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AUTHOR	Ryan, Michael; Tankard, James W., Jr.
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ABSTRACT

Several potential "problem areas" in the science news coverage process were identified through analysis of comments written by 193 scientists who were asked to assess the accuracy of science news stories in which they were cited as the major source. The analysis led to a number of recommendations for improving the objective reporting of science news. To verify their stories, reporters should not rely solely on interviews with scientists or on publicity handouts but should also use journal articles and published reports. In writing their stories, reporters should attempt to find the angle of the stofy, avoid oversimplifying or exaggerating the lead sentence to attract reader interest, quote accurately and in context, use language and terminology accurately, and interpret technical conclusions properly. A special problem in science news coverage which must be overcome by reporters is sensationalizing information. The words "cure" and "breakthrough" should not be used unless the scientist himself approves the words in describing his work. Information sources might also be given an opportunity to review articles for accuracy before publication. Finally, it is important for editors to realize that the practice of cutting news stories from the bottom to fit available space may not apply to science stories, which often need to be reported completely to make sense. (EE)

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PROBLEM AREAS IN SCIENCE NEWS REPORTING, WRITING, AND EDITING

Michael Ryan and James W. Tankard, Jr.

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PROBLEM AREAS IN SCIENCE NEWS

REPORTING, WRITING, AND EDITING

Science writing is a decision-making process, and as such it is fraught with potential problem areas and pitfalls. This paper examines some of the more serious problem areas and illustrates some of the possible consequences of the decisions science writers make each day.

The problem areas and pitfalls were identified in a study of the accuracy of science news reporting in newspapers.[1] The primary focus of the accuracy study was on the quantitative assessment of the accuracy of science reporting through fixed-alternative questions, but many scientists made additional comments.

Comments about the handling of individual science stories often were extensive, and in some cases scientists supplied almost enough information for a case study of an incident of science coverage. Many scientists also went beyond individual cases to comment on science writing in general. General comments and those pertaining to specific news stories were examined to identify recurring problems in science news reporting, writing, and editing.

This paper is divided into three major sections: 1) a brief summary of the method and results of the quantitative accuracy study, 2) a discussion, based on scientists' comments, of problem areas in science coverage, and 3) a brief summary of findings. The second part of the paper is divided into five sections, which correspond to different stages in the science reporting, writing, and editing process: information collection, news writing, special writing problems, source review of copy, and editing.

The Quantitative Accuracy Study

The quantitative accuracy study reported in this section was designed primarily to provide evidence on the kinds of errors (as perceived by news sources) frequently committed in science news reporting. The study represented an extension to science writing of the methods applied by Charnley, Brown, Berry, and Blankenburg to general news reporting.[2]

Specific Methodology

A hundred and sixty-seven newspapers from the 26 states east of the Mississippi River had equal opportunities for inclusion in the 20-newspaper sample from which science articles were clipped. Only newspapers published in cities east of the Mississippi were included because the authors wanted to have the news reports and questionnaires in the hands of the respondents within a week of publication.

The universe was limited to newspapers with circulations exceeding 50,000 on the assumption that smaller newspapers do not publish a sufficiently large number of science news articles to make their analysis economically worthwhile. A total of 167 newspapers east of the Mississippi have circulations exceeding 50,000.

Each issue of each daily newspaper was searched for science articles for three months of 1972. A science article was defined as:

> A newspaper report of empirical results obtained from controlled observation or experimentation. To be included in the study, a story also must: 1) deal with information obtained primarily from one investigator or team of investigators (51 per cent of any one story must deal specifically

with the work of one investigator or team), 2) report results which are new and the work of the source cited, 3) identify the principal investigator or investigators by name, 4) provide sufficient information about the address of the source that he might be located by mail, and 5) deal with the work of scientists living or working inside the United States.

Articles were clipped and given to one of the authors, who read the stories, judged whether they fulfilled the criteria, and passed them on to the other author, who read and judged the same articles.[3] When the investigators could not agree on whether a particular story met the criteria, it was not mailed.

In the four-page questionnaire sent with each clipping, the respondent was asked to check which, if any, of 42 kinds of errors occurred in the story citing him as the major source. Items for the error checklist were drawn from studies by Berry, Blankenburg, Brown, Charnley, Krieghbaum,[4] and Tichenor et al.[5] and from the authors' own experience. Earlier accuracy studies identified no more than 14 kinds of errors, but the authors attempted to generate a questionnaire including as many kinds of errors as possible. Emphasis was on comprehensiveness; little effort was made to make categories mutually exclusive.

A separate question was designed to measure perceived accuracy of the lead paragraph, since the lead typically capsulizes an entire story and often is written to attract reader attention. The question was: "Was there a significant error in the first paragraph of the enclosed story?" The question was followed by a space for the respondent to check "yes" or "no" and the statement, "If so, briefly describe the error."

Cover letters, questionnaires, clippings, and return envelopes were mailed to 242 scientists. Two were returned by respondents who refused to cooperate, 13 were returned for lack of complete address, and 193 were returned in usable form. Two follow-up mailings were sent to those who failed to respond. The first was mailed approximately one month after the initial mailing and the second was sent approximately one month after that.

The final response rate may be computed in two ways, depending on whether the 13 returned for lack of sufficient address are included in the number sent. If one included the 13, the response rate would be 193 of 242, for a final rate of 79.8 per cent. If one excluded the 13, the response would be 193 of 229, for a final rate of 84.3 per cent.

Results

The mean number of kinds of errors per story--one index of accuracy--was 6.22. The number of kinds of errors reported ranged from 0 to 24 of the possible 42. The number of science stories falling into each category of error frequency is shown in Table 1, page 35, which indicates that 17 stories, or 8.8 per cent of the sample, were reported to contain no errors. More than half of the stories were reported to have no more than four kinds of errors.

The question on the accuracy of the lead paragraph showed that 42 of 193 respondents, or 21.8 per cent, thought there was a significant error in the lead. Descriptions of the errors in the leads ranged from minor complaints about wording and emphasis to major complaints about serious inaccuracies. (Criticisms of the leads are described in detail in the section on lead writing, page 12 of this paper.)

Figures showing the kinds of errors which occur most frequently in science news coverage are reported in Table 2, page 36; the kinds of errors are ranked in this table according to frequency, with the most common listed first. The first nine error types listed occurred in 25 per cent or more of the articles.

Major Problem Areas in Science Coverage

Scientists and science writers evaluate the accuracy of news from distinctly different points of view. The reporter often must sacrifice accuracy (as defined by the scientist) to write a readable and interesting story. The scientist often wants his research presented with all the proper scholarly qualifications and explanations so it will be "accepted" by his peers.

The "errors" and problems in science writing discussed here are those identified by scientists and it should be recognized that writing and reporting described by scientists as erroneous may not be similarly described by a reporter facing deadline pressures, competition, and other difficulties. The problems described in this section fall into five categories: information collection, writing the news, special writing problems, source review of copy, and the editing process.

Information Collection

A reporter can obtain information for a science news report in one of three ways: from a publicity handout, from a scientific paper, or from direct contact with the scientist (either by telephone, face-to-face interview, or the news conference). The reporter may have problems regardless of how he collects his information, as indicated in this section.

Publicity Handouts

One advantage of the publicity handout is that the source can determine what goes into the release and insure that it is accurate, at least from his point of view. As a professor of biochemistry and microbiology said:

> To obtain total accuracy, the [press release reporting his work on antibiotics in animal feeds] had to be rewritten by the investigators. Although time consuming, it is better to edit releases than allow misquotes or misconceptions.

The publicity handout, however, can cause problems, according to some of the scientists in the study, in that relatively unimportant research results can have wider play than they perhaps should. The scientist quoted as the major information source in the following story, for example, said, "This was a handout by our PR man and [was] given more publicity than it deserves":

> A ____ scientist says gigantic waves recently found radiating from sunspots are probably sound waves.
>
> ____, ____ professor of astrophysics, said Wednesday the expanding waves travel at speeds between 18,000 and 25,000 miles per hour and are about 1,600 miles apart between crests. The waves emanate at 270-second intervals, ____ added.
>
> He said these were the first "running" waves ever observed on the sun. Waves seen in the past stayed in one location, he added.
>
> They have been named Stein waves after Alan Stein, a 22-year-old Caltech graduate student who first spotten them in movies of the sun taken at Big Bear solar observatory headed by ____.
>
> Because they maintain a constant speed, scientists believe they are sound waves, since magnetic waves tend to lose speed as they expand.

The scientist, commenting on science writing in general, said that "[the] main problem is that there is no science news reporting. . . . All they ever publish is handouts, which is good for accuracy but lousy for news."

Another scientist, commenting on a science story citing him as the major source, said, "This particular story was not a piece of original research, but a review of the scientific literature on an environmental problem." Results of the review were summarized in a press release which, the scientist said, was quoted almost in full. "I am flattered that the newspaper should pick it up, but it was hardly an imaginative piece of reporting."

An example of what one source considered to be an excessive reliance on publicity releases occurred in connection with a story about the release of Gigi, a radio-equipped gray whale, after a year in captivity. One of those close to the project described the reporting of the whale's release this way:

> We experienced a unique example [of science reporting] in connection with the media coverage of this whale release. As ____, I obtained a large, stable craft for media reps desiring to go out to sea with the release "task force." I arranged to have aboard half a dozen of the most knowledgeable cetologists in the country (who were out here to observe the event and help as consultants). In addition, we had representatives from [the] Depts. of Commerce and Interior aboard, representing the agencies which had granted permits for the original capture and the later release of the whale.
>
> Instead of availing themselves of these people for quotes, for information which would probably not have been available elsewhere, the reporters--ALL OF THEM--chose to go with the provided press kit material and their own observation. I felt that it was a remarkable demonstration of unprofessionalism.

Scientific Papers

Although many scientists objected to the use by newspapers of publicity releases, some expressed the belief that the preparation of stories from another kind of written document--the formal report of results or the published article--is desirable.

One scientist, a medical doctor commenting on the difficulties involved when a reporter with a non-scientific background attempts to handle a science story, said, "There usually is greater accuracy of news reports when the information originates from scientific articles upon publication, since the reporter has copy material available to construct the story." The scientist strongly implied that science news stories should be written after publication elsewhere when he said, "In addition, I think the scientific audience should be informed before general readership if possible."

In some cases, unfortunately, science writers do not have either the time or the inclination to read a prepared paper, as indicated by a scientist concerned about the contamination of spices with potentially dangerous materials. The following paragraph appeared in the story:

> ____ and his colleagues tested 11 samples of black pepper for fungus and for a species of bacteria called escherichia coli. He found fungal colonies in numbers up to 850,000 an ounce, and a bacteriologist detected quantities of E. coli averaging 5.5 billion organisms per ounce and ranging up to 20 billion per ounce.

The scientist noted that the reporter erred ". . . in reporting [the] number of bacteria and fungi per <u>ounce</u> rather than per <u>gram</u> and so came out 29 times too low."

In this case, the news service reporter had access to a written report of the research, but he failed to make use of the paper, as indicated by this comment from the scientist:

> He [the reporter] could have bothered to read the paper (I sent him a reprint) on which the report was based instead of relying only on the phone conversation. None of the three reporters who contacted me by phone or in person on this wanted to read the four page paper we published on this but depended on talk only. Don't newspapermen read?

The Scientist's Role
in Information Collection

Science reporters and persons who provide them with information often assume that the full responsibility for producing accurate copy about research lies with the newsman. Some scientists who commented on the reporter-scientist relationship in the studies reported here, however, said it is incumbent upon the scientist to convey information in such a way that the probability for accuracy is increased.

A Department of Agriculture scientist, for example, said:

> In general I feel that many of the so-called "problems" that scientists have with science writers result from the unwillingness or inability of the scientists to think about their work [in] a simple and adequate manner that the laymen can understand. I have formerly felt that my work was misinterpreted but in recent years, by [watching] carefully how what I say might be interpreted, I have not had any problems.

A clinical professor of psychiatry in another part of the United States expressed much the same sentiment. In discussing the issue of news accuracy with, among others, the managing editor of the newspaper which published the story quoting him as a major information source, the scientist said:

> I related my general satisfaction with [the newspaper's] reporting (I've never been quoted nationally) and Mr. ____ [managing editor] felt it was not always so easy, and that all credit should not go to the reporter. He does know me pretty well and felt that I have certain verbal skills and that I no doubt gave clear information to the reporter to account for "my report of accuracy." I say this not to brag, but because it may be of use to you in your researches to consider the <u>ability of the scientist to convey</u> his work to others, rather than just the reporters' skill.

A pharmacologist places part of the blame for accuracy breakdowns on the terminology used by some scientists:

> Scientists like myself have become so used to a specialized jargon that we have a hard time describing the nuances of

> our work in terms that science writers can comprehend. Perhaps there are certain concepts that take more time to comprehend than these writers can usually afford.

In some cases, the scientist may think the newsman will report what he says inaccurately, no matter how he says it. As a heart scientist said, "There are some very good science reporters--and, as in any field, some clunkers." He also put a great deal of the responsibility for accuracy on the scientist when he said, "It is incumbent on the scientists themselves to avoid becoming the subject of a story written by a clunker."

Scientists might also protect the accuracy of the reports of their research by answering questions selectively, avoiding those questions which are absurd or might lead to inaccurate interpretations. In one case, a science writer for a newspaper covered the results of a scientist's work well, the scientist thought, and a wire service reporter was assigned to re-write the story. This is the scientist's account of what happened:

> When the ____ reporter, ____, phoned me, he implied that he wanted something to liven up his own wire release story--although in this case it seems to me the ____ article by ____ (which ____ had seen before he called me) could have been edited into a condensed, suitably-interesting-enough one, without any additional information.
>
> ____ managed to "liven-up" his story by actually asking [such] questions as: "Were you excited when you dug out the bones?" and "Was (the locality) a weird looking place?", and other such bullshit, obviously so he could <u>truthfully</u> work my replies into his release. (I really shouldn't be blaming <u>him</u>--it was <u>my</u> fault for ever <u>answering</u> such things.)

Writing the News

Science writers, in organizing and writing their articles, can encounter difficulty in finding the angle, writing the lead, quoting accurately and in context, using language and terminology accurately, and interpreting technical conclusions properly. Each problem area is discussed in this section.

Finding the Angle

"Finding the angle" is perhaps an even greater problem in science news writing than in general reporting. One scientist illustrated the difficulties involved by relating this story about a science writer:

> Sometimes [science writers] are more interested in "angles," however, than in sober, accurate reporting. For example, at a recent conference a woman from a West Coast paper was bemoaning the fact that she had talked her boss into sending her to ____ and now she wasn't finding any stories worth the investment. She had to find "news" and there wasn't much there.

In some cases, the attempt to find news or to find the angle can result in inaccuracy and bad feeling between the scientist and the newsman, as did the following report of research on the effects of drugs:

> Drugs may work one way on healthy people and another on the sick, says a ____ pharmacologist who is trying to tailor drug doses to meet the needs of the individual patient.
>
> ____ said in an interview Tuesday that drug dosages are established with research on healthy human volunteers.
>
> But these drugs may not work the same way for the sick person, he added. The dose may not be sufficient to provide optimum therapy, or it may be too great and create a toxic--even fatal--condition.
>
> ____ and his colleagues are studying patients at ____ Hospital and other hospitals affiliated with the ____ Medical School to try to develop ways for doctors to individualize therapy.
>
> He has received a grant of $125,000 from the ____ Fund to establish a division of clinical pharmacology and to support his research during the next five years.

The scientist interviewed for the story and the reporter disagreed in this case about which aspect of the story should have been played up in the lead. "[The] main purpose of [the] release," the scientist said, "was to publicize the grant by ____ to ____--rather than to report any 'breakthrough.'" The information about the effects of drugs on healthy and sick individuals, the scientist said, was given as background to ". . . supplement [the] main purpose of the release--not overshadow it."

Writing the Lead

Lead sentences typically are evaluated by the science writer and the scientist from distinctly different points of view. A reporter may consider that holding reader attention is more important than using numerous qualifying or explanatory words to achieve what the scientist says is accuracy. The scientist, on the other hand, may consider a lead erroneous if the qualifications and explanations are not in the lead sentence.

The following lead is one in which the scientist felt more qualification should have been given in the first sentence: "More than half the college students fail to earn degrees from their first institutions but a nationwide study indicates they are not necessarily dropouts."

The respondent, an official of the American Council on Education, said the lead sentence ". . . should have been qualified [to read]: 'failed to obtain a degree within four years.'" The next sentence in the article contained the qualification, but the scientist believed the qualification should have been in the first sentence.

The scientist cited as the major information source in an article about tumors in cats and dogs also argued for more qualification in this lead: "Relax, you can't catch cancer from your cat, says Dr. ____."

"What I stated," the scientist said, "was that the probabilities were small, based on my data; however, my data were not good enough to rule out the possibility of a rare event relationship."

Finally, a biologist found the following lead misleading: "____ would like to catch a codfish in the cold cold water of the North Atlantic Ocean--and then give it a blood transfusion."

"More correctly," the biologist stated, "[I am giving] an injection of glycoproteins with antifreeze properties as I don't know whether the red blood cells of the antarctic fishes are compatible with the blood of the Atlantic cod."

Another complaint about leads on science news stories was that certain elements of the story were over-emphasized or exaggerated, as, according to the source, in the following lead:

> A group of college students who spent last summer studying the ecology of the New Jersey pine barrens believes many of the area's natural resources could be destroyed if a proposed method for tapping water is used there.

The scientist said the article ". . . seemed to over-emphasize ecological impact, and generalize it too far to the entire pineland region, not the swamps and bogs we studied."

Another scientist complained about exaggeration in this lead: "Countless small bits of floating plastics, apparently the refuse of industrial society, have been found drifting over wide areas of a region of the Atlantic Ocean called the Sargasso Sea." The biologist working on the project said, "The plastics were not present in 'countless' concentrations. The first sentence exaggerates the quantity of plastic found in the sea."

In some cases, scientists find fault with science writers who play down or ignore what they think is the basic thrust of the work, as in the following example:

> With the long weekend holidays the pleasant rule now, one must expect an accompanying hazard--hourly reports on the ever rising traffic toll. Increasingly, sensible people have elected to stay off the roads, large or small, during slaughterhouse times, such as New Year's Eve.
>
> But, sad to say, it sometimes seems as if it were New Year's Eve nightly out there on those cement ribbons that constitute US highways and byways. Witch and warlock, singly or together, seem to be riding to some appointed rendezvous with disaster to themselves and others.
>
> It is enough to make one swear off wheels.
>
> An intriguing illumination of the US driver and his Halloween habits comes from two very diverse sources. At the University of ____ last year, investigators at the Highway Research Institute undertook a fascinating survey.

The scientist cited in the article as the major information source noted that the lead "paragraph said nothing."

Quoting Accurately and in Context

The third most frequent error reported by scientists in the accuracy study (see Table 2, page 36) was "Investigator misquoted." This error was reported by 33.2 per cent of the respondents. "Investigator quoted out of context" was the seventh most frequent error and was reported by 28.5 per cent of the scientists responding.

The scientists' comments indicated that the inaccurate and incomplete quotations took a number of forms, varying from the relatively mild to the serious.

A professor of medicine was quoted in a news story as saying, "Unless it is used in cases of rheumatoid arthritis or rheumatic fever, I don't think aspirin should be taken indiscriminately without a prescription."

The professor commented: "I did not say aspirin should not be taken without a prescription. I said aspirin should be taken on the advice of a physician."

A story on the treatment of heart patients contained this last paragraph: "Ultimately, if patients can be taught successfully to control their heart rates the risk of fatal heart attacks might be reduced."

"In this story I was misquoted," the scientist said, "and a question to which I answered no was quoted as if I said this work would reduce the risk of fatal heart attack."

A professor of physiology commented on another story:

> The reporter who wrote the article that you enclosed simply manufactured "quotations" to fit his own misconceptions. Less than half of the material enclosed in quotation marks was actually stated by me during the telephone interview, for which I was called out of a meeting because of the reporter's insistence that his call was important.

Another scientist made this general comment: "Reporters should write the total interview or not at all, or allow the scientist to proof before printing."

To quote the source accurately and in context is a basic requirement of any reporting. It may be even more important in the reporting of science, where the careful use of language can be essential.

Use of Language

Scientists are trained to be particularly careful in the use of language. They are trained to define terms precisely and to use technical terms rather than the terms of common discourse. The reporter is tempted to use ordinary language to describe a scientist's work because this language will be understood by more people. The difference in the purposes of language leads to some differences of opinion between scientists and science reporters about the way language should be used in science articles.

One respondent stated the scientists' argument quite succinctly: "Terms and analogies, if any, should be accurate."

The terminology of the following lead was criticized by another researcher: "A research group reported Friday that marijuana causes chimpanzees to overestimate the passage of time, and a single dose can keep them befuddled for up to three days."

The researcher commented:

> The term "befuddle" was not employed in our scientific report, and the statement in the news article "and a single dose can keep them befuddled for up to three days" is erroneous and misleading. Three days were required to recover normal baseline performance following administration of high doses.

Another news article began with the following lead: "A piece of old wood lying in a ditch might have alerted geologists to the fact that California's San Fernando fault was active and likely to cause trouble."

The geologist quoted in the story stated that the lead had this significant error: "An exploratory trench, excavated for the investigation, was referred to as a 'ditch.'"

A story reporting research on aspirin was criticized for its use of terminology by a scientist on the research team. The lead stated: "Plain aspirin is the best and cheapest pain killer among common drugs, a ____ investigative team said yesterday in a report on a study."

According to the researcher, "'Plain' aspirin implies aspirin alone is better than analgesic drug combinations. This is misleading. Our study did not evaluate combinations."

Another paragraph in the story stated:

> The patients were given a variety of analgesics along with placebos--harmless sugar and water pills--all of which were prepared

> in identical capsules so the patient would not know just what he was getting.

The researcher said, ". . . 'harmless' dummy pill implies the active agents tested were harmful. This is not true. Placebos were not sugar and water. They were stated to be only U.S.P. Lactose."

Another story criticized for its use of terminology contained the following lead sentence: "A ____ researcher says he has found indications of biological differences between orientals and whites through studies of reaction to alcohol."

The researcher commented:

> I am critical of the terminology used because I tried to be particularly careful not to use words "Asian" or "Oriental" or white for Caucusoid and Mongoloid. I realize the latter name can create misconceptions (e.g., Downs' syndrome), but "Asian" and "Oriental" as well as white carry quite as bad a group of connotations.

Interpreting Technical Conclusions

The interpretation of scientific results and technical conclusions is difficult even for scientists, and the reporter sometimes does what the scientist considers to be a poor job of interpretation, as in the following example. The first few paragraphs of the reporter's story were:

> Forest Service scientists are challenging the message of the patron saint of the American forest fire-prevention effort, Smokey the Bear.
>
> "We have to get beyond the bear in our approach to forest fires; Smokey the Bear is grade school stuff, and grade school is where Smokey belongs," said ____, principal research forester of the U.S. Forest Services' ____ forest fire laboratory here.
>
> These scientists are not saying that campers can afford to be careless with fire. They are saying that Smokey the Bear's message--that all forest fires are bad--is simple-minded and harmful.

Commenting on the lead, the scientist said: "'Spectacularization' and 'over-simplfication' leading to completely erroneous impression on [the] reader." He continued: "From now on, I'll write my own stories. I don't need pipsqueek newsmen to interpret my technical conclusions."

In another instance, the lead on a news story reporting the results of research on aspirin was:

> The simple aspirin is not so simple, an allergist said yesterday, explaining the little "blah" pill can drastically affect a person's body chemistry for as long as six weeks.

The researcher, commenting on the reporter's interpretation of his technical conclusions, noted the phrase ". . . drastically affect a person's body chemistry for as long as six weeks . . ." and emphasized that his results showed that aspirin ". . . can alter equilibrium for six weeks."

In another case, a scientist who found that the presence in soap of antibacterial agents might have adverse effects on the user complained that his results were misinterpreted by a reporter who led his story this way:

> Take a good look at the bar of soap you are using next time you wash your face and hands. It could be the reason you get a sunburn everytime you "just look at the sun."
>
> Recently there have been increasing reports of persons made allergic to sunlight by the germ-killing chemical tribromosalicylanidlide (TBS) contained in certain deodorant soaps.

"I warned [the consumer] to examine the label or container for the presence of antibacterial agents, not to 'take a good look at the bar of soap,'" the scientist said. "'Just looking at the sun' will not produce photosensitivity reactions--one has to expose the skin."

Special Problems in Science News Coverage

Many scientists in this study complained that science news reports often are sensationalized to "liven up" stories about scientific research results and some singled out for particular complaint reporters who use such terms as "cure" and "breakthrough" to describe research results. Each problem is discussed here.

Sensationalism

The criticism that science news coverage leans too much toward the sensational appeared many times in the comments scientists made about science reporting.

"I am convinced," a professor of pharmacology and medicine said, for example, "that much science reporting is designed to be 'an exclusive' and leans toward the sensational--which applies to much of media reporting."

"In my opinion," said a scientist who expressed much the same sentiment, "science news reporting in my own field [cancer research] often tends to be simplistic and sensational--predicting 'breakthroughs' or initiating 'scares' that are not warranted by the facts."

An example of the kind of sensationalism some scientists object to is found in the story reporting the release of Gigi, the California gray whale. A source close to the story described what happened this way:

> UPI interviewed a maverick scientist, a local scientist-for-hire who was NOT among those invited to consult on the release operation. This gent, who had recently published a book on birds, and who needed publicity to help sell same, castigated both Sea World and NUC (Naval Undersea Research and Development Center) for the release, saying all manner of things about "She doesn't have the chance of a snowball in

hell"; or "She's probably malformed by having been penned in a small circular tank. No wonder she swims in circles"; or "She'll starve to death since she has never had to feed herself"--this sort of thing. UPI gleefully pounced on this ONE individual's comments and went with it coast-to-coast. Your own clipping [the one sent to the source for comment on the article's accuracy] contains some of that crap. They didn't even TRY to get a balanced story, though all these nationally prominent scientists were readily available.

Sensational science reporting may stem in part from the nature of scientific work itself. As one scientist, a pharmacologist, said:

> A real difficulty may be that most real progress in research is slow and a result of 90 per cent hard work and persistence and 10 per cent intelligence. Describing this does not make good copy.

Sensationalism also may result when science writers are forced to compete with other reporters for news and space. Science writers, like other newsmen, must compete with reporters for other media for the reader's attention, and they must compete with reporters for their own newspapers for limited editorial space.

Using the Words "Cure" and "Breakthrough"

Two words that can lead to particularly serious problems when they are misused are "cure" and "breakthrough." The survey uncovered two cases in which the inappropriate use of these terms in news stories resulted in disastrous consequences for scientists.

In one case, a medical research team's work on a treatment for psoriasis was reported in a story with the headline, "Psoriasis Cure Breakthrough Seen."

The lead of the story stated: "University of ____ scientists Wednesday announced a breakthrough in treating psoriasis, the skin disease which causes misery for about 6 million Americans."

The project director, who was critical of the use of the word "cure" in the headline and the word "breakthrough" in the lead, explained:

> We prepared a carefully written story for ____ news information service. Nowhere in that writeup nor at the meeting was the word breakthrough used. [The] last sentence of our writeup said cure of psoriasis is probably 50 years away. Yet the title of this article you sent says "Psoriasis Cure Breakthrough Seen." All I can say is, for Christ's Sake!

The director also gave the following summary of his experience in releasing information about the team's research:

> Our research report was carried on CBS-TV, so I am told, [and] by UPI and AP. All were furnished with an approved (by us) release by the University of ____ news service at request of ____. What I did not know was that each reporter would lift what he damn well pleased--a stupid error on my part. I figured the entire release, which was fairly short, would be published. I will not speak to a reporter in the future nor will I prepare a release. I have the phone ringing every five to 10 minutes with patients from all over the world. I have received several thousand letters which I can't answer (having only one secretary). I had to have an unlisted phone put in to conduct usual business. Regular phone tied up. This is a total disaster. Our work is key and we are working on a treatment, as paper says. Whether this is a breakthrough and whether we have a "cure" will be known in no less than five years and only in retrospect. I recommend you advise experienced scientists of what they can be in for when tangled up with the newspapers.

A similar unfortunate incident involved a wire service story describing a program of research on polycythemia vera, a form of cancer. The story ran under the headline: "Blood, Bone Cancer Possibly Controlled." The headline was called "quite misleading" by the professor of pharmacology and medicine cited as the information source. He went on to criticize the following paragraph from the story:

> ____ added, however, the disease was a slow cancer that may take years to kill and it is too early to say the experiment is a cure. He also said other treatments had arrested the disease for the same length of time, but it eventually reappeared.

The medical researcher commented: "'Cure' should never have been used in this article at all—even if prefaced by 'too early to say if'—since unfortunate victims of cancer focus on this word."

The scientist gave the following summary of his involvement in the reporting of the news story and the later consequences of the story:

> Over $1\frac{1}{2}$ hours was spent with this reporter, carefully explaining the work, its preliminary nature, the need for conservative reporting and for accuracy. There was no urgency to "meet a deadline." The reporter was specifically requested to allow me to review the report for accuracy, etc., prior to printing, but this was denied on the grounds that it would interfere with "freedom of the press."
>
> I am convinced that much science reporting is designed to be "an exclusive" and leans toward the sensational—which applies to much of media reporting.
>
> Headlines, generally not written by the reporter, are particularly misleading. I suppose they are designed to attract the reader—and then the article can clarify the untruths in the headline. But who reads carefully? And if they do and the article is inaccurate? It's a can of worms.
>
> Hundreds of letters, phone calls, telegrams [were] received as a result of [the] original article, this condensation, and inaccurate . . . wire releases—the majority of which were from patients (or relatives) with diseases other than polycythemia vera.

Another researcher, by the following comment, showed some insight into the factors which might cause a reporter to use a word like "cure" or "breakthrough": "Science writers seem to operate under considerable pressure to describe dramatic breakthroughs in research. This serves to maintain a climate of unrealistic expectations."

He suggested the remedy that a number of the scientists suggested: "In view of this it would seem to be a good general policy for science writers to have their stories read by the responsible scientists before publication."

Source Review of Copy

The most frequent comment written on questionnaires was that scientists should be permitted to review articles on their work before publication.

Some comments were:

A psychologist: "I believe stories should be checked by the researcher before they are printed so any misconceptions may be cleared up."

A highway accident researcher: "In spite of their time pressures, reporters should have the courtesy to show the article to the scientist involved. I have made exceptions in the past when I trusted the writer's judgment."

A statistician with the National Communicable Disease Center: "Generally newspaper stories are inaccurate or misleading, probably by intent as few reporters will agree to a review of a story before publication."

A professor of pharmacology and medicine: "The reporter was specifically requested to allow me to review the report for accuracy, etc., prior to printing--but this was denied on the grounds that it would interfere with 'freedom of the press.'"

A vertebrate zoologist probably stated the scientists' case most fully:

> I would think that at least 95 per cent of scientists' complaints about the published versions of their own story to a reporter could probably be eliminated by allowing the interviewed scientist to read and edit as necessary the final story copy before printing--although, I fully realize this would seldom be practical. However, just having the reporter read <u>his</u> version to the scientist--and incorporating any <u>essential</u> corrections and additions--before submission of the story to the editorial staff would often be practical. And, this would certainly lead to a better relationship between scientist and reporter--with the general public being the beneficiary.

Some science writers apparently are already giving scientists a "right of review." When a public relations man prepares a press release, the scientist involved often has a right of review. This is understandable, since in these cases the scientist and the publicist typically are employed by the same agency or organization.

The following comment seems to indicate how this "right of review" operates:

> The article you sent me to comment on was composed by a PR man in the office of the ____ based on an application (submitted by me) for grant support of an ongoing project. He read it to me over the telephone--I insisted on calling at the ____ office and clearing up some of the statements, which I did. The article was sent out as a release from ____.

In other situations, reporters sometimes appear to agree to a review by the scientist in order to get an "exclusive" story.

A sociologist investigating spiritualism said she was given the opportunity to review a newspaper reporter's story on her work:

> Although reporter ____ [is] personally "into" psychic phenomena and spiritualism, she was able to take a paper I had written, combine it with an interview and prepare an accurate report. I insisted on seeing the articles before they were published. She was, understandably, a bit reluctant. I assured her that I would not criticize style, vocabulary, etc., and that I understood that our publics were different. I wanted only to check that I did not sound patronizing or offensive. She complied. I was satisfied with the tone of the stories. Evidently, they were satisfactory to others, because I have several offers of help from mediums as a result of the articles.

The following comment describes another case in which the right of review was exchanged for an exclusive story, this time by a wire service reporter. "[We] gave him [the reporter] the information as a news break for ____ and then supervised the final ____ release, which was a good deal longer than the enclosed article."

Upon occasions, then, some reporters are willing to allow a scientist to read their story before it is printed, particularly if this will assure them of getting an exclusive story. This kind of action has a classic precedent. When Alfred Kinsey's second volume, Sexual Behavior in the Human Female, was released, science writers had to sign an agreement giving Kinsey the right to check their copy before they were allowed to see advance copies of the book. Galley proofs of the book were made available only if the journalist signed beforehand a three-page agreement and went to the University of Indiana at Bloomington. The document required the writer to submit his story to Kinsey for the correction of factual errors before publication. About 60 journalists went to Bloomington on these terms, and there is no indication that anyone refused to go because he objected to prior censorship.[6]

The "right of review" by a source may be an issue whose time has come, not just in science reporting but in reporting in general.[7] Hugh C. Sherwood, in his recent book, The Journalistic Interview, includes a chapter on "The Right of Review."[8] His conclusion is that "the case for checking out articles is much stronger than the case against it." According to Sherwood, "Ensuring factual accuracy is the overriding reason for submitting articles to sources."

The Editing Process

The writing of headlines and the local editing of wire service copy were two areas of the editing process which some scientists in this study found particularly offensive. The problems described by the scientists are discussed in this section.

Headlines

Headlines on science stories drew criticism from a number of scientists. An attitude question in the accuracy study showed that 82.4 per cent of the scientists surveyed agreed with the statement: "Headlines on science stories often are misleading."

The following comments spell out some of their criticisms:

A medical researcher: "My impression is that science writers, in general, are conscientious and cooperative. My chief complaint concerns the editors who almost invariably insert headlines which are both inaccurate and misleading."

Another medical researcher: "In general, my major complaint has to do with misleading headlines. Why can't editors do better than they do? Science reporters in San Francisco say that they have no control over the editor's headline!"

An officer at the Naval Undersea Research and Development Center, San Diego:

> Often we find that a good science story is turned in by a reporter only to have some idiot headline writer, totally unfamiliar with science, the story, [or] the situation surrounding the story, come up with scare headlines. Or he'll take a sensational approach when the story is rock-solid, offending the science community and the story source.

An example of a particular headline criticized by a scientist was the headline, "Sargasso Inundated With Plastic," on a story about the finding of plastic particles floating in the ocean.

The scientist commented, "I object to the headline. We never said the Sargasso sea was 'inundated' with plastic and I think that this word is a scare word that blows our work out of proportion."

This same scientist also objected to this headline on another story describing his work: "Plastic Pollution May Peril Sea Life."

A headline criticized by an agricultural researcher was the following: "PCB-contaminated Cows Pose a Costly Problem." He wrote, "The headline is a proper description of the plight of an individual with this problem. However, the story did not point out that only a small percentage of the nation's dairymen may have this problem."

An industrial hygienist criticized the headline, "Scientists Contend Beards Endanger Some Workmen," saying it should have read, "Scientists Contend Beards Can Endanger Some Workmen."

A researcher whose studies on environmental noise showed that many snowmobile drivers report a temporary hearing loss after even short rides, described a headline that read "Snowmobiles Driving Drivers Deaf" as "terribly misleading."

A final example of a misleading headline on a science story did not come directly from the survey mailings of questionnaires to scientists but was made public by a letter from a scientist in an Austin, Texas, newspaper.[9]

The headline criticized in the letter was: "Sociologist Finds Poor People Responsible For Their Own Poverty." The lead paragraph of the story read as follows: "Many Americans believe the responsibility for poverty rests 'squarely on the shoulders of poor people themselves,' a University of Texas sociologist has found."

The letter from the sociologist, Associate Professor Joe Feagin, read in part:

> While I appreciated your publishing the press release on my recent Psychology Today article on poverty attitudes, I

must protest the extraordinarily inaccurate headline you put on the article: "Sociologist Finds Poor People Responsible for Their Own Poverty." In fact, I "found" no such thing.

I did discover in a nationwide survey that American views of the poor emphasize the responsibility of the poor for poverty and are extremely critical of welfare. But just because a majority of Americans believe something to be true does not by any means make it true.

Editing, Cutting Copy

Several scientists in the survey objected to the practice of editing wire copy to fit the available space and argued that the practice contributes to the problem of inaccurate science news coverage. "Even if a wire service story does happen to 'start off' O.K.," one scientist said, "it appears to be often variously rearranged, recaptioned or re-headed, or shortened, as different papers take it off the wire."

A professor of anatomy was particularly unhappy with the handling of his research results by Associated Press clients, as indicated by this comment:

> AP ran this story across the country. I have been receiving newspaper clippings from people in many different states. The story appeared in big city papers and little town papers. Half of them were god awful! None of the stories was the same. Over half were quite incorrect. Those that were correct had many misspellings and typos.

The scientist believes the following news report of his research findings ". . . is intelligently and accurately condensed from an extensive write-up that AP put out":

> Evidence has been discovered which indicates Neanderthal man isn't the close relative of modern man that everyone thought, according to a ____ professor.
>
> ____, professor of anatomy at ____, has discovered that Neanderthal man couldn't talk, as previously supposed, and that this knocks him way back in his ancestral relationship to modern man.

____ found that the bone structure of Neanderthal man's upper throat prevented him from making sounds, in the same way that an infant or chimpanzee can't talk.

____, who studied the upper throat region of the skulls of several types of prehistoric man with two other non-anthropologists, had earlier learned that chimps and infants cannot produce sounds because their throats aren't shaped the right way.

He says that the physical ability to produce sound comes later in the development of a human with the lengthening of the throat.

The ability to speak was far more important to survival on the evolutionary chain than brain size or the ability to chew, the previous anthropological criteria, ____ says.

While Neanderthal man, who lived some 40,000 to 70,000 years ago, didn't have this ability, two other types of prehistoric men did and are therefore more direct ancestors of modern man, ____ says.

Those two are Cro-Magnon man, a contemporary of the Neanderthal, and Steinheim man, who lived at least 300,000 years ago. Both show development of the physical capacity for speech.

____ thinks that Neanderthal man came to an evolutionary end because he couldn't develop the capacity for speech, which leads to language, which in turn leads to the building of a body of shared intelligence.

____ worked with ____, linguistics professor at ____, on the matter, using the ____ Laboratory in ____ and computers at the ____.

A second report of the same research elicited entirely different reactions in that it is ". . . an example of the original long release that was excerpted to make it sensational." The article:

A ____ professor says he and two other scientists have found evidence that Neanderthal man could not have been more than a distant cousin of modern man and certainly was not a forebear because he could not speak.

The evidence, they say, is in Neanderthal man's throat. It shows he could speak no better than a new-born infant or chimpanzee. Other strains of pre-historic man, they say, had developed their physical ability for speech and language long before his time and evidently were in a different evolutionary strain. These strains became the ancestors of modern man, the scientists say.

The discovery, says ____, has already revamped anthropology courses at ____ and ____. He says several writers of anthropology books are revising their work to "disinherit" Neanderthal man from his role as a close relative, or perhaps an ancestor, of modern man.

"A lot of people have questioned that role," ____ says. "But this puts a real clincher on it."

"The significant thing is this long, flat area here," ____ said in an interview, pointing to the throat of one Neanderthal skull model. "Take a look at that. Boy!"

The scientist commented on the material underlined above, saying, "This makes me sound like a crazy man. Boy!"

None of the three scientists who did the work is trained as an anthropologist, but ____, an anatomy professor, says most anthropology thus far has been "unscientific."

The scientist's comment on the underlined material: "This is out of context and used in such a way that it makes me an enemy of anthropologists!"

He says the study of prehistoric skulls is a "hobby" for him that grew out of work he did on the anatomy of newborn infants several years ago. He then got together with ____ of ____ in ____ and the ____ Laboratory in ____.

The two worked with ____ of ____ to get statistical information from ____ computers on possible speech patterns of various types of prehistoric man.

What the three believe, basically, is that Neanderthal man lived at the same time as other pre-historic forms of men and, like them, had developed more brainpower than apes.

But the other forms of men--Cro-Magnon man in particular--had long before begun developing the physical throat structures that enabled them to speak.

The scientist's comment on the underlined material: "Cro-Magnon man came after Neanderthal, so this is quite incorrect. I said that Steinheim man came before!"

Although several scientists said the local editing of wire service copy is a problem, one man said a story reporting results of his study was picked up by at least 10 newspaper and four radio and television stations with no loss of accuracy. Local editing did not reduce the accuracy of the article, he said, ". . . thanks to the excellent UPI release."

Summary

This paper has attempted to describe a number of potential problem areas in the reporting, writing, and editing of science news. Problem areas--points in the science coverage process where inaccuracies, distortions, and misleading impressions are frequently introduced--were identified through analysis of comments written by scientists in a study of the accuracy of science news reporting in newspapers.

Problem areas that were discussed were information gathering (by publicity handout, scientific paper, and personal contact), writing the news (including finding the angle, writing the lead, quoting accurately and in context, using language properly, and interpreting technical conclusions), special problems in science news coverage (including sensationalism and using the words "cure" and "breakthrough"), source review of copy, and editing (including writing headlines and handling of copy).

The identification and analysis of problem areas lead to the following recommendations:

1) Science reporters, like reporters in other areas (such as government), should dig for information beyond the publicity handout.

2) Science reporters should use journal articles and published reports to verify and improve the accuracy of their stories. They should not rely solely on interviews with scientists.

3) Science reporters should resist the temptation to exaggerate or oversimplify in a lead sentence for the purpose of attracting reader interest; many scientists report that "catchy" leads distort their findings.

4) Science reporters should pay particular attention to quoting sources accurately and in context. This may be more important in science than in other areas of news because of the care with which scientists use language.

5) Science reporters should be cautious in introducing lay terminology that the scientist himself did not actually use. Scientists often object to such terminology and find it inaccurate.

6) Science reporters should be wary of interpreting a scientist's technical conclusions, as scientists often think such interpretations are misleading.

7) Science reporters should avoid the temptation to sensationalize information about science. As one responding scientist pointed out, progress in science is slow and often does not make "good copy."

8) Science reporters should avoid using the words "cure" and "breakthrough" unless the scientist himself approves the use of the words in describing his work.

9) Science reporters should consider giving information sources an opportunity to review articles or parts of articles for accuracy before publication. Such a review can be done with the reporter still making the final editorial decision, and it might help prevent serious inaccuracies.

10) Headline writers should resist the temptation to put simplistic, cute, or "scare" headlines on science stories.

11) Make-up editors should be aware that the practice of cutting news stories from the bottom to fit available space may not apply very well to science stories, as science articles often need to be reported completely to make sense.

12) Finally, scientists themselves should accept their share of the responsibility for accurate communication of science information to the public. In the words of one of the responding scientists, they should learn to "think about their work [in] a simple and adequate manner that the layman can understand."

REFERENCES

[1]Results of the quantitative accuracy study are reported in an as yet unpublished paper by these writers entitled, "News Source Perceptions of the Accuracy of Science Coverage." Only those parts of the accuracy study considered relevant to this paper are reported here.

[2]Mitchell V. Charnley, "Preliminary Notes on a Study of Newspaper Accuracy," Journalism Quarterly, 13:394-401 (December 1936); Charles H. Brown, "Majority of Readers Give Papers an A for Accuracy," Editor & Publisher, 63:13, 63 (February 12, 1965); Fred C. Berry, Jr., "A Study of Accuracy in Local News Stories of Three Dailies," Journalism Quarterly, 44:482-90 (Autumn 1967); and William B. Blankenburg, "News Accuracy: Some Findings on the Meaning of Errors," Journal of Communication, 20:375-86 (December 1970).

[3]The authors thank Ms. Sally Taylor, a graduate assistant in the Department of Journalism at Temple University, and Ms. Wendie Waschitsch, a work study student at Temple for their assistance in the project.

[4]Hillier Krieghbaum, When Doctors Meet Reporters (New York: New York University Press, 1957), and Hillier Krieghbaum, Science and the Mass Media (New York: New York University Press, 1967).

[5]Phillip J. Tichenor, Clarice N. Olien, Annette Harrison, and George Donohue, "Mass Communication Systems and Communication Accuracy in Science News Reporting," Journalism Quarterly, 47:673-83 (Winter 1970).

[6]Paul D. Brinkman, "Dr. Alfred C. Kinsey and the Press: Historical Case Study of the Relationship of the Mass Media and a Pioneering Behavioral Scientist," unpublished Ph.D. dissertation, University of Indiana, 1971.

[7]A discussion of the general issue of source review of copy is found in James W. Tankard, Jr. and Michael Ryan, "The Right of Review: Error Check or Censorship?" The Quill, 61:20-22 (May 1973).

[8]Hugh C. Sherwood, The Journalistic Interview (New York: Harper and Row, 1969).

[9]Joe Feagin, "Letter to the Editor," The Austin Statesman, November 19, 1972.

Table 1

Distribution of Numbers of Kinds of Errors

Number of Kinds of Errors	Articles	Percentage of Total Number of Articles
0	17	8.8
1-2	46	23.8
3-4	34	17.6
5-6	24	12.4
7-8	19	9.8
9-10	14	7.3
11-12	11	5.7
13-14	7	3.6
15-16	8	4.1
17-18	4	2.1
19-20	3	1.6
21-22	3	1.6
23-24	3	1.6
	193	100.0

Table 2

Kinds of Errors Ranked According to Frequency of Occurrence

	Frequency	Percentage of Total (193)
Relevant information about method of study omitted	68	35.2
Relevant information about results omitted	65	33.7
Investigator misquoted	64	33.2
Names of other investigators on research team omitted	61	31.6
Qualifications of statements omitted	60	31.1
Misleading headline	59	30.6
Investigator quoted out of context	55	28.5
Continuity of research with earlier work ignored	55	28.5
Story too brief	49	25.4
Relevant information about inferences drawn omitted	46	23.8
Causal inference overstated	42	21.8
Nonscientific aspects of study overemphasized	39	20.2
Speculation treated as fact	39	20.2
Generality of findings overstated	35	18.1
Definition of technical term incorrect or omitted	33	17.1
Typographical errors	30	15.5
Uniqueness of research overemphasized	29	15.0

Table 2 Continued

	Frequency	Percentage of Total (193)
Significance of contribution exaggerated	29	15.0
Inaccurate headline	28	14.5
Title of study incorrect	27	14.0
Misleading analogy	26	13.5
Definition of technical terms omitted	25	13.0
Identification of chief investigator incorrect	23	11.9
Credit for earlier research assigned to present investigator	23	11.9
Name of organization for which study done incorrect	20	10.4
Science reported in a humorous vein	20	10.4
Applicability of finding overstated	17	8.8
Other spelling errors	16	8.3
Important analogy omitted	16	8.3
Scientific terms misspelled	13	6.7
Figures incorrect	13	6.7
Significance of contribution understated	13	6.7
Uniqueness of research under-emphasized	12	6.2
Applicability of finding under-stated	10	5.2
Fact treated as speculation	8	4.1
Name of organization for which study done incorrectly spelled	7	3.6

Table 2 Continued

	Frequency	Percentage of Total (193)
Important table omitted	6	3.1
Omitted table poorly summarized	6	3.1
Generality of findings understated	5	2.6
Names of other investigators consistently misspelled	4	2.1
Causal inference understated	3	1.6
Confidential information released	1	.5