The Scientific Paperback Revolution

A traditional medium assumes a new role in science and education.

Hayward Cirker

Within the past few decades a number of new developments have appeared which have been hailed as important aids to education and research. Among these are audiovisual aids, educational television, microfilms, microcards, haloid duplication, and the teaching machine. Occasionally, "intellectual" paperbacks are mentioned as an important new medium for education and research, especially in the sciences. This paperback phenomenon is now widespread, and a review of its history and some appraisal of its uses and potential should be made, preferably in some relation to the other, newer developments. Such a review would not only be a useful evaluation of the paperback books for education and research but might put the other new aids into better perspective. It would also press us to take a sharper view of what education is, and how research develops. It should, of course, be written by a scientist-educator. As a publisher of intellectual paperbacks I will try to make a preliminary contribution to a possible larger study by defining and describing the intellectual paperback phenomenon and sketching in its background and history. Much of this I can do from my experience, and it should be reasonably accurate. If my personal comments and judgments seem prejudiced, it is because I cannot disassociate myself from the bias of my background.

A Description of Current Intellectual Paperbacks

The intellectual paperback phenomenon is characterized by a profusion of educational and scholarly books on a wide variety of subjects. Most of the titles have been selected from previously published books. Some original books do appear in this format, but not enough to change the reprint character of the phenomenon or to indicate a trend away from the publication of new books in their traditional higher-priced, clothbound format. Pricing varies between $1 and $2.50, along no fixed lines, but always with an eye to impulse buying. The approach in packaging and design is similarly varied, and here again the goal is impulse purchase. Production standards vary; some of the books are durable and legible, some are only a little better than the 25- to 50-cent paperback. Since quality of production is not easily discernible at first glance, paperback publishers often tend to cut corners in manufacture. Printings range from 5000 to 10,000 copies. This range is not as wide as that for clothbound books (such printings may vary between 1000 and 100,000 copies), and runs are not as large as those of mass-circulation paperbacks—between 50,000 and 200,000 copies.

Selection of title does not seem to be made with an eye to sales appeal, and this is what gives current intellectual paperback publishing its unusual and surprising character. Titles appear to be selected more for their intrinsic merit than through regard for market. By and large, the selection reflects the judgment of a new group of young intellectual publishers and of consulting educators and scientists. Little or no attention is paid to sales managers, production managers, or administrative and accounting executives.

Although the distribution of intellectual paperbacks follows no discernible pattern, the books are widely available in bookshops, on newsstands, and through mail-order catalogs, and distribution is generally better than it is for other cultural commodities such as classical records and clothbound books. Extensive publishing of paperbacks has stimulated establishment of a new kind of retail outlet—the paperback bookstore. These, though few in number, have a character and personality of their own and are in themselves a notable retailing and cultural development. Through these various channels of distribution the serious reader is exposed frequently to hundreds, even thousands, of titles.

Perhaps the most important characteristic of the intellectual paperback development is that it seems to be having an important impact upon education and the cultural development of the country. Although the effect is not measurable, sales, readership, and the statements of thoughtful, knowledgeable observers indicate that it is considerable.

Historical Sketch

There is no element in the present intellectual paperback development that is novel. Only a new and timely combination of older innovations gives it its character and ostensible originality. Its roots and history come from many different sources, not from any single publisher. The myth that this development is the single-handed creation of one publisher seems to have been started with publicity releases and to have been perpetuated by professional writers whose research has extended only to the previously published articles. By this time it would be as difficult to eradicate this pseudohistory from the record as to eradicate Mencken's bathtub hoax. The true history is a varied and complex social and economic phenomenon, and most of the facts of individual contribution are lost and of relative insignificance.

An important technological development occurred in the early 1930's which made much of current paperback publishing possible. Offset presses, papers, and skills improved to the point where the process could be used to reprint entire books economically and in completely acceptable form. The offset camera and plate obviated costly resetting of type or stereotyping when the original type or plates were no longer in existence, and use of the off-

The author is president of Dover Publications, Inc., New York.

set press reduced the cost of make-ready (the process of preparing the plate or type for the printing run). This development provided the technical means of producing, at low cost, small runs of older books for which type or plates were no longer available. Scholarly booksellers were the first to exploit this process. During the 1930's and early 1940's Peter Smith and Stechert-Hafner republished scores of out-of-print scholarly books in cloth-bound editions. These were generally limited to a few hundred copies, were somewhat expensive, and were sold mainly to libraries. The works selected for republication were of much the same type as current intellectual paperbacks. However, these publishers failed to reach the market they could have reached through larger printings, lower prices, better packaging, and wider distribution. Offset is not the only printing process used in the production of paperbacks, and it was not the most important factor in the development of the movement, but it did make possible, especially for the sciences, inexpensive publication of specialized books on an unprecedented scale.

During the 1920's and 1930's several unsuccessful efforts were made by Bonibooks and Modern Age Books to publish cheap intellectual books. At about the same time, the odd-priced cloth-bound reprint and the older "remainder" appeared and were marketed successfully in book stores and drug stores. These lines, published by Garden City, Tudor Publishing Company, Crown Publishers, Grosset and Dunlap, World Publishing Company, the Willey Book Company, and Modern Library, included a good many serious titles, but the editorial point of view was not in the direction of scholarly literature. The same thing was true of the pioneering contribution made by Pocket Books in the field of mass-circulation paperbacks. Penguin Books and New American Library were the first publishers to issue a series of intellectual paperbacks systematically. In 1945 Dover Publications began to reprint moderately priced clothbound editions of advanced scientific books, taking advantage of the offset process and reaching out to a rapidly expanding market. As a further development, in 1949 Dover began to issue such titles in paper binding at prices and press runs comparable to those of the odd-priced clothbound book and the better remainder (*1*). By 1950 there were hundreds of inexpensively priced cultural paperbacks available, and the phenomenon was very definitely established. However, the development was greatly accelerated when Doubleday entered the field with their Anchor books. Through better packaging, advertising, and publicity they made many reviewers and the public aware of the development for the first time. They also aroused other book editors and publishers; these entered the field in rapid succession and thereby greatly accelerated the expansion of publication. I doubt if there were more than 50 inexpensive books of scientific interest available before 1949. Within 10 years this number has grown to more than 1500 titles through the publishing programs of Dover, Anchor, Knopf, Meridian, Crowell-Collier, Barnes and Noble, and the university presses. The number will probably double and triple within the next 5 years.

Current Paperback Scientific Literature

Although the 1500 scientific paperbacks do not seem to have been selected in any systematic way, I will make some broad classifications in order to comment on their range and usefulness. The obvious divisions into traditional disciplines would be less useful for my discussion than a rather personal classification that takes into consideration the type of book, the level of exposition, and the potential audience.

Classics of science. Never before have as many great books and papers been so readily available in the English-speaking world. Scores of great contributors are represented on paperback lists: Helmholtz, Einstein, Michelson, Hooke, Pascal, Lavoisier, Gibbs, Born, Rayleigh, Leeuwenhoek, Harvey, Faraday, Darwin, Fourier, William James, Euclid, Archimedes, and many others. I will not argue the obvious case for direct exposure to the discoveries and thought processes of the great minds and teachers of science. In most cases only books make this exposure possible, and inexpensive paperbacks make it easy. Most of the newer communication aids, such as microfilm, microcard, and haloid duplication, are by comparison awkward, inconvenient, and expensive. Paperbacks have met this need of science and scientific education best. If the classics of science continue to be bought by the public, American paperback publishers may fill, in the foreseeable future, almost every important gap in the literature of the history of science. This accomplishment has never been achieved by publishers anywhere else in the world. This is a powerful tool that can be used to give an understanding of science which could not possibly be achieved through the use of educational television, films, or teaching machines. The tool requires skill and hard work and imagination, but the goal and the rewards are magnificent.

The paperback textbook. Paperback textbooks existed before the present intellectual paperback revolution. Barnes and Noble and the Oxford Book Company were publishing inexpensive high school and college textbooks in the 1920's and 1930's. Although the paperback textbook seems to fill certain requirements, it has not supplanted the traditional clothbound textbook to any great extent. The reasons for this are complex and mainly economic. If paperbacks have not fulfilled their promise as textbooks it is because the standard clothbound, higher-priced textbook does a better job for more authors, students and teachers. However, the paperback is playing a new and valuable role as a supplement to the textbook. For the first time a large body of peripheral literature has become readily available to students for reading at home and in class. Facilities for supplementary reading have therefore become so greatly expanded as to alter previous attitudes toward the textbook. For the first time it has become easy, through the paperback, to teach historical, cultural, and philosophical aspects of a subject not fully developed in the textbook. The paperback has also provided the means of enlarging and enriching the program for the more gifted student. Imaginative teachers welcomed this varied body of literature as a means of introducing students to the idea that there is no easy answer to all the problems of science, and that asking the right questions and seeking answers in a large range of literature is closer to the processes of lifetime education than learning to provide pat answers to predigested questions ticked off by teaching machines. The intellectual paperback is valuable because it requires a greater degree of analysis and comprehension on the part of the student. Moreover, such supplementary read-

ing provides a constant exposure to the fact that no single book contains all the answers or the clearest exposition in every aspect of the subject it covers (students who spend a whole year on a single book may come to a different conclusion). Knowledge and ideas must come from many different sources, and the student must learn to select his sources on the basis of his own questions, his own critical analysis, and his state of knowledge. Supplementary reading cannot replace a good standard textbook, but it can help meet the requirements for lifetime education.

The popular book that explains science. On a very elementary level the layman is probably best introduced to various aspects of science through good newspaper reporting, magazine articles, popular lectures, and television. But for a fuller and deeper approach, the popular scientific book is the best medium. There are hundreds of thousands of scientists and nonscientists who need such literature for their work or who buy such books to satisfy their curiosity—for example, executives, legislators, military men, salesmen, bright high school students, and scientists who want more background in a peripheral field. It is impossible to establish what degree of sophistication the individual reader may bring to a book, and this is why it is so desirable that scientific books at different levels of presentation as well as on a wide variety of subjects be made available. One easily forgets that many decisions affecting science are made by this group of professionals on the periphery of scientific activity.

Publishers of paperbacks have helped to fill this need. The number of titles could profitably be increased four- to fivefold without waste or duplication. Authors should be encouraged to write new books on science for paperback publication, as the National Science Foundation is encouraging them to do. In addition to financial grants, such authors should be given the same recognition that comes with the publication of research papers. There is a rich mine of new scientific literature in German, French, and Russian that could be profitably published in inexpensive editions, if only more capable translators were available. Such translation requires highly developed linguistic and teaching skills and a professional scientific background. Skilled translators will continue to be scarce as long as such work brings so little honor and prestige.

The scientific treatise or monograph. The paperback reprint of the advanced scientific work serves, of course, the useful function of making readily available literature that has hitherto been difficult to obtain. Microfilm, microcard, and haloid duplication do the same thing in a more awkward and more expensive manner. More important than quality of production, however, is the fact that paperbacks are published, not just manufactured. The paperback publisher's work does not end with production. He publicizes, advertises, distributes, and sells. In so doing he brings the reprint to the attention of thousands of scientists who have not been looking for it, or who are not even familiar with it. Through his merchandising procedures he says to the scientist unfamiliar with the original work, "Look here, this book has been eagerly sought after by some very knowledgeable people. Perhaps you ought to look at it. It won't cost more than a dollar or two." It is as difficult to measure the effects of such a sale as it is to evaluate peripheral reading. Learning and research do not follow a straight line, and the article we didn't intend to read sometimes gives us greater insight into immediate problems than an article we may have been looking for. Automated information retrieval is depriving students and researchers of the opportunity to gain new insights through serendipity. The highly organized research library that brings forth only one book at a time and the electronic machine that produces a few pages at a time are delivering material in a manner that is inconsistent with the way the human mind probes and meanders during its periods of greatest creativity. Through impulsive purchase of paperbacks for a home library the scientist may gain that familiarity with a wide variety of related works that seems to have such a stimulating effect on his mental processes.

American intellectual paperbacks have been as well received abroad as here. I estimate that export sales of these books vary between 5 and 15 percent for each printing. They are well represented in many foreign bookstores, and they have evidently stimulated foreign publishers to similar activity. Few other export commodities have done so much to improve the American image abroad. All this has been done with very little government subsidy or encouragement.

Since the beginning of scientific paperback publishing I have heard all kinds of forecasts, varying from predictions that the paperback phenomenon will have an early demise to predictions that paperbacks will eventually replace all other types of books. They are now firmly established. Their value is proved, and their future, within the limitations now apparent, is secure. Even though they are no longer a novelty, they will continue to be published probably at an accelerated rate. The type of publisher, too, is changing. Most of the small young publishing houses that contributed so much have been absorbed by larger houses. Although the declared reason for these mergers is the better development of paperback lines, I suspect that they took place mainly because our tax structure makes operation of larger enterprises far more attractive than the continued development of smaller ones. It remains to be seen whether these absorbed paperback lines will maintain their vigor and originality. There will certainly be new paperback publishers and new paperback lines. In the past few years many university presses and a few mass-circulation publishers have entered the field. Paperbacks are now coming from England, where, except for Penguin Books, the development followed that in America, and where it has met with the same flowering success.

The only adverse circumstance that I can foresee is the passage of the proposed bill for copyright revision which will take a vast amount of literary property from the public domain and give it to private interests by extending copyright of all previously published works from 56 to 76 years. The vitality of inexpensive publication in the United States depends somewhat upon public domain. In spite of powerful lobbying by private interests, I am hopeful that the bill will be defeated when the scientific and educational community voices its objections to this unwarranted usurpation of a public heritage.

The number of scientific paperbacks will certainly increase two- to threefold within the next few years. Evaluation of these books and provision for their greater use are important challenges. Until now, almost every review such as this has been made by professional writers and publishers. These evalua-

tions should now be made by educators and scientists. Paperbacks have been absorbed into teaching and educational programs on a haphazard, individualistic basis. More considered plans and recommendations for their use could be helpful, along with carefully evaluated reading lists. (Some efforts have been made along these lines in the *Inexpensive Science Library* booklet, put out by the American Association for the Advancement of Science.) Suggestions for further paperback republication of monographs and treatises are not lacking, and all that is needed in that category is continued support through purchase by individuals, schools, and libraries. Encouragement of a more active nature is needed if the many gaps in popular scientific literature are to be filled.

Although the paperback is only a slight modification of the traditional book it may very well be a more powerful tool in scientific education than recent developments which assume a more modern and complex form. The book, like the wheel, is a magnificent contribution of the past which still has a great potential and which is not likely to be superseded in the foreseeable future. Paperbacks have reminded us not to take books for granted but to exploit them with enthusiasm and imagination.

Note

1. During the past 50 years there have been similar developments in European literature, such as Ostwald's *Klassiker, Sammlung Göschen*, and the *Que Sais-Je* series. These parallel developments did not appear directly to affect the trends in America and England, except perhaps to afford a stimulus to individual editors and publishers.

Potpourri and Gallimaufry

Being a Random Assortment of Anecdotes about Greater and Lesser Scientists

Paul E. Klopsteg

During the years which have passed since my becoming identified with science in general and physics in particular, many events of a sort not usually publicized have come within my experience and are stored in my memory. I remember them, probably, because of the unusual personalities with whom they are associated, and because the events themselves are not commonplace.

Memory is not a dependable source of facts amenable to proof. In such a recital as this, however, unswerving adherence to facts is not demanded. Anecdotal material does not call for a notarized statement attesting to its complete factuality, but this does not imply that the stories are inventions. I have endeavored to state forthrightly what I have been able to draw from my recollections. These word pictures may help to humanize notable personages in a way which could not be done in research papers or other more formal presentations.

The author was a member of the Governing Board of the American Institute of Physics for 16 years, and its chairman for 7. He is a past president of the AAAS.

Robert A. Millikan

My first story is about Robert Andrews Millikan. At the time, he was a demigod to a beginning graduate student, although his image became more terrestrial with growing acquaintance. It was in Minneapolis, at the 1910 meeting of the American Association for the Advancement of Science, that Millikan was scheduled to give his first paper on the oil-drop experiment for measuring the charge of an electron. My studies were in part financed with money I earned as lecture assistant to John and Anthony Zeleny, professors of physics at the University of Minnesota.

Millikan's talk was to be given in the main lecture room of the physics building, and it was to be illustrated with lantern slides. Because the 750- or 1000-watt bulb with concentrated filament had not yet been invented, the carbon arc was the universal light source for projection lanterns. The arc was controllable in position, if not in steadiness, by concentric adjusting knobs at the rear of the projector. My job made me ex-officio projectionist, for which my undergraduate work in electrical engineering helped to qualify me as an expert.

In his talks Millikan was somewhat wordy and rambling, and no time table for showing the slides had been provided. Since the arc could not be turned on and stabilized quickly, I kept it ready for instant response to the speaker's signal. Millikan's discussion continued at such length that the rapid consumption of the carbons gave me increasing anxiety. By perverse coincidence, the signal for the first slide came just as the arc failed. Changing carbons without getting one's skin seared by contact with hot metal required most deliberate care, and a minimum period of perhaps a minute, with another quarter of a minute added before the arc could be adjusted properly. During this nervous interval Millikan made some uncomplimentary comments while waiting impatiently for the first slide. I am sure that his remarks, in relation to what he felt, were restrained, and represented magnificent self-control; for Millikan was a religious man.

A. Wilmer Duff

During World War I Millikan was a lieutenant colonel in the Signal Corps, in charge of a research and development group which, in miniature, was a precursor in purpose if not organization of the National Defense Research Committee of World War II. The group worked under the auspices of the newly created National Research Council. Among its members were F. C. Brown, A. Wilmer Duff, L. P. Sieg, John T.