
The Antiphysical Review

Founded and Edited by M. Apostol

24 (1999)

ISSN 1453-4436

Scientific Research in Romania and around the World

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Abstract

A brief historical survey of the scientific and technological research in Romania is outlined, with emphasis on physics, and in an international context; a few related, prospective comments are also included on the future developments around the world.

Romania started its scientific research in 1949; this political decision was taken as a consequence of the communist ideology of that time, and it was implemented in close contact with the Soviet Union. Accordingly, the Institute of Atomic Physics was set up at Magurele near Bucharest in 1949, and a Russian nuclear reactor was located there; it was followed soon by a cyclotron, a betatron, and various other equipments of nuclear detection and dosimetry, cosmic rays, materials sciences, radiochemistry, optics, etc; working groups of researchers were established in atomic physics, nuclear physics, theoretical physics, solid state physics, optics, later on in computational physics, etc; the Institute of Atomic Physics had already at that time a few hundreds people. Those times were optimistic, enthusiastic and naive, not only in Romania but everywhere else; people believed in science, especially in the new, modern physics; they had confidence in science, not only as an intellectual adventure, but as a promising hope toward welfare and a better life too. This belief paid off during the next few decades, more in the Soviet Union, USA and Western Europe, but less in Romania and other countries.

Between 1950 and 1970 Romanian researchers succeeded to develop a well-defined scientific research in the Institute of Atomic Physics, with notable achievements: there were performed original studies of nuclear reactions, X-rays and neutron studies of materials structure, there were developed various atomic and nuclear techniques, some of them with a promising applicability potential; Romanian researchers reproduced, among the first in the world, the laser effect; there have been performed original investigations of theoretical physics, and scientific papers coming from Romania started to appear in international publications; *Revue Roumaine de Physique* has been established as a national scientific journal of physics; researches conducted in the Institute of Atomic Physics started to acquire a multidisciplinary character, including, beside physics, chemistry, mathematics, engineering. However, the entire activity of research at that time in Romania was carried out under the ascendancy of the Soviet Union, Romanian researchers seeking guidance from "the great soviet science"; Romanian science was plagued at that time with the prevailing communist ideology; for instance, the Heisenberg's uncertainty relations were forbidden, officially, in the Romanian physics education, as being "agnostic" (this is a philosophic term meaning "impossible to be known"), and, in general, everything which was coming at that time from the West was being

rejected as "false, dangerous and imperialist"; subscriptions to the *Physical Review* were hardly permitted in Romania at that time. In those years, however, the Soviet Union, USA and Western Europe were developing their own physics, and, in general, scientific research, each of them in its own style. The Soviet Union emphasized basic science and scientific applications for military industry; the USA wrestled with the prewar, European, modern physics and invested heavily in technological applications, both civil and military; France remained a little too analytical, almost "metaphysical", in its basic science, while moving, however, resolutely toward high-tech; Germany, rather slowly, started to rediscover its national technical vocation; England remained faithful to its positivist and empirical tradition of great originality; etc. All these national "colours" and diversity can still be noticed even nowadays, with variations brought about by time and various other changes, but these worldwide scientific cultures share a common feature: they are all orientated toward a positive, constructive and progressive scientific research of their own, in order to gain knowledge and skill, to develop technologies, for the welfare of their nations, for being able to cope with the wealth of challenging issues of a technological society. Noteworthy, and to its credit, the Soviet Union was committed to such a philosophy since its beginning, in spite of many damaging aspects of its communist ideology. Unfortunately, Romania of those years (and, to a various extent, other small countries politically close to the Soviet Union) choose to remain dependent on the Soviet Union in science policy, and even in scientific matters. It must be emphasized that this dependence has been a choice, it has not been the result of a political pressure, nor the result of a lost political battle; on the contrary, it has been accepted in fact as a beneficial situation. Such an unrealistic orientation of the Romanian policy has had damaging and longlasting consequences, and it originates in fact in an improper collective mentality of the Romanians, which is basically regressive and inadequate to science and technology. This can even be noticed in the excessive formalism which dominates the scientific culture and education in Romania.

Around 1970 an interesting change occurred in the scientific research in Romania, in relation, in fact, to notable changes all over the world. First, the western countries gained a definite scientific and technological momentum; in addition, South-Eastern Asia entered science and technology, especially through Japan; and critical thinking started to prevail again, to some extent, in Europe. Consequently, Romania, as well as other communist countries (Soviet Union included) began to look westward; English has definitely replaced Russian as the language of scientific research in Romania; the national side started to be emphasized in Romania, a general awareness of a global scientific and technological competition appeared, and it was realized that there could be great problems in the world. At the same time, a new generation of communist politicians acceded to power in Romania; they were nationalists and uneducated; one of the directors of the Institute of Atomic Physics at that time reportedly failed to get his remove as a student, for instance. Nevertheless, in the 70s Romania invested significantly in scientific research; the Institute of Atomic Physics extended to a few thousands people, a linear accelerator and a radioisotope unit were purchased; researches were diversified, materials, lasers, plasma and optical devices, even nuclear medicine, biophysics and environmental physics have been included; the physics higher-education has been based at Magurele at that time, and this small village turned into a campus of scientific research in physics and related fields; there were built many new research facilities, few modern residence quarters, and new, modern research equipments were purchased; about the same time local political struggles evolved, and various, more or less autonomous, departments spun off the main Institute of Atomic Physics, while the central administration was preserved; this led to a significant increase of bureaucracy. During the same decade Romania has invested much in other areas of scientific and technological research, including chemistry and chemical engineering, biology and biochemistry, microelectronics, even in nuclear industry and space sciences; this development took place not only in Bucharest or nearby, but all over across the

country. The ideological substrate behind such an ambitious program was the complete economical independence of Romania. Specifically, the physics research in Romania was asked by the political leaders of the time what it "may offer to the society" in this respect, in return of the money invested; and here, the political leaders and administrators of the Romanian research, promised, unprofessionally, if not the atomic bomb, a nuclear industry and a substantial nuclear-power plant at least; the promise has been accepted, those research leaders were promoted, more funds were allotted to physics and nuclear research, and this bargain was the beginning of destruction of the physics, and of the scientific research in general, in Romania; it shows again a perfect inadequacy in tackling the scientific and technological research at the social level. An ambitious political funding, beyond the reach of any realistic managerial control, and a non-professional and irresponsible science policy, both the cause and the effect of each other, acted conjointly between 1970 and 1990 to destroy the physics research, and the scientific and technological research in general, in Romania. Of course, as a consequence of the funding, there were developed valuable researches at the individual level in Romania during that period; but they failed both to be recognized or to be applied, as a consequence of the steady "politicizing" of the scientific research, *i.e.* because the overwhelming intrusion of politics in science matters. At the same time, a huge proportion of research workers were recruited, or acted voluntarily, as informers and collaborators of the secret political police of the ex-communist party in Romania; almost exclusively they dominate the research institutions even today, as well as the entire political life and state administration in Romania.

Deadlined frequently for reporting to the political leaders on one hand, and fiercely fighting between themselves to take over the funds on the other, the various administrators and leaders of research at Magurele ordered, entertained and performed between 1970 and 1990 a continuous process of "reorganization". In 1977 these leaders pronounced bad the previous research, declared that the scientific research conducted previously in the Institute of Atomic Physics was improper, of poor quality, "unscientifically" managed, and consequently it must be "destroyed"; this destruction was carried out physically, *i.e.* expensive laboratory equipments were physically destroyed, labs water and gas appliances were knocked down by hammers, glass tubes and pipings were crushed underfoot, walls were demolished, and buildings changed destination to the new bureaucratic missions; the physics research at Magurele was sort of "exorcised" in 1977. On that occasion engineers pervaded massively the Institute of Atomic Physics, the nuclear core of the institute being definitely turned into a "nuclear engineering" institute; this was meant to justify the "serious" commitment toward "nuclear industry" and "technological applications" of the Romanian physics research. In those years, Romania has produced engineers in excess; their vast majority found no real job in a backward industry, and turned to politics; the Romanian political class of today consists, mainly, of those engineers. In the Institute of Atomic Physics these engineers entered the local political fights, and they rule the various institutes at Magurele even nowadays. However, some of these engineers, and, especially, the medium-level technical staff had notable achievements in physics research; for instance, Romania produced heavy water for nuclear reactors, nuclear-fuel elements, as well as few other equipment parts of a rather high technological level; all of them, however, failed to be incorporated in a sustainable industry. Around 1990 Romania bought finally an expensive nuclear-power plant from Canada, and this completed the process of destruction of the physics, and scientific research in Romania.

Around 1990 the communist regimes all over the world have not been able anymore to ensure a decent life for their citizens, and to satisfy the ever increasing demands of living standards. At the same time, there has appeared in the communist countries a class of relatively enriched political leaders and state administrators, who were not committed anymore to the communist

ideals; on the contrary, they were supporters of individual freedoms and of the capitalist way of life; finding support in many intellectuals with a rather confused social "philosophy", and with some encouragement and aid from the western countries, this new breed of politicians succeeded to overthrow the communist regimes almost everywhere. The new rulers formulated a rather vague political program, requiring a "reform" in order to make a "transition" to capitalism. Actually, the ex-communist states were in a collapse after the political changes occurred in 1990, and the only pertinent political program would have been the reconstruction and the development of the countries. Nevertheless, some of these countries made progress in reconstruction and development, and with a substantial help from the developed countries they have succeeded to improve, to some extent, the life of their citizens. Unfortunately, some others, like the states of the former Soviet Union, Romania, Bulgaria, and, recently, Serbia failed along this way, at 10 years after the collapse of the communism. The political reform in Romania, for instance, aimed at establishing the private property, the "privatization" of the economy, a free market, both internal and external, a foreign politics in tune with some international requirements, and internal democratic freedoms; all these have been attained to a great extent, yet the economical situation of Romania is now worse than ever; at this moment Romania is thoroughly disorganized, lacks a social solidarity, has no socially consistent and profitable economical process, the state authority is vanishing, while it is confronted with a corruption of huge proportions; the social protection is practically absent, health care and education are decaying; Romania subsists at this moment exclusively on iterative international financial loans, through selling off its few productive economical units, and on the consumption of the natural resources. Under these circumstances, it is hard to speak anymore of scientific and technological research in Romania. The profound cause of this disastrous situation is the lack of reasonable and realistic judgment of the Romanians.

After 1990 the remnants of the Institute of Atomic Physics at Magurele are ruled by non-professionals, many of them engineers, with almost no scientific degree; very frequently, they share a previous membership in the ruling structures of the ex-communist party, and a background of informers and collaborators of the previous secret political police. These persons hardly have a managerial capability in scientific research; however, even if they had, there would not be much to do, because there were made no investments in scientific research after 1990, except perhaps for a lagging unit of gamma rays irradiation, with an obscure mission, started around 1990; no equipments were purchased, large facilities are shut down, laboratories are dismantled, working groups of research are disintegrating, the researchers are hardly paid meagre salaries; the campus at Magurele is often unable to pay for its gas and electricity supply. The atmosphere of the scientific research in Romania today is dominated by lack of professionalism, corruption, promiscuity and backwardness; people, both common and highly-positioned, are incapable, lazy, rude, aggressive, fraudulent, scared, and hopeless. (The grounds of the Institute of Atomic Physics are scoured by vagrant dogs packs, for instance, as everywhere in the Romanian cities, and nobody cares or dares to uproot this plague, because it would be "undemocratic"; it looks as if the dog in Romania is viewed today as the symbol of democracy, almost every household nurtures one, in promiscuous conditions - caused both by misery and lack of education - and it seems that today the dog is considered by Romanians sort of an Indian "sacred cow"). All the rest of the research institutions in Romania are in a similar situation, if not in a worse one. There exist few slogans in matters of "science policy" in Romania today, namely: the scientific research must get more "applicative", the "technological transfer" must be strengthened by small and medium-size enterprises, "excellence" centers must be set up, the basic research should move to the academy and universities, the promotion of the researchers and professors must be done according to "scientometric criteria", young people entering scientific research in Romania must go to the USA or Western Europe, for longer and longer stays, if not forever, the research must be "reorganized" continuously,

the Romanian research must be "recognized" and "accredited" by some (not very clear which ones) international bodies, and it must be "integrated" in the international research; inspired by some dilettante, and interested, circles from abroad, all this pseudo-policy disguises in fact the desire for power and money of a huge number of individuals who set themselves up for policy-makers; beside the headquarters of the various research institutes, these persons are located in the Romanian Academy, the National Agency of Research and Technology (the former Ministry of Research and Technology), the Ministry of National Education, and in various obscure societies and associations; various sorts of rocket scientists make epochs now in Romania, for a few months, or years, non-professionals accede politically to important positions in academia and research institutes, and, in general, various types of impostors, swindlers, crooks and blackmailers are everywhere; the laws in Romania of today are quite confusing and in a perpetual change, so that nobody can anymore distinguish a fraud; and, in fact, almost no one cares, anymore. One can hardly see a solution to this difficult situation at this moment, and very likely there exist no solution; building its own economy, developing science and technology of its own, a serious commitment to its own national life, a resolute desire for a consistent society, and, in general, a life of a minimal decency, and the deep conviction that all these are possible, on a reasonable scale at least, are certainly alien to the Romanians; honest, hard work, respect of the laws, social solidarity, professional values, education, belief in the scientific and technological progress, national consistency, and, after all, the very life of the Romanian citizens on their territory seem to be obsolete and old-fashioned nowadays. Romania, if it will still exist anymore, will continue to have a very bad life. As a matter of fact, however, there are, and will be, extremely difficult problems all over the world, most of them deeply related to the scientific and technological development, and, in the context of the present globalization, these problems are relevant even for Romania.

In view of their recent appreciable economical growth, it is only natural for the USA to try to assume for themselves the role of a unique, and absolute, world leader, especially in the context of the recent political developments; unsurprisingly, such a leadership might be pursued, if it is not yet, in science and technology, and it might not be very curious when the "correct" and "incorrect" in science and technology will be dictated from Washington "urbi et orbi", as any other political, economical, military, or whatever else matter. This trend is only natural, though certainly of an aggressive nature, but it will create great troubles all over the world through its inconsistency; by pure reason, the absolute power could not work on an earthly scale, it will turn against itself, for instance. Besides, Japan and China, whose economical and financial power may hardly be neglected, would not be very happy with such a prospect, for instance, by virtue of the same natural trend; and by the same token, the western countries of the old Europe will try to fit themselves into the picture; though the "eurocrats" in the European Union and Council still have much to do in order to pass beyond their empty verbosity, and to accept their mutual inequalities, while being challenged by the USA leadership; a powerful military force like NATO, even if universal, absolute and unique (or especially such one), will never succeed to impose "eine neue Ordnung", for many reasons; for instance, because such a force will not be able to fight itself, at least. The political actors of the world head now uncritically toward a competition which will have damaging consequences for everybody, by its lack of balance, correctness and control. International authorities like UN become obsolete and ineffectual, while the developed countries profess, by their very nature, an aggressive and expansionist politics, even if not always officially or openly endorsed; a sure victim of such an aggression will undoubtedly be the ex-communist states in Eastern Europe, like Romania, as ones of the weakest. The completion of such an enterprise will, in turn, considerably weaken the aggressors. At the same time, the huge population of the un- and under-developed countries will always be a social and biological danger for the advanced democracies, which turn more and more "libertarian", in spite of the totalitarian trend

of their politicians. All this arises in fact from the main problem of the mankind, both of the developed, developing, un- and under-developed countries, which is the socio-cultural process of production, consumption and their financial expression. Basically, this is an unknown process, and it confounds itself with the very nature of the human race. Contrary, perhaps, to its appearance, this is a "theoretical" problem, *i.e.* a problem which must not be perceived in its own terms, but in the meaning of their causes and consequences. Actually, this is a pretty old problem in fact, but it acquired an almost capital importance in the modern society, as a result of the scientific and technological development; the modern society depends in a vulnerable way on science and technology; could anyone imagine, for instance, what would instantly become of a city like New York, say, without the electricity supply? The soon-coming new developments in the computing high technologies, for instance, and the astounding progress of biology and medical research, or materials sciences, will force everyone to face the problem of production, consumption, and money; it touches essentially the nature of the mankind, and of human race, namely that of trying to subsist on the basis of understanding; the wisdom seem to be the only infinite and plentifully distributed resource, as nobody complains of not having enough of it. This capital problem can only be "solved" in a paradoxical way, namely, by recognizing that it is an insoluble problem; we should realize that we can only accomodate ourselves to this problem, at most, and try to do it as better as possible, and we ought to, as we ourselves are this problem; either we are, and do exist, and then we can not settle this problem, or we are not anymore. In any case, looking continuously for partial, inadequate and approximate "solutions", such as to partially, and mutually, accomodate our needs, interests, beliefs, convictions and whims, *i.e.* negotiating continuously our existence, may be the only decent way of life. This might serve to a better understanding of why we all should try to work, have sympathy and tolerance, acquire skill and wisdom, take care and be prudent, do science, and think more.