DOCUMENT RESUME

ED 217 480 CS 207 032

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TITLE Factors Influencing Scientists as Journalistic Sources.
PUB DATE Jul 82
NOTE 27p.; Paper presented at the Annual Meeting of the Association for Education in Journalism (65th, Athens, OH, July 25-28, 1982).

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Communication (Thought Transfer); Influences; *Information Dissemination; *Information Sources; Journalism; *Media Research; News Media; News Reporting; *Occupational Surveys; *Scientists; *Social Behavior; Social Environment
IDENTIFIERS *News Sources

ABSTRACT

Journalists often find that scientists are particularly "difficult" news sources. One possible reason is that the structures within which scientists work do not encourage their members to get involved in the public dissemination of information. Using a national sample of both physical and social scientists, a study sought to discover if scientists themselves perceived the existence of any constraints in three different scientific structures: science itself as a social organization, scientific societies with which scientists are often affiliated, and institutions that employ scientists. Specifically, the following research questions were asked: (1) Do scientists perceive the structure of science as a social system to be a barrier? (2) Do scientists perceive the policies of scientific societies to constitute a barrier? and (3) Do scientists perceive the policies of organizations who employ them to be a barrier? Subjects were 456 scientists drawn from the reference work, "American Men and Women of Science." Responses to the survey showed that scientists seemed to perceive some of the structures within which they work to be barriers to their involvement in the public dissemination of information through the mass media. Both the social system of science and the scientific employer seemed to present barriers to many of the respondents. Many acknowledged the inadequacy of training programs in preparing scientists to deal with the media, and the priority that communicating with fellow scientists has over any obligation to get research findings into the public domain. Most importantly, responses indicated that scientists felt they had little to gain within science by engaging in the public dissemination of information. (HOD)

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Factors Influencing Scientists as Journalistic Sources

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Paper presented at the "New Trends in Science--Mass Communications Research" session, Mass Communications & Society Division and Science Writing Educators Group, Association for Education in Journalism, Annual Convention, Athens, Ohio, July 1982.

FACTORS INFLUENCING SCIENTISTS AS JOURNALISTIC SOURCES*

Journalists often find that scientists are particularly "difficult" sources. Some scientists, they say, refuse to talk to reporters at all. Others agree to interviews but try to control the time ("I will talk to you only after my research is published in a journal") or the story content ("I'd like to take a look at your story before publication, just to make sure the facts are accurate."). In a world full of eager information sources, scientists often stand out because of their reluctance to play that role.

While countless anecdotes suggest the existence of these difficulties, little research has focused on the extent to which or why they exist. In this study we examine one possible answer: that the structures within which scientists work do not encourage their members to get involved in the public dissemination of information; that, on the contrary, such structures actively discourage or at the very least try to control popularization activities.

Using a national sample of both physical and social scientists, we tried to find out if scientists themselves perceive the existence of any constraints in three different scientific structures: science itself as a social organization, scientific societies with which scientists are often affiliated, and institutions that employ scientists.

Structure #1:

Science as a social system. Science is very much a self-policing culture. It establishes its own training procedures for persons wanting to enter the system and defines for itself what differentiates a "good" scientist from a "bad" scientist. Sociologists of science have already

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*The authors would like to gratefully acknowledge the schools of journalism of both West Virginia University and Ohio State University for their assistance in funding this research. Additionally, Dunwoody would like to thank graduate research assistant John Byczkowski for his help with the data gathering and coding.

spent several decades trying to isolate the criteria that science uses to make those kinds of differentiations.[1]

For our purposes, however, the important question is: how does science as a social system deal with scientists' participation in the public dissemination of scientific information? We will examine this question relative to several points.

Training of scientists: The training of scientists in the United States is highly structured, but most academic programs offer little to no assistance in helping neophyte scientists learn to communicate with either nonscientists or with journalists.[2] A lack of such training within the social system of science may be perceived as a significant barrier.

The normative reward system: According to sociologists of science, "good" scientists are those who are actively engaged in research.[3] Science's primary rewards, therefore, are reserved for those who add to our body of knowledge. But does the normative reward system take into account other activities, such as increasing the public's understanding of science via media? Science certainly gives lip service to the need for better public understanding of science, but there is little evidence that those scientists who do engage in such activities find any rewards within science.

At least two studies, in fact, suggest that scientists are not rewarded by their peers for popularizing research. Carter, in a study of medical doctors as media sources, noted that "publicity seems to offer little status-conferral value" and, in fact, "is threatening insofar as his (the doctor's) relationships with his colleagues are concerned."[4] And in a study of French biologists, Boltanski and Maldidier suggest that popularization of science is a "marginal or negligible activity not possessing any clearly defined status within the scientific community."[5]

The peer review system. Research typically comes to be labeled "science" by virtue of publication in a refereed journal. Since the peer view inherent in that publication process constitutes quality control within science, scientists are often reluctant to talk to nonscientists about their work until that process has been completed.

Although the priority of peer review over public dissemination is usually an unwritten rule, it has occasionally been cast into concrete. Witness, for example, the New England Journal of Medicine's "Ingelfinger Rule," which specifies that any research that has already received substantial attention from the medical trade publications or popular press runs the risk of being rejected out of hand by NEJM editors. The rule's creator, then-editor Franz J. Ingelfinger, said that the restriction simply reinforces the unwritten rule that it is "worthwhile" to have a scientists's work reviewed by his or her peers before it is seen by the public.[6] Recent research by Ryan finds that scientists still agree with the notion that peer review should precede public dissemination.[7] If so, then peer review may indeed act as a structural constraint on a scientist's public dissemination activities.

Structure #2:

Scientific societies. Scientists often belong to a variety of professional and academic societies. In some cases, these groups attempt to maintain some control over what constitutes "proper" behavior for members. In the past, such attempts took the form of overt constraints on scientists' dissemination activities.

Here's one example: A medical researcher working on a treatment for Meniere's Disease, an inner-ear disorder, agreed to talk to a local newspaper reporter about his work. A feature story resulted. Two years later, when the researcher applied for membership in a prestigious society related to his resaerch interests, he was told that since the use of his name in the feature

article constituted a breach of the society's ethics, he would be banned from membership consideration for two years.[8]

Today, many societies actively promote their members' participation in public dissemination activites.[9] But anecdotal evidence suggests that others still view popularization as nothing more that "unethical advertising."[10]

Structure #3:

Scientific employers. Scientists are rarely self-employed. Rather, they are most often found in larger organizations. And in such settings they must cope with the needs and limitations of fairly rigid structures. Because scientific information is produced within these oganizatins, one would expect them to attempt to control the flow of information into the public domain for any number of reasons: proprietary, economic, political. Numerous studies have documented the perceptions of scientists in industry that their employers place restrictions on their freedom to communicate with colleagues outside their organizations.[11] In this study we were interested in finding out if scientists perceived institutional "rules" as constraints on their public dissemination activities.

The research funding reward system. Finally, scientists are largely dependent on sources outside science for research funding. The "significant others" when it comes to such funding include politicians, industry and foundations. Carter notes that the perception of "significant others" may strongly influence source perceptions of the rewards to be gained from interacting with media.[12] And when it comes to money, scientists indeed may feel that increasing one's visibility within the public domain is an effective means of reaching those influential people outside science.

Anecdotal evidence suggests that scientists may indeed perceive a relationship between public visibility and chances for research funding. One scientist employed by a research institute that is totally dependent on outside

grants noted that he and his colleagues were much more amenable to talking to journalists than were his university cohorts because such publicity could help the institute obtain more funds.[13]

Research Questions

This national survey of scientists attempted to find out if respondents perceived the various structures within which they work to be barriers to their involvement in the public dissemination of science via mass media. Specifically, the following research questions were asked:

1. Do scientists perceive the structure of science as a social system to be a barrier?

2. Do scientists perceive the policies of scientific societies to constitute a barrier?

3. Do scientists perceive the policies of organizations who employ them to be a barrier?

In addition, we examined the likelihod that some of the perceptions of barriers would vary on the basis of (1) type of employer and (2) type of scientist.

Type of employer: Scientific training is the same for a chemistry Ph.D. regardless of who ultimately employs her. So we would not expect type of employer to have any effect on a scientist's perception of barriers to public communication erected by the social system of science or by scientific societies. However, a scientist's employer could affect how she perceives the nature of institutional barriers. For example, a scientist may be working in a public organization because she feels that industry is too constraining. Or a scientist working in an industrial laboratory may have assimilated many of the values of the workplace and might perceive his employer to levy few constraints on his communicative behavior. Thus we hypothesized in this study

that:

H1: Perceptions of institutional barriers will vary among respondents affiliated with universities, government and industry.

Type of scientist: Hagstrom has suggested that there are some fundamental differences between social scientists and those in the physical/natural sciences. He notes that scientific norms are more vague in the social sciences than in the physical sciences, and he suggests that "deviation from vague norms is more likely than deviation from norms specified for a concrete set of practices. It follows that physical scientists are less likely to deviate from the norms of science and scholarship than are social scientists or humanists."[14]

If norms within social science are indeed more vague, then one would expect social scientists to be less likely to perceive the social system of science as constraining them from public communication than would physical/natural scientists. This leads to the second hypothesis:

H2: Social scientists are less likely than physical/natural scientists to perceive that science as a social system constrains its members from public dissemination activities.

Methods

A sample of 456 scientists was drawn from the reference work, American Men and Women of Science.[15] This work was selected as the universe for this study because (1) it provided an available pool of both physical and social scientists for sampling and (2) individuals in these volumes had already attained a certain stature within science and thus may have had a greater opportunity to deal with journalists.

Although only about 16% of the more than 150,000 names listed in the work were social scientists, that group was oversampled so that it would constitute about 50% of the sample.

The following sampling procedure was used: Random numbers were used to select as many pages as there were individuals in the sample. Then a single number, n, was selected, and the nth person was chosen from each of the previously selected pages. Of the 456 individuals who received questionnaires, 229 were physical scientists and 227 were social scientists.

An intitial mailing of the questionnaire and one follow-up were sent during 1981. A total of 287 respondents returned usable questionnaires for a response rate of 63%.[16]

The questionnaire was composed of two parts. Respondents were asked in Part 1 to respond to 34 statements, each of which was related to a potential constraint on the dissemination of science to the general public. Of the 34, 15 items were related to various aspects of science as a social system (4 training items, 8 normative reward items, and 3 peer review items), 3 items were related to societal barriers, 4 items dealt with possible institutional barriers, and 2 items dealt with funding rewards outside science. (The items are listed in Table 1).

Each item was followed by a modified Likert scale that asked respondents to indicate whether they "strongly agreed," "agreed," "disagreed" or "strongly disagreed" with, or were "undecided," "neutral" or had "no opinion" about the statement.[17]

Part 2 of the questionnaire asked respondents to supply information about, among other variables, age, highest degree earned, research specialty, recent publication record, source of research funding and their levels of interaction with journalists during the past year.

Findings

Summary of sample demographics. The sample of 287 respondents was almost evently divided between physical scientists (52.8%) and social scientists (47.2%). Of the 287, 68.3% were employed by universitites, 18% by industry

and 11.6% by local, state or national governments.

Ninety-three percent of the respondents had earned Ph.D.s, and 79.3% identified themselves as actively engaged in research. The average respondent had been engaged in research for 20 years.

A total of 34.1% of the respondents indicated that funds for their research came primarily from governmental sources. Another 15.3% said that universities funded most of their research, and 10.8% indicated their funding came primarily from private industry. Respondents citing other primary sources, such as foundations or personal funds, constituted smaller percentages of the sample.

Respondents had produced a median 3.4 convention papers and a median 4.5 journal articles within the past five years. Although a majority indicated that during that same period they had not engaged in writing books, 43% reported that they had indeed been involved in authoring or coauthoring books.

Within the previous year, respondents had encountered a median 1.7 journalists. Of the samle, 36.6% had dealt with no journalists at all during that time period, while a handful of other respondents claimed to have interacted with from 25 to 100 of them.

Science as a social system. As indicated in Table 1, mean responses of scientists to the 15 items varied widely.

Training. These four items generated some of the strongest aggregated responses. In general, they indicate that the sample thought it important for scientists to learn to communicate with nonscientists and that the training system at present does not adequately accomplish that objective. The scientists did not agree that formal scientific training discourages interaction with media, however. And they strongly disagreed with the notion that they can rely on journlaists alone to translate scientific material for nonscientists.

The normative reward system. Scientists in the sample felt that involvement in disseminating information via mass media has an effect on a scientist's chances for advancement in science, and that the effect is likely to be negative. While they disagreed with the statement that other scientists might regard media visibility as "unseemly advertisements," they agreed that scientists "usually are not rewarded within the scientific community" for public dissemination activities. And they disagreed with the statement that publication in the media results in increased respect from peers.

Boltanski and Maldidier and Dunwoody and Scott[18] have found that higher ranking scientists are more likely to be involved in media interactions than are lower ranking scientists. This led them to suggest that the social system of science might provide more positive rewards for high-ranking popularizers than for low-ranking individuals. Three items in this survey (Items 10, 11, 12) attempted to find out if scientists in the sample perceived any differential rewards for scientists that could be ascribed to status within science. The answer was no.

The peer review system. While respondents seemed ambivalent about the statement that peer review should always precede media contact, they reinforced the notion that a scientist's primary responsibility is to other scientists by disagreeing with statements suggesting a responsibility to the general public that occasionally could override peer review.

Scientific societies. Although respondents felt that these organizations should become more involved in helping scientists learn to deal with the media, they clearly felt that scientific societies do not throw up barriers to members who do want to become involved in public dissemination activities.

Scientific employers. While respondents disagreed with the idea that most institutions employing scientists try to control scientists' relationships with journalists, they did agree that scientists in private research settings

are less free than those in public settings to deal with the media. They also agreed that scientists in public settings may be faced with indirect constraints on their freedom to interact with media; examples of such indirect pressures might be considerations of how a state legislature might react at budget-voting time to a particular research story.

The research funding reward system. Respondents indeed perceived the existence of a positive relationship between media visibility and obtaining research funds. They also felt that scientists dependent on outside funding were more likely to deal with media than were those not dependent on outside sources.

Hypothesis 1: We explored perceptions of institutional barriers using four items (Items 19, 20, 21 and 22 in Table 1). Oneway analysis of variance was performed for each item, with item responses as the criterion variables and type of employer as the independent variable. Three of the four items produced statistically significant f scores. For those items, Duncan's multiple range test was used to isolate means that differed at a significance level of .05, using two-tailed tests. The results are in Table 2.

Although respondents generally agreed that they should be free to make decisions about media interactions without pressure from their employers, industry scientists were less likely to agree than were others. There was a statistically significant difference betwen the mean response of university and industry scientists to this item (Item 19).

University scientists were less likely than other scientists to agree with the statement that scientists employed by public institutions often must deal with indirect constraints related to their institution when dealing with the media (Item 21). The difference between the mean response of university scientists and the responses of the other two groups was statistically significant.

The largest differences among respondents with different institutional affiliations came to the statement (Item 22) that "most institutions where scientists are employed try to regulate the researchers' relationships with media representatives." While university scientists disagreed with the statement, government scientists scored "neutral" on the item and industry scientists agreed with it. The differences among all three means were statistically signficant.

All scientists, regardless of institutional affiliation, agreed with the statement that "scientists in private research institutions are less free than their colleagues in public institutions to disseminate information about their research to the popular media" (Item 21).

Hypothesis 2: T-tests were used to look for statistically significant differences between the mean responses of social scientists and physical scientists to 15 statements related to different aspects of science as a social system (Items 1 to 15 in Table 1). Since the hypothesis predicted direction, one-tailed tests were used. Of the 15 items, only four produced statistically significant differences at the .05 level. Two concern the normative reward system and two are related to attitudes about the peer review process. The results are in Table 3.

First, it should be noted that on more than two thirds of the items, social scientists and physical scientists did not differ significantly in their responses. Since the training items (Items 1 to 4 in Table 1) dealt only with scientists' formal training in popularization, it is not surprising that both social and physical scientists noted the lack of such training in their educations; such training literally does not exist. But among the eight normative items (Items 5 to 12), differnces were found on only two. And social scientists were found to differ significantly from physical scientists on two of the three peer review items (Items 13 to 15).

But while the items producing significant differences are not themselves large in number, the differences found are in accord with the hypothesis. On Item 7, for example, although both physical and social scientists disagreed with the statement that "popularization of research through the media is a process that is outside the scientific community and thus has no effect on scientists' chances for advancement in their fields," social scientists disagreed more strongly. In fact, the mean response of physical scientists was nearly "neutral" for that item.

Physical scientists gave a mean "neutral" response to the statement that "scientists can gain respect among their colleagues through publication in the popular media" (Item 9). Social scientists, on the other hand, gave a weak positive response to the statement.

Responses to the peer review items indicated that social scientists might feel a bit less constranied by the peer review norm. Both physical and social scientists disagreed with the statement that "some scientific discoveries are so important that scientists are obliged to report their results to the general public before the research is presented at a conference or published in a journal" (Item 13). But the strength of the response differed, with physical scientists disagreeing more strongly than social scientists.

And while both groups agreed with the statement that "the peer review of articles submitted for publication or for presentation at a convention is science's method of validating the quality of scientific work; thus, a scientist should not communicate with journalists until his or her work is 'validated' by peers" (Item 15), the physical scientists agreed much more strongly than did the social scientists. The mean response of social scientists, in fact, was nearly "neutral."

Summary and Discussion

Scientists in this survey indeed seemed to perceive some of the structures within which they work to be barriers to their involvement in the public dissemination of science through the mass media. Of the three structures we examined, two--the social system of science and scientific employer--clearly seemed to present barriers to many of the respondents. The third structure, scientific societies, was not perceived as constituting much of a barrier to popularization efforts.

Within science as a social system, respondents acknowledged the inadequacy of training programs in preparing scientists to deal with the media or to communicate scientific information to nonscientists. Certainly, greater efforts are being made these days to provide such training, but such attempts are not systematic and are highly dependent on funding levels both within government and within institutions.[19]

Through responses to items related to the peer review of articles, respondents also acknowledged the priority that communicating with fellow scientists has over any obligation to get research findings into the public domain. Such a sense of priority, while expected, could act as a constraint on public dissemination.

But perhaps most importantly, scientists' responses to items related to the normative reward system in science indicated that, in general, there is still little to be gained within science by engaging in the public dissemination of information. Being a "good" scientist in the eyes of one's colleagues does not require that attention be paid to such concerns as the public understanding of science. As sociologist Dorothy Nelkin notes, "Scientists consider science and society efforts as a kind of marginal frill."[20]

While popularization apparently brings with it few normative rewards, it may provide rewards of another kind: financial. Respondents agreed that

media visibility may help one to obtain research money. And as competition for dwindling research dollars increases, one might expect to see the popularization behaviors of scientists increasing correspondingly. Science reporters already report an increase in contacts from scientists who are concerned about continued funding of their research. Cristine Russell, national science reporter for The Washington Post, has noted that she now routinely asks sources about their funding status when she conducts interviews.[21]

The rather pronounced difference between the perceived rewards of public dissemination within science (normative) and without (research) funding does lend support to Carter's proposition that analysis of journalist/source interactions requires some knowledge of who are the source's "significant others." In this case, when the "significant other" is a scientific colleague, scientists regard journalistic products as being of little value to them. But when the "significant other" is a funding agency, the scientist appears to attach more personal value to the popularization process.

Scientists in this study roundly disagreed with the statement that scientific societies restrain scientists who want to popularize their work. One explanation for this finding is that the organizations whose restraining behaviors we described earlier in this paper are anomalies, that societies generally are as open as is the American Association for the Advancement of Science to the notion of popularization. A second explanation is that all societies are not alike, that some are more likely than others to levy restraints on their members, and that the scientists in this sample were less likely to belong to "restraining" societies than they were to belong to societies that promote popularization of science.

Societies that traditionally have been most concerned about "proper" member behavior have been professional associations composed of individuals engaged in "applied science," individuals such as doctors, dentists and

veterinarians. These groups have often set stringent membership standards that include restrictions on such things as advertising. Originally such standards were designed to differentiate the "professional" practitioner from the quack. But many societies have been relatively slow to acknowledge that the public dissemination of information may not be synonymous with "unethical advertising."[23] Few members of this sample of scientists seemed to belong to such professional organizations. So it was impossible to test for societal differences in this group.

It is not surprising that scientists in this sample perceived that institutions try to have some control over scientists' dissemination activities. A bit unexpected, however, was the acknowledgement of the respondents that universities may levy indirect constraints on scientists; acknowledgement of industry restraints was expected, but universities often pride themselves on the free and open climate that they offer to their employees.

Both hypotheses posed in this study received some support. Type of employer does seem to be related to scientists' perceptions of the ability of institutions to place constraints on the public communication process. For example, scientists employed by industry were less likely than university scientists to feel that scientists should be free of pressure from employers when interacting with journalists. And industry-employed scientists also were more likely than other respondents to feel that <u>all</u> institutions try to regulate scientist/journalist behaviors in some way.

Numerous studies by sociologists of science have found that industry often constrains its scientists from communicating freely with "outside" scientists, either through meetings or through journal publications.[24] But this study suggests--not surprisingly--that such constraints may be broadened to include the public communication process as well. No one has examined scientific employers with this topic in mind, but the subject needs exploration.

And finally, although not strong, evidence from this study suggests that social scientists may be deriving somewhat more positive benefits from interacting with media than do physical scientists. Again, on most items related to the normative aspects of science, social and physical scientists did not differ significantly in attitudes. But on some of the items social scientists offered evidence that they feel more strongly than physical scientists that popularization of their research does affect their eventual "scientific" rewards and that such an effect can be positive.

As noted earlier, Hagstrom[25] would suggest that such a situation exists because scientific norms for social scientists are more vague than are norms for physical scientists; thus, punishment for violations of norms will be much less--or perhaps even nonexistent--for social scientists.

Another explanation, however, may be that interaction with journalists is simply a more typical aspect of social scientific work than it is of the work of physical scientists. At least one study indicates that newspapers are more likely to publish social science stories than other types of stories.[26] And, as Carter[27] notes, increased frequency of interaction may have the effect of making such interactions more an expected part of a source's work life.

Scientists choose to become involved--or choose not to become involved--in the public dissemination of science for reasons. Those reasons are complex, but studies such as this one may begin to sort out some of the more important variables affecting scientists' behaviors as sources. Just as it is important for scientists to understand what motivates reporters, so it is important for journalists to begin to understand how the environment within which scientists work may play a major role in determining the boundaries of scientists' relationships with the media.

Table 1

Mean Responses of Scientists to Items

Item	Mean Response (5=Strongly agree; 1=Strongly disagree)
Training	
1. Formal training in science seems to predispose those who go through it to have negative attitudes toward the idea that scientific achievements should be reported in the popular media.	2.6
2. It is important for scientists to learn how to discuss their research in terms that are clear to nonscientists.	4.6
3. Scientists do not need to be taught how to communicate with the public, since they can rely on journalists to disseminate science news widely and clearly.	1.5
4. Most scientific training does not adequately teach those who go through it to communicate with media representatives.	4.3
The normative reward system	
5. When stories about scientists' work appear in the popular media, other scientists are likely to regard the articles as "unseemly" advertisements for research efforts.	2.2
6. Scientists usually are not rewarded within the scientific community for having their work reported in the popular media.	3.6
7. Popularization of research through the media is a process that is ouside the scientific community and thus has no effect on scientists' chances for advancement in their fields.	2.2
8. Scientists who allow their work to be publicized in the popular media are more likely to be criticized than praised by fellow scientists.	3.0
9. Scientists can gain respect among their colleagues through publication in the popular media.	2.7
10. Scientists new to a field avoid journalists because they worry that too much media exposure will hurt their chances for advancement within the scientific community.	2.3

Table 1 continued

Item	Mean Response (5=Strongly agree; 1=Strongly disagree)
11. Scientists new to a field are reluctant to deal with journalists because they lack the confidence to do so, not because they feel pressure from peers or from the institutions for which they work.	3.2
12. Older, established scientists make better "spokepersons" for a scientific field than do younger scientists who do not have extensive research records.	3.0
The peer review system	
13. Some scientific discoveries are so important that scientists are obliged to report their results to the general public before the research is presented at a conference or published in a journal.	2.3
14. Scientists should feel obligated to discuss their scientific work with journalists who ask about their research, even when their work has not been "reviewed" in some form by other scientists.	2.3
15. The peer review of artcles submitted for publication or for presentation at a convention is science's method of validating the quality of scientific work; thus, a scientists should not communicate with journalists until his or her work is "validated" by peers.	3.0
Scientific societies	
16. Scientific societies and professional organizations exert considerable restraint on scientists who want to communicate research findings to the public.	1.9
17. Societal or professional codes of ethics for scientists should include statements about how scientists should (or should not) deal with the popular media.	2.8
18. Professional associations and scientific societies should do more to help scientists learn to deal with journalists.	3.6
Institutions employing scientists	
19. Scientists should be free to decide how and when to deal with the popular media without interference or pressure from the institutions for which they work.	3.7
20. Scientists in private research institutions are less free than their colleagues in public institutions to disseminate information about their research to the popular media.	3.4

Table 1 continued

Item	Mean Response (5=Strongly agree; 1=Strongly disagree)
21. Scientists who are employed by public institutions (e.g., universities, public research labs) sometimes are constrained in their dealings with the media by considerations of how boards of trustess, legislatures, government agencies and other governing bodies might react.	3.6
22. Most institutions where scientists are employed try to regulate the researchers' relationships with media representatives.	2.8
The research funding reward system	
23. Publicity about scientists' work can sometimes help them get research funds.	4.0
24. Scientists who must get external funding for their research are more likely to deal with the media than are those who are not forced to seek such funding.	3.5

Table 2

Mean Responses[1] to Statements About Institutional Constraints by Institutional Affiliation

Item (See Table 1 for item wording)	Institutional Affiliation		
	University	Government	Industry
Item 19 (n=269)	3.9	3.7	3.1
Item 20 (n=191)	3.4	3.5	3.3
Item 21 (n=191)*	3.4	3.9	4.0
Item 22 (n=183)*	2.4	3.3	4.0

[1]Responses to items ranged from 5 (strongly agree) to 1 (strongly disagree). Thus, the higher the mean response, the stronger the agreement.

*Analysis of variance indicated statistically significant differences at the .05 level among groups for these items (2-tailed tests).

Table 3

Mean Responses[1] to Statements About Normative Constraints by Type of Scientist

Item (See Table 1) for item wording)	Type of Scientist	
	Social Scientist	Physical/Natural Scientist
Item 1 (n=265)	2.8	2.5
Item 2 (n=284)	4.6	4.7
Item 3 (n=264)	1.5	1.5
Item 4 (n=264)	4.3	4.3
Item 5 (n=275)	2.2	2.2
Item 6 (n=271)	3.4	3.7
Item 7 (n=265)*	2.0	2.4
Item 8 (n=251)	2.9	3.0
Item 9 (n=262)*	2.9	2.5
Item 10 (n=224)	2.8	2.5
Item 11 (n=222)	3.2	3.2
Item 12 (n=264)	2.9	3.0
Item 13 (n=266)*	2.5	2.2
Item 14 (n=261)	2.3	2.3
Item 15 (n=264)*	2.8	3.1

[1]Responses to items ranged from 5 (strongly agree) to 1 (strongly disagree). Thus, the higher the mean response, the stronger the agreement.

*T-tests indicated statistically significant differences at the .05 level between the groups for these items (1-tailed tests).

Footnotes

[1]See, for example, Robert K. Merton, Social Theory and Social Structure (Glencoe, Il: Free Press, 1949); and Warren O. Hagstrom, The Scientific Community (Carbondale, IL: Southern Illinois University Press, 1965).

[2]Although we have no data to support our assertion that academic science programs do not teach scientists communicating skills, anecdotal evidence over the years does support this point. Scientists are regularly taken to task in their own journals for lack of communicating skills. See, for example, D.A.E. Shephard, "Medical Writing: Problems and Solutions," The Canadian Journal of Surgery 19: 478-480, November 1976; and Michael Crichton, "Medical Obfuscation: Structure and Function," New England Journal of Medicine 293: 1257-1259, 11 December 1975.

[3]Nicholas C. Mullins, Science: Some Sociological Perspectives (Indianapolis: The Bobbs-Merrill Company, Inc., 1973).

[4]Roy E. Carter, Jr. "Newspaper 'Gatekeepers' and the Sources of News," Public Opinion Quarterly 22: 133-144, Summer 1958, p. 138.

[5]Luc Boltanski and Pascale Maldidier, "Carriere scientifique, morale scientifique et vulgarisation," Social Science Information 9:99-118, 1970, p. 101.

[6]Barbara Culliton, "Dual Publication: 'Ingelfinger Rule' Debated by Scientists and Press," Science 176:1403-1405, 30 June 1972, p. 1404.

[7]Michael Ryan, "Attitudes of Scientists and Journalists Toward Media Coverage of Science News," Journalism Quarterly 56:18-26, 53, Spring 1979.

[8]Based on correspondence between a physician affiliated with the Presbyterian-University of Pennsylvania Medical Center in Philadelphia and the American Laryngological, Rhinological and Otological Society, Inc., 15 January through 7 Febrary 1968.

[9]Among the more active ones are the American Association for the Advancement of Science, the American Chemical Society, the American Institute of Physics and the American Psychological Association.

[10]For example, a 1977 issue of Columbia Journalism Review contains the results of a National News Council analysis of the media policies of the Broward County (Florida) Medical Association. Among other restrictions, the association's new code of ethics prohibited doctors from allowing their names to be used in media accounts without prior association approval. It prohibited the use by media of posed pictures of doctors. And it required that announcements of medical innovations be made through the association, with any further media requests handled only by the association. According to accounts in the Fort Lauderdale newspapers, the new code came about in part because some members of the medical community felt that some of their colleagues were involved in publicity that they interpreted as unethical and self-aggrandizing. Details of this case can be found in "The media-shy physicians of Broward County, Florida," in the National News Council Report, Columbia Journalism Review, March/April 1977, pp. 78-79.

[11]See, for example, William Kornhauser, Scientists in Industry (Berkeley and Los Angeles: University of California Press, 1963) pp. 73-80; and Stephen Cotgrave and Steven Box, Science, Industry and Society (London: George Allen & Unwin Ltd., 1970) pp.100-101.

[12]Carter, op. cit.

[13]Personal interview with scientist employed by Battelle Memorial Laboratories, Columbus, OH, April 1978.

[14]Warren Hagstrom, The Scientific Community (Carbondale and Edwardsville: Southern Illinois University Press, 1965) p. 11.

[15]Jaques Cattell Press, American Men and Women of Science, Social and Behavioral Sciences, 13th ed. (New York: R.R. Bowker Company, 1978), and

Jaques Cattell Press, ed., American Men and Women of Science, Physical and Biological Sciences, 14th ed. (New York: R.R. Bowker Company, 1979).

[16]The final 287 respondents include 29 scientists who were involved in a pretest of the questionnaire. Since the pretest population had been selected from the reference works using systematic random sampling and since pretesting resulted in no changes in the questionnaire, those responding to the pretest mailing were included in the larger sample.

[17]"Undecided" and "no-opinion" responses were not included in the data analyses. The remaining responses were coded as follows: "Strongly agree" - 5; "Agree" - 4; "Neutral" - 3; "Disagree" - 2; and "Strongly disagree" - 1.

[18]Boltanski and Maldidier, op. cit.; Sharon Dunwoody and Byron T. Scott, "Scientists as Mass Media Sources," Journalism Quarterly, 59:52-59, Spring 1982.

[19]Examples of institutions that have attempted to institutionalize training in communicating skills for scientists include MIT, which is setting up both undergraduate and graduate courses in science communication for science majors, and Johns Hopkins, which offered a communications course for the first time this past spring to doctoral candidates in the biological sciences. Joann Rodgers, Hearst medical writer and the instructor for the Johns Hopkins course, indicates that the university hopes to make it a regular part of the curriculum. Activities have also taken place at the federal level: for the past two years the National Science Foundation's Chautauqua Short Courses for college science teachers have included a course titled "Science, the Media, and the Public."

[20]Dorothy Nelkin, "Science and the Public: The Communications Con," remarks made at a conference, "Communicating University Research: The Next Step," sponsored by the Council for the Advancement and Support of Education (CASE), March 1982, Alexandria, VA.

[21]Cristine Russell, "How Does the Science News Network Operate?" presented at the conference, "Communicating University Research: The Next Step," sponsored by the Council for the Advancement and Support of Education (CASE), March 1982, Alexandria, VA.

[22]Carter, op cit.

[23]County dental societies are often illustrative. The chairman of the Board of Censors of one county group noted, "This topic of advertising is a heated subject around here (Philadelphia). Most dentists don't want their names used by reporters; the first thing any dentist would think was 'advertising.'" This particular group went so far in the mid 1970s as to prohibit member dentists from listing their specialties in the telephone directory on the grounds that any information other than name constituted "unethical advertising." From Sharon Dunwoody, "Ethical Problems in Science Writing," unpublished paper, Temple University, Philadelphia, 1974, p. 15.

[24]Kornhauser, op. cit.; Cotgrove and Box, op. cit.

[25]Hagstrom, op. cit.

[26]Sharon Dunwoody, "Tracking Newspaper Science Stories from Source to Publication: A Case-Study Examination of the Popularization Process," paper presented to the meeting of the Society for the Social Studies of Science, Toronto, October 1980.

[27]Carter, op. cit.