The False Images of Science

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ADVENTURES OF THE MIND

43.

The False Images of Science

By GERALD HOLTON

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Of the influences that shape man's actions, none is more powerful than the images we carry in our heads. Every subject is apt to invoke in our minds a specific image, made up of concrete information, misinformation, folklore, desire and prejudice. Thus, how people see themselves as a nation determines to a large extent how they will respond to any new challenge. The roles we play in our family life, particularly with respect to our children, depend greatly on what roles we assign ourselves in the society around us.

In the same way, our images of science vastly affect the relationship between science and society. Practically, these images determine the level and the sources of financial support, the quality and quantity of instruction offered, and the development of new scientists. The effects on professional morale and the goals scientists set for themselves—in short, on the scientists' image of their own work—are also considerable. But even more important is the role images play in deciding this urgent question: Can scientific activity be an integrated part of our culture, or will it be forced to develop independently? Right or wrong, ideas are powerful. Therein lies the chief danger of false images. Like bad grammar, bad images become dominant when they gain wide currency, and so undermine communication among thoughtful people. It is high time, therefore, to consider the prevailing public images of the role of science, using the most straightforward language possible.

Pure Thought and Practical Power. Each person's image of science is different from the next, but all are composed of seven main elements. The first goes back to Plato and portrays science as a tonic with double benefits—science as pure thought helps the mind find truth, and science as power provides the tools for effective action. The main flaw in this image is that it omits a third vital aspect. Pure science allows us to understand the physical world and, through its applications, allows us to control and change

About the Author

Gerald Holton, professor of physics at Harvard University, is active in three fields—physics, teaching and scholarly editing. Doctor Holton pursues experimental research on the properties of materials under high pressures; he teaches and writes in the fields of physics and the history and philosophy of science; and he is also editor-in-chief of Daedalus, the journal of the American Academy of Arts and Sciences. Born of Austrian parents, Doctor Holton is thirty-seven years old. Photograph by Arnold Newman
that world. But science also has a mytho-
poetic function; that is, it generates an
immanent order and serves as the guid-
ary and provides some of the meta-
physical axioms on which the philosophical
conceptions of our ideology.
As a consequence, the methods of argu-
ment of science, its conceptions and its
models, permeate first the intellectual
life of the time, then the tenets and usage
of everyday life. Our language of ideas,
for example, owes a debt to the science of
statics and hydraulics and the model of
the oikos (the house) behind the powerful
analyses in many fields of study.
Guiding ideas—such as conditions of
equilibrium, centrifugal forces, con-
ervatives laws and the balance of energy
or power, feedback, invariance, comple-
mentarity—enrich the general arsenal of
imaginative and technical thinking. All
philosophers have a share with the science to
work with concepts such as space, time,
quantity, matter, order, law, causality,
verification, reality.
A sound image of science must, there-
fore, embrace this third function, in addi-
tion to the other two functions of com-
pleting and to practical applications. How-
ever, more usually, only one of the three
is recognised. For example, folklore some-
times depicts the life of the scientist as a
lonely, isolated, divorced from life and
beneficent action in the larger sense.
In the second image of long standing
is that of the scientist as iconoclasm.
Indeed, almost every major scientific
t_____ (text continues on next page)
like a tree, ring by ring. Einstein did not prove the work of Newton wrong; he provided a larger setting within which some contradictions and inconsistencies of the older physics disappeared.

But the impact of science as an ecological disaster can be subjected to a more severe critique. Regardless of science's part in the corruption of absolute values, have those values really given us a safe anchor? A priori absolutes stand still over the globe in completely contradictory vacuums. Most of the holistic philosophies that have been carried out under the banner of some absolutist philosophy, from the Artech quest to the auto da fé of the Spanish Inquisition, from the massacres of the Hispanics to the Nazi gas chambers. It is at best an optical illusion which makes the foursquare world look so serene and desirable to modern critics of the recent, "scientific" periods, just as the title of the "savage savagery," so esteemed by eighteenth-century philosophers, has been seen to be what it is, and who it is.

Science has last four images implied a revolution from science. We might describe the next one as an addition to science. Scientists divide all thought into two categories—up-to-date scientific knowledge and the rest. They dismiss the rest to this category, but most of its adherents are the scientists themselves. Among the social studies, for example, there are some voices of the seductive idea that the mathematical sciences offer the only permissible models for successfullly solving scientific problems. A far more significant symptom of science is the growing identification of scientists as the creators of new science. This is an effect of the new science.

Fact noneutrophils would be likely to suspect a hoax if it were incidentally mentioned that a unnecessary light higher than hydrogen had been syn- dicated or that the United States had beaten Russia in a secret race to establish a manned observation platform at the surface of the sun. Apparently anything can happen these days; science has no inherent limitations. Thus, the image depicts science as magic, the scien- tist as a wizard playing with his sub- ject. We tend to either to fear him or to accept his authority without question. Like the other false images of science, this one is partly an educational problem. All our voracious consumption of techni- cal devices, all our talk about science, and all the more misused, is not the development developments cannot hide that most of us are content to remain completely ignorant of science. In a recent nationwide survey, nearly 40 per cent of those who had attended college confessed they read only a single course in science or physical or biological science. Those who did devoted generally less than 10 per cent of their courses to science. Moreover, in science classes they miss all too often of the kind of teacher who can impart to the average student a wide appreciation of both the inherent powers and the inherent limitations of science, who can show how to distinguish challenging from trivial problems, how to detect the insidiousness of the solution by which to dig it up.

The Root of the Failure. To expose the falsity of the current images of science is not enough, any more than is treating symptoms rather than the disease itself. The inadequate scientific education the general student receives at all is only in part to explain the distortions, but only in part. When we try to understand why people hold these views and why they are held with too little knowledge about science, we discover that the major share of the blame does not lie with the ordinary citi- zens. In this matter he is only taking his cue from the intellectuals—the writers, scholars, lawyers, politicians, scientists and all others who deal professionally to ideas. Among the scientists themselves, busy with exciting work, they take on no strong responsibility for taking part in the necessary educational efforts; many have forgotten, especially at a time of rapid expansion of knowledge, they have an extra obligation to the public generally, if only because it must feel the bill and foot the tab. The next crop of students.

Among the intellectuals the old image is more visible. The wrong images, which they share with the common man, prevail amongst them as they are anchored in their ignorance. One kind is basic and factual—what biology says about life, what chem- istry and physics say about matter, what astronomy says about the structure of the universe. The nonscientist realizes that the old common-sense ways of understanding things have become obsolete. He has been troubled by his old world, has been broken. Few intellectuals are now prepared to act as spokesmen. And while science advances faster and faster every day, widens the rift between science and culture.

To restore to them some kind of re- cognition, to understand how the difference in the two sets of people may be bridged by the field of our common culture—that is the great challenge before intellectuals to-day. And nothing better illustrates the urgency and difficulty of this task than the false images prevailing about science.

For readers who wish to pursue the subject further, the following books are recommended:


- Adelson-Weinberger Publishing Company. $7.50

- Holton, Gerald, Editor, Science and the Modern Mind. Beacon Press. $4.00

- Frankel, Charles, The Case for Modern Man. Beacon Press. $1.75

- Bronowski, Jacob, The Common Sense of Science. Harvard University Press. $2.00

- Blanshard, Paul, Editor, Education in the Age of Science. Basic Books. $4.50