

# Writing about Science for General Audiences

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*This presentation distinguishes science writing from scientific and technical writing. It offers suggestions for writing articles about science and technology for beginning freelancers and for students: choose timely subjects; focus on what's new; clarify how the information is important; consider the audience's knowledge of the subject; use a good hook; place the technical explanation carefully; control statistics and technical terms; control the pace of the article; cite local experts in regional publications; include graphics or concepts for illustrations; and write a convincing submittal letter.*

Science writing presents information about science and technology (the application of the principles of science, usually for commercial purposes) for a range of audiences, usually readers who are not experts in the field. In many ways, writing about science is like writing about any other subject--history, art, education, travel. Whatever the subject, the writer must be clear, informative, and interesting.

Science writing includes articles for newspapers, magazines, and newsletters, anthologized in collections such as Quammen's The Best American Science and Nature Writing 2000; bestsellers such as Hawking's A Brief History of Time; classic studies such as Carson's Silent Spring; scripts for television and radio programs, and documentary film; press releases; and other types. Science articles for general audiences tend to focus on recent developments in an area of science rather than on background/historical events.

Science writing differs from scientific writing and technical writing. Science writing is done primarily by "science journalists," who usually belong to the National Association of Science Writers rather than the Society for Technical Communication. Science writing is most often taught in schools of Journalism or Communications. Science writing appears in daily newspapers (especially in Science and Medicine pages or sections), general-readership news magazines, popular magazines such as National Geographic, more specialized (and scientific) magazines such as Scientific American, and more technical but still mass-market (selected newsstand) magazines such as Science and Nature.

## SCIENCE WRITING AND SCIENTIFIC WRITING

Scientific writing is done by writers trained in the sciences. It is learned by writers as they study science (or "scientific and technical" communication), usually by following examples as they prepare lab reports and formal research articles. The most common type of scientific writing is the research article, common in journals throughout the sciences and technologies. However, experts write also for experts in periodicals with broader readership, such as Science.

The primary differences between science writing and scientific writing appear in audience and purpose. Science writing articles and books are designed to entertain and inform an audience of non-experts in the subject; scientific writing articles are designed primarily to inform experts about the subject, in established formats such as the laboratory report or the research article. Science writing addresses a broader audience, perhaps a very general audience in daily newspapers, a narrower audience in publications that focus on science and technology. Science writing appears in periodicals; scientific writing appears in journals. (According to Webster's Unabridged, a journal is "a periodical or magazine, especially one published for a special group, learned society, or profession.")

## SCIENCE WRITING AND TECHNICAL WRITING

Science writing also differs from technical writing, which differs from scientific writing. Technical writing shares with scientific writing the primary objective to inform rather than entertain. However, technical writing is done for a broader range of readers than is scientific writing. Technical writing ranges from instructions for installing a garage-door opener to a parts catalog to user documentation for software to a proposal to manufacture electronic devices for the military.

The audience of technical writing may range from the lay reader with no experience in (or tools for) installing the garage-door opener to the electronics expert with advanced degrees reading the proposal. Whatever the subject and audience, technical writing aims to inform rather than entertain, aligning it more closely with scientific writing than science writing.

Technical writing is done by two types of writers: technical staff (engineers and systems analysts, for example) employed by companies or government

agencies, and technical communicators hired to produce technical documents (proposals and computer documentation, for example). Most technical staff get little relevant writing instruction in college, as discussed in Jackson, Lewis, and Wallace, Reforming College Composition. Most technical communicators are taught theory and the use of tools in programs in technical communication, which are usually housed in English or rhetoric departments.

Technical documents are prepared for a broad range of audiences, from lay readers through experts. Usually, however, a technical document (or a section) is prepared for a narrowly defined audience and written appropriately for that audience's knowledge of the subject matter. (Except perhaps for user documentation, which usually lumps users with differing degrees of knowledge about computers and software into one audience, boring some readers and bewildering others.)

Science writing also differs from technical writing, which tends to focus more on professional documents such as proposals and instructions and on technology. Technical writing involves in-house documents for use in the writer's company or agency, and documents for customers, such as computer documentation or other instructions.

These generalizations are only generalizations, as subject knowledge and writing skills are the two most important factors for success in any of the three related types of writing, and the three types of writing overlap. However, the generalizations here are useful, as they invite examination of audience and purpose.

## SCIENCE WRITING

Even within science writing, types differ; for example, articles for newspapers differ from articles for magazines, and both differ greatly from scripts for documentaries. Also, there are different audiences within the broad "general audiences," and writers adapt the principles of science writing for them. Writing for children, for example, in publications such as Ranger Rick, differs from writing for adults.

Science writers for popular media--newspapers, general-audience magazines, television and radio--often read scientific articles designed for expert readers and published in scientific journals to discover information that might be of interest to general audiences. They then take that information (citing the source, of course), add to it information from other experts (especially local experts, and especially dissenting views), and "translate" the information to their more general audience.

Science writers rely on abstracts, interviews with experts, and press releases more than information from library or internet research. Quotations are important, and the

presentation of the opposing view(s) in the article is often essential to demonstrate objectivity. Abstracts in medicine and other fields provide writers with concise summaries of articles.

Science writers work for newspapers, magazines, government agencies, public and private colleges and universities, and other employers. Many science writers are freelancers; others are staff for newspapers, magazines, businesses, government agencies, colleges, and universities. Some write books; most write articles. Their backgrounds, as revealed in Blum and Knudson's A Field Guide for Science Writers, range from a PhD in biochemistry to a BA in the humanities. Many successful science writers do not have a degree in the sciences. While a technical writer is expected to have a four-year degree or equivalent experience, there is no such educational requirement for the science writer. In most cases, the only criteria significant to editors in deciding whether to publish an article are the quality of the article and its appropriateness for the intended audience.

To write effective articles about science and technology, a writer should:

- Choose a subject readers will be interested in
- Create interest in the article
- Control pace and level of complexity
- Use effective strategies
- Convince the editor that the article merits publication

## CHOOSING A SUBJECT

When science writers can choose their topic, they tend to write on news, on topics of current interest. Readers will naturally be more interested in reading the article, as long as it doesn't merely report what has already been reported. Some articles in the popular press do not add to what is already known, especially when there have not been significant recent discoveries to enable writers to report "news" (as with AIDS). Readers might read the article in hopes of finding new information or insight, but if they do not they might feel cheated, and few editors will publish an article that might leave readers feeling cheated. So topics of current interest tied to the season, to current events, or to people in the news are common choices. However, writers often choose topics they are interested in, as their interest makes it easier to get information and create an interesting article.

## CREATING INTEREST

How many moviegoers choose to go to a movie they have never seen advertised and know nothing about? Daniel Boorstin pointed out in The Image that

Americans tend to expect the familiar--a hotel in Paris with some decor that says France but with a staff that speaks English and a menu that includes steak and cheeseburgers--a hotel that is not much different from a hotel in the United States. So one of the challenges for writers writing for general audiences is to make the unfamiliar familiar.

The same holds true with the subjects science writers write about. If a topic isn't a matter of current interest, many readers will not begin reading the article. So some periodicals try to snare readers with titles such as "Killer Bug Ate My Face." One approach is to clarify early in the article what it adds to what is already known about the subject, thereby emphasizing what's new.

However, writers can also arouse interest with a striking statement of the unfamiliar. Beginning an article on life in Morocco, George Orwell wrote, "As the corpse went past, the flies left the restaurant table in a cloud and rushed after it, but they came back a few minutes later." Such a statement is an effective "hook," an opening that will strike readers and encourage them to read on.

A startling little-known fact is one way to create interest--for example, that cockroaches have "ears" in their knees that "detect the faintest of airborne sounds--even the footfalls of other roaches," according to Gordon's The Compleat Cockroach.

Readers of articles about science and technology expect the most recent information on the subject, and expert opinions on it. For local publications, editors expect statements from local experts; for any publication, editors expect statements that are new and consistent with the tone and purpose of the article. Pointed quotations should appear throughout the article to support points, present ideas and information distinctively, and lend the discussion a sense of authority and accuracy. In a local publication, editors are often more interested in quotations from local experts than from experts with national or international reputations.

For expert readers who are knowledgeable about the subject, writers do not need to use background information or illustrative examples. For general audiences that need background information, however, writers usually present it toward the middle of the article, not at the beginning (lest it interfere with the hook or story) and not at the end (lest the article end weak or lose focus on what's new). For expert readers, writers do not need to define common scientific terms, describe familiar processes, or be as concerned about motivating the reader. Experts tend to read articles on subjects in their fields and in related fields to maintain or expand their expertise as professionals or amateurs in their field(s) of interest. The discussion can be more complex, and presented at a faster pace.

## **CONTROLLING PACE AND LEVEL OF COMPLEXITY**

Successful science writers can make the complicated seem simple, the "scientific" exciting, if they understand their audience. They know that most readers like a good story, preferably one with human drama, a story that ends happily despite peril or a story that ends tragically despite heroic efforts to succeed. (Good science writers know what Homer and Shakespeare and Faulkner and all the great writers have always known.)

To succeed at such an undertaking, which is complicated by the writer's need to restrict himself or herself to fact (the genre of science fiction is not addressed in this discussion, although many of the observations here apply), the writer has to determine how much the readers already know about the subject, to avoid boring them or losing them. Although technical writing textbooks have suggested that writers can make choices about writing techniques such as pace, use of background information, and sentence complexity based on the readers' educational level, audience analysis of this direction is misguided. A reader with a PhD may have very little or no knowledge about the subject matter of an article.

So the science writer must estimate the readers' familiarity with a particular topic. The writer reads what the readers read in the target publication and similar publications, to get a sense of what readers will know and what they will be accustomed to in the treatment of the topic. A major challenge for science writers--a greater challenge perhaps than understanding the topic and capturing sources for the article--is getting a sense of what their readers already know about the topic.

With a sense of what the readers already know and are accustomed to, the writer can decide the appropriate level of complexity for the discussion--how much explanation of scientific/technical information is required, whether technical terms will be understood or need definition, how quickly the presentation of information can proceed.

## **USING SCIENCE WRITING STRATEGIES**

When science writers write for readers who know little about the subject matter, several strategies are available:

- Using human interest, explaining how the topic affects people like the reader. An article on a disease might focus on a specific real person who has it rather than on the disease itself. (Scientific writing would tend to focus on the disease.) Many readers will be drawn more to the story of a person than to what might seem a biology lesson, and many will read on in the article just to find out what happened to the person.
- Providing background information. Lay readers need the basics to follow discussion, so science

writers provide needed explanation, usually in the middle third of the article.

- Limiting technical terms in an article for general audiences, defining any unfamiliar terms that you must use. Limiting the use of such terms is a better strategy than using the terms and defining them, because the latter approach risks turning the article into a vocabulary lesson and readers might lose the story. Similarly, writers limit the use of statistics, aiming for effect with a few striking statistics rather than risking overkill by piling them up.
- Clarifying concepts and abstractions by using analogy and examples.
- Using shorter, more straightforward sentences than in scientific writing, making the style more similar to technical writing. In scientific writing, writers can present information in a more complex style, as the expert readers are knowledgeable about the subject matter, accustomed to reading such documents, and motivated to get the information. However, general audiences will comprehend more easily and continue to read the article if the writing is simpler, with less subordination, more active voice, and shorter sentences that are still varied in length.
- Using a slower pace than in scientific writing, a pace closer to that of technical writing for a lay audience. Writers use examples, repetition, paragraph breaks, etc. to allow information to "sink in" before they move on, and transitions to clarify the connection between sentences or paragraphs.
- Identifying the purpose. Rather than be coy, writers tell the readers what the article is about, and suggest what it is designed to do. Science writing shares with scientific and technical writing this emphasis on readers having a clear sense of purpose.
- Motivating the readers. Experts in science are motivated to read articles reporting research in their area so they can be aware of recent findings and techniques and maintain or expand their expertise. General readers of articles in newspapers and magazines, however, do not have this motivation. Science writers often motivate readers by establishing early in the article how the information might save the reader time or money, protect the reader's or a family member's health, or make the reader more knowledgeable about a topic of current interest (such as influenza during flu season).
- Observing customary organizational structures (for different types of articles) and length limits in the target publication.

## RESEARCH FOR SCIENCE WRITING

Science writers must make sure that their information is accurate, reliable, and current, before they try to make it interesting, significant, and impressive. To make sure the information is good, they should rely on reputable publications (print or online), referred or well-edited sources with reputations for accuracy, to gather the right kind of information.

Students tend to rely on published materials for information--and recently, on information available on the internet. However, any tyro with internet access and minimal knowledge of FrontPage can place information about science on the internet. For some readers and students, what's on the internet must be correct since it's on the internet.

Traditional research enables science writers to prepare to interview experts to gather information. Traditional research leads to a method that serves them better: talking with experts. Practicing science writers stress the importance of the interview, to gather opinions as well as information but also to fill gaps in the information the writer has gained through preliminary research.

## PREPARING FOR SCIENCE WRITING

How can one prepare for freelance science writing? The best way may be by reading broadly and often about science, which can help the writer:

- Learn about recent developments and new interpretations of older scientific information.
- Identify subjects that editors consider to be of interest to the readers of their newspapers and magazines.
- Identify experts who are cited on particular subjects.
- See different approaches other writers have used to interest readers in the subject and present the information.
- Discover concepts for illustrations for articles.
- Identify print and electronic sources of additional information on the topic.
- Discern developing areas of interest for future articles.

## CONVINCING THE EDITOR

When freelance science writers submit an article for publication, they send hard copy (unless directed to send electronic) to the editor with a submittal letter. A good submittal letter is as important as the article, because it

influences the editor's response to the article as he or she reads it. In a good submittal letter, the writer should:

- Indicate the approach taken to the subject (the slant)
- Clarify how the article differs from articles previously published on the subject, in the target publication and in other publications
- Indicate the section of the target publication that the article would be appropriate for
- State why readers of the target publication would be interested in the article
- Explain his or her qualifications, noting especially the titles of published articles and where they appeared
- Identify the most significant sources, especially experts whose statements made to the writer have been incorporated in the article
- Identify the expert(s) who reviewed the article for accuracy

A submittal letter is similar to a query letter, which is sent in advance to determine the editor's possible interest in the unfinished (perhaps not even started) article. Each is a persuasive document similar to a technical proposal, as it stresses the writer's qualifications and argues that the article fulfills a need--for articles. The letter clarifies how the article contributes to the popular literature on the subject, and indicates why, in the writer's opinion, the readers will be interested in the article.

## CONCLUSION

Science writing tends to differ from scientific writing in its audience and from technical writing in its purpose. Science writing allows writers a sense of latitude in choice of topics and approaches that scientific and technical writers often do not have in their work. Consequently, science writing can be an interesting outlet for technical communicators, who usually do not get to exert such self-determination in their writing or employ their creativity this way. Science writing can be a pleasurable (and profitable!) outlet for professionals in scientific and technical communication, a good way for writers to follow their interests and employ their skills.

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