

READER INTEREST IN SCIENCE: CHILDREN

Sidney Rosen

My interest in science was first stirred by reading the adventures of an extraordinary young man, who combined the ingenuity of an Edison with the moral integrity of a Plato and the get-up-and-go of a Horatio Alger hero. His name was Tom Swift, and I read my way through his series of adventures with marvelous rapidity. Such books, of course, were acquired (along with Frank Merriwell and Nick Carter) by a mysterious trading process; they did not sit on the shelves of my public library. After Tom Swift came The Lost World, by Arthur Conan Doyle, and The Land That Time Forgot, by Edgar Rice Burroughs, both introducing me to the realms of historical geology. The piece-de-resistance of that glorious period of reading was Paul de Kruif's The Microbe Hunters. This work did the job of convincing me (and many of my contemporaries) that science was one of the most adventurous areas of man's knowledge.

This notion of reader interest at a young age pointing the reader toward a career is not a new one. Many of the thinkers and doers in man's history were affected deeply by the reading they did when young, whether they read words printed on paper, inscribed on parchment, or hieroglyphics on papyrus and cuneiforms stabbed into wet clay. One of the first "easy" books on science, a forerunner of "do-it-yourself knowledge," was Jane Marcet's Conversations on Chemistry, published in England in 1820. This book sold over half a million copies in America alone, and was responsible for many young men turning to chemistry as a career; one famous example was Josiah Cooke, the great nineteenth century Harvard professor of chemistry.

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But what of the period in my youth before Tom Swift, before I had reached the junior high school level? I began reading voraciously at about the age of five, but I can remember virtually nothing that could have been categorized as science until I came to the Tom Swift books. At that time, in the elementary schools of my city, science was--to put it mildly--a peripheral subject. American elementary education was still in the grip of the "nature study" cult then, and I recall vaguely that my science came in minute doses from characters like Peter Rabbit and the North Wind. In fact, the sharpest memory I have of science during my elementary school days is the information gleaned from a book left behind by one of a series of boarders at our house, a textbook entitled Town and City, which dealt with civic hygiene. This information was that malaria was carried by a variety of mosquito known as the anopheles mosquito, whose distinguishing feature was that it kept its behind up in the air as it perched, unlike the ordinary variety, or culex mosquito. Though I looked with extreme care at the behinds of all mosquitoes before slapping, I never found an anopheles.

But that world has passed. We are more aware of science as a force in our civilization today than ever before. And young children today, almost from birth, are aware of science as a force in their lives. They see manifestations of what we know as science in the world about them, from the falling of a leaf to the shriek of a jet plane in the skies. They soon learn that mother has a washing machine, and a dryer, and a dishwasher, and a toaster, and an electric steam iron, and even an electric hair dryer, so that she can wash her hair on a rainy day without fear. She does not have to pickle or dry meat to keep it from spoiling, for she has a refrigerator and a freezer. And of course, we cannot omit the ubiquitous automobile or television set. Children are fascinated by the subject matter of science, because it concerns almost everything that seems to be happening about them.

And since children are, quite fortunately, unlike adults, their curiosity about nature is open and unashamed; they want to know why everything happens and how it happens. One little boy told me that for him, first-grade science was the most exciting thing in the classroom because, "science means when you find out!" Children are ready for an understanding of science. And since they are going to be spending the rest of their grown-up lives in a world endowed with the results of scientific thinking, why shouldn't we tell them all they want to know about science as soon as they want to know?

There has been one revolution in elementary school science teaching, inspired by Craig in the middle-thirties (too late for me!). And new revolutions are brewing now--two right on the University of Illinois campus. Professor J. Myron Atkin of the College of Education is demonstrating successfully that our children can meet the challenge of thinking conceptually in science at high levels of sophistication. And Professor J. Richard Suchman, of the same college, is investigating the nature of inquiry about scientific phenomena by children and the uses of inquiry as a teaching device in elementary school science.

On the other hand, one might well ask, "why do adults dislike science?" Today, too many adult Americans, regardless of their intellectual status, dislike and fear science (particularly the physical sciences). Is it the result of poor teaching during their youth? Or is it the result of a fear of the unknown? It does seem strange that the average American should willfully choose to cut himself off from an understanding of this particular area of knowledge. And coupled with this fear of science is a fear of mathematics--a fear that almost seems to be passed on from father to son, from mother to daughter, as a loving heritage. While this may sound like an exaggeration, we know it is not; for the frightening results of the survey of teenage attitudes toward science and scientists, made by Drs. Margaret Mead and Rhoda Metraux in 1957, showed that the fears of and misunderstanding about science are very, very real. Coupled with this fear of science and scientists are the usual companions of fear: distrust and apathy.

In their study, Mead and Metraux found the real shocker: that even the positive image of the scientist was a distorted one in many young minds. If their conclusion is a valid one, something must be going wrong in our science education at an early stage. Why should children be any more afraid of science than they are of poetry, art, or history. If I remember my Dobzhansky correctly, a fear of science is not contained in the genes. So, it must be a learned fear. And where would a child learn such a fear? The answer is obvious: from a prejudiced adult. In the teen-age image of the scientist, we can see the effects of the mass media: Hollywood (or the Frankenstein image), the horror-fantasy magazine, radio, and television. Prejudices against science are particularly harmful when they affect the formal education of our children. A teacher who is biased against science may spend less time teaching it in the classroom; a librarian can exert her prejudices by buying only those books she favors to be put on her library shelves.

There has been much progress in the teaching of elementary school science since the days of nature study. In many school systems, science is now being taught from the first grade on. But it is still a painful fact that in the preparatory curricula experienced by many of our elementary school teachers, science is still treated as a peripheral subject. In the teachers colleges and colleges of education, science methods courses for prospective elementary school teachers are usually elective and not required.

Many of our teachers who have to teach science in the self-contained elementary classroom are uneasy about it. They often feel that the youngsters know more about science than they do. Many are ill at ease, trying to teach an area of knowledge which they "had" in college (as one "has" the measles), but which they never really understood.

And so, when it comes to teaching science--and we all understand that these days school administrators are being harrassed by requests (or demands) to step up science teaching in the elementary curriculum--the elementary school teacher falls back upon the one reliable crutch she learns to use in cases of emergency: the textbook. The one prerequisite for the teaching of science becomes not the ability to understand science, but simply the ability to read. And for the children, the understanding of science becomes merely their ability to recall the factual material of the textbook.

What effect does the sole reliance upon a textbook have upon the reading habits of children. Not a very good one, I think. Most, if not all elementary school science textbooks are subject to a vocabulary regulation, predetermined by certain standards which are accepted and insisted upon by educational administrators and, therefore, by textbook publishers. A book written, let us say, for the third grade level must use words which are on the prescribed third grade vocabulary list. Such lists are usually based upon pseudo-scientific formulas whose validity is not above reproach. Authors of these textbooks have to confine themselves as much as possible to the given vocabularies; if they unconsciously go beyond them, the material must be rewritten, or it will not be acceptable. I am reminded of the story about the illustrious author of The Cat in the Hat, who did marvelously well with his given word list, except that it did not contain one word he had wanted to use: bird. He tried to combine what was available, but the best he could come up with was "wing-thing," and he gave up. Another restraint usually imposed upon authors of elementary school science textbooks is the use of simple sentences and short paragraphs.

But there exists another world of writing for children-- a world where the only restriction upon the author is that the writing ought to make the child want to keep on reading the book. I am referring, of course, to the books known as trade books, the ones available in bookstores and on library shelves. Unlike the textbook, the trade book offers an opportunity for a wide variety of stylistic approaches to a subject, both in writing and illustration. The possible number of things to write about is virtually infinite. It is interesting to compare the work of such a fine writing team in the field of science for young children as Herman and Nina Schneider in their textbook series and their many trade books. The writing in the latter is relaxed and graceful, the two or three syllable words are let fall where they may, the sentences are compound and elegant. In their textbook series, however, the constraint under which they write is obvious, the style now more forced and artificial.

What about the central character in all this, the child? Do children like to read trade books, and do they enjoy reading them more than textbooks? I think every children's librarian and school librarian in the country must know the answer to that question. Librarians know that, in general, children in grades one through six love to read. For many young children, reading is like food and drink. They have discovered a new path to take them closer to an understanding of the mysterious and exciting world about them. And most important, the trade books are not imposed upon the children by a higher authority, as are textbooks. Trade books are simply sitting there on the shelves, waiting for any child to select them or not, as he pleases. I am sure that cases must occur in the schools where "Johnny can't read" textbooks, but can read with eagerness and even ease trade books which interest and motivate him.

Here then is the situation: there are elementary school science textbooks in the schools, and there are elementary science trade books in the libraries. What is the responsibility of the teacher in relation to these two separate worlds of writing for children? What is the responsibility of the librarian? The elementary school teacher, of course, is usually bound to the textbooks, not only in terms of her own anxieties about teaching science, but by the normal administrative restrictions of the school system requirements. And though many elementary school teachers are aware of the wonderful science trade books for children that exist outside the school walls, and try to take advantage of these books in their teaching of science, the average teacher is often too overworked, too busy with the details of everyday teaching to take out time to use the books in

the library to her advantage. Many teachers simply are unaware of the existence of these books, or have failed to keep up with the new ones which appear in increasing numbers every year. Many teachers cannot tell a "good" easy science book from a "bad" one among the flood of juveniles coming from the publishers' presses. Many teachers cannot distinguish the publisher who is concerned about the quality of his science books for young children from the one who is jumping on the popular science bandwagon to "make a fast buck."

It is in this connection that the work of the librarian becomes very important. For the children's librarian (and the school librarian) is as close to the child as the teacher. Sometimes, in fact, the librarian is even closer, because her work with children takes place in a less formal, more permissive atmosphere. The librarian who knows her business has a good idea of what books children like to read. She has developed criteria for the evaluation and selection of children's books in general, or she has available at her fingertips critical evaluations of such books by specialists in the field of children's literature in such journals as The Horn Book, The Children's Catalog, Bulletin of the Center for Children's Books, School Libraries, and the Wilson Library Bulletin. The librarian is in a position to pass on to the elementary school teacher information about books that might take the teacher a long time to acquire.

Librarians, like teachers, are only human and can be subject to the same biases against and anxieties about science as teachers. But, like the teacher, the librarian must rid herself of these prejudices and realize that science is a most important area of man's knowledge which ought to be understood and not feared. Pertinent to this last, perhaps, is the story of the little third-grade boy who dashed into the children's room of a library and quickly seized upon a book he had been waiting many weeks to get his hands on--the well-known First Book of Snakes. He bore his prize proudly up to the front desk, where the head librarian, a very fine, well-bred lady, with the air and attitude of--well, you know, a head librarian--presided. As she turned the front cover of the book, her gaze fell upon the illustrations printed inside--a green mass of writhing, crawly creatures--she could not repress an involuntary shudder. Noticing this, the boy drew himself up to his full height and insisted sternly, "Lady, if you wanna learn about science, you gotta like snakes!" Librarians, there is a moral here somewhere!

In some large urban areas, there exist programs of cooperation between children's librarians and elementary school teachers. Such programs involve book reviewing for the teachers by librarians, visits to the library by school children, and visits to the schools by librarians. The ideal situation, of course, would be to have a library and elementary school librarian in every elementary school. But the position of elementary school librarian is too new and too sparsely filled to diminish the importance of the cooperative program mentioned above.

Of course, it must be recognized that in many communities, particularly rural ones, even children's librarians may be non-existent in public libraries. Often, in such communities, the librarians, trained specifically in the care and feeding of adults, either forget about, or pay little attention to the wonderful new world of science books for children. And in these libraries, children find too little to read that is apart from the confines of the elementary school science textbook. This is not to suggest that textbooks are unnecessary; indeed, they have their place and their use. But textbooks alone cannot motivate reader interest in science on the part of young children.

What ought to be done about the interest of children in reading about science?

First, as in all cases where a problem exists, there ought to be an awareness of the problem on the part of all people concerned, the elementary school teacher, the librarian, the school administrator. And this awareness might well be communicated to the parents of the children, so that they may share with their children the discovery of new and exciting adventures in reading about science.

The acquisition of a school librarian by every elementary school system in the United States is, for budgetary reasons, a distant utopia. But something ought to be done now to bring the elementary school teachers and the public librarians closer together. What I would like to propose, then already exists in communities throughout the country; but it exists on too small a scale. I propose a deliberate program of cooperation on a national scale between all elementary schools and all public libraries. Whether such a program is to be instigated by local school systems or public libraries is a matter of convenience. But in the matter of elementary school science and the problem of motivating children's interest in science, such a program could prove to be of inestimable value to teachers (not to mention the step-up in library circulation so dear to the hearts of all librarians).

This kind of program might involve, for example, the planning of seminars attended by teachers and librarians, where discussions of mutual problems in developing the interest of children in reading about science would take place. Librarians could prepare monthly reviews of good children's books in science to be distributed to teachers. Elementary school administrators would make available to librarians an opportunity to share in any special in-service courses or workshops in science being held for elementary school teachers. Tied in with these activities would be the fairly regular visits of the local librarian to the elementary school classrooms to tell the children about the new acquisitions in science, and to remind the children of how the facilities of the library can be used for research.

It seems to me that such a planned program, begun in every community in the United States that has at least one elementary school and one public library, could well provide a most important stimulus toward the solution of some of the problems of teaching science in the elementary school. Not only do the librarian and the elementary school teacher complement each other in education, but each has much to offer the other. The librarian will be widening the horizons of her influence. The teacher will find herself relying less and less upon the elementary school science textbook as the only means of instruction.

And the children--most important of all, the children--will find in all the fine books about science for young people a new and strong motivation toward an understanding and appreciation of man's universe.