The Criticism of Scientific Books

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THERE WERE 11,255 books published in America in 1951, according to the statistics of *Publishers' Weekly*. Of these, 722 were classed as "science"—a small number compared with "fiction" (2135) or "juvenile" (1072), but larger than any of the other categories except "religion" (731). "Medicine and hygiene" are included in a separate listing, with 478 titles, as are "sociology and economics," with 506 titles.

Two books on science every day make a respectable enough showing, yet few of us feel that science is being adequately explained to the general public, or that the problems of science and society are receiving adequate attention from our intellectual leaders. To be sure, many of the 722 titles are textbooks designed for special purposes, and many others are technical volumes aimed at narrow reader groups; but there must still remain a considerable annual flow aimed at informing the general reader about this or that aspect of science. I doubt whether many of us feel that there should be more books on science; but probably all of us feel that the books that are published should be given more attention, and that more of them should be written in a fashion that would warrant wide attention.

The improvement of this situation depends on us, the scientists of America. Professional journalists may have responsibility for the final steps of popularization, in news stories for the daily press and in articles for magazines of mass circulation. Writing for such media requires training in the special techniques of arousing and maintaining interest, and takes more time than a working scientist would have available. But even in this case the background material must come from the scientists, by way of the books and articles that summarize our growing and changing knowledge. Only a specialist can find his way through the maze of current technical reports to emerge with significant facts and trends; and only the working scientist can get the "feel of the material."

Scientists themselves can and ought to write in a way capable of reaching a wide and influential audience. There is a long history of distinguished scientific writing to prove this—perhaps more obviously in England than in America. It is understandable that a painter or musician might not be able to explain his works in words, since he is dealing primarily with a different kind of symbolism. But every scientist must deal with words, except to the extent that he can substitute mathematical formulations, and every scientist must, then, for his own purposes, master the techniques of writing. The basic principles, of clearness and simplicity, ought to apply as much to research reports as to popular books. The differences are relative, depending on the amount of knowledge presupposed in the reader, which in turn controls the extent to which technical short-cuts in vocabulary can be used.

Why, then, do we not produce more scientific books that are readable? Partly, I think, because we are afraid of one another. Scientists can be very mean to one another, and fear of criticism is one of the things that keeps us all in the straight and narrow path, even in our research work. This is healthy. The standards of scientific work seem to deteriorate easily when criticism is absent, or when it is directed by nonscientific outsiders, as in totalitarian regimes. But we need to be careful that our criticism is constructive, and that it is adjusted to the nature of the material under scrutiny.

I admitted once that in my own writing I was always conscious of ghostly colleagues peering over my shoulders, looking for the mistakes. As a result of that confession, many scientists have told me that they feel the same way, and that, in writing, they are impelled to throw in technicalities and qualifications that slow up the pace and do not really modify the conception, merely as sops to these ghostly critics. I have been surprised to learn that this applies even to people whose accomplishments and prestige would seem to allow them to rise above such considerations.

This attitude toward the popularization of science is intangible, difficult to define and even more difficult to modify. On the one hand, we are all anxious that science be more generally understood and appreciated; but, on the other hand, we are unwilling to give the breaks to people who attempt to further this objective. It is true that in America the best-selling books on "science" have often been dismal affairs, and their authors have perhaps deserved the opprobrium they have gained from the scientific community. The effect, however, is to reinforce the feeling that the opprobrium is attached to the popular success rather than to the bad science.

One remedy for this situation might be the development of a special field of criticism for attempts at scientific popularization. As it is now, all books on science get about the same treatment, regardless of the audience at which the book is directed. The reviewer will note the inadequate index and faulty documentation, correct three misprints, reprove the author for not citing work published six months before (forgetting the time lag between manscript and publication, and the cost of changes in proof), and gleefully point out all the howlers he can find. The reviewer may also point out that the book has adequately summarized knowledge in the particular field covered, and note that current ideas have been effec-

tively presented; but these positive values are lost in the catalogue of faults. We rarely try to evaluate the book in terms of how well it has succeeded in attaining its objectives; we are ready to damn, but we are cautious with our praise. (This is no personal peeve, because my reviewing colleagues have been kind—even suppressing mention of howlers in their reviews and pointing them out by letter instead.)

A scientist thrives on the good opinion of his colleagues. If, then, we really want scientists to write readable books that will reach nonscientific readers, we must recognize accomplishment in this just as we would recognize accomplishment in research. The best way, I think, is by giving serious attention to such efforts in our scientific journals.

Such attention might also help with the other problem—that of giving the good books wider circulation. A given book is likely to get lost in that annual flood of 700 volumes; and it is also likely to get lost in an even flow of equally numerous, equivalently written, book reviews. The reviewing should serve a selective function, not only sorting the books into their different categories, but also giving some indication of their relative potential importance.

At first sight there would seem to be little connection between the notice of books in scientific journals and their circulation among nonscientific readers. Probably there is, in fact, no connection at the present time. But if we developed a really live scientific criticism, this might serve the literary critics by drawing to their attention the books that we think most seriously warrant that attention. Also, each scientist is a point of contact with many parts of the nonscientific world. Whether in a university or in industry or government, each of us has many opportunities to recommend reading about science to nonscientists, and we ought to be in a position to make intelligent recommendations. All of us have a hard time keeping up with the research literature in our specialty, and we cannot possibly undertake the additional task of independently judging the general literature of science. We need guidance to the books that we ourselves should read about fields of science in which we are not directly working, and to the books that we might want to recommend to our friends.

The development of a lively criticism of scientific books would mean a considerable editorial burden, since the editor must screen the books that pass over his desk, judge space requirements, find capable reviewers, persuade them to deliver the goods, sometimes edit the product, and try to be alert about unfair judgments. I think SCIENCE should take the lead in this effort. It is the weekly source of news about science for the majority of American scientists, and surely general books about science are an important item of scientific news. The technical books can safely be left to the specialized journals, or be given a short notice for prompt announcement of publication.

As it is now, the best reviewing of general scientific books occurs in the monthly or quarterly journals. The *Quarterly Review of Biology,* for instance, has a long history of distinguished book reviewing. But reviews in such journals reach a restricted audience, and their publication is often greatly delayed. They serve an important scholarly function because of the complete coverage, and because the evaluations have been made in a leisurely way by competent authorities. These reviews can serve to deter the popularizer, because he knows that eventually his colleagues will expose his sins in their learned pages; but no matter how sympathetically written, they can have little effect in encouraging popularization, because of their limited circulation.

The development of a constructive criticism on general scientific books might seem to be a function of the general magazines of science, such as THE SCIENTIFIC MONTHLY, the *American Scientist,* and the *Scientific American.* Certainly these journals now play important roles. But, after all, the development of vigorous criticism will require the expression of a diversity of opinions in different publication media. People who take much interest in general literature follow the reviews in both the weekly and the monthly periodicals, and I have never heard anyone (certainly not authors!) complain of the duplication.

We need, of course, to have more and better coverage of scientific popularizations in the literary periodicals, because these periodicals are read by the general public at which we are aiming. I think, however, we must go lightly on the editors of these journals, because that whole annual flood of 11,000 volumes passes over their desks, and it is no wonder that many interesting items in the science section get overlooked or mishandled. It seems to me that we, as scientists, ought to take the lead in our own journals. If we set the pace in selection and appraisal, and the literary journals pay no heed, we can start throwing stones.

Actually, the literary reviews often do surprisingly good jobs with scientific books. The *Saturday Review of Literature* especially, I think, deserves praise for the space and attention that it devotes to science. Science writing, to get attention in these reviews, must be good writing and interesting writing; and that, again, is our problem.

Who should write our book reviews? Editors of both scientific and literary journals have a tendency to send a new book to the man who has most recently written a book on the same general subject. This has an advantage, since the reviewer should know the subject; but it also has disadvantages. Sometimes, both in literature and in science, it leads to mutual back-scratching, which may be very pleasant for both parties but of no help to the onlooker; and sometimes it leads to consequences that are not pleasant for anyone. I do not believe that book writing and book reviewing are necessarily related abilities; and it is hard for one author to look with real impartiality on the books of another author. (I keep resolving not to write any more book reviews myself, but then the temptations of this easy road to a free library overcome my scruples. Editors ought to withhold temptation from such weak characters.)

It must be a hard job for an editor to build up a reliable corps of reviewers. I wonder whether the best reviewing might not be done by relatively young men, whose eyes are not yet clouded by the accumulated prejudices of their working careers. Ferreting out such talent would not be easy for an editor, and this is something in which we might all help by keeping alert to the potentialities of our younger colleagues and forwarding suggestions to our journal editors.

In writing about the criticism of scientific books, I have tackled only one small angle of the large problem of the explanation and interpretation of science, but I think it is a key angle: both because it should influence and enhance the prestige value of successful popularization among scientists themselves, and because it seems a basic mechanism for sorting out the good from the bad in the annual flood of books.

Actually, I think the outlook for an increasing understanding of science by the American public is very good. During 1950, with *Worlds in Collision* and *Dianetics* keeping their steady place on the best-seller lists, the outlook was gloomy indeed. But, for many months now, a glance at the weekly papers has always been reassuring. There, at the top of the list, *The Sea Around Us* kept its place. I do not believe scientists had anything to do with the establishment of Miss Carson's book,[1] but her accomplishment proves that there is a wide audience capable of appreciating a serious interpretation of a field of science. We cannot, then, blame the public for failing to notice our writings; we must look to ourselves and see how we can manage a better and more persuasive job within the limits of our canons of taste and integrity.

[1] As an editorial note, it might be mentioned that Chapter 7 in Rachel L. Carson's book was published in *The Yale Review*, where its merit was recognized by scientists. It received the AAAS–George Westinghouse Science Writing Award for magazines at the Cleveland meeting of the Association in 1950, several weeks before *The Sea Around Us* was published.

Reporting Science

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EVERY ONCE IN A WHILE I get a letter from some young man with ambitions to become a science writer for a newspaper, asking me how to go about it. My first advice is: "Go get yourself a job on a small newspaper and go out and cover a fire." If this sounds like heresy to a scientist, so be it. But, actually, it is not only sound advice for the prospective science writer, but possibly an indirect contribution to the advancement of science itself. The point is that if anyone expects to write science for laymen he must be first and foremost a good all-around reporter of news.

The obvious way of getting reportorial training is to do all the things that work on a small-town newspaper requires. It can mean chasing the fire engines to a big blaze, riding with the cops to the scene of an accident or to a raid on a bookie joint, buttonholing the mayor or the city councilors at City Hall, or interviewing labor leaders on a picket line on a rainy day. It can also mean covering a concert, a ball game, a clambake, a strawberry festival, or the "carrots-peas-and-chicken-a-la-king circuit" of service club luncheons.

And why is all this grist for the mill of the would-be science writer when, of itself, it isn't even remotely connected with science? First of all, if he has the makings of a reporter, it teaches him what constitutes *news* and also how to get facts straight—often under conditions of rush and other stress. (And if you don't think a science reporter is called upon to work under such conditions at times, watch one trying to interview a gun-shy scientist who, after making a controversial statement at a scientific meeting, insists he has only ten minutes to make a train. Or watch a science reporter break for a telephone after a news conference of the Atomic Energy Commission has produced the makings of a page one story.)

Second, it teaches him that the particular story he's covering on a certain day must compete, for inclusion in the paper, with stories coming in to the newspaper from all over the city, the state, the nation, and the world. Thus, he may learn to marshal his facts and to lay down his story in such an interesting way that even on a day when hot news is breaking everywhere, he'll still make the paper with his yarn. Also, he should learn that, even though his story may wind up on the city editor's desk spike, tomorrow is another day—and he'll keep pitching. As a science reporter, he'd face that situation constantly, particularly if he became a science reporter for a wire service like the Associated Press. Stories totaling more than 100,000 words a day move on the wires of the AP to newspapers all over the world—and news interest is the prime criterion in the selection of stories that make the wire. The wire is not made of rubber.

If the science reporter comes up with a story about a new and effective treatment for the common cold, he's in the money so far as getting it on the press association wire and into an individual paper is concerned. The same may be true, even on a hot news day, of a science story that reports NO new treat-