

LETTERS TO PROGRESS IN PHYSICS**Where is the Science?**

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The important rôle played in society today by scientific research is highlighted, and the related various social, economical and political conditionings of science are discussed. It is suggested that the exclusive emphasis upon the multiple technological applications of science, the use and abuse of scientific research, may lead to the very disappearance of science, transforming scientific research into a routine and almost ritualistic activity, empty of any real content. This may already be seen in the inadequate way present day society tackles the fundamental problems we are confronted with, issues such as the environment, conflict, life and the thinking process.

Science is used and misused today in a great variety of ways, in all of the utmost relevance to human life and activity. Worldwide policy has found it useful for science to be employed by the military, and developed nations spend generously on this application of science. New, sophisticated, powerful weaponry is produced today, by an application of scientific achievements. It has also been found beneficial to put science to work for a more comfortable life; highly-developed technologies, industry, manufacturing, farming, agriculture, commerce, services, transport and communications are science-based today. Education, culture, civilization, a highly-qualified work force are produced on the basis of science. Everything that matters to humans, namely wealth, fame and pleasure, is achieved on an ever larger scale today by using science. Modern science is viewed as an immensely beneficial resource, whose rôle in society is to be tapped more and more for the greatest of profit. In this respect, everybody talks now only of “technology transfer”, “competitiveness”, “innovation”, “leadership”, and last but not least, of “intellectual leadership”, through science. Science is everywhere “oriented” on our epoch towards the military, warfare, technology, industry, economy, education, etc, etc. There is no more “simply science”; it is everywhere determined, oriented, conditioned.

Scientists should feel well and flattered by the great interest shown by society in their art and trade. The fact is that science has provided much for society, through mechanical constructions, thermal machines, electricity, nuclear energy, materials, electronics, and it is natural for society to try to control, accelerate and harness all this in the process of profiting by the use and abuse of science.

Yet nobody is satisfied with such a policy, all around the world. Taxpayers want more and more from science, and the scientists are more and more incapable of responding to their high demands. In addition, politicians stir up heavily this

conflictual issue. The reason for such a failure resides in the inadequacy of this type of science policy.

Indeed, science is not funded, according to this policy, unless it produces something immediately relevant to society, i.e. something useful for the military, for industry, the economy, education, etc. Scientific research, which is the way science advances, is only desired for its applications. Yet all these outlets for science, in various areas of activity and interest, are not science; they are only its applications. Science policy today greatly confuses science with its applications. By laying emphasis exclusively on applications we will end up having no science at all.

Science is a resource, like any other, and yet a bit special. Of course, scientific knowledge does not fade, or degrade, by repeated use, it is not wasted or dissipated by using it. Newton's laws do not vanish by being repeatedly used. But people who have scientific knowledge, and who at least endeavour to maintain it, if not advancing it, i.e. those we call scientists, disappear, if not properly cultivated. We have a lot of applications of science, a serious endeavour for technology transfer, great expectations from using this science, but where is the science? We have no science anymore by such policy which provides exclusively for scientific applications, irrespective of how desirable and beneficial they might be.

A very deeply-rooted fallacy is to think that scientists are in universities. This is profoundly wrong. In universities we have professors who teach science to young people. They need to acquire scientific fuel for this teaching process, from elsewhere. We cannot say reasonably that teachers in universities do both science and teaching contemporaneously, because they then do either half of each or half of neither. It is more appropriate to emphasize the exclusive educational task of the universities, and provide separately for scientists, in distinct laboratories, institutes, etc. The great advances in science and in its applications made by the former Soviet

Union and the USA in the last half of the past century were achieved precisely because these States cultivated distinctly science and scientists, and did not mix up science with teaching or production.

Of course, these things are related, and it is desirable and profitable to cultivate such naturally beneficial relations. How are we going to strengthen the relations between universities, scientists and high-tech entrepreneurs? Simply by doing precisely what we need to: by providing for close relationships between such people, encouraging their meetings, discussions, talks, cooperation, etc. The main cause of the difficulties and dissatisfaction today with the “failure” of science in society is due precisely to the vanishing relationship between scientists, technologists, entrepreneurs, and teachers. We need to urgently provide for such close contacts, but we have to be very careful not to mix things up: to keep the distinction between these socio-professional categories. It is a scientific fact that distinctiveness and variety produce force and motion, whilst admixture increases only the potential of ineffectiveness, resulting in only a restful peace.

If we are going to cultivate, by our policies, the distinction between scientists, teachers, professors, technologists, entrepreneurs, to provide for close collaborative relationships between all them, keeping at the same time the distinction, and not to mistake science and scientific research for teaching or production, then we will be more scientific in our endeavours, and will be more fortunate in our expectations.

We are yet pretty unscientific with respect to basic issues. For instance, nowadays we set for science the mission of reducing, or circumventing, the degradation of the environment, without noticing that every human activity degrades the environment. Indeed, even the mental processes degrade their environment; brains in this case. Life is an organized process whereby entropy is diminished, and therefore it is a great fluctuation, but at the same time we increase also the environmental entropy, including that of our own body, just by living, and the increase is greater than the decrease, and the process goes to equilibrium. We will end with a more balanced world, where life will become extinct, because the fluctuations diminish near equilibrium. We would think of finding a solution for preserving life by creating artificially another similar fluctuation, then with a greater spending of energy. The inherent limitations of such an artificial process will then pose serious issues regarding how, who and how many would be going to live that artificial life. This may present a serious problem for science and technology, and for the future of our society. Another is the process of thinking, for many believe that we should think the thinking process in order to understand what we are tinkering. First, they assume erroneously that there exists a conscience, or a consciousness, i.e. a state or process of thinking the thinking process, which is false. Anyone who thinks is not conscious of what he or she is doing, there is no double thinking; consciousness is identical to thinking itself. Thinking is a natural process, associated with

the complexity of the human brain, and so we do not think of thinking, because it is impossible, we just do it. To think is just to be. Such sorts of things we only learn through science, so, providing in our policies for properly cultivating science will greatly enhance our chances of responding to truly relevant questions. Besides, life and the thinking process may be manipulated and controlled by others, but never in those who are doing that. But full power is illusory. We may destroy science in others but never in ourselves. The need for scientific knowledge is essential for survival.

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