

SOME PROBLEMS OF INSTITUTIONAL DEVELOPMENT OF SCIENCE IN GEORGIA

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The author of this article reviewed the issues of science management in Georgia, as well as he touched on similar issues on a global scale. Georgia became an independent state 23 years ago. Being an integral part of the Soviet Union, Georgia has made an impressive spurt in different branches of science, as well as in the sphere of science management in general. The central authority in the field of science management was the Academy of Sciences of Georgia, which consisted of 53 research institutions on various branches of science. The number of scientific workers in 1990 reached 28,000 people. After gaining independence and the sharp deterioration of the financial situation in the country the development of science has been overlooked, and the state funding of Academy of Science and research institutes almost stopped. In 2004, the Government made a decision according to which all research institutes were out of control of the Academy of Sciences. It has become almost murderous event, both for scientific institutions and for science in general. On the basis of the comparative method, the author have analyzed different forms of science management and offered activities to be undertaken in order to correct the state governance of science management. The article provides state legal assessment of previous years and makes recommendations for new decisions.

For more than two recent decades, against the background of various political and socio-economic processes the attempt of ignoring Georgian science and destruction of scientific achievements still continues leading to grave results. Out of 53 000 scientists only 2 000 are left. As a result of hard work and diligence 82 scientific research institutes were created (of them 56 were within the Georgian Academy of Sciences, 7 worked within the USSR Academy of Sciences and 19 were institutional). At present only some of them are left to fulfill major scientific tasks and develop Georgian traditional prospective and innovative directions. Yet they are in such a bad condition that probably soon they will also stop existence.

Naturally, it was necessary to optimize them rather than destroy. There are no research and experimental bases left; the scientists are humiliated with their salaries 10-15 times less compared to those of the public officials of even low rank. There is no motivation for young people to pursue scientific career. Actually, we are against the risk of total destroy of science leading to disappearance of qualified teachers.

There are some objective reasons blamed for such a really negative process –the area of the country, insufficient funds etc. and we would add the negligence and absolutely careless attitude to future. The model for science is created with participation of all the kinds of government officials

and “supporters” of science, all kinds of “experts” and “competent people” except scientists themselves, who are categorically prevented from that job. The result is disastrous.

By way of providing some figures let us illustrate the above said in order to have a general idea about the problem: in recent years there were 5 501 499 scientists in the world or 894 scientists per 1 million people. In developed countries there are 71% of scientists or 3 273 scientists per 1 million people, while in poor countries there are just 374 scientists per 1 million people [1].

In developed countries the salary of a scientist is more than \$165 000 a year, on average, or \$14 000 per month not to say anything about Japan, where the monthly salary of a scientist is about \$20 000, on average. In relatively poor countries their salary is \$114 300 a year or \$9500 per month. Comparison of these average figures to Georgian salaries is difficult. It is difficult to say even the exact amount of average salary of our scientists. I do not mean monetary compensation for a lecture delivered by a professor. I mean the expenses spent on the research carried out. The average monthly salary of a scientist of the Scientific Research Institute is about 200GEL or \$114 per month that is \$1370 a year. What is such a scientist destined for? Most of them have 30-40 years of experience of scientific work.

From the point of the level of development, Georgia is

significantly left behind by Azerbaijan, Armenia and Central Asia. According to the recent research, we are just on the third place with quite obscure future. We are immediately followed by the countries, where illiteracy is almost 70 %.

There are attempts to select a model of scientific development for our country, or to create something "quite new and unusual". There are some, who say that such a small country as Georgia does not need science at all. Meanwhile, one of the most important phenomena of science gradually disappears – this is the continuity of knowledge, permanent scientific thinking and the harmony in generation replacement. The scientists, who are also the greatest teachers, disappear from our life and there is nobody to replace them. We are quite near to generation gap, to final destruction of science.

To illustrate the above said we provide some figures of the specialized international organizations. The corporation RAND published its large-scale research "Global Technology Revolution 2020" describing scientific technological capacities of different countries in contemporary world. According to that research, Belorussia is on the 30th place, Estonia on the 34th, Azerbaijan on the 38th, Armenia on the 57th and Georgia on the 100th place. Then, there come Chad, Lao and Gabon [2].

In the next category of the same research – "Adaptation of Scientific achievements" assessed by 100 score the situation in Georgia is described as the "hardest".

With the capacity of scientific development we are on the third place "with quite obscure future." We can provide lots of similar researches, where Georgia is among the last five countries, even among the former Soviet republics. Who is responsible for that?

Such a stagnation of science had number of objective reasons. One of them was the false idea of the government that for such a small and poor country burdened with post-soviet problems it was sheer luxury to carry out fundamental researches and to provide finances for that. According to them, the only job we could do was the use of results obtained by others. Therefore, there was a practice of financing the science with the "leftover". In 2005 the science was financed by GEL21 million from the State budget. It should be noted that today the science is financed from the State budget as before. In 2006 it was financed by GEL18.2 million that was 0.15% of GDP in 2005 and 0.13 % in 2006. For comparison, it should be noted that it was 3% in Japan, 2.7% in Germany, 2.5% in France, 2.4% in Great Britain, 1.2% in Russia, 1.1% in Kazakhstan and so on.

The systemic transformation of social life and globalization caused rapid changes of situation, which, in its turn, put individual skills of a person at the top of the agenda and promoted such features of a person as creativity,

independence, initiative, responsibility and so on. At the same time, at present education implies realization of the social function of a person. The main objective of education reform should be the symbiosis of positive experience accumulated in any field and the innovations of globalizations and preparation of competitive human resource for international labor market on that basis. It is of no less importance to bring up well-educated, enthusiast and competent members of democratic society. The process of education should be continuous focusing on the raise of the level of information awareness in society. Today, for a human being apart from the matter and power there is one more form of existence - it is information. The experience of such countries as Finland and Ireland shows that relatively small countries with relatively poor resources also have an opportunity of success as long as they can correctly define the priorities of their development and carry out scientifically approved economical and technological reforms [3]

On the basis of the above said, it is crucial radically to change the government strategy in science and education. In order to avoid destruction of most fields and branches, to avoid the human resource gap it is necessary to provide conceptual foundation for reforms. The scientists never lived in luxury, because scientific work itself is far from easy and comfortable life – it is a kind of commitment, search of new ideas, finding out the cause and effect relations, aspiration to truth. It is difficult to force anybody to live such a life when you know that it means poverty, starvation and to be unwanted. . . The prospects are not luring. Actually there is zero motivation in young people to be interested in science. Science is artificially separated from the University life, which means that there are number of fundamental issues to be revised. The reforms carried out at Universities under the name of the Bologna Process are not always carried out in the right way and require rapid changes and reorganization. It is high time to stop recruitment of incompetent human resource from the clans, friends and relatives, instead of highly-qualified and competent people [4].

The Ministry of Education and Science must return the scientists to laboratories and lecture-rooms and motivate the students to study. Science, research and the economics of knowledge based on that will necessarily guarantee development of the State, because to have a good scientist means to have a good University and the knowledge received there to be the basis of future. Therefore, sensible government policy implies well-developed science. Without it there can't be a talk about serious progress of the country.

However, the main thing is to understand the mission and necessity of science, correctly to understand its role in society, in development of the state and in formation of the

national consciousness and civil society.

In the nearest future the government of the country and the Georgian National Academy of Sciences should determine the prioritized fundamental and applicable fields of science and develop a detailed plan for further development of those fields. It is a very hard and responsible problem, which must determine the future of Georgian science. There is no alternative to that. Otherwise Georgian nation is destined to be a permanent sponger on the other peoples' intellect, and nobody will pay attention to the fact that this nation had Gelati and Ikalto Academies as far back as the 12th century and it is the nation who gave "The Knight in the Panther's Skin" ("Vepxistkaosani") and many other things to the world.

We completely share the moral, civil and national responsibility of our generation with account of the grave period. Therefore, we call for every scientist or educated people, government officials or ordinary people, who do care for the future of our generation, to support the justice and common sense and not to let Georgian reason and mind finally to die out.

The first urgent and the most important task for saving Georgian science from final destruction is immediately to stop the process of the science destruction.

In order effectively to manage any phenomenon/problem, at least two things are necessary: the first, thoroughly to know the phenomenon/problem itself, and the second, to know numerous versatile forms of management, of which the one should be selected, which will exactly and optimally fit the object of management and will completely reveal its potential. Management specialists know quite well that in the process of management of a social body of medium difficulty there is used/materialized 75-77% of scientific knowledge and everything else is just 23-25% altogether. If the object of management is a relatively complex and multispectral body this ratio is more radical, and in case of the super-complex systems (such as science) the specific weight of scientific knowledge is about 95%.

Science is the most difficult and at the same time quite different material and socio-psychological phenomenon, and its management is as complex and as multidimensional as its content.

In order exactly to define the ways and stages of science development it is necessary thoroughly to study the country and its financial and economic capacities, actual situation in different fields of science, conditions of the remained scientific research and experimental base, and what is more, actual situation with respect to the scientific human resource. In short, after a "destructive war" general inventory is required. Just after gathering of all this and some more other information we will be able to define the first and further steps to withdraw science from the deep crisis. Such information can be gathered just by

the researchers with special education, scientific work experience and high skills.

Management of science is impossible if the manager does not have clear and thoroughly exact information about the fields of science and their specificity, if he/she does not thoroughly know the essence and potential of each field, if he/she does not know the details of the problem of the field and does not know the scientists occupied in that certain field. We rely on an axiomatic proposition that relevant management of science requires a highly organized symbiosis to carry out a certain scientific research, on the one hand, and on the other hand, to view this research through the global system of scientific fields, through the most complex system, where everything is interdependent determining each other. Nobody can perform the above-said functions except scientists and scientific organizations. No novel government structure can have so much experience, professionalism and level of information awareness as the mentioned society.

Apart from the above said, science management is difficult because it covers all the fields of human life and mind, and each of them requires its specific methods, forms and financial and material-technical support. Given the fact that in recent 20 years there appeared about 40 novel scientific directions in science and now the accumulated scientific knowledge is doubled in every 20 years (from 2035 it will double just in every 7-8 years), it is clear that science management itself is the most complex object of scientific research, which can be studied only by the scientists themselves and their organizations, of course, in close relation with the government.

We consider the role of the government in science management to be the most important and in some cases decisive. The main problem of the State and the science is identification of the optimal form and dose the State can interfere in science management so that not to cause negative results as far as the science itself is an independent self-developing phenomenon and its efficient management requires a very careful, reasonable and highly professional attitude rather than active administrative influence/action on the object. In that case the State has a specific role expressed with the word State "support" [5].

The Georgian National Academy of Sciences should undertake an engagement for preparing an annual report for the Government about scientific development. The report should be submitted to the government before the 1st of February to be considered at the Government session.

It is necessary to say a few words in response to those people, who state that such a "small country" (with the word "small" they mean the territory of the country) as Georgia does not need science at all, the more so scientific development. It is clear that such a position implies to destroy science. Such a poor idea about science cannot have a response

from the position of science but we could tell those who think so that there are lots of “smaller” countries in Europe such as Holland, Belgium, Austria, Switzerland, Czechia, Slovakia, Croatia, Liechtenstein, Estonia, Latvia. Israel is also “smaller” than Georgia and hundreds others [6-8].

We would be happy to have the same level in science development as it is in Holland, for example, or in Israel. However, it is also important to remember that just to copy any model of science management from foreign countries cannot provide a desirable affect unless it is implanted in Georgian roots/unless the Georgian culture, Georgian reality, Georgian specifics, Georgian mentality and even Georgian temperament are taken into account.

In our opinion, Georgian National Academy of Sciences should draw up a consolidated budget of science development and submit to the Government.

We regard it to be necessary to consider such a postulate of science development, which is

based on financing of the leading scientists and those subject areas, which are the State priorities.

Essentially, scientific work or scientific process consists of several logical stages, of which the first and the most important one is the stage of knowledge accumulation, where 97% of the scientists are busy. As is known, any novelty can be created no earlier than the accumulated science allows it, and just to the extent it allows. When Newton was asked how he made his discovery, he said: “If I have seen further it is by standing on the shoulders of Giants”. A long time has passed after Newton. Today, scientific knowledge increases so rapidly that it is a greatest problem to process and systematize knowledge.

There are individual scientists as well as great scientific organizations participating in the process of scientific researches. Each of them knows very well that scientific breakthrough is achieved primarily on the basis of the achievements in fundamental sciences. Generally, fundamental sciences do not and cannot have an instant result but its discoveries allow higher achievements of high quality in the fields of applied science. This gives rise to a false opinion as if fundamental sciences do not have practical significance. Without development of fundamental sciences it would be impossible to develop the fields of applied sciences or those fields of science, which are of practical significance. The professionals rely just on this fact when they say that fundamental sciences are of the greatest practical significance. Also, it should be noted that sometimes even a little novelty achieved in any field of science can lead to a sudden great discovery or invention in quite different field of science.

It is obvious that if the scientific knowledge accumulation process stops, it will immediately stop the science development. Of course, the Government can finance any additional project of their priority or give a special order to

some gifted and experienced scientist or a group of scientists to perform a certain assignment but just in case the scientific research institutes have the so-called basic financing, which means that the scientific knowledge accumulation process of paramount importance will not stop.

The important instruments of support to the development of science are the grants, competitions and other stimulating funds and their efficient management. It seems strange to us that such a function is performed by some other body rather than by the Academy of Sciences.

We completely understand that in a new situation the Academy of Sciences will have to carry out a radical reform in its management, and it should be theoretically and practically ready for that.

The question of award of scientific degrees cannot be left aside as it is frustrating for the whole scientific community. Georgia has joined the Bologna process but it cannot bear the fruit unless we work in true aspiration and right direction. One-level doctoral and uncontrolled procedures of dissertation defend significantly lowered the barrier for qualification of the scientific work and it has become easy to anyone to pass it. Of course, I do not mean all the dissertations defended in the new system because there are some really gifted and hard-working young scientists truly deserving it, but everybody agrees that general level of scientific value of dissertations significantly lowered. Just comparison of dissertations of the old candidates of sciences and the present doctoral dissertations (these two terms are officially equal now) clearly shows that many doctoral dissertations defended in the new system would not have succeed in the old system. Indeed, this is the problem of the whole system of education and science, but it will not be right not to denote it [9].

In our opinion, it is necessary to introduce a public holiday “Scientist’s Day”. On that day current situation of science shall be assessed and successful scientists will be awarded. It will make the government to consider the problems of science at least once a year.

Science development in itself does not mean development of new (high) technologies and their introduction in life. Science development prepares theoretical ground and project for development of such technologies, but they require additional socio-technical factors such as readiness of the society for innovations, existence of demand, finances, human resource and many other. Science, which is organically and inseparably connected to knowledge, is nourished on that as well as knowledge is nourished on scientific activities.

It should be noted that the pace of technological development of a country is immediately related to the existing level of technological development of that country, i.e. in normal conditions the higher the level of technological development of a certain country the greater the pace of development

of that country. Such regularity leads to a very important conclusion that in equal conditions, in conditions of technological equality (equal scientific and technical level) of countries is impossible to achieve. With that respect, in the course of time the difference between the countries will grow until the scientific and technical integration and internationalization transforms into a solid, interrelated systemic phenomenon.

A priori expression of the existing principal problems of science today can have a form of two global spheres. One will be a group of problems related to the origin of the universe and the human being, and the other to the functioning of human brain. While the questions related to the first group of problems are more or less clear and understandable, the questions related to the human brain is increasing in a geometrical progression against the background of study and research of the latter causing terrifying abstractions. For example, individual mental scientists of the highest ranks as well but some most influential scientific organizations state that there is no answer to such questions as what the mind is, or the reason, wisdom or memory. The in-depth understanding of awareness, conscious and creativity is not defined yet. Recent researches carried out in this field make us put quite unbelievable and sacrament questions on the agenda whether the brain is a part of a human being or a human being is a part of brain, or whether human being controls the brain or vice versa. There is no proper answer to these questions. Supposedly, there will be great breakthroughs in every field of science in the nearest 50 years but the greatest breakthroughs are expected in physics, neurosciences, biology, chemistry, genetics and astronomy (I mean the whole areas of these fields or all their directions). There will be greatest achievements in medicine and generally, in healthcare. The only difference is that medicine, as a field of science, apart from having its own subject of research and methodology, is a conglomerate of different fields of science, i.e. its success (both in diagnostics and treatment) mainly depends on the achievements in other fields. For example, its progress is impossible without development of chemistry, physics, biology etc.

The problem of the so-called “artificial intellect” should be specially highlighted. Is it really possible to create the “artificial intellect”? This is a challenging question for modern scientists and the answer to this question can radically change the universe. In my opinion, science is not ready yet to give the exact and well-founded answer to that question. Evidently, the answer to this question must be the real “artificial intellect” itself, which does not principally exist yet. But what will be in half a century? The period of fifty years is quite a great period for such a pace of science as it has today. It should be taken into account that this pace is systematically increasing in every direction of science.

On the ground of all of these my intuition tells me that such an intellect will be created, and even more, we are not far from that moment. Like any great discovery, the “artificial intellect” will bring colossal scientific and technological progress. At the same time it will give rise to the greatest problems, mainly of nonmaterial character and it will be connected to intellectual and social difficulties to cope with them.

Generally, intensive development of science will cause differentiation of the existing fields of science and also it will give rise to quite new fields of science, some of which will develop on the verge of several science on the ground of the synthesis of their research methodologies. Given the new practice, the objects of scientific research will considerably complicate putting on the agenda the problem of further intensification and development of the scientific research methodology. Appearance of new fields of science will cause formation of new specific methods of scientific research, on the one hand, and on the other hand, necessity of preparing a certain number of new specialists of narrow profile.

Meanwhile, some alternative sources of energy will be found. Absolute majority of the new sources of energy will not be dependent on the earth resources. Their source will be the cosmic power and artificial substrates, which will be far cheaper than the current energy carriers. Besides, the number of people employed in that field will greatly decrease. It will categorically change current structure of economics causing great redistribution of power over the planet. Cheap power resource will greatly accelerate economic development and will solve great number of ecological problems.

Development of informational technologies will have the greatest positive influence on the progress of science, technology, economy as well as on all the aspects of individual or social life. The process of information gathering and processing will be easier and faster and its quality will be high. Information will be more systematized, detailed, exhaustive and analytical. The role of professional (special) information will radically increase. Supposedly, at the end of this century about 70-80% of printed material will be just in an electronic form that will increase the opportunity of applicability of this production and at the same time will reduce its price giving great benefits. Information access will simplify socialization of individuals and their involvement in social system. It will reduce the usage of natural resources and will save them [10].

Eventually, the problem of AIDS and cancer will be solved. As the medics state, in the nearest 100 years an average lifespan of a human being will be about 100 years and at the same time the level of life will be quite better. An average medical service will be accessible for the absolute majority of people [11].

Ecological deterioration will lead to real possibility of disaster. The problem of ecology will become the number one problem. The future of food production will become topical and after adequate perception of the problem it will attract relevant attention. Human food will be ecologically safe and, at the same time, it will be diversified on the basis of inorganic food.

Introduction of new technologies (high technologies) and their vast and intensive application will change the human life. In 50-70 years the living conditions will change so rapidly and so significantly that people will have other psychological problems that will not be easy to cope with. New technologies will intensively develop in several fields and will soon become of intensive character. It will cover the industry, agriculture, service sector, transport and even more, the methods and means of scientific research. The latter factor will accelerate the technical progress and will give rise to number of new subjects. People will have a great choice of subjects for any activity. It will be necessary to systematically control the pace of introduction of technical innovations into practice in order the human mind and body be able to percept and understand them.

Rapid and intensive development of scientific-technical vector will definitely reflect on the martial technologies and armament. In the nearest 50-70 years there will inevitably be created a strong and reliable international mechanism for controlling the armament.

Supposedly, social and humanitarian sciences will not develop in such a pace and in such a scale as natural (all the other) fields of science. This is quite reasonable and logical way of their development because, generally, they study the essence of the society, its institutions, State, law, ethics, aesthetics etc. and their meaning, regularities and peculiarities. These phenomena are connected to relatively

permanent substrates, which are not characterized by rapid and dynamic changes.

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НЕКОТОРЫЕ ПРОБЛЕМЫ ИНСТИТУЦИОНАЛЬНОГО РАЗВИТИЯ НАУКИ В ГРУЗИИ

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Автор статьи рассмотрел вопросы управления наукой в Грузии, а также коснулся аналогичных вопросов в глобальном масштабе. Грузия стала независимым государством 23 год тому назад. Являясь неотъемлемой частью Советского Союза, Грузия сделала заметный рывок в различных отраслях науки, а также в сфере управления наукой в целом. Центральным органом в области управления науки была Академия наук Грузии, которая состояла из 53 научно-исследовательских институтов по различным отраслям науки. Число научных работников в 1990 году достигло 28 000 человек. После обретения независимости и резкого ухудшения финансового положения в стране, развитие науки было замедленно, государственное финансирование Академии Наук и научно-исследовательские институты почти прекратилось. В 2004 году Правительство приняло решение, согласно которому все научно-исследовательские институты вышли из-под контроля Академии Наук. Это стало отрицательным событием, как для научных учреждений, так и для науки в целом. Автор проанализировал различные формы управления наукой в различных странах и предложил предпринять действия по урегулированию вопроса управления наукой Правительством. В статье дается государственно-правовая оценка прошлых лет и предлагаются рекомендации по улучшению ситуации.