Science Information and the Public— A Review of Literature

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Informing the public about science: Is it an awful bore, or is it of critical importance to the survival of the world? This article is a review of literature that addresses this question. Most of the major research articles are reviewed and a bibliography is provided. This research was originally done to provide background and support for a video documentary on the flow of science information from scientists to the public via mass media.

In reviewing the sometimes immense difference of opinion that exists about the need to tell the general public about science, a good place to start is with Leon Trachtman and Issac Asimov's point/counterpoint article in the 1983 winter issue of *National Forum*, the Phi Kappa Phi journal. The authors place the major points of the argument in perspective and argue opposing points of view admirably.

Another good place to gain a basic understanding of the potential problems of science communication is with Hillier Krieghbaum's *Science and the Mass Media*.

According to Krieghbaum, communication of science to the general public faces a number of inherent obstacles. For one thing, relations between the news media and the scientific community often are strained as the result of defaults or defects on both sides.

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Many science writers realize this. Victor Cohn, formerly a science writer for the *Minneapolis Tribune* and now for *The Washington Post*, in a speech to the American Association for the Advancement of Science in 1964 placed some of the responsibility on the scientists.

"You publish, publish, publish some of the most unimportant stuff that has ever been published in the history of science; it's almost as bad as some of our stories," Cohn said.

He went on to indicate that too many papers are being written for too many journals that basically lend an association prestige or make some middleman some money. Nineteen years ago when Cohn published his speech in *Science*, he said that each week he received in the mail enough journals to stack two feet high; *The New York Times* got between one and three feet of journals every day.

Scientists tend to show little sympathy for Cohn's position. Some think Cohn is not part of the audience they are trying to communicate with; their peers are more important than Cohn and his audience, the general public.

Many communication and social science researchers have reviewed the problem of divergent audiences and conducted research to examine the effect of catering to different audiences on the flow of science information.

In a *Journalism Quarterly* study of scientists' and journalists' attitudes toward media coverage of science, Michael Ryan examined the extent to which scientists and journalists agree about major issues in science coverage, the extent to which the two groups perceive differences in their views, and the extent to which individuals in each group accurately predict the views of individuals in the other group.

Three variables were generated: agreement, congruency, and accuracy. These variables were measured by using questionnaires with 38 statements relating to science news coverage and its problems. The 38 statements were selected by Ryan by first creating a pool of nearly 100 items relating to various problems and issues in science news coverage. Statements were taken primarily from the works of Ryan, James Tankard, David Burkett, and Krieghbaum. All attempted to identify through systematic procedures some of the major problems in media coverage of science.

Results indicated that the attitudes of scientists and science journalists toward science news coverage are remarkably similar.

But, there were areas of definite disagreement. Science writers strongly disagreed with the idea that it would be a good general policy to have their stories checked by the scientists quoted in the articles before publication. They also disagreed that they should rely completely on the scientist to point out the most important contribution of the scientist's work or that a scientist should release information to the press only after it has appeared in a peer-reviewed scientific publication. And they felt strongly that science writers should not interpret a scientist's technical conclusions. Scientists strongly agreed with each of the ideas. Futhermore, science writers agree that they rarely sensationalized the news, while scientists disagreed.

According to Ryan, it is in these areas of disagreement that serious barriers to effective communication exist. Such barriers have serious implications for science news coverage.

One proposition, relating news reporting in general to the characteristics of a social system, was presented by George Donohue, Phillip Tichenor, and Clarice Olien in *Journalism Quarterly.* They indicate that the more pluralistic and differentiated a social system is, the more likely mass media will perform a "feedback-control" function as well as a distributive function. This " watchdog" role of the press means the mass media will keep a watchful eye on social institutions and report any apparent deviations to society.

One possible reason for some of the disagreement discoved by Ryan might be the increasing aggressiveness of science writers in recent years in pursuing this task. Bruce Cole, writing in *Journalism Quarterly,* analyzed science and conflict coverage in four metropolitan newspapers in 1951, 1961, and 1971.

Cole says the scientific community has become more diverse in the past several decades and that as Donohue, Tichenor, and Olien suggest, the journalists have been performing more than just a distribution function; they have also begun performing the "watchdog" role as well.

Susan Borman, also writing in *Journalism Quarterly*, analyzed three scientific events that combine controversy with scientific significance and the coverage these events received. Each group of articles that was generated by science writers about the three events—fluorocarbon in the ozone layer, pregnant women inadvertently using birth control pills, and recombinant DNA research—was analyzed by ten scientific evaluators.

The major area of criticism from the evaluators was omission of relevant information. The most frequently cited omissions and percentage of articles in which they occurred were: failure to mention research methods, 21 percent; incomplete information about important results, 21 percent; omission of the primary investigator's name, 25 percent; and lack of a qualifying statement important for an accurate impression, 21 percent.

In the cases where the evaluators were complimentary, the key points observed were: (1) results were discussed in a scientific framework, including a discussion of research methods and continuity with past research, as well as inclusion of the names of the primary investigators, (2) speculation was clearly distinguished from points with experimental proof, and (3) scientific terminology was used in combination with descriptive lay translations.

In another area of contention, D. Lynn Pulford quantified the number of errors found in a sample of science news stories. Earlier research by Tankard and Ryan had found an average of 6.2 errors per story, but Pulford felt that the relatively large number of errors per story was more a function of the long list of potential errors that the early research used, rather than a realistic number of discernible errors.

Pulford reduced the number of errors listed on the questionnaire from 42 to 14 and replicated Tankard and Ryan's study. The error rate in Pulford's study was a more realistic 2.16 per story.

But more importantly to our subject, Pulford supports the findings of Borman that omission was a major error factor. The largest portion of errors found in Pulford's study dealt with omission of information from the story. Pulford suggests that perhaps editors should consider running fuller stories containing more information that will place the story in context of its usefulness and applicability to the reader, listener, or viewer, even if running fuller stories might mean running fewer.

Can a science writer convert dull journal reading into enjoyable magazine or newspaper reading without sacrificing accuracy? Some writers such as M. Thistle, writing in *Science*, suggest that very little scientific knowledge can be transmitted to the lay public. But survey work done by Stephen Withey in the 1950's suggests reader enjoyment of science news increases if the news story speaks of accomplished facts rather

than theories, deals with specifics rather than generalizations, and has relevance to human behavior and welfare.

G. Ray Funkhouser and Nathan Maccoby found that science writers can tailor science writing to the general public by using fewer of what they called "science words" and more activity words, as well as using examples and mentioning practical applications.

Alan Hunsaker hypothesized that skilled science writing can increase reader enjoyment of journal material without decreasing reader information gain. Two points worth noting came from the Hunsaker study. The first is that reader enjoyment varies as a function of the type of writing. As expected, reader enjoyment of science material increased as the articles became more "popularized." The second point was that reader enjoyment does not necessarily result in decreased information gain. Hunsaker showed that it is possible to present information in a form that lay people will read without sacrificing accuracy.

The results of the research projects listed above give some indication of the complexity and depth of the problem of delivering information about science to the public.

Turning momentarily from individual research reports, the Spring 1981 issue of the *Journal of Communications* is worth noting. This issue discusses the problems and challenges involved in science information.

Magareta Cronholm and Rolf Sandell offer an exhaustive review of research worldwide concerning the flow of science information to all audiences. Allan Mazur, using a detailed correlational review of several science controversies from the mid-1970's, proposes that media coverage of science news events and controversies tends to ellicit a conservative public bias. Nancy Pfund and Laura Hofstadter reviewed media coverage of recombinant DNA work and found a lack of attention to dissenting scientific points of view and inordinate attention to the industry point of view. Vicki Freimuth and J. Paul Van Nevel reviewed an asbestos awareness campaign and offer an evaluation of the various means used to inform the public about science controversies. As with many journalism studies, the importance of media gatekeepers in providing maximum exposure of the subject is very obvious in this study. Finally, Jon Miller and Thomas Barrington conducted a six-factor analysis of the acquisition and retention of science information to develop models that indicate who

might avail themselves and ultimately retain science information. This study is useful in understanding which parts of our audiences will be most positively affected by science communication.

Transmitting science information to the public is not solely a need of institutions of higher learning and research. With the growth of so-called "high-tech" industries, the private sector continues to encounter similar problems. Joel Strasser, vice president of Industrial and Scientific Communications Services for Hill and Knowlton of New York, writing in *Public Relations Journal*, lists 12 do's and don't's of scientific communications. Strasser's article, "How to Communicate Your Scientific Identity," covers much of the ground that is basic to institutional relations for universities and colleges, but his perspective adds information that is helpful.

Most of the literature reviewed is about science writing for print media. There has been little specific research concerning science news on television or radio perhaps because, until recently, there was little science news or information on television. Even now it is mostly confined to public broadcasting productions such as Nova or infrequent commercial television "specials."

San Francisco Chronicle science writer David Perlman, writing in *Daedalus* in 1974, considered it an outrage that commercial American television should be so bereft of material in an area that can produce so much visually satisfying, entertaining, and enlightening information on a most vital aspect of human culture. Perlman said that "In terms of continuing discourse between scientist and citizen, American commercial television is the most bankrupt of the mass media. Except for major developments that make the front page of almost every newspaper, TV networks pay little attention to science news."

This literature review was originally conducted as background research for a television production on transmitting science information to the public.

Entitled, "Whatever Happened to Mr. Wizard, or How Do We Really Find Out About Science?", the half-hour television documentary charts the flow of information from research laboratories to the general public and documents barriers that may occur in the pathway.

The potential barriers to communication that were discovered and discussed in the documentary include: peer

review of research before it is released to the public; who instigates the meeting between journalists and scientists; the degree of journalistic interpretation needed and accepted; checking a story back with a source, and the problem of perceived errors.

The program presents journalists and scientists expressing their feelings about these potential barriers and what they feel might be the best methods for overcoming them.

The production is being used as a training presentation for groups of journalists and scientists and other communicators who find themselves caught in the middle of this science information dilemma.

Bibliographic Review

This is a list of articles and books that are useful resources in reviewing the need for methods of providing information about science to the general public. All the articles and research cited in this literature review are listed, as well as others which served as background information.

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