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# The State of the Physics

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**Abstract**

In order to understand what is going on at present with physics in society we must simplify the things a little. Such a simplification is oferred here.

Physics research was currently subsidized by two myths: the cold war and the development of civilian technological applications. These two myths have disappeared. The former vanished, there is no cold war anymore; the latter became reality, physics research has succeeded in producing an impressive number of highly-valuable technological applications for the civilian life. It is largely felt in society that there is no more a reason for continued financing of scientific research in physics. Physicists have lost the game, and we should admit it.

Few recent attempts of infusing money into physics research, like the big projects of thermonuclear fusion, superconducting supercollider and space research, have met with a complete failure. Those who control the money no longer fear nuclear war, enjoy already a wealth of science by-products in the form of modern conveniences, and many others of the latter are in stock for them for a long time since now. Why should they bother with further funding for science? No need anymore. There are, of course, problems, even for them, like diseases, famine, over-population, crime or the weaknesses of democracies; and perhaps they would not be very reluctant to pay for solving these problems. Unfortunately, physics cannot promise much in these directions. The poor, on the other hand, have not gained much apparent benefit from science, and, consequently, believe it no more. We lost this credit, too, though we should admit that we enjoyed it undeservedly. The large body of the middle classes have no perception of these things, and they are immaterial; politics is made by smaller and smaller groups.

What will we be doing? Most of us will move to teaching in various schools, colleges and universities, which will proliferate in small sizes and low standards. People at large will be more and more attracted by the outfits of physics: the fascination surrounding the scientific discoveries, the thrilling adventures of the human mind in unravelling the mysteries of the nature while searching for truth, the anecdotal life of the great physicists, and a few other excitating, romantic things of this sort; the minimal knowledge of switching on and off the electronic devices which make the everyday life so sweet; and the fashionable diplomas and degrees. Physics will become more of a cultural and educational pursuit as soon as it will consent to lower its requirements. The only thing we are left with for sale is the exterior appearrance of this science, and we shall peddle it. Some others will remain in small experimental laboratories, which will turn more and more technical and less scientifical, and will provide assistance, counselling and expertise for

business enterprises, either from outside or from inside. Few others will enter other disciplines, like engineering, chemistry, biology, medicine, climate and geophysics, economics, social sciences, communications, food, transport and entertainment industries, which are, more or less, at a descriptive level; their analytical and technical skills and their experience of a scientifically, fully accomplished discipline will be, hopefully, an asset for the development of these activities. None of this has anything to do with scientific research: it is only what the physicists will be doing soon, after they will be no more physicists.

Most of us do not yet believe that the party is over, and for a good deal henceforth, and we still indulge ourselves in the illusion that the things are still going on or will do so soon. Trying to keep the dead alive we are doing the best we know: lots of irrelevant publications, almost daily announcements of breathtaking new discoveries proven false each next day, large conferences and congresses in the hope that the big numbers should also be those that matter, schools of all-the-four-seasons to get the impression and convey the notion that someting is still on the way and in the air; or inflicting upon ourselves the burden of membership to small, exclusive circles which pretend to be the only ones which are doing the "politically correct" science. The taste of money was sweet, the vanity is a hugely driving force, and in all cases we show up a lack of critical thinking. Likewise the laymen, physicists have their own portion of lack of common sense. Others agitate themselves in a confusing manner, trying frantically to do something, which, in the best cases, is only a sort of mimicry. Our professional journals are currently publishing wrong, or trivial, papers, while systematically rejecting the few good ones. We have to admit that, simply, we are too many and too bad. The scientific community nowadays is order of magnitude larger than that of the last three centuries, and still, since the quantum mechanics, there was no basic advance in knowledge within our science. Physics is still a science, and as such it is only partially applicable to the human beings; it should, consequently, be taken cum grano salis. While the public money proved to be so addictive for us, the physicists, it is, however, obvious, on the other hand, that all of the technological achievements of our present society do originate in our work, and that the social cost of this work was extremely low. That is, we all should be aware that we are also too cheap and too useful. It is saddening, therefore, to see how much, we, the physicists, like many other humans, display our own bad habits, lack of judgment, arrogance and frustrations. After all, the scientific excitement and fun can no longer compete with those the entertainment industry is currently delivering, and acting as comedians is no longer a pallatable strategy. Fact is, however, that there is just less and less money left for scientific research.

Why did the whole business go wrong, except for a small minority of fortunates? We do not know. But we have learned a good lesson, which might help us become wiser. Now, in retrospect, that the things got colder, we may see how unwise we are and what foolish game we play with the society-funded research.

When, after WWII, physicists and society decided to strike a deal and get physics research financed directly, when the great "factories of science", i.e. the research institutes, have been established, neither side knew what they were selling and what the other was buying. The only fact, which served as a terrific credential for physicists (and a bargaining tool?), was the atomic bomb. But the object of the deal remains a confusing dream, borne out of a mixture of the desire for power, humanitarian ideals, elating enthusiasm, fear, promises of comfort and wellfare, etc. Why should the deal have gone well, when nobody knew what is doing? Nobody could ever possibly have figured out the astonishing output: nuclear reactors, silicon microelectronics, the laser, magnetic resonance, magnetic memories, the electronic microscope, molecular epitaxy and

high-temperature superconductivity. However, there were two subtle motivations for the deal, as well, which rarely receive attention, in spite of their utmost relevance. One is on the side with physicists. Scientific research is a continuous oscillatory motion between belief and disbelief, at the border between knowledge and ignorance. Researchers know only that something should be, but the particular form it may take they know not. Consequently, they will ever be tempted to check their visions, to see if really these are for real. When society offerred them the opportunity to do this, they jumped to strike the deal. They always will do, and never will they be able to tell exactly what they will come up with. The object of any such bargain will always be largely unknown at the beginning. On the other side, society invested an amazingly derisory amount of money in research, and always will be the same, had the opportunity ever occur. Fact is that the scientific research is extremely cheap, in comparison with other social spendings. The general lack of interest in research is the reason for its cheapness, there is no large market for research, and never will be. The fact that the money invested in science was so little was the second profound motivation for doing it. The risk was low. Of course that most of this money has been lost, but even the largest fraction of something small is still small. The little remaining fraction, however, turned out to be extremely profitable. This is how that small portion of fortunates got richer and more powerful. Having invested in science business was an extremely profitable venture. So profitable, that now one must stop doing it further and take the time to enjoy the revenues. Economical competition should be read collecting the gains from the scientifical and technological achievements in the shortest time. Military strategists will play computer wars for long coming decades since now, while their arsenals are full with the final weapons, impossible to be further sophysticated; bankers will play infinitely with the speadability the electronic communications allow money be shifted to and fro, while still keeping track of them; politicians will have a good nice time pondering over what all means, and what to do with it, a period which will be everlasting; and above all, all the people will be wired up watching endless TV broadcastings and cable pumpings, psychologically absorbed into cyberspaces, and enjoying the limitless resources of nuclear energy. The crisis that afflicts the scientific research nowadays is a crisis of over-production.

Scientists behave amazingly in society. The critical thinking which is proper to science is seldom, if ever, showed by us when interacting with society. We share our knowledge indiscriminately, with everyone, out of urge to verify this knowledge; openess is a very fruitfull way of doing science. While undertaking this indistinct dissemination we do not only trade our own knowledge but the entire stock inherited from the past generations. When asking for funding for our research projects we sell not only our own knowledge but the entire tradition of science, which throws a shadow upon our moral responsability, or, at least, upon our judgment as regards the profitability of research. We never bothered to provide guaranties for future developments, not even when we have witnessed the high profitability of the output of our endeavours. On the other hand, we do not have the habit to stress enough that science is still far away from solving the great problems of the mankind, we do not say very often the basic tenets that define our own profession: we do not know, we can not do. This is why we lost so much of our credit at large. We lure the beginners into the field of scientific research without being able to tell them what is all about. The collectivity of scientific researchers has increased indiscriminately over the years; society discovered another vocation for itself, and there should be little surprise when the right to the scientific research will be inscribed among the Human Rights. People will come to science to see for themselves, through their own experience, what science is, in fact. They will find out that science is the knowledge of our limits, and doubts are to be cast whether this will ever please them.

What about physics? In spite of the large amount of facts we have accumulated, and in so many

and diverse domains, no new problem emerged. On the contrary, while identifying new physical objects, we are continuosly losing at the same time old, good problems that are the breadth of our science. The frequent announcements of new problems are of false problems. There are many questions, but no new problem. We have tested all the known ideas and concepts, and they work finely. We are still left with the old puzzles (this does not mean that one should set oneself and try to solve them!): why F=ma, why the entropy increases, why space is related to time, and why particles and waves are the same thing. We do not know, but who is asking? Nobody asked Descartes, Galilei or Newton to explain motion; they were just curious (though they were asking for money!). There was no need in epoch to figure out the chaotical motion of the atoms; Boltzmann did it, out of a sort of enthusiasm, probably, that could very well be what has been fatal to him. The practitioners of the electromag- netism equations were not at all aware of their missing of the displacement current, with one exception: Maxwell. Without Bohr' stubborness that something must work with the electrons in atoms we have not had, very likely, the quantum mechanics. Silently and humble, after the hubris that marked its interlude with society, physics will regain its destiny: that of Philosophiae Naturalis.

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