

SCIENTISTS and JOURNALISTS

Reporting Science as News

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CHAPTER 8

What Makes a Good Science Story?

*Panel Discussion with Ira Flatow,
Dennis S. O'Leary, Joann E. Rodgers,
Stephen H. Schneider, and Robert J. Trotter*

The "perfect" science story is an elusive entity. In this discussion—an updated and expanded version of a panel discussion that took place during the 1982 Annual Meeting of the American Association for the Advancement of Science—a group of scientists and science reporters explore some serious questions for the field of science communication.

Ira Flatow has worked as a science reporter for National Public Radio since the early 1970s. His broadcasts are heard frequently on the morning news and on NPR's celebrated "All Things Considered." In addition, he is the writer/host for the PBS science show "Newton's Apple." In 1981 he received the Science and Society Award of the National Association of Science Writers for his coverage of the creationism–evolution controversy. He was a co-winner of the 1983 AAAS–Westinghouse Science Journalism Award in both the radio and television categories.

Dennis S. O'Leary became something of a household word in 1981 when he assumed the role of spokesman for The George Washington University Medical Center in Washington, D.C., during the tense days following the attempt to assassinate President Ronald Reagan. His comments on "Physicians and Reporters: Conflicts, Commonalities, and Collaboration" appear in Chapter 7.

Joann E. Rodgers, currently deputy director and director of media at the Johns Hopkins Medical Institution's Office of Public Affairs,

was a science writer for the Hearst Newspapers for eighteen years, serving as both a columnist and a national science correspondent between 1973 and 1984. Additionally, she was a contributing editor *Science* 81, 82, and 83 and is a frequent contributor to *Science Digest*. She has received awards for her writing from the Lasker Foundation, the American Heart Association, the American Cancer Society, the National Council for Medical Research, and the Cystic Fibrosis Foundation. She is immediate past president of the National Association of Science Writers and a director of the Council for the Advancement of Science Writing.

Stephen H. Schneider is the deputy director of the Advanced Study Program at the National Center for Atmospheric Research in Boulder, Colorado. He is nationally known for his writings on climatology, and his comments on "Both Sides of the Fence: The Scientist as Source and Author" appear in Chapter 16.

Robert J. Trotter worked for *Science News* from 1969 to 1981, spending his last four years as editor of the magazine. During much of his tenure there, Trotter specialized in covering the social sciences, and in 1980 he won a special media award from the American Psychological Association for "making a sustained contribution in communicating psychology to the general public." Since leaving *Science News*, he has worked as a freelance science writer in Washington, D.C., and he is currently a senior editor at *Psychology Today*.

THE MODERATORS, Sharon Dunwoody and Sharon Friedman, posed the following questions for this panel discussion.

QUESTION: One major area of disagreement between scientists and journalists is over something called "accuracy." Do scientists and journalists disagree over what makes a statement inaccurate? And why is this such a sensitive and continuing issue for both groups?

TROTTER: Accuracy should be one of the most important concerns of any reporter, but it is especially important in science stories. Not only do inaccuracies infuriate scientists and prejudice them against journalists, but inaccuracies also can have dangerous and far-reaching effects.

Science stories deal with hard facts. And because many readers tend to take the word of scientists as gospel, any inaccuracy can lead to serious misunderstandings. A misleading story about a "cancer cure," for instance, could give false hopes to victims or send hundreds of people to a possibly dangerous laetrile clinic in Mexico. Inaccuracies could eventually prejudice readers against both scientists and journalists and make it harder for them to be concerned to do their jobs.

There should be no disagreement between scientists and science writers about the importance of accuracy, but there may be some disagreement about what constitutes accuracy. In many cases, scientists want to see a full, dispassionate discussion of their work—including all pertinent details and background information. But reporters, who have to deal with deadlines, space problems, and editors, may have to sacrifice some of the more technical details and emphasize some of the more striking aspects of a story. In doing so, they may be less accurate or less complete than the scientists would like. But if science writers care about what they are doing, they can learn to be both accurate and readable.

Good science writers are the ones who can satisfy both editors and readers and present an accurate science story. Good scientists in this context are the ones who understand the problems reporters face and try to work with them in order to end up with a story that is both accurate and printable. The solution to the "accuracy problem," I think, is mutual, professional respect between scientist and journalist. Accurate stories can help journalists earn this respect.

SCHNEIDER: Scientists often are offended when they say "3.65" and it comes out in an article as "about 4." This doesn't bother me, but it is often deemed inaccurate and irresponsible by many of my colleagues. More serious, perhaps, is the "paraphrase problem." I refer to the reporting of a scientist's opinion on a sensitive issue, when the journalist simplifies through paraphrasing a point of contention and that paraphrasing subsequently gets the scientist in trouble with colleagues—at least in his or her perception—because the scientist's own statements to the journalist were more precise and careful than the printed version. What the scientist does not realize is that his or her own words were probably not easily quotable (or even comprehensible) in their often involuted, Germanic form.

Finally, it is not infrequent, especially for general assignment journalists, to completely mix up basic points and quantitative statements in a story in which the technical component is complex or subtle. I think both scientists and journalists could agree that this is simply bad work and should be dealt with by stricter forms of internal controls within journalism that would warn, punish, and ultimately fire people who repeatedly put in such inaccurate performances, regardless of how beautifully they may write, how glamorous they may look, or how popular they may be with certain segments of the public. This is especially a problem for television journalists.

O'LEARY: The problem of accuracy lies in the fact that people live in their own worlds and thus see the world from their own perspectives. The journalist probably has a better sense of what will sell newspapers or catch the interest of the public. But in acting on this knowledge, the average journalist may not pay attention to enough of the details from the scientist's perspective. As far as the scientist is concerned, accuracy is lost in the translation.

The scientist who reads a newspaper story about himself or his work is reading it as a scientist and is probably concerned that his colleagues are reading the story as well. He is wondering how those colleagues may react to

that story, because they do not read it in the same way as does the public might be a terrific story from the standpoint of the lay public, but the scientist will be wondering, "Will I be reviled by my colleagues?"

Often, the scientist has provided the facts, but the story just does come out in a way that makes sense to him as a scientist. This gets into issues of balance and tone. An example is when a scientist feels that some fact received undue attention in an article, or when another fact that he felt very important has not received sufficient attention. Or an article may convey too great a degree of promise or hope. For instance, let's say that a scientist has made a discovery that would make it possible to produce an important new vaccine. The reality, though, from a production standpoint, is that a new product will not be on the market for three to ten years. If this is conveyed in the story, then public demand for the vaccine may be immediate.

An important caveat is that when the scientist is dealing with science writers rather than general reporters not experienced in covering science, the sophistication of the reporting is quite different. Relatively few scientists or physicians understand the difference between a science writer and a general reporter; they do not appreciate the level of sophistication of a lot of the science writers.

FLATOW: Scientists usually refer to "accuracy" when they are critical of the way journalists convey the importance or meaning of their work. A scientist might feel that his work is meaningful because it is leading in such-and-such a direction. However, a reporter may disagree not with the content of the research itself but with the scientist's feeling about where his work is leading. The two may disagree over its ramifications, in other words. Sometimes when a scientist does not fully understand or agree with the reporter's point of view about such implications, he or she may call a story "inaccurate."

This is a continuing issue between reporters and scientists, because the accuracy or integrity—a better word—of the research project is not being questioned. Rather, it is the implications that are at issue. Scientists do like to think about those implications. They like to think they are doing pure science while others—technologists—are taking their work and applying it.

That's what made the debate over recombinant DNA research so unusual. Scientists in this rare case stopped their work to consider the ramifications of the genetic engineering research they were doing. Yet even here, a typical conversation between a scientist and a reporter might have resulted in clear agreement over how the DNA research was accomplished and in disagreement (and, consequently, "inaccurate" reporting) over where the research might lead (for example, "monsters" escaping from the lab).

QUESTION: What some of you seem to be saying is that judgments about accuracy may in fact be value-laden, with scientists and journalists essentially disagreeing over what information belongs in a story and how that information should be played. Is that correct? Could you give us some examples?

SCHNEIDER: Often scientists who have made discoveries greatly valued by their peers are disappointed when they find that journalists have primarily

peated what is already well known to the scientific community and at most have made only peripheral mention of the new discovery in the article. These scientists fear that they may appear to their colleagues as unoriginal, self-appointed spokespersons for the field rather than "sticking" to their areas of acknowledged expertise. However, they are more upset because the journalists do not recognize them for the importance of their discovery—their little detail, in which a total of twelve people may have an intense interest but about which the rest of us could hardly care.

In addition, journalists often tend to stress issues of obvious significance to people now, sometimes missing the more subtle or long-range aspects of new work that have less "immediate" value.

Finally, there is the whole journalistic style of putting unqualified, headline-like statements in the first paragraph, with increasing details and qualifiers banished to the following paragraphs, and with—especially in the view of scientists—necessary caveats appearing last. I have on more than one occasion known editors to chop off the bottom few paragraphs that responsible journalists had loaded with appropriate caveats. I still remember a story in my local newspaper quoting me. The headline, "Scientist Predicts Ice Age," was followed by a total of two paragraphs that attempted to tell readers all about what the ice age would do to the economy, population, and other things of social interest, all described in the most dramatic terms. The editor—who in my opinion was completely irresponsible and should have been disciplined—had chopped out the bottom paragraph, in which I was properly quoted as saying, "but we have 10,000 to 20,000 years before it happens!"

Science journalists, in particular, are going to have to be very tough with their editors, some to the point of threatening to resign, in order to minimize this problem. The journalists could point out that they will lose their best sources of information if people who are not involved with the story make arbitrary editing decisions after a writer has spent a great deal of time assembling a balanced presentation. Perhaps the best journalists already know how to write a scissors-proof piece by including the right degree of caveats along with each paragraph. If so, then the problem is one of merely spreading this art more widely among the general practitioners.

QUESTION: Several people have suggested that scientists and journalists sometimes disagree on what constitutes a valid scientific source. For example, some scientists argue that journalists often give too much space to "extremists" in the interest of balancing their stories. How do you feel about this issue?

RODGERS: American journalistic tradition seeks "truth" with what someone has called a two-handed approach. That is, reporters attempt to balance information "on the one hand" with information "on the other hand." For the novice science writer, especially, there is security and comfort in this formula. It provides at least a patina of "fairness," and if enough "hands" are investigated, visible evidence of a lot of work.

The charge that journalists often give too much space to "extremists" may arise from scientists who misunderstand or ignore this traditional ap-

proach to reporting. It is as deeply entrenched among journalists as is the scientist's commitment to scientific method. In our efforts to get all sides of a story, presenting fringe positions is inevitable.

However, I agree with some of the scientist-critics of this tradition, because the practice may do little more than provide cover for a science journalist's unwillingness to make a judgment. The journalist is more than a stenographer; he or she is also a gatekeeper. At some point a position must be taken. There is not always an "other hand."

On the other hand (sorry!), scientists often take the position that "accuracy" requires an unwillingness to take a position. Or they may practice their own form of timid investigation and operate from the philosophical base that there is no "truth." Existentially, I may agree. But followed to its logical conclusion, this stance denies a social conscience to some of the best educated and most thoughtful human beings on this planet. Real people who must make real decisions on the basis of always imperfect information must come away from a science story with at least some basis for getting off the dime.

In sum, what I'm saying is that the processes of both science and science writing take some guts and some willingness to commit to a point of view or a conclusion, on paper or on the airwaves. Good science journalism can be objective, but the finished product can never be neutral.

FLATOW: Moderation is not what makes "news." Rightly or wrongly, newspaper journalists and broadcasters do not make a living reporting that "nothing is wrong."

However, I think that many times extremists are given too much space in stories because "balance" is missing. Sometimes this balance can only be supplied by reporters knowledgeable enough to know where to look for the other side of the story. Remember, too, that extremists can turn out to be right!

SCHNEIDER: This issue of balance can take several forms. For example, many scientists are nettled when a journalist feels his or her responsibility for fairness has been discharged simply by quoting one lunatic fringe against another. It is imperative both for the credibility of the scientific community and the education of the public that reporters have a reasonable sense of what the spectrum of prevailing scientific opinion is on some complex subject so that they can choose where the middle is and avoid being caught in a fruitless debate between jargon-wielding, often special-interest extremes. Sometimes this is difficult to do because it means getting involved enough in the subject to find out where the middle is, but frankly, people unwilling to do so should turn in their press cards.

Another form of balance often nettles some scientists, including myself. I have often been "used" by journalists who have quoted me accurately on a particular topic and then used that quote to balance a story. So if the story was balanced, why do I complain? Primarily because the quote dealt with something only peripheral to my interest and, in fact, could well have been outside my principal field and outside the principal thrust of the interview. Thus, when colleagues see me in print talking about, say, nuclear

power, even though I only used it briefly as an analogy to carbon dioxide's effect on the climate, they begin to wonder why I've become an instant expert in all subjects and why I don't spend the bulk of my time talking about my field. Many scientists feel they have been abused when their principal points are ignored and only peripheral comments—usually dramatic or quotable ones—are taken out of the context of the overall presentation. Consequently, this practice bothers scientists even when the quotes are fair representations of the limited context in which they were made.

TROTTER: Scientists may complain that journalists give too much space to extremists. But if properly done, this can be a useful ploy. In some cases, it is possible to give the extremists enough rope to hang themselves. In other cases, it is possible to set up the extremist position and then knock it down with a more rational view. Either way, the story should leave the reader with a balanced or accurate view—and the journalist still has the extremist viewpoint to use for a “grabber” lead. The question of extremists is related to the question of accuracy. Extremists often are used because they make good copy, but they should be used only if the end result is an accurate and balanced story.

QUESTION: A perennial point of confrontation between scientists and journalists is “fact checking.” Scientists often want to examine a journalist's story before publication to check for inaccuracies. Journalists, on the other hand, are loath to turn their manuscripts over to any source at any point. What are your experiences with this dilemma (if, in fact, you consider it a dilemma) and how do you personally react to it?

SCHNEIDER: If there is one thing I can't stand, it's the flimsy excuse that phoning back a source to check the facts—or even the whole story—is somehow compromising “journalistic independence.” There is no way a source can hold the pen in his or her hand that could change any word the journalist wishes to write. On the other hand, the source can make it very uncomfortable, ethically or otherwise, for a journalist who doesn't wish to change something that is incorrect or exploitative of the source.

I can't for the life of me understand how independence is compromised when a journalist checks back with a scientist on complex and often politically sensitive issues to be sure that—in the opinion of the scientist—the story is accurate and balanced. If the journalist simply believes that the scientist is trying to “cover his tail,” then he or she should by all means avoid making the changes the scientist has requested. But that journalist also must be prepared to defend him- or herself later on.

On the other hand, scientists tend to be about as dense as lead in understanding the problems that science journalists face in dealing with their editors and with the public. So I don't see scientist-journalist problems as a one-way street. But if journalists checked back more and were perceived as more responsible, I'm sure that scientists would be more willing to talk to them. Right now, when somebody mentions to scientific colleagues that he or she has just gotten off the phone with “that newspaper reporter,” a frequent response is snickers.

RODGERS: "Fact checking" is at best a euphemism and at worst a con. The issue in the flap over fact-checking privileges, for both scientists and journalists, is mutual trust and respect or the lack thereof.

It is certainly a worthwhile goal to enhance mutual trust and respect between the scientific and journalistic communities. I personally believe it is. But the primary goal of journalists is to get information out as accurately and quickly as possible. Furthermore, there is a certain "adversariness," to coin a word, built into the pursuit of this goal that has stood the test of time as a means to serve the public interest.

The process is imperfect. Inaccuracies get into print. Some journalists fail to uphold high standards. But before we apply corrective measures, let's make certain they do not rely solely on simplistic "fact-checking" formulas. Otherwise, the cure may be worse than the disease.

I have worked with many of these formulas. All have benefits; all have risks. Broadly speaking, the benefits include some peace of mind on the part of the scientific source and an expert hedge against inaccuracy for the journalist. The potential risks are, however, important concerns, because implicit in any—repeat, any—system of "checking back" are promises of power and penalty.

The journalist knows that when she goes back to a source to read her story, she is offering that source some say over more than the facts. It is both a professional and human quality to exercise that say, particularly, as Schneider notes, when the issues are complex, politically sensitive, or linked to social policy.

The scientist who offers to cooperate with a journalist only if he is allowed to "fact check" knows this very well. For again, implicit in the system is the promise of penalty if the journalist refuses. Perhaps the source will not cooperate, or he may complain to the journalist's editor or publisher. Aggravating the situation are deadlines and the inevitable misunderstanding on the part of scientific sources about the role of science journalism. Science reports in newspapers, magazines, and on the air are at best tentative. They are not meant as stenographic reports, final words, or monuments.

Let's suppose, however, that the journalist agrees to check back. While theoretically, or in the best of all possible worlds, it is true that the source cannot force the journalist to change what he or she has written, the reality is often in my experience, otherwise. Women's and other mass circulation magazines are a case in point. They have some of the most ferocious fact-checking systems in use anywhere in the free world. They send full manuscripts not only to particular sources but often to consultants who sit on their boards. The upshot has been galloping timidity in scientific and medical copy. When a journalist knows that sources are given unlimited access to copy, after a while he begins to avoid making certain inquiries or reporting certain information. This self-censorship is born of the journalist's long experience with frustration in trying to defend material that a source questions.

In the hands of sensitive, knowledgeable, and professional editors, these abuses of the fact-checking system are minimal. I know because I have

worked with such editors. They do exist. Unfortunately, they are not in the majority. Even on science magazines, there are some editors who, as a matter of policy, opt to placate a vocally unhappy source at the expense of a science journalist's report. Recently, an editor whom I respect elected to remove an entire reference to a piece of *published* research because the scientist who wrote it refused to confirm the current validity of the work unless he got to make major additions to the manuscript.

So where does that leave us? To my way of thinking, we're left with an imperfect but nevertheless workable process of challenge, compromise, and standard-setting. It's a feel-your-way system all up and down the science journalism front lines; it's a system to muddle through. My guidelines are as follows:

1. During the interview process, or certainly before leaving the source, science journalists should periodically and carefully go back over technical, complicated, or sensitive ground. I say things such as, "Let me make sure I have my facts straight," and "If I interpret your conclusions thus and such, would you agree?" This approach serves two purposes: one, to check on accuracy, and two, to reassure the scientific source that I am determined to be accurate and that I will take care not to misinterpret what he says or does.

2. I ask my sources to tell me who in their field would agree and disagree with them and who else in their field they think I should speak with. Again, this approach serves two purposes: to let the source know that I intend to check out what she says very carefully and to reassure her that I want to give her view a fair treatment.

3. I say nothing to a source at the beginning of the interview about going off the record or fact checking unless the source asks. If he brings the subject up, I ask that the source be as specific as possible about what is to be on or off the record. This gives me a sense of what the source is anxious about and a clue to how I can reassure him.

4. If the source insists on seeing the manuscript or on having me read back material, I may offer to read back direct quotes and specific technical matter. I also try to tell the source in what context generally I plan to place her material.

5. If a source wants to know why I am reluctant to send the manuscript to him or read it to him, and if I have time, I briefly summarize what I've written above. I don't, by the way, plead my case on the basis of "compromised independence."

6. When a source complains about an inaccuracy, I check it out fast and respond personally.

I think Steve Schneider hits an interesting note in his statement that "if journalists . . . were *perceived* as more responsible . . . scientists would be more willing to talk to them." In order for mutual trust and respect to enhance accurate science reporting, *both* journalists and scientists must perceive those traits to be in place.

QUESTION: In journalism there appear to be no explicit ground rules governing the kinds of information that belong in a science news story. When writ-

ing about research, for example, how much and what kind of details belong in a journalistic account? How does a journalist know when to stop

FLATOW: The detail, of course, depends upon the audience. A more technical readership needs and deserves more detail, but they may rightfully expect to find it in a technical journal rather than in the mass media.

Unfortunately, the question of detail becomes more and more important as our technical society gets more and more complex. In a society that depends upon high technology, decision makers and the public must continually juggle their need to know with their ability to understand.

In daily news broadcasting, detail is usually kept to a minimum. Broadcasters realize that they cannot and should not attempt to take the place of the written word by providing detail. Usually, once a broadcast story goes by, it is lost. There is no way to go back and "hear" a sentence again as one might reread it in a newspaper or magazine. That's why broadcast writing is as simple as possible. However, there are times that cry out for details, such as life-and-death situations, and these details must be repeated as often as necessary to make the point.

O'LEARY: A good science writer puts a certain amount of background research into a story in order to help readers understand the broader context within which the story falls. For example, while serving as a spokesman for the medical center during the Reagan assassination attempt, I spent a tremendous amount of time with reporters on background, on broad context. I was concerned about translating medical facts for a lay public, but much more important to me were balance and tone. Reporters had to understand what a fact meant, how important it was, and that it should be presented as neither more or less important than it was.

If reporters have done their homework, then they understand the context within which facts lie, and they are going to produce a better story regardless of the circumstances.

TROTTER: Journalists writing about research should include enough detail to explain how important conclusions were reached. The amount of detail provided, however, will differ depending on the audience. Readers with a technical or scientific background may feel cheated if they do not get enough information. Less sophisticated readers may not be able to follow anything more complex than the basic steps of a research project.

Communication is the goal, and the wants, needs, and abilities of the audience must be considered if the communication is to be effective.

SCHNEIDER: I generally tend to side with the journalists in the sense that their stories are primarily intended for the public and thus should contain a reasonable background summary of the issues, regardless of whether such a summary is "original" from the scientist's point of view. I also think that emphases on policy or other "vague" issues of public interest constitute perfectly legitimate foci for stories.

On the other hand (there is always an "other hand"), a few strokes for the fragile egos of specialized scientists whose chief rewards come through recognition of their major achievements (even if those achievements are

really minor in the general scheme of things) is more than a nice gesture. It may even add information of interest to some readers. At the least it will gain for the journalist a friend who could act as a reliable evaluator of the accuracy of future stories that deal with the same subject.

RODGERS: The amount of detail in a journalistic account and the extent to which the science journalist sticks to the scientific account are determined largely by the peculiarities of the topic, the medium, and the contingencies of preparation time and space allotment.

If I am writing about prostaglandin synthesis for the *Ladies' Home Journal*, I will not describe the biochemical pathways of the pituitary in detail. I will describe what the research is likely to mean to women with fertility or menstrual problems. If I am writing the same piece for *Science 85*, I might focus on benchmarks in the history of prostaglandin research and on the people who carried the research along. And if I am writing it for *Scientific American* or a high-technology publication, I would want to provide great detail on lab methodology. If I am writing on the subject for a daily tabloid, the story would probably be a newsy account of a published paper or meeting report.

QUESTION: How should journalists deal with the need for immediate information during a crisis that has scientific or technological aspects—crises such as the accident at Three Mile Island or the Reagan assassination attempt—when only incomplete information is available and when sources need time to put such information together? In other words, how does the public's right—and need—to know get balanced with the potential for delivering erroneous information?

FLATOW: This is one of the most difficult decisions facing science journalists: how much incomplete information can still be labeled "responsible journalism"? Should a reporter tell "all" that he or she knows, realizing that this may entail communicating information that could be inaccurate, misleading, or potentially dangerous?

In the case of Three Mile Island, the public's right to know was overriding because a disaster might have occurred. Word of a crisis might have helped people make decisions about whether their lives were in danger. In this case, though, it turned out that no one knew at the time how dangerous the situation really was; they didn't know how much damage had been done to the core. Conflicting information from company officials and federal investigators only served to make the picture even fuzzier.

The Reagan shooting resulted in a different kind of panic. No lives were in danger on a mass scale. But the sheer scope of the situation—the shooting of the president—made it an event of the utmost public attention.

Having experienced the TMI confusion firsthand, I decided during the Reagan crisis that the best way to deal with the overload of incomplete information was to simply tell my listeners that "we don't really know what the truth is. Here is the best we can do. You'll have to live with the 'facts' as we know them at this moment." Thank goodness we did not air an obituary for presidential press secretary James Brady, as did other media. Those pre-

mature announcements of Brady's death were undoubtedly caused by the pressure to be "first" with the news, but in this case the journalists who were "first" were also wrong.

SCHNEIDER: It seems to me that there is a simple operating rule: don't offer as truth what you know to be rumor, speculation, or soon-to-be-revised statements. By all means report what is known or said, but give people a sense of what it is worth! Use plausible alternative scenarios, if you can get some, and try to explain the ramifications of "what happens if." At least this will enable readers or viewers to anticipate the options and to deal with the truth when it ultimately comes out. While headline writers will never do such things as scenario analysis, good journalists need not always be reduced to the lowest common denominator in their writings.

TROTTER: The public has a right to get accurate, not erroneous, information. In times of crisis, such as Three Mile Island, a good journalist will have or find sources who can discuss the situation and evaluate it based on the information available. But the resulting story should always indicate that it is based on incomplete information. Even an incomplete story can be good if the reporter explains why it is incomplete. Again, the emphasis should be on accuracy.

O'LEARY: First of all, there's no such thing as a well-organized disaster. The more complex the disaster situation, the more unlikely it is that leadership will emerge quickly, not only to take charge of the situation but also to provide understandable information to the public.

The situation I dealt with (the Reagan assassination attempt) was in a sense much easier to handle than something like Three Mile Island, where there was the potential for multiple injuries. If one is going to be the spokesperson pulling together information, there has to be some way to gather that information and to make some sort of coherent presentation to the public. The public is probably not well served by fragmentary, piecemeal information. Since gathering information takes a finite period of time, there is going to be a delay in relaying that information to the public.

The next question is how much of a delay is reasonable. At The George Washington University Medical Center we delayed in producing information at first because our patient was in surgery. The people with the information were the doctors who were taking care of him. Their first responsibility was to care for the patient, and then, secondarily, they were responsible for relating information about him. Once surgery was completed, we were able to move forward in preparing a response for the public.

Through the early days of that period we were producing press releases and meeting with the media twice a day. But when it was time for, say, the afternoon press briefing and something was going on, we would delay the briefing as long as we could in order to provide as much information as possible. For example, on the fifth day of his hospitalization, President Reagan underwent a bronchoscopy to remove some secretions from his chest. We held up the afternoon briefing long enough to know the results of the bronchoscopy procedure.

We must be sensitive to the needs of the media, but meeting these needs may be a juggling act. You cannot serve only your own needs and you cannot serve only the media's needs. Invariably there are going to be some compromises and you do the best you can.

RODGERS: For good or ill, the public demands immediate gratification of its news hunger. It's a fact that must be dealt with, not an issue to be debated or something to be blamed on someone. If that fact is the starting point, then the goal of science communication must be to keep channels open. That requires coordination of effort on both sides: those with the information and those who transmit it to the public.

Those with the information and expertise can perform best when they equip spokespersons with frequent updates on information, when they give them free rein to respond to press inquiries, and when they provide sufficient round-the-clock access for the press. Otherwise, they inevitably create communications bottlenecks that frustrate reporters to the degree that some journalists will go with rumors, guesses, or other questionable information.

My approach to crisis science journalism, in general, is to maintain a home base through which information can be filtered and checked. That base gives the journalistic specialist better access to his or her expert sources, files, libraries, and other media, including wires, television, and competing newspapers. During a crisis the science journalist functions best, in my opinion, as a resource and gatekeeper rather than as a street reporter. During Three Mile Island, for example, I believe I did a better job sitting in my newsroom, talking to health physicists and nuclear engineers to supplement and explain the information coming out of the chaos at the Pennsylvania press site. During the Reagan assassination attempt, the need was similar.

Finally, I have a bias about science communications that may be as unpopular with science reporters as with scientists. It is this: if the choice is between getting some information out—even though it has a high risk of carrying some inaccurate or misleading material to the public—and getting no information out, I choose the former.

In my experience, attempts to guarantee 100 percent accuracy by withholding information are a poor trade-off. And they almost never work. The good science journalist will *always* strive to be 100 percent accurate and will never fail to report her reservations about the veracity of information along with that information. But there comes a point when the science journalist must "go with what she's got," even if in her heart of hearts she suspects it won't stand the test of time. Good communications is a process; it has to start somewhere. Unless initial information gets out, that process will be short-circuited and stunted, possibly with worse consequences than would result from a piece of inaccurate or incomplete information. Without the first report, there is no opportunity to rebut, discuss, challenge, explain, or educate.

Both Sides of the Fence: The Scientist as Source and Author

Stephen H. Schneider

Although the most frequent role for a scientist in the science communication process is that of an information source for journalists, a growing number of scientists are becoming public communicators themselves. Stephen Schneider fills both roles, as source and communicator, and in this chapter he suggests strategies for surviving and thriving in this dual capacity.

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HOW—AND WHY—DOES A SCIENTIST one day find himself or herself both a source and author of science information for the public? There are, no doubt, many different answers. I'll offer mine from the perspec-

tive of personal experience. My initial moment as a source occurred early in my first postdoctoral year, when a Radio Sweden reporter found me at an international meeting, backed me against a locked door, stuck a microphone in my face, and asked, "Dr. Schneider, you have said in a recent paper that human pollution will [actually, I had said "could"] bring on the next ice age. So when will it begin?" I no longer recall how I answered that question, but I vividly remember my feelings: fright, exhilaration, and a (somewhat overblown) sense of self-importance. I also learned from this first loss of scientific innocence that being interviewed poses a substantial element of hide-and-seek between a reporter looking for juicy quotes and a scientist trying to minimize damage to his reputation from oversimple public pronouncements or outright media distortion. The game viewed from my side is simple enough, although the solution is difficult: try to say something with sufficient impact to keep me in the story which at the same time will keep me in my job. Steering a safe course between scientific respectability and good copy isn't easy, particularly for a young scientist. It's even tougher when the pen—or editing pencil—is not in your own hand.

It was, ironically, several additional encounters as a source that ultimately led me to become an author. At the center where I work we have a public information office that has a clipping service. Every time my institution's name appears in one of several hundred newspapers or journals, we receive a clipping. In addition, every six to eight weeks the public information office compiles all these clippings and mails them out to a rather sizable fraction of the atmospheric science research community. About ten years ago I got an eye-opening lesson in the perils of being a young—that is, pre-tenure—source of public science. At an AAAS conference I delivered a paper on some possible inadvertent effects of human pollution on climate. Unknown to me, the distinguished silver-haired gentleman sitting near the front taking careful notes was Walter Sullivan of *The New York Times*. Although the story that later appeared was both responsible and a great delight to my New York City relatives, its trail across the country left me truly shocked. At first things went fine. In addition to the *Times*' use of the article, several other newspapers picked up the story within a few days of its initial publication. These not only acknowledged the source, but they also included Sullivan's byline. Perhaps a dozen other publications condensed or paraphrased the story, attributing much of it to Sullivan and the *Times*.

Then, things began to change as clippings of variously edited versions of Sullivan's story came out of the hinterlands. By the time some newspapers were finished, bylines of local reporters had appeared and Sullivan's role had vanished. One newspaper, in a drought-prone area of the Great Plains, had even changed Sullivan's emphasis on weather modification to a distorted story on water modification. Ultimately, I

learned that even good stories pose risks after one of my colleagues posted this last, distorted clipping on the door of the weather map room where nearly everyone could see it.

Paraphrases of the source by the reporter—or by another newspaper—are often believed by the scientist's colleagues to be accurate reflections of his statements; implications and conclusions of the story are, likewise, usually assumed to be coincident with the source's views. Thus, only a few bad stories can cause a lot of damage to a source. Because of this bad early experience and several similar ones over the next half-dozen years, I eventually concluded that there were only two ways I could ever expect my colleagues to get a fully balanced account of the totality and tone of my public statements: (1) send them all the diverse and sometimes contradictory clippings put together, since, *taken together*, the ensemble of stories coming in from our clipping service almost always yielded something close to what I had said; or (2) do my own writing and be responsible for it. Since the former was difficult to achieve, I chose to do my own books.

From Source to Author, and Back Again

I discovered two things in the wake of writing and promoting my first book. First, those who don't like the idea of popularizing by scientists will take any opportunity to discredit the popularizer. Second, the message of most scientists who do their own writing is really not carried to the general public by his or her own words (with the rare exception of a Carl Sagan or a Margaret Mead); rather, its transmission still is dependent on science journalists. In this case, the reporters write stories based on the scientist's writings rather than taking the usual route of a personal interview.

There are probably two generalizations I can make from my experiences in dealing with journalists. First, science journalists almost always do a better job of "getting the story straight" than general assignment reporters sent out into what many perceive as the intimidating—or dull—science beat. Second, in my field at least, the quality of science writing from the hard core of full-time science writers who regularly attend the annual meeting of the AAAS has improved immensely since the early 1970s. Indeed, some reporters have become so sharp in climatology that they can even quote back to me previous years' statements which were slightly different from this year's, wanting to know why things have changed. Reporters with such a steep learning curve tend to be those who call up to check back with me to be sure that the facts of their story accurately reflect my views. Over time I've learned whom I can trust. These reporters get juicier quotes simply

because they can be relied on to put such statements in a context that doesn't do violence to the balance of my own views. Ironically, as mentioned earlier, I've found that my popular writings have primarily helped to inform this group of reporters and thus have helped improve the general quality of stories on weather and climate they write. These journalists, more than I, have communicated my written ideas to lay audiences. My attempt to break into the scientist-as-author category has merely reinforced my initial role as a source.

Controlling the Interview: Finding the Compromise

While most scientists' roles as popular authors cannot really be separated from their roles as scientific sources because their books have their primary impact on the public through the science press rather than directly, some practical distinctions can be made between the role of scientist as source and scientist as author. Let's discuss the source role first.

As a source, I have come to realize that a journalist who interviews a scientist often is stuck between an editor demanding a jazzy news peg or a dramatic storyline and a source hoping to put his best scientific face forward, with "best" defined within the value system of the scientist's colleagues. Often, what impresses these colleagues is of little interest (or use) to lay persons grappling with their own scientific illiteracy.

After a decade of experience, I have developed several strategies as a source. First, I try to anticipate what I believe the public wants—and needs—to know about atmospheric science problems. Rather than stress my own work in interviews, I generally try to present a broad overview of the entire field with very little specialized detail; then, later on, I hone in on the particular specifics to which my own research contributions may be relevant. At first this was resented by many of my colleagues as taking credit for other scientists' work, but by now most of my peers have become used to me as a self-ordained "mouthpiece" for the field, and thus they expect me to describe more than my own work in interviews, and they even encourage me—as long as the product isn't too wild.

Second, I try to get a reporter to include in a story some notion of the longer-term, global-scale, policy implications of scientific research, and the recognition that public decisions to deal with these issues are *value judgments* for which scientific expertise is only an input, not a special license to choose for society how to act. I admit that I often bring these policy issues in, even though I may not be asked about them in an interview. However, I feel that being a source is a two-way street: the reporter is getting information that can help lead to a credible story, and I am get-

ting public exposure for ideas that I think are important and for which the media are my best routes to the public. While I never expect a writer to hammer out a story that reflects all—or even most—of what I want said, I do expect that at least some of the material I want aired will appear. Very often, and particularly with veteran science reporters who understand the interplay involved, we both seem pleased with a compromise outcome.

Third, I use analogies and metaphors that are common to the experience of most readers but don't do violence to the scientific content that the metaphor is to illustrate. Economic analogies—in particular, personal budgets—are very useful in my field of climatology.

Some Tough Standards for the Scientist-as-Author

Except when I am writing very narrowly about those subjects in which I have research experience, I, too, am a science journalist in my popular writings. Yet there is a difference, for I believe that the scientist-author has special standards to maintain. For example, my book-writing technique usually involves at least four drafts. The first one or two are negotiated between myself and a coauthor, typically a science writer. Third drafts follow after consideration of comments from sharp, close friends—typically my graduate students and postdoctoral fellows. Then the third-draft chapters go out to perhaps a dozen outside scientists who are experts in the diverse fields from whose work I have drawn. I ask them to be tolerant of the popular purpose of the book but to be brutal in order to keep me honest in their respective disciplines.

The other side of this coin is that my nonclimatologist manuscript critics can send me their writings containing climatic components, and I do for them what they've done for me. Over the years I have built up a network of such contacts in a variety of fields, and I feel that these critics of my journalistic activities distinguish science writing by a scientist from science writing by most nonexperts.

There are other distinctions as well. For instance, I firmly believe that it is not sufficient to simply put down a quote or two from scientist A and an opposite set of views from scientist B, judging that my obligation for fairness to the reader is met. I feel that the public expects me as a scientist to do more than quote fairly the differing views of other scientists; I also should provide an assessment of the worth of these views. *If I repeat in print someone else's opinion without criticism or comment, then it has implicitly become my opinion.* After all, am I not supposed to be in a better position to judge the validity of other scientists' opinions than the lay reader? That may not always be true, but I believe it to be a widespread perception of lay readers of books by scientists.

In contrast, most science journalists present opinions of various scientists fairly, often juxtaposing one extreme view against another. Occasionally, a journalistic author takes sides, but this is not enough. The public needs to know not only which extreme expert is at the throat of which counterpart but also something about the *spectrum of scientific opinion* on the subject, with some indication of where extremes fit on that spectrum. People need a sense of the *likelihood* that any scientific opinion might be correct, and they should be told of the possibility that we can't tell yet who is correct or if indeed any of the present theories might ever prove right. There are exceptions, of course, but most popular scientific writings by journalists don't go far enough to give a true sense of the spectrum of scientific opinions on an issue, nor do they offer probabilities as to who might be right or even discuss what it will take to resolve the uncertainties.

On the other side, many scientist-popularizers are not very interesting storytellers or are not very good writers. Even if they correctly describe the spectrum of opinion in their field, they may be doing it to an audience of a few hundred specialized or professionally interested readers. Of course, there are a few notable exceptions, such as those scientist-authors who tend to get on the best-seller list and command large public followings.

Trial by Television

Finally, let me come to a point where "scientist as author" merges with "scientist as source": television and radio appearances. Whether pushed into the electronic media by one's publisher or invited by the networks, scientists who write popular books often have a surprisingly easy time getting such media appearances. For me, few things are more frustrating than having to condense 500 meaty pages into 500 words that must include two good jokes and one dramatic conclusion. However, such talk-show appearances have at least one distinct plus: you live by your wits and what is said is not paraphrased, misquoted, distorted, or interpreted, for what you say is what the viewer gets. If things go wrong, it is probably your fault.

One also may be involved in serious interviews on film or tape by serious evening news reporters or feature media journalists. These may be less frustrating encounters than entertainment shows but present the same risks for a scientist as do interviews with the print media: journalists can paraphrase and select quotes.

Like print interviews, those on television require simple statements of complex materials and are helped by everyday metaphors. To com-

municate successfully one learns to fashion carefully worded—yet sufficiently dramatic—quotable quotes. The primary difference between the studio and the notepad interview is the pressure: the camera catches your eyes, your twitches, your crumpled suit, your uncertainty, and your five o'clock shadow. Perhaps these added stresses help to explain why only a relatively small number of scientists are interviewed and reinterviewed on a variety of scientific subjects on television. Print journalists, on the other hand, can draw from a much wider pool of scientific talent for their sources, since a scientist's nervous demeanor or other appearance-related aspects do not matter. The scientist can be laundered by the pen of the writer.

Scientists and Journalists: Partners in Communication

In summary, then, my views from both sides of the fence are surprisingly similar: the scientist-as-source and scientist-as-author are usually not very independent roles. The public learns about most of a scientist's popular writings through journalists who report on them rather than through firsthand reading of the scientist's own words—with a few spectacular, best-selling exceptions.

However, there are differences between these roles, too, since I believe the scientist-as-writer has the obligation to provide readers with critical evaluation of the spectrum of scientific views in his or her field—and the likelihood of their validity. The scientist-as-source is less obliged to fashion such broad perspectives and more constrained by the narrower subjects imposed by the interviewer. However, I believe that the source should still go beyond the narrow technical questions and offer some overview and implications of his or her work—assuming, of course, that the source has thought seriously and read widely about such implications and isn't merely talking off the top of his or her head!

Scientists-as-writers emphasize those points they believe the public should know, whereas scientists-as-sources have to work hard to convince journalists to write about what they think the story should contain. Some compromise between interviewer and interviewee probably leads to the best story, for few scientists or journalists could, by themselves, capture the essence of what's important in a complicated field and communicate it in an interesting way to the public.

Therefore, I don't see the science journalist, scientist-as-journalist, or scientist-as-source in their conventional roles as independent or adversarial entities. The public needs information from all of these incarnations to get a readable and honest impression of what is going on in

science and what it means for them. Reducing tensions among these groups, primarily through better appreciation of each other's interdependent roles, is a major priority for our respective professions. Given the increasing importance to a democracy of a scientifically literate public, this priority for better communication among the communicators is also part of our obligation to society.