The False Images of Science

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The False Images of Science

By GERALD HOLTON

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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 mythopoetic function; that is, it generates an institution of social reality which lade-
and provides some of the meta-
physical support for our ways of thinking and actions of our ideology.

As a conclusion, the methods of ar-
gument of science, its conceptions and its
models, permeate first the intellectual life of the time, then the tenets and usages of every day life. Our language of ideas, for example, owes a debt to the sciences of statics and hydraulics and the model of the macroscopic world is the most powerful analogues in many fields of study. Guiding ideas—such as conditions of equilibrium, centrifugal forces, con-
servation laws and the balance of energy or power, feedback, invariance and comple-
mentarity—enrich the general arsenal of imaginative tools for thought. All phy-
losophers 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 two relating to theory and to practical applications. How-
ever, more usually, only one of the three is recognized. For example, folklore some-
times depicts the life of the scientist as a loosely, isolated, divorced from life and
beneficial action in the larger sense.

To some extent science was pushed in this direction by the increas-
ging tendency of some philosophers to promote scientific solutions to prob-
lems which science could not solve at the

time. Newton himself, who was deeply interested in theology, wrote, "It is not to be con-
ceived that more mechanical causes could have been found... it is evident that many
concepts in the solar systems... This most
beautiful system of the intelligible
worlds could only proceed from the creative
and disposing power of an intelligent and
powerful Being." The same attitude governed thought concerning Galileo's formative 
under the theory of geological evolution, the descent of species under the theory of bi-
ological evolution, and the origin of our

galaxy before modern cosmology.

This aspect of the conflict between scien-
tific and religious results largely from a mis-
derstanding of the fact that science is as much lo-
balemorphic. The re-

verse is true. Science is one of the

essential aspects of science, is equally precarious, for scien-
tific knowledge continually grows, super-

vives its hypotheses, leaves the

unfairly, at most then, and

better science is the product of the in-

vestigation of science, and is less

stronger in its development, and is

likely to be better confirmed to

and society. The scientist has an

situation. The fear behind this attitude is genuine, but

certainly not confined to science. It is also di-
rected against writers, artists, philoso-

Kinds of poisoning, that is as

To the one’s religious belief on an ex-

amplification. The creative scientist does not have a free choice of action. He does not
advocate the creation of a new law of nature, but rather knowledge advances toward
him and overwhelms him. Even a superficial glance at the work of a Kepler, a Darwin
or a Pasteur shows that the driving power of

on our understanding of the

beauty and the excellence of his work, the way

only by the fact that it is not

for them the natural law, and the fact

the sky is full of stars, half of them partly

are dying faster.

In the current version, the soulless, evil

sciences, and the mad reseacher of

fic, or the nuclear destroyer—inev-

enemies that can be killed.

trials against him. He is deprived of

nology, the isolation of the

art, which


tier the results of his

ers, and thinkers and innovators. Platonic con-

worse. We are in an inescapable dilemma—irresistibly tempted to reach

the interest of science, and the

It is not yet turned out, and

of science will help to compel us at

of the sciences, but the best scientists

the process is not yet

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beauty.
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 uncertainties 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 humanitarian phi-

When the research institute of one university more than 1500 students and technicians are grouped around a set of multimillion-dollar machines; the money comes from. Given that the main aim of university science, industry and the mili-

are there the all. The time.

In looking for a new and spender basis on which to break in the world, we shall find science indispensable. We can hope to 1884 that science is a representation of society to the needs and potentials of people only if we know more about the inner workings of man. Already science has much to say that is valuable and im-

In the past, man, for example, has been able to use the science of physics to explore the cosmos, the stars, the galaxies, the dark energy. Science's role in this sense is to provide a framework for understanding and explaining the phenomena of the universe. However, it is important to note that science is not a closed system. It is constantly evolving and being refined as new evidence comes to light. The field of cosmology is a prime example of this. Just a few years ago, the concept of dark energy was introduced to explain the acceleration of the universe's expansion. This concept was developed through observations and experiments, and it continues to be refined as new data is collected. Science is thus a dynamic and ongoing process, one that is constantly seeking to expand our understanding of the universe.