the typical view of nature in traditional Japan. The underlying idea of Lynn White's article, "The historical roots of our ecologic crisis" (*8*), is closely related to my view. In discussing the environmental crisis today, he asserts that "both modern technology and modern science are distinctively *Occidental*," that "Human ecology is deeply conditioned by beliefs about our nature and destiny—that is, by religion," and that "Our science and technology have grown out of Christian attitudes toward man's relation to nature . . . ." In the counterculture groups, he discerns "a sound instinct in their affinity for Zen Buddhism," but he is doubtful of the viability of these faiths among Western people, an opinion with which I agree. White ends his article by proposing as "a patron saint for ecologists" St. Francis of Assisi, who "tried to depose man from his monarchy over creation and set up a democracy of all God's creatures."

I do not know whether White would include Buddhist priests in a catalog of patron saints for ecologists. But let me cite two instances of Buddhist practice. When going out for the daily mendicancy, it was customary for Southeast Asian monks to wait until twilight, when there was sufficient light to see the lines on the palms of their hands, lest they should tread on little worms and insects while walking on the dim ground. A second example comes from the life of Ryokan (1757–1831), a Japanese Zen priest and poet, who had a particular following among farmers and children. He is said to have used a mosquito net in summer, not to protect himself from being bitten by mosquitoes, but to prevent his unconsciously slapping them while sleeping. He left one of his legs outside the net so that mosquitoes might live on him.

Obviously, this kind of sentiment has been rapidly fading in Japan since the hasty introduction of modern science and technology. This traditional sentiment, however, has not been completely replaced by the idea of man and his relation to nature which underlies Western science. Still immersed in nature itself, the Japanese people do not quite realize what is happening to nature and to themselves, and are thus exposed more directly to, and are more helpless in, the current environmental crisis.

References and Notes

1. "Of a promise kept," in L. Hearn, *A Japanese Miscellany* (Tuttle, Rutland, Vt., 1954), pp. 11–17.
2. Lafcadio Hearn (1850–1904) thus came to contribute a great deal to the introduction of the Japanese culture to the Western world.
3. C. Mather, *The Christian Philosopher* (E. Matthews, London, 1721), p. 8.
4. K. no Chiyo, in K. Abe and I. Abe, Eds., *Kinsei Haiku Haibun Shū* (Iwanami Shoten, Tokyo, 1964), p. 152.
5. K. no Chomei, in *Anthology of Japanese Literature from the Earliest Era to the Mid-Nineteenth Century*, D. Keene, Ed. (Grove, New York, 1955), p. 211.
6. I. Shimizu, *Kindai Nihon Shisoshi Koza*, **3**, 9 (1960).
7. J. Frisch, in *Studies in Japanese Culture*, J. Roggendorf, Ed. (Sophia University, Tokyo, 1963), pp. 225–244.
8. L. White, Jr., *Science* **155**, 1203 1967).

Soaring Prices and Sinking Sales of Science Monographs

Curtis G. Benjamin

Having a perennial and nagging concern for the economic viability of scientific monographs and treatises, I was interested, but not surprised, to read a letter from David Lester (*1*) complaining about the high prices of scholarly books. He is right in saying that such prices have increased drastically in recent years. Since I have long maintained periodic indexes of the costs, prices, and sales of scientific books of monographic nature, I can document the case retrospectively.

Per-page prices were 2.5¢ for books published in 1957, 3.8¢ for 1967, and 6.1¢ for 1972. Thus prices have increased by 144 percent over the 15-year period, and about 60 percent of the total increase came in the last 5 years. These rates of increase certainly are drastic—indeed they are alarming.

Although one might naturally assume that publishers are getting rich on sales at current prices, this is not so. In fact, the opposite is true: the publication of monographs has become less and less profitable in recent years. Sales per title continue to decline sharply, hence printings must be smaller and unit production costs higher in proportion. Many of the major publishing firms have already felt compelled to cut back on their production of monographs, and more probably will soon have to follow suit.

The main cause of this enigmatic price-profit situation is, clearly, the historic pattern of declining markets for monographs in the United States. According to my index of sales per title in the 5-year period after a book's publication, average sales of such works declined from 4977 copies in 1957 to 3761 copies in 1967, then to 2961 copies in 1972. (The dates indicate the ends of the 5-year sales periods.) Here one can readily observe an acceleration of the declining sales curve, although it is not as rapid as that of the mounting price curve. At any rate, it is obvious that smaller sales have resulted in higher prices or that higher prices have resulted in smaller sales. As a close student of the matter, I opt for the former cause, and I shall try to explain why the rate of price increase has been greater than the rate of sales decrease.

Of the several observable reasons for the sales decline (none of which is accurately measurable), the most obvious one is resistance to high prices. This resistance comes largely from librarians, and it can be readily understood, what with the deplorable squeeze

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that all libraries have had on their operating budgets year after year. This factor is important because the kind of book under discussion here depends on library sales for its sustaining market. Still, resistance to high prices has not yet become a highly critical factor.

The second reason is the operation of what I have called by analogy the "twigging phenomenon" in the publication of scientific monographs. A good number of years ago I described this phenomenon as the continual fractionation of scientific knowledge and, hence, of the subject matter of scientific books. Naturally, this endless fractionation results in scores of highly specialized books being written each year for groups of readers that are no larger today than they were 25 years ago, despite the fact that our total population of scientists has more than quadrupled in the past quarter-century.

In my analogy, the subjects of such books represent twigs on the tree of scientific knowledge. Although the tree itself is perhaps five times larger than it was 25 years ago, the twigs are still the same size—and so are the markets for specialized scientific books. The trunk of the tree, representing basic textbooks and handbooks, is much larger, of course. So are the main limbs and secondary boughs, representing intermediate textbooks and general treatises. Both kinds of scientific books are sold in much larger numbers. But for the "twig" books—the advanced treatises and monographs—the market has not increased at all.

While on the subject of the twigging phenomenon, I should deal with the question of why it is such a crucial economic factor. The answer is a matter of simple arithmetic. The per-copy production cost of a new book is determined by dividing the total of such costs by the number of copies printed. The rub comes, of course, when the current, much higher initial "plant" costs (editorial, typesetting, proofreading, illustration, engraving, and plating) have to be spread over the same number of copies as that printed many years ago.

This kind of squeeze does not occur in the production of a textbook, for example, where even a 100 percent increase in plant costs can be leveled out by a print order two or three times as big as it would have been 25 years ago. But the twig books have to bear the economic curse of continual fractionation of markets. And their prices will continue to be disproportionately high if scientists are to be served adequately in their professional literature.

The third, and the most important, reason for the blight on twig books in more recent years has been the employment of the so-called new technology and of new circulation practices by research and special libraries. Widespread and almost uninhibited photocopying, both legal and extralegal, for personal use of library patrons has for some years been increasingly harmful to book sales. More recently, photocopying for interlibrary loans has taken an additional toll—this is the practice of supplying a "sister" library with a reprographic copy of a wanted part of a work rather than to lend the book itself. On top of this have come sophisticated (and costly) technical systems for electron-optical transmission of reference materials among large networks of research libraries. All of these practices have been so employed that in many library systems one copy of a monograph now serves where three or four copies were needed 20 years ago.

Now admittedly, no one can prove conclusively just how much these new practices have hurt the sale of monographs. However, publishers can clearly discern progressive changes for the worse in the pattern of library purchases of such books. They can also discern that the progression has worsened sharply in recent years, when the copying practices have become more prevalent. Thus, the prima facie, presumptive evidence is very strong. In any case, one can assume that the rapid acceleration of prices recently has been caused by the dual impact of inflated dollar costs and depressed sales, with the latter being the result of the harmful photocopying imposed upon the restrictive twigging phenomenon. With all these compounding negative factors at work, it seems safe to predict that the printed monograph will become economically unviable well before the end of the present decade.

Further, I foresee a much quicker demise if certain prominent scientists and educators succeed in their efforts to gain broad exemptions from copyright protection under the copyright revision legislation that is now before the Congress. An ad hoc committee, sponsored by the National Education Association and supported by some 40 other professional organizations, has proposed an amendment to the pending bill which would allow "nonprofit use of a portion of a copyrighted work for noncommercial teaching, scholarship, and research." If this amendment is accepted and enacted into the new law, the lid will be off of photocopying and the withering twig book will, consequently, meet a much more sudden death.

I see the problem as a race between the waning viability of an important class of printed works and the maturing of the new technology for information transfer. It could be that the Gutenberg technology has had its day—that the new technology must inevitably take over the information transfer function of the twig book. This may well be so, but I am deeply concerned that the printed monograph will be killed off long before the new technology is ready to take over in the form of an economically supportable replacement system.

In my view, this is a possible contingency that should worry everyone concerned—authors, publishers, librarians, and scientists alike. But it seems that only the publishers and a few authors are at all worried. This is strange because publishers are the ones who should worry the least. Most publishing firms would exist very comfortably if they should be forced overnight to stop publishing monographs. At the risk of appearing cavalier in attitude, I shall cite McGraw-Hill as an example. At any time in the past 5 years, McGraw-Hill has had about 1000 titles on its list of monographs in science and high technology—a list that is renewed every 5 to 6 years. As important as it is in other terms, this list has produced annually no more than 3 percent of the company's volume of book sales and less than 2 percent of its operating profit thereon. With these facts in the back of my mind, I am always pained when librarians and scientists tell me (as they often and sometimes brusquely do) that the fate of the twig book is something for me, not them, to worry about. I have to wonder how they can be so unconcerned about their own more imperative needs.

Lester concluded his letter by stating: "Book publishers appear to be urgently in need of technological advances that will cut the cost of production" (*1*). While this statement is decidedly correct, it should not be assumed that no such advances have

been made. Actually, most publishers have already employed several technological advances to cut costs in both the composition and printing of short-run editions. The gains have been substantial, but far from enough to offset the increases in other elements of operating costs, much less the sharp increase in production cost caused by progressively shorter press runs. Moreover, the problem of production cost alone is not as important as one might reasonably expect it to be. This is because the production cost of the average monograph is usually no more than 25 percent of the list price. (A typical formula for pricing a presumably *profitable* monograph covers other costs—discounts, royalty, advertising and sales, order fulfillment, and general overhead—that typically amount to about 67 percent of the list price. This leaves the publisher some 8 percent for operating profit before taxes at the 54 percent corporate rate—but, of course, neither the typical formula nor the tax charge can be applied to the monograph that does not sell well enough to cover the cost of its first printing.) Thus it is obvious that even a drastic cut in manufacturing cost produced by a technological miracle would not serve to reduce the list price by a noticeably large amount.

No, the publishers of scientific monographs need much more than a breakthrough in cost-cutting production technology. They need either many more customers for their present product or else a revolutionary system for recording and disseminating specialized works of more than article length. Since a fulfillment of the first need is out of the question, and since the second is not likely to be met economically for several years to come, we can, I believe, expect an ad interim crisis that will be shocking to everyone concerned.

Reference

1. D. Lester, *Science* **181**, 220 (1973).

NEWS AND COMMENT

Prescription Drugs: HEW Will Only Pay Lowest Price

The federal government intends to stop buying high-priced prescription drugs for Medicare and Medicaid patients whenever equivalent medications are available at a lower price. This decision to economize, made recently by Health, Education, and Welfare Secretary Caspar Weinberger, could mean that the 10-year war between the government and the drug industry is finally nearing an end, with the government coming out ahead. It is also possible that the ultimate effect of Weinberger's decision, which is in the process of being translated into federal regulations, will be a reduction in the cost of prescription drugs for all of us.

In spite of the fact that we are used to the idea of virtually identical products selling for widely varying prices, depending on the label or brand name, the idea that this practice applies to drugs, just as it does to washing machines, repels a fair number of people. They want to know, for example, why 1000 tablets of a common tranquilizer cost $4.95 if their physician writes a prescription for meprobamate and $68.21 if he calls them Equanil. Similarly, people have asked why 100 tablets of penicillin cost $1.45 if they are called penicillin and $10.04 if those same tablets are called by the brand name, Pentids.

For years, members of Congress have been asking questions like these. So have former Secretaries of HEW. Interest in buying prescription drugs by their so-called generic, or chemical, name rather than by brand name became particularly strong after the passage of the Medicare and Medicaid legislation in 1965. Several bills have been introduced that would have required the government to pay for drugs under their generic names to avoid paying the premium price that often goes with brand name products. But none of the bills ever passed, and HEW Secretaries who considered doing what Weinberger has done were persuaded not to.

The issues, pro and con, are complex. They were 10 years ago and they still are. The only thing that has changed, as far as is evident, is the Secretary. Weinberger is committed to saving money, at all costs, and this decision on drug purchasing will do that. He estimates that, had the "buy low" regulation gone into effect last July, the government could have saved $28 million in fiscal 1974 for Medicaid patients alone. In an interview with *Science*, he said that the decision to save money on prescription drugs for Medicare and Medicaid patients should be seen in the context of the Administration's effort to save money on medical bills across the board. "It is part of a whole package of economy," he said, "and it will be especially important if we're going to pay for drugs under national health insurance." Although he anticipates strong opposition to the new regulations from the drug industry, particularly the Pharmaceutical Manufacturers Association (PMA), which represents about 95 percent of the nation's drugmakers, Weinberger fully expects them to go into effect after passing through normal channels. That means they will be published in the *Federal Register* and interested parties will be invited to comment. You can be sure PMA will comment. Officials of HEW figure that it will be July at the earliest before the regulations actually take effect.

The assumption underlying Weinberger's decision to buy medications at the lowest available price—an assumption the PMA has always contested—is that all drugs are created equal. Therefore, one assumes that, if 20 companies manufacture the same drug, each of those 20 products contains exactly the same amount of active ingredient and that each is made under equally rigorous and sanitary manufacturing processes. One also assumes that each is the same as far as bioavailability or therapeutic equivalence is concerned. Do various versions of the same drug dissolve with equal speed? Are blood concentrations equally high and are they maintained for equal periods of time? Although officials of the current Administration have said that the bioavailability issue has been exaggerated beyond its importance, PMA, as well as many independent pharmacologists, has long insisted that it is the issue on which everything turns.