journalism research. We will then present a selection of findings from a German-French project that has spent the last five years identifying structural characteristics of science reporting. Finally, we will discuss how plausible systemic repercussions are in the light of the empirical findings.

## 2 Medialization of Science

Medialization presupposes a functional differentiation between autonomously operating social systems (Marcinkowski & Steiner, 2010). If we consider theoretical analyses of the public sphere and journalism, which, especially in Germany, have been presented in the debate on Niklas Luhmann's theory of social systems since the beginning of the 1990s, then the public sphere and one of its performance systems, journalism, have developed into a system in a recursive communicative process. Without journalism, modern societies would be incapable of becoming aware of the interdependencies between their parts. Journalism is presented as a system that has addressed this problem professionally. The boundaries of this system are determined by the basic distinction of whether or not an event could attract attention in other social subsystems. This is what journalism specializes in as a performance system in the public sphere. It is the (only) entity that can create and bundle broad attention for relevant topics, i.e., topics that can be connected across subsystems (Kohring, 2004).

This distinction marks the essential difference to science, whose boundaries have been formed by the guiding distinction true/false. As a result, science speaks about events that could be true. All selections made by science are geared to this sense-constituting distinction. The science system is thus specialized in the production of reliable knowledge.

In the concept of medialization – which the German sociologist of science Peter Weingart transferred from political communication research to science research (Weingart, 2001) – two premises are usually conflated:

1. The concept assumes that science or selected areas of science have become more meaningful to the public. This gain in significance is the result of changes in the coupling of science with its social environment, which are reflected in journalistically dominated media. It derives from an increasing socialization of science, which Weingart, among others, has condensed in the concept of the "knowledge society" (Weingart, 2008). The increase in the importance of science for journalism is thus based on the development of its relationship to politics, economics, education etc.
2. It assumes that the public has become more significant for science. The reason for this upgrade in importance is considered to be "the increased competition within science as well as between it and other social sub-sectors for scarce resources" (Weingart, 2001). This, in turn, is the result of what is often described as artificial competition, which has been implemented in science as a result of so-called New Public Management (Weingart, 2022). Over the last 30 years or so, most western science systems have gradually been subjected to New Public Management (Schimank, 2010).

As a collective term, medialization describes "supra-individual phenomena" that occur in science "as a result of the differentiation of a media system with its own logic as well as the respective given need for public attention" within science (Marcinkowski & Steiner, 2010). With regard to actor theory, medialization thus directs attention to the actions of scientific actors which aim to generate and concentrate public attention by means of mass media and which produce a "supra-individual phenomenon" within science. The term is thus to be understood as a collective term for change within science that is caused by a greater need for attention to science, for which it is dependent on the performance of journalism.

The concept acquires its social relevance when the attention-seeking selection activities of scientific actors (authors, reviewers, editors of scientific journals, scientific organisations, publishers) come into conflict with those aimed at the genesis of true statements (Franzen, 2011). They can lead to exaggeration or promote a choice of topics that is oriented towards current trends. In summary, the term refers to practices that make a scientific result or a project appear in a way that does not correspond to the scientifically agreed requirements of accuracy and/or methodological rigour. These practices are chosen because they are expected to achieve greater publicity, which in turn requires the performance of journalism specialized in generating and concentrating attention. Instead of accurate information, image-building, publicity, and self-promotion take over, which does not promote trust in science but endangers it (Weingart, 2022).

In addition to the various spectacular cases of fraud in social psychology, physics or stem cell research, the recent history of science includes numerous other, less spectacular individual cases that point to such a conflict, such as the alleged discovery of bacteria that can metabolise arsenic instead of phosphorus – a claim that has since been falsified, which was quite obviously due to inappropriate research practices that should actually have been uncovered in the peer review process (Lehmkuhl, 2011). Or take the hype about "Ida," a very well preserved primate fossil from the Messel Pit, over 40 million years old, which was briefly inflated by Norwegian palaeontologist Jörn Hurum in association with three TV stations to become probably the most famous fossil in the world (Nowotny, 2011).

It is therefore fair to say that one cannot deny the plausibility of this concept. At the same time, it proves to be exceptionally challenging when it comes to quantifying empirical social research specialized in journalism and/or science, which strives to embed its findings in a context of medialization. There are two main reasons for this:

1. The concept does not clearly distinguish between the repercussions of striving for attention external to science and those internal to science. It thus leaves open which mechanism is to be regarded as the actual driver of change processes as the basis for reputation acquisition, the striving for external popularity or for internal popularity. "Supra-individual phenomena," such as a tendency to exaggerate the relevance of individual findings in the research literature (Dumas-Mallet & Gonon, 2020; Gonon et al., 2011; Gonon et al., 2012), can be interpreted as manifestations of medialization, even if the mass media have not yet taken any note of this research literature. The term could then be justified by the fact that practices are chosen (exaggerations for instance) that are also used in journalism to generate attention. However, empirical evidence of such practices alone cannot convincingly index medialization because they are also suitable for attracting greater attention within academia. It is therefore not possible to draw conclusions about the motives for their use based on empirical evidence of such practices.
2. The concept suggests a causal relationship at least between the existence of journalism and processes of change within science. In order to call processes of change medialization, it would – strictly speaking – be necessary to prove that they only take place because journalism or the mass media exist. However, this is not possible, at least not within the framework of empirical analyses. Firstly, the influence of the mass media in particular cannot be distinguished from those of social media because both spheres correspond closely

(Gilardi et al., 2022). Even if one neglects this aspect, the concept incorporates the problem, which is well known from media effects research, that media influences cannot be convincingly separated empirically from other influencing variables, at least not yet, which makes "hard" evidence of repercussions seem almost unattainable. This is due to the "double role" of journalism which changes the world while describing it (Rosen, 1999). It is, for instance, obvious that mass media play an important role in changing values regarding animal trials. But the question of whether it is the change in values itself, the attention it receives in journalism, or, in return, the feedback from public attention in politics that has an influence on science, is practically unanswerable.

As a result, this concept cannot be falsified by means of empirical social research. At best, it can be made plausible, which is what we will address in the following. In doing so, however, we essentially limit our focus to only one aspect: to the performance of journalism in generating attention for science and research that is external to science. We are therefore concerned with assessing the plausibility of one of the assumptions that is of central importance for medialization, namely the social significance of science journalism.

### **3 Focusing attention as an achievement of science journalism**

As outlined, we consider the ability of journalism to direct and focus public attention on scientific events as one of the prerequisites for medialization. This is what makes journalism so important in the concept of medialization and justifies the term. If journalism did not regularly focus public interest on scientific events, the medialization thesis would be deprived of one of its essential basic assumptions. Without significant reporting, one could not call the actual media reporting a mediator of feedback between journalism and science. Scientific actors must be able to count on their actions being observed by journalism in order to make possible repercussions plausible. It is plausible, for example, to assume that the actions of professional footballers or top politicians are influenced by the fact that they are under constant media observation. Every gesture, every statement can become the subject of reporting. The players observe this and adjust to it (Meyen, 2014). In principle, it is also plausible that the media presence of certain actors

influences the actions of other actors who do not themselves expect media observation. Amateur footballers, for example, might copy jubilant poses that they know from the media. However, such effects require that journalism focuses attention on such practices. But how plausible is this assumption even for top actors in academia?

To address this question, we argue that it is not sufficient to merely look at the extent of scientific references in reporting – the increase in references to science in mass media in the last decades, which we can assume (Bauer et al., 2006; Bucchi & Mazzolini, 2003; Elmer et al., 2008) does not convincingly support the assumption that journalism is permanently observing science or parts of it. An increase in scientific references can, for example, come about because political actors cite scientific references more frequently or involve scientific experts more often in political decision-making processes (Weingart & Lentsch, 2008). In this case, references to scientific content and scientific actors do increase in the reporting. However, they are not the result of a change in journalistic observation of science but are of a secondary nature. They are a consequence of changes in the political system. In this respect, the increase in scientific references would not be a change that points to an increase in the importance of science for journalism. Instead, they primarily refer to changes in politics – what one could perhaps call the "epistemisation of politics" (Bogner, 2021) – the consequence of which might be, among other things, a greater presence of scientific experts in reporting. If such a dynamic led to repercussions within science, which would be conceivable, then one would have to call this the politicization of science rather than medialization.

In order to be able to make feedback effects more plausible, we believe one must look more closely at the journalistic achievement of directing and concentrating attention on units that are particularly relevant for feedback processes and that are amenable to empirical analysis. It is – we argue – not only the number of references that matters, but also their distribution.

In the context of science, these relevant units include, in particular, study results and scientific experts or, more generally, scientific actors. These units are pragmatically relevant because they are relatively easy to grasp empirically. But they are relevant above all because observable changes in these units (studies exaggerate their relevance, statements oversimplify a fact, etc.) can be linked to actual media attention or more generally to "media logics."

In the journalistic context, results or expert statements become prompts for reporting, with feedback becoming more likely if the journalistic selections are suitable for focusing public attention on very specific results and scientific actors. This can be plausibly inferred when individual results or actors are not only

picked up on by individual editorial offices, but when the journalistic system – understood here as a unit consisting of a multitude of individual journalists – pays attention to certain prompts. Especially when individual journalists select prompts, topics or experts congruently, public attention is generated to an extent that makes feedback from this publicity more likely.

### **3.1 Study results as units of journalistic observation**

In the next section, we want to look in rather more detail at study results that have sought to estimate the degree to which journalism is able to focus public attention on the results of certain scientific studies. To this end, we conducted several sub-studies:

1. Over a period of two weeks in 2018 and one week in 2019, we checked a very small sample of five German quality newspapers and seven online titles, all of which have science sections, to determine how many of the scientific events were picked up congruently by one media title, how many by two, and so on. In other words, we tried to estimate how much overlap there was in the journalistic selection of individual scientific events. We compared the figures with those in other departments, namely politics, business, culture, and miscellaneous (Hanebeck, 2021; Lehmkuhl & Promies, 2021).
2. We attempted to estimate the number of all of the approximately eight million study results listed on Scopus in the period between 2014 and 2018 that were selected by international journalism congruently (Lehmkuhl & Promies, 2020). To identify these studies, we used the Altmetric.com mmscore indicating the number of media titles that have selected a particular finding.
3. We did the same again on the basis of a subsample of neuroscientific results to find differences depending on topic (Kohler et al., 2020).

The four studies aimed at finding structural similarities in journalistic selection processes that are expressed in very small as well as in very large samples. This research design was inspired by the question of whether something that the mathematician Benoit Mandelbrot called "fractals" also develops in social systems. We wanted to know whether the journalism system could be described in a similar way to a tree, for example, whose trunk branches out into several large main branches according to a certain pattern. The main branches in turn branch out according to the same pattern, then the branches themselves. This continues into the small leaf-bearing tips (Brockmann, 2021).

The results indicate that this seems possible. We find astonishing structural similarities in both the very small and the very large samples. Journalistic selection seems to follow clear mathematical rules that are so common that the term “power law” has been used to describe them (Newman, 2005). The actually measured congruence-frequency distribution can be described almost exactly in all the studies mentioned so far with a basically simple formula that relates the congruence, i.e., the number of media titles that select an event ( $K$ ), and their frequency:  $H=1/K^{\text{alpha}}$ . The parameter alpha of the right-skewed distribution was a good three in both the small and the big samples (Lehmkuhl & Promies, 2021; Lehmkuhl & Promies, 2020).

Apart from these structural similarities, our results show that the wide dissemination of individual scientific results is rare to very rare. Considering the small national sample of print and online titles in detail, we come to the following generalized conclusion: out of 100 scientific events that are picked up by German print and online journalism in an ordinary week, about 90 are taken up by one title only, whether by online titles or print titles. That a scientific event is taken up by more than half of all media titles in these small samples does not occur in an ordinary week. The selection of individual events is thus much less congruent than in almost all other journalistic departments. In politics, economics, culture, and miscellaneous, 70-75 of 100 events in a week are covered exclusively by one title, two-three by all.

These results concur almost completely with the findings of earlier studies, one of which, a good ten years ago, specifically examined the selection made by the science sections of nine different German media titles, including radio and online titles (Wilhelm, 2008). Other analyses going back 20 years, specifically of political reporting, also coincide with our findings (Rössler, 2002, 2003).

With regard to science journalism in Germany, we find firstly no evidence that the ability of the journalistic system to focus attention on individual scientific events has changed, at least not in the last ten years. And secondly, we must state that the ability of the journalistic system in Germany to focus public attention on scientific events is comparatively low, certainly significantly lower than in other fields. Although numerous events are picked up, the selection is extraordinarily diverse. There is singing, one might say, but no choir.

We successfully reproduced this structural feature of the journalistic selection of individual scientific events in two further sub-studies with very large samples (Kohler et al., 2020; Lehmkuhl & Promies, 2020). We used the msm-score from Altmetric.com as an indicator. This score ostensibly measures the distribution of individual scientific studies in about 2,000 journalistically dominated online media. In validation experiments, however, we came to the conclusion

that Altmetric's msm scores smaller than 50 do not reliably indicate that journalism has selected a result. Only above this value can one assume that isolated journalistically dominated online titles on national media markets (and not mere aggregators of press releases such as EurekAlert!) have actually picked up a study result. From a value of approximately 100, a slightly congruent selection can be assumed. Above this value, it is likely that more than one media title on a national media market has taken up the result.<sup>1</sup> For all of the approximately eight million studies that appeared in Scopus between 2014 and 2018, we estimated how often they were picked up by journalist-dominated online media. If we only look at the results that were picked up congruently, then journalism generated public attention for about one to two studies out of 10,000 in the period mentioned.<sup>2</sup>

Based on these findings, we assume that the structure of journalistic selection processes found in the small, national samples is not a German peculiarity, but also prevails in other national media markets. Only a tiny part of the scientific study output is even mentioned in journalistically dominated dissemination media. And of this tiny part, journalism again only focuses public attention through congruent selection on a small proportion: approximately one tenth of the studies selected. A strong focus of attention by means of a highly congruent selection by the journalism system does probably occur but is rare to very rare.

We have argued that bundling attention to study results is conceivable as one mechanism for making feedback plausible. However, in relation to our findings, we have to state that the journalistic system only rarely achieves this. On the basis

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1 Our validation was based on 1,601 scientific articles that were published in the journals *Nature* and *Science* between January and October 2017 (extracted from Scopus database). We collected the msm-scores of these studies and assigned them to 11 groups, namely scores of 1–9; 10–19; 20–29; ...;  $\geq 100$ . Subsequently, we conducted a manual search of randomly selected sets of five research articles per group ( $N = 55$ ) in the full-text press database Nexis to determine from which score we could infer journalistic coverage on three large national media markets (the United Kingdom, the United States, and Germany). The amount of press coverage was classified as “noteworthy” if more than 15 articles on at least one of the five studies per category had appeared in these media markets. Our results showed that only a score  $\geq 50$  indicates that single media titles pick up a scientific paper. From a score of  $\geq 100$  it can be assumed that a result has been taken up congruently by a larger number of media titles in different countries (USA, UK, and Germany), indicating a broad international dissemination. Additionally, we researched studies with no Altmetric.com scores, since it is known that many studies are not captured by Altmetric.com. We therefore used a random sample of 100 results not captured by Altmetric.com to see if media titles in the three media markets USA, UK, and Germany reported on any of these studies. This was not the case.

2 It should be emphasized that this is an estimate.

of these analyses, we find no evidence for the assumption that feedback on science can somehow be influenced by broad, journalistically mediated public attention or extends beyond individual cases.

### 3.2 Scientific actors as units of journalistic observation

Focusing public attention on study results is only one possible mechanism that can plausibilize feedback. Another is public attention on scientific actors who serve as sources for journalism. Again, we argue that it is not only the extent of referencing scientific sources that is relevant for plausibilizing feedback on journalistic selection, but, additionally, the distribution of these references. With regard to the plausibility of feedback relating to actors, it is also important how high the share of those sources is in the mass media, if they are present at all. However, it also depends on how this presence is distributed. Feedback that can generate "supra-individual phenomena" is plausible where actors can count on their communicative actions being observed by journalism.

This point can be illustrated with an example from political communication. Plausibility has been convincingly demonstrated in the German parliament where opposition politicians increasingly submit so-called "minor requests" to the government because they have observed that it helps them increase their chances of attracting media attention. This has led to the "supra-individual phenomenon" that the number of minor-requests has increased over time. The observation that certain communicative acts are successful thus sets a dynamic in motion that can be called the medialization of politics. Essentially, for this dynamic to gain momentum, the preceding observation about the success of a practice, i.e., actual media coverage, is a precondition (Jandura, 2007).

What can be said about public attention for scientific actors? First of all, we can basically assume that scientific experts are quoted more frequently by journalists today than two, three or four decades ago, although reliable studies on this are rare and do not consistently confirm a growing trend (Huber, 2014). One study from Denmark shows a considerable increase in journalistic references to scientific experts in three Danish print titles by a factor of three for the period between 1961 and 2001, with the highest growth between 1991 and 2001. Social scientists and humanities scholars accounted for the lion's share of this growth, while references to hard scientists increased only very moderately in this study (Albæk et al., 2003). We ourselves surveyed recently all references to individual actors in 1,855 articles, each of which appeared in an artificial week in 2000 or 2019 in six German media titles. In both periods, about 2,600 different actors are cited by journalists. In 2000, eight percent of these references were to scientific

experts; twenty years later, it was 11 percent. The enormous growth in references to scientists in Denmark in the 1990s does not seem to have continued after 2000, at least not in Germany. Nevertheless, the share of approximately 11 percent in the most recent period is noteworthy if one compares it with the share of references to members of the government, which amounts to 16 percent.

As described, the plausibility of a feedback mechanism also depends on how these references are distributed. To the best of our knowledge, there is only one reliable finding from Switzerland on this topic in relation to individual academic experts. It surveyed the media presence of all 6,000 professors in Switzerland in national and international media. Almost 70 percent of these professors did not appear by name in the course of 2016. The journalistic references in the predominantly Swiss media titles were allotted to 1,877 professors, the majority of whom appeared only once within a year, i.e., once within a year in one of dozens of Swiss media titles. The bulk of attention went to a small group of 188 professors, or three percent of the total, who accounted for 50 percent of all references (Rauchfleisch & Schäfer, 2018).

We ourselves surveyed the number of sources on which international journalism based its selection of study results in the period between 2014 and 2018, and how the selection of sources was distributed. We therefore examined from which journals the study results originated that international journalism selected for reporting, once for all study results (Lehmkuhl & Promies, 2020) and once for studies that can be attributed to the relatively popular neurosciences (Kohler et al., 2020).

The results are quite astonishing when one compares the number of times individual journals are mentioned as sources in journalism with those of individual professors from Switzerland. Fifty-five percent of all 1,236 journals that were mentioned in mass media were cited once in the four-year study period, which is approximately three percent of all journals listed in Scopus. The top decile of sources, i.e., the 120 journals with the most mentions, accounted for about two-thirds of all references. Both distributions are very similar. According to this estimate, the probability that a journal with  $n$  references in journalism will be referenced a second time regularly decreases by  $x^{-2}$  (Lehmkuhl & Promies, 2020). This is approximately the same as for Swiss professors.

Like the study results, the journalistic system focuses public attention only on a small section (individual scientists in a national context) or tiny part (scientific publishers) of the actors.

However, the focus on individual actors as sources of information and expertise is strong. For this very small group of individual actors, repercussions from

public attention are at least plausible even though empirical evidence is rare: individual scientific actors might be more frequently requested for lectures, might have greater chances of becoming members of political advisory bodies, while their study results receive greater attention in the scientific community, etc. (Dumas-Mallet et al., 2020). Even more significant, however, is that their strong public presence cannot be explained without assuming that the actions of journalistic actors and these individual scientific actors have been coordinated. But given the low frequency, it is doubtful whether such feedback is systemically relevant.

Feedback is also plausible in the case of the journals on which journalism concentrates, especially if we also take into account the fact that the journalistic focus on a small number of individual journals, above all *Science* and *Nature*, but also *Lancet*, *JAMA* or *PNAS*, has prevailed for at least three decades (Lehmkuhl & Promies, 2020). Such a sustained journalistic focus on these sources cannot be plausibly explained without assuming that the editorial selection in these journals is oriented towards news factors, even if the editors may deny this (Franzen, 2011). Despite this observation, in our view no "systemic" feedback can be plausibly explained, because there are only a handful of scientific dissemination media whose study results are picked up by journalism to any appreciable extent.

### **3.3 Study results and scientific actors in the context of science-related public debates**

Up to now, we have tried to assess how journalism focuses public attention on individual study results and individual actors in a relatively decontextualized way. In doing so, we have so far ignored the fact that one of journalism's very important achievements is to draw attention to issues and to bundle them. Journalism regularly assigns study results and statements by individual actors to overarching contexts of meaning, which we can call topics (e.g., antibiotic resistance, cancer) or topic groups (e.g., biotechnology) (Kepplinger, 2011), although the boundaries between these contexts can be difficult to determine in individual cases.

In several sub-studies over recent years, we have examined, among other things, differences in journalistic selectivity relevant in this context, namely whether the arbitrariness of the selection of individual study results or of scientific actors as sources for expert opinions changes when public attention focuses on science-related topics, such as the use of glyphosate in agriculture, the role of nitrogen oxides in air pollution control or COVID-19 (see also Chapters 2 and 3 in this book). We have done research on eight topics and four groups of topics,

which, however, essentially only relate to Germany (Kohler et al., 2020; Lehmkuhl & Leidecker-Sandmann, 2019; Leidecker-Sandmann, Attar, et al., 2022; Leidecker-Sandmann, Promies, et al., 2022).

The relatively pronounced concentration of journalism on just a tiny section of journals as sources says little about whether other journals come into play depending on the topic, so that feedback on a wider circle of journals could be plausible under certain circumstances. Surprisingly, however, this is not the case. Essentially, the journalism in all nine individual topics we investigated always bases the bulk of its study selection on the same journals. If we again select the upper decile of influential journals for the overarching description, then almost two-thirds (62%) of all references in the individual topics also occur in this small group of journals, above all *Science*, *Nature*, *Lancet*, and *NEJM*. In other words, regardless of whether the subject is neuroscience, infections (antibiotic resistance, Ebola, influenza) or environmental topics (dioxin, glyphosate, nitrogen oxides), about COVID-19 or about marijuana, the study results that journalism selects for these topics overwhelmingly derive from these journals. Differences between the individual topics only arise in the composition of the journals from which occasional study results are taken. Here there are differences between the individual topics. Accordingly, we cannot find any indication in this research approach regarding the journalistic focus on individual journals that could plausibilize feedback that extends beyond the tiny circle of the journals mentioned.

However, in terms of topics, the dominance of this small group of journals is so great that it is plausible to assume that other journals will follow suit. If we simplify and assume that in principle every journal has an interest in generating attention in journalism, then the most plausible feedback mechanism is to favor topics on which journalism has concentrated attention. This need not be limited to the top journals.

We explored this question in another study. We investigated whether more thematically similar studies are published by journals after a single study has been congruently selected by journalism. To do this, we used the approximately 1,000 study results that received a lot of media attention in the period between 2014 and 2018. We assumed that the congruently selected study results tended to be the ones that referred to a topic more widely discussed in society. In fact, the number of publications of thematically similar studies increases slightly when a study has achieved broad attention in journalism. This is not restricted to the top journals. The effect also occurs in journals that are not favored by journalism (Leidecker-Sandmann et al., 2023). In other words, in those rare cases in which it

focuses attention on science-related topics, there is a kind of correspondence between the popularity of a certain topic, indicated by congruent selection of journalism, and the topic selection in journals.

We also examined the distribution of references to individual scientific experts in the topic-related studies. Here we find a notable difference compared to the general referencing structure. In the science-related debates, there is generally only a very limited focus on a few, particularly visible, scientific experts. However, the exception is the COVID-19 debate, where this does occur (Leidecker-Sandmann et al., 2022; Eisenegger et al., 2020). Here, there is a greater concentration on a few individual scientific actors, although the COVID-19 debate, like all other topics, is fundamentally characterized by the fact that most of the various scientific experts only have their say at best sporadically. It is the only topic we are aware of so far, which makes individual scientists “stars.”

For three groups of topics (biotechnology, neuroscience, climate change) we have tried to estimate the temporal stability of the dominant referencing pattern. We compared the distribution of references to individual scientific actors in the reporting of six German media titles in 2000 with that in 2019. There are hardly any significant differences. In 2019, references to scientific experts are even slightly more sporadic than 20 years earlier. In both periods, approximately 80-85 percent of all scientists are only cited once by journalists in the six titles studied. Visible scientists do exist in each of the topic groups, but these are individual cases (Promies et. al., [in preparation]).

## 4 Discussion: On the plausibility of the medialization thesis

We find very few features in the actual media coverage of science that would serve to plausibilize a significant role played by science journalism. As a rule, journalism hardly focuses public attention on scientific results or scientific actors. It usually does not achieve what is attributed to it in the context of the medialization thesis. This does not mean that the media presence of science does not achieve selective effects. Media attention on individual scientific studies can increase scientific attention (e.g., Dumas-Mallet et al., 2020; see also Chapters 4 and 5 within this book), the public prominence of topics can selectively influence the selectivity of journals (Leidecker-Sandmann et al., 2023). In our opinion, however, such repercussions cannot justify the term “medialization” because this term seeks to

describe systemic effects that are not plausible, at least not on the basis of the actual media presence of relevant scientific units.

The low degree of public focus on study results can be explained, among other things (Lehmkuhl & Promies, 2020), by the fact that, unlike politics, business or culture, science is less likely to produce individual events whose news value exceeds the critical threshold at which the entire system of journalism, or at least significant parts of this system, react by reporting. Secondly, it can be explained by the fact that science produces a comparatively larger number of events with similar news value, so that science journalism finds it more difficult to make congruent selections than political, economic or cultural journalism.

The fact that there is seldom a focus on individual scientific actors can be explained, among other things, by the fact that individual experts are generally experts on an extremely small area of world events, which means the journalistic focus is limited to a very small circle of actors. In addition, science has so far hardly differentiated prominent spokesperson roles in the sense that an actor would be legitimized to speak for other scientists or other scientific organisations.

In the context of the medialization thesis, the findings described above on the role of a small group of scientific journals deserve special attention. Our findings suggest that this very small number of journals function *de facto* as agencies for publicly relevant scientific studies. This is indicated by the constancy of their topic-independent dominance as sources of international science journalism, which cannot be plausibilized without the assumption of reciprocal co-orientation processes. We can only hint at the theoretical implications of this finding here. But given the extensive editorial selection practised by these journals even before reviews, it seems plausible that selection processes within these journals rather than the ones in journalism can mediate feedback processes (Franzen, 2011).

Taken together, we find very little empirical substance for the theoretical optics of the medialization thesis when considering feedback from real media coverage. But to stress this point again: these findings cannot falsify medialization, since real media coverage is just one mechanism to justify the term medialization. Another is the so-called "actor fiction" regarding the importance of media presence that seems to be widespread within science, especially within the PR-departments of scientific organisations (Marcinkowski et al., 2014; Marcinkowski & Steiner, 2010). Such a fiction can plausibilize, among other things, a notable increase in the PR efforts of science organizations (Autzen, 2014; Serong et al., 2017; Vogler & Schäfer, 2020), which is cause for concern. With Weingart (2022) and many others, we consider it fundamentally plausible that a bare belief in the importance of media presence heralded by the New Public Management is filtering

through to the core of scholarly communication (Lehmkuhl, 2019). However, we doubt that these developments should be named “medialization” since they correlate insufficiently with actual media coverage. The term blames mass media for something that cannot be sufficiently related to what the mass media actually do.

## 5 References

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