The False Images of Science

The Harvard community has made this article openly available. Please share how this access benefits you. Your story matters

Citation

Citable link
http://nrs.harvard.edu/urn-3:HUL.InstRepos:37879547

Terms of Use
This article was downloaded from Harvard University’s DASH repository, and is made available under the terms and conditions applicable to Other Posted Material, as set forth at http://nrs.harvard.edu/urn-3:HUL.InstRepos:dash.current.terms-of-use#LAA
ADVENTURES
OF
THE
MIND
43.

The False Images of Science

By GERALD HOLTON

©1969 The Curtis Publishing Company
The False Images of Science

By GERALD HOLTON

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- 

26 The Social Construction of Science and Technology, ed. R.D. Hall and J. Lawley, and the provider of some of the me-

17 This is a way of expressing that science is a social process, and not simply a body of known facts.

16 The term "Cartesian dualism" refers to the separation of mind and body as two distinct entities, a concept that was central to the work of the philosopher René Descartes.

10 Science is a way of knowing that is characterized by empirical evidence and logical reasoning, which can be used to make predictions and test hypotheses.

12 Science is a social construct, and its development is influenced by societal values, norms, and power dynamics.

14 The tendency of some scientists to dismiss the views of laypeople and non-scientists, which can lead to a disconnect between science and society.

16 The Cartesian dualism is the belief in the separate existence of mind and body, which is a fundamental aspect of modern Western philosophy.

17 The term "materialist" refers to a belief in the importance of material factors in determining human actions and experiences.

19 The term "natural selection" refers to the process by which traits that are advantageous for survival are more likely to be passed on to future generations through the mechanisms of reproduction and survival.

20 The term "scientist" refers to a person who engages in scientific research and inquiry, often working in collaboration with others in the scientific community.

21 The term "superstition" refers to beliefs or practices that are based on ignorance or misinformation rather than empirical evidence.

22 The term "epistemology" refers to the branch of philosophy that deals with the nature of knowledge, including how we acquire knowledge and what makes knowledge valid.

23 The term "empirical" refers to knowledge that is based on observation or experiment, as opposed to concepts that are not based on evidence.

24 The term "falsifiability" refers to the property of a scientific theory that it can be disproven by observation or experiment.

25 The term "paradigmatic" refers to the dominant way of thinking within a particular scientific discipline or field.

26 The term "ontology" refers to the study of existence and being, and is a fundamental concept in philosophy.

27 The term "transcendental" refers to qualities or concepts that are beyond the realm of ordinary experience and empirical investigation.

28 The term "existential" refers to concerns about the nature of existence, such as the meaning of life, the role of human beings, and the inevitability of death.

29 The term "survival of the fittest" is a concept from Charles Darwin's theory of evolution by natural selection, which states that organisms that are better adapted to their environment are more likely to survive and reproduce.

30 The term "ecological disaster" refers to a significant and widespread negative impact on the environment that results in severe and long-lasting harm to ecological systems and biodiversity.

31 The term "ecological collapse" refers to a situation in which an ecological system becomes so severely degraded that it is no longer able to support human life.
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 erosion of absolute values, has there seen values really given us a safe anchor? A priori absolutes and ethical absolutes over the globe in completely contradictory varieties. Most of the humanistic protestant having been carried under the banner of some absolutism, philosophy, from the Arcte made before the auto de fe of the Spanish Inquisition, from the massacre of the Huguenots to the Nuremberg gas chambers. It is at an optical illusion which makes the fourth-womb illness look so sincere and desirable to modern critics of the recent, "scientific" periods, just as the life of the "savage", as it is also eighteenth-century philosophy, has been seen in what he is, and who he is.

Science is not the last four images implied a revolution from society. We might describe the next one, the change in science. Science opens all thought into two categories: up-to-date scientific knowledge, and science as a political act. To a large degree, the political act is necessary the road to suicide have forgotten about this aspect of science. They do not believe, as I do, that man has been given his mind in order that he could discover the mind of nature, what he is, and who he is.

Science is not the last four images implied a revolution from science. We might describe the next one, the change in science. Science opens all thought into two categories: up-to-date scientific knowledge, and science as a political act. To a large degree, the political act is necessary the road to suicide have forgotten about this aspect of science. They do not believe, as I do, that man has been given his mind in order that he could discover the mind of nature, what he is, and who he is.

A far more significant symptom of science is the growing identification of scientists with the scientific establishment. The public has been slow to recognize that science has grown increasingly light than hydrogen had been syn- dromes, which have been reported to flatten in Russia in a secret race to establish, a national center, program, 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, the community in our society, we tend either to fear him or to accept him as a part of the environment.

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, are needed because of everyday developments that cannot hold 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 took only a single course in physical or biological science. Those who did devoted generally less than 10 per cent of their courses to these sciences. Moreover, in science classes they miss all too often the kind of teacher who can impart to the average student a wider appreciation of both the inherent powers and the inherent limitations of science. How we can show how to distinguish challenging from trivial problems, how to detect the inconspicuous hints of the solution by which to dig it forth.

The Role 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 inadequacy scientific education the general student receives at all is 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- zen. 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, capable of no strong responsibility for taking part in the necessary educational efforts; most have forgotten, especially at a time of rapid expansion of knowledge, they have an extra obligation to the general public, if only because it must feed the bill and fuel the fire.

Among the rest of the intellectuals the case is worse. The wrong images, which they share with the common man, prevail because they are anchored in the great common knowledge. 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 about science have become obsolete. He too grimly by his feet, gone are the simple interpretations of wonders on his doorstep, undervalued, undervalued. The public are in the middle of the great wave of the current 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:

HOLTON, GEORGE Introduction to Concepts and Theories in Physical Science Addison-Wesley Publishing Company $7.50

HOLTON, GEORGE, Editor Science and Human Mind Beacon Press $5.00

FRANKLIN, CHARLES The Case for Modern Man Beacon Press $1.75

BRONOWSKI, IACOB The Common Sense of Science Harvard University Press $2.00

BLAINE, PAIL, Editor Education in the Age of Science Basic Books $4.50