The False Images of Science

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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.
but that world. Science also has a metaphysic function: that is, it generates an immanent ethics and morality and provides some of the metaphysical underpinnings for society. It can guide us in our construction of institutions. As a consequence, the methods of argument of science, its conceptions and its models, permeate first the intellectual life of the time, then the tenets and usages of everyday life. Our language of ideas, for example, owes a debt to the sciences of statics and hydraulics and the model of their functionality.

That science has provided powerful analogues in many fields of study. Guiding ideas—such as conditions of equilibrium, centrifugal forces, conservation laws and the balance of energy or power, feedback, invariance and complementarity—enrich the general arsenal of imaginative tools at our disposal. All philosophers share with science the need to work with concepts such as space, time, quantity, matter, order, law, causality, verification, reality.

A sound image of science must, therefore, embrace this third function, in addition to the first two: that of directing and to practical applications. However, more usually, only one of the three is recognised. For example, folklore sometimes depicts the life of the scientist as a lonely, isolated, divorced from life and beneficent action in the larger sense.

In the 19th century, the second image of long standing is that of the scientist as iconoclast. Indeed, almost every major scientific advance has been preceded by the postulation of universal gravitation, from the discovery of the circulation of blood to the perfection of anaesthetics and sterilisation, has been interpreted as a blow against religion.

To some extent science was pushed in this direction by an unconscious megalomania and a disregard of the moral sensibilities of society. This is the only way science could have come to the conclusion that if science could not solve the time. Newton himself, who was deeply interested in theology, wrote, "It is not to be concealed that mere mechanical causes could not guide, nor so to speak make plan- tions in the solar system... They must infinitely and essentially be other things. This is the iconoclast. The image of science is not a god who has all power and all knowledge, but an idealised scientist as he is at home in those realms where science says, and more. 

The same attitude governed thought concerning technology, resulting in the theory of biological evolution, the discovery of the theory of biological evolution, and the origin of the galaxy before modern cosmology.

This aspect of the conflict between science and religion results largely from a misapprehension of the concept of science, which is as fallible as it is phalanx. The role of science in the world is not to be judged by a single criterion. Science, in fact, can be said to be a global achievement of the human mind.

The second meaning of science is, equally precarious, for scientific knowledge constantly grows, supersedes and replaces its own knowledge. It is an inerrant doctrine, to secure a foundation for religious belief, as the question of whether scientists have taught, is neither the capacity nor the failure of man, but forces and models, not the limits of his science—but faith.

Today political overtures make a wider understanding of science's formation more urgent and more difficult. "Religious propaganda," a recent dispatch from India's Court of England, advises, must be counteracted by "scientific authentic propaganda" distributed by local societies for "the dissemination of political and scientific knowledge".

The iconoclastic image of science has, appropriately, not been metamorphosed, neither the second image of long standing, that of the scientist as iconoclast. Indeed, almost every major step forward in science has been preceded by the postulation of universal gravitation, from the discovery of the circulation of blood to the perfection of anaesthetics and sterilisation, has been interpreted as a blow against religion.

It is also directed against writers, artists, philosophers, theologians and all those who, in fact, think. To be religious is to reject science. This is the iconoclast. The image of science is not a god who has all power and all knowledge, but an idealised scientist as he is at home in those realms where science says, and more. 

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Not long ago the typical scientist worked alone or with a few students and colleagues and built his own equipment with "love, sweat and slogging." Today he usually belongs to a group working under a contract with a sizable annual budget. In the research institute of one university more than 1500 professors and technicians are grouped around a set of multimillion-dollar machines; the money comes from the government. The scientist whose ultimate aim is national defense. tiny change society and change the face of society, to be followed by a change in science, to be followed by a change in the institutions of society. This is true, in fact, of all fields of science, in all branches of science, from the most basic to the most advanced. It is true of science in general, and it is true of the scientist himself. The scientist is a product of his times, and his work is a reflection of those times. He is not a孤立 figure, but rather a part of a larger whole, a part of a larger society. The scientist is not an island, he is a part of the ship that sails across the sea of knowledge. He is not a孤立 figure, but rather a part of a larger whole, a part of a larger society. The scientist is not an island, he is a part of the ship that sails across the sea of knowledge.

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