

# SCIENCE

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# EDITORIAL

## Science Is Great, But Scientists Are Still People

In parlous times, some truths need to be remembered and repeated. When science is under attack from many quarters, we need to be reminded of the distinctions between the extraordinary power of science and the fallibility of those who practice it. We are aware of prodigious feats in the arts, law, and religion that endure for ages. Yet none of these disciplines offer individuals, as science does, the opportunity to contribute to a progressive understanding of nature. In persuading the public to support scientists in their attempts to achieve a more rational and effective understanding of ourselves and of the world about us, we must be clear in distinguishing the uniqueness of science as a practice from the human qualities of its practitioners.

Because the term science has been applied from politics to engineering, I will confine its use here to the recording of observations of the physical and biological universe in a detail sufficient for others to repeat and extend them. The ultimate scientific languages used to report results are international, tolerate no dialects, and remain valid for all of time.

The value of science to all citizens can be made plain in the foundations and tools science has provided and promises for virtually every aspect of civilized life—industry, medicine, agriculture, and communications. Beyond that, we owe science our understanding of the nature of the universe, the origins of life on Earth, and the intimate kinship we have with our earthly neighbors. While we have few or no scientific solutions to economic problems or to living at peace with ourselves and with our neighbors, there is no doubt that in the long term, only a profound grasp of the chemistry of life can offer the hope of solving these difficult problems.

As for scientists, they are not a breed apart. Compared to the scientists of only a few decades ago, they are more numerous, specialized, and costly. But as people, they are much the same, with individualities and frailties like those in other walks of life. Beyond the extreme of acceptable behavior, there may be laxity and negligence and rare instances of fraud, all of which now receive exaggerated media attention. It is common for science frauds to be attributed to ills in our society or to mismanagement of science, but I recall that 40 to 50 years ago, such psychopathic cases seemed as frequent as now on a per capita basis. Now, as then, the more startling the discovery claimed, the more it attracts attention and, if false, the sooner it is exposed. Bureaucratic procedures are being proposed to detect and expose deviant behavior in science, but such measures will not prevent these rare aberrations and will instead impose a major nuisance and expense on the conduct of science.

With regard to the support of science, the major flaw is the demand that the scientist justify a project on the basis of its goals. The more limited the resources of a nation or its agencies for funding science, the more stringent is the requirement that the research be visibly directed to solve some urgent problem of society. This philosophy is misguided in a fundamental way. The truly major discoveries that have altered the face of medicine—for example, x-rays, penicillin, recombinant DNA—have all come from the pursuit of curiosity about nature without relevance to medicine. The same can be said of great industrial inventions, which were haphazard at the outset and only later recognized for their commercial value. No matter how counter-intuitive it may seem—to the scientist as well as to the layman—the most sure and cost-effective route to discovery is through the creative activity of the scientist or inventor rather than the pursuit of a defined goal.

The award of a research grant is fundamentally flawed when it requires that the applicant chart a path to discoveries that will have practical consequences or, at least, will reorient the direction of a discipline. This makes no sense whatever. Scientists, as is true of athletes and artists, should be awarded contracts on the basis of what they have achieved rather than for what they promise to do. Scientists working at a frontier of science or creating a new one must rely on intuition, serendipity, and a capacity to move quickly in new directions to exploit findings that emerge from their research and that of others.

To summarize, I want to extol the discipline of science unique among human activities. The practice of science enables scientists as ordinary people to go about doing generally ordinary things which, when assembled, reveal the extraordinary intricacies and awesome beauties of nature. Science not only enables the scientist to contribute to the progress of grand enterprises, but also offers an endless frontier for the exploration of nature.

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