

Modernization of Basic Research in Russia: Russian Academy of Sciences' (RAS) Vision

Russia stands among the few countries of the world engaged in basic research along all its principal avenues. A considerable part of it is traditionally concentrated in the Russian Academy of Sciences (RAS) (**Slide 2**), which, according to 2008 state statistics, embarks 466 academic organizations (against 3,666 organizations in Russia) with 93,700 persons employed (761,200 in Russia), including 54,700 researchers (375,800 in Russia). The qualification level of researchers working in the Academy is substantially higher than that in other R&D institutions. For example, in 2008 the total share of Candidates of Science engaged in Russian research organizations made 20.2% and that of Doctors of Science 6.7% whereas in RAS institutes the indicators were 43.0 and 19.0% respectively.

Research is traditionally carried out in RAS along all principal avenues of fundamental science (**Slide 3**); the RAS cadre potential is distributed in accordance with the fields of science in the following way: 72.6% of all researchers fall on natural sciences, 12.8% on technical sciences, 0.4% on medical sciences, 0.5% on agricultural sciences, 6.0% on social sciences, and 7.6% on humanities.

Parallel to their basic researches RAS institutes are also engaged in applied researches, in the majority of cases the latter rest on findings received in the process of fundamental research.

(**Slide 4**). Considerable state property is concentrated in RAS. The Academy has broad competences in disposing of this property when pursuing goals indicated in its Statute.

The state also allocates financial means to fund both RAS current activities and investment into construction of new objects. Internal RAS expenses for R&D make 13% of all internal expenses of the Russian Federation on these goals. In addition, RAS earns more than 30% of its budget thanks to commercializing applied research findings.

RAS acts in line with the self-governance principle, it adopts independent decisions on the distributing available resources between various research directions. The Academy also takes autonomous decisions on the foundation, liquidation and transformation of its organizations.

The system of academic self-governance comprises academic councils at the level of research institutes, general meetings of members of subject and regional branches, scientific centers and the RAS General Meeting as well as governing bodies formed by these meetings to monitor current activities (bureau of scientific centers and departments, RAS Presidium).

All academic offices beginning with junior researcher and up to RAS President are replaced on competitive basis by secret ballot.

The research program of institutes is designed by their academic councils proceeding from proposals made by structural units (laboratories, departments, centers). The plan of an institute is approved by the academic branch it integrates and by the tutoring RAS vice-presidents in the name of RAS Presidium.

The basic funding of a RAS institute is provided by the property at its disposal and covers current expenditures connected with the execution of the approved plan of scientific research.

About 20% of all funds allocated by the state are distributed by RAS Presidium and its branches on competitive basis to finance big research programs of interdisciplinary character, as a rule. Basic and program funding of RAS institutes goes in line with the budget.

In recent years an active discussion is running in the country on the extent to which the forms of organizing basic science meet up-to-date requirements (**Slide 5**); these mainly touch upon the following questions:

- What kind of basic science does Russia need?
- What should be the relations between science and higher learning?
- Who is the main actor in research: an institute or a laboratory?
- How should the efficiency of basic research be evaluated? What is the role of formal indicators (amount of publications, citation indexes, etc.) and expert assessments?
- How to better finance fundamental researches: through grants or on the basis of budget estimates?

In the end, by answering the above questions, the parties in discussion draw various conclusions about the factual and potential competitiveness of modern Russian science. Accordingly, programs of actions aimed at modernizing research which they put forward differ radically.

The generalized position of RAS critics may be presented as follows (**Slide 6**):

The Russian Federation cannot afford an all-embracing basic science. We should concentrate resources on research avenues where Russian science has reached the world level. In addition, according to some opponents, today in Russia no more than 10,000-12,000 people are capable to work at world level in the field of basic research. Thus, proceeding from this viewpoint as well claims on retaining a strong basic science are groundless.

The key link in basic research is a scientific laboratory. It is the laboratory that produces the main products of researches, i.e. scientific publications. The quality of the scientific products is evidenced by citation index and impact factor of those academic journals where the academic article appears.

Natural ways of funding researches are grants, so various laboratories enter a competition to win them. Financing of institutes based on budget estimates is qualified as wittingly inefficient.

Thus, the most natural place for basic science is higher learning institutions. The Academy is likened to a bureaucratic institution and the academic form of scientific organization is stigmatized as inefficient in its essence. For the transition period, active use of a tough linkage between state funding and formal efficiency indicators, a shift in funding researches towards grant basis also within the Academy, strong reliance on international expertise in assessing the efficiency of academic institutes are proposed (members of the Russian scientific diaspora are also suggested to be attracted to this kind of work).

Let us start with the point of the efficiency of academic research in the framework of RAS (**Slide 7**). It should be stressed that in our view any formal indicators are no more than raw material for a qualified expert evaluation.

According to Essential Science Indicators, in the category of amount of publications in 1996-2005 per \$1 mln. at purchasing power parity Russian science at large with

16.6 articles occupied the 22nd place. At the same time RAS published 70.7 articles and found itself on the 1st place.

Similar is the situation with the citation index. In Russian science at large 58.1 citations (the 33rd place) corresponded to the financing volume of \$1 mln. at purchasing power parity, whereas RAS had 269.5 citations (the 4th place). Finally, in the period of 1998-2008 compared to 1997-2007 citations of Russian science grew by 7% and RAS by 16%.

In the Russian Academy of Sciences we proceed from the idea (**Slide 8**) that the scale and configuration of basic research derive from strategic goals formed in society as to the place the country will occupy in the world in the future. All-round basic researches are a most important asset in ambitious plans of a comprehensive modernization of Russian society. This science ensures the availability of needed cadre resources to rapidly concentrate efforts in breakthrough directions of technological development. At the same time, sustaining this scientific potential is an inadmissible luxury if national aspirations are limited by maximizing proceeds from exploiting natural resources.

We categorically disagree with the statement that today Russian science does not dispose of the needed cadre potential to carry out ambitious plans. It is a heavy error to limit this potential by researchers whose articles are published in foreign journals with high impact factor. By the way, one has to bear in mind that researchers of the older generation have been formed against another historic background, and it is at least not sensible to ignore their scientific potential by applying similar indicators.

The Russian Academy of Sciences is open for international cooperation, ready to actively use its most advanced forms, inclusively attract foreign researchers to work at our institutes (among them representatives of the Russian diaspora). Our position, however, is a matter of principle: employment conditions should depend not on the researcher's citizenship but on his/her qualification as well as on general rules in force in the country.

(**Slide 9**). We do not share the viewpoint that laboratories are key academic actors, and funds should be distributed precisely among them on grant basis. RAS institutes do not represent economic superstructures placed above laboratories integrating these institutes but are full-fledged academic structures, which ensure the development of big scientific programs. Our experience evidences that academic institutes are effective members of cooperation (both between themselves and with off-academic scientific centers); thanks to this cooperation efforts are consolidated for breakthrough directions of technological progress, and most significant state projects are underway.

(**Slide 10**). There is nothing reprehensible in basic funding of RAS institutes either. Important is only that it should be used for avenues chosen by the corresponding team on competitive basis.

We hold that in principle the existing system of allocating financial resources within the Academy offers all opportunities for the academic community to autonomously determine priorities in research. It does not mean, of course, that we are in general against grant funding; it seems to us this method produces the best results if applied to select potentially promising projects proposed by individual researchers or their relatively small groups.

(**Slide 11**). RAS considers it to be an important task to restore the level of basic research in high schools, which plummeted in the 1990s. But we believe the attempt to tackle the task on the account of limiting RAS funding would be a grave error. And we consider plans to relocate all basic researches to the institutions of higher learning as simply dangerous for Russian science.

Carefully balanced development of basic science in the academic area and in high schools, retention of various channels and mechanisms of funding creative science will build up optimal conditions for research.

Thus, we are convinced the academic form of organizing science that has been established in Russia over almost three centuries retains its viability. But it does not ensue we neglect those serious internal problems and challenges which academic science faces today and which make the goal of its modernization more than topical.

(Slide 12). Problem number one is the unfavorable age structure of the scientific personnel as the outcome of catastrophically low funding of science in the 1990s. By end-2008 the age structure was as follows: researcher under 29 years of age made 13.5%, between 30 and 39 years 14.8%, between 40 and 49 years 15.5%, between 50 and 59 years 24.1%, over 60 years 32%. The obvious “demographic pit” of researchers of middle age poses a complicated task - to actively attract young people to science and set up conditions to share with them the expertise of the older generation.

We manage to do something in this respect. Thanks to a special project applied in 2006-2008 the wages of researchers of budgetary origin were raised by 5 times. The average monthly wage of the personnel engaged in R&D made in the Russian Federation 19,263 rubles in 2009 and 26,963 rubles in RAS. As a result, young researchers (mainly graduates from post-graduate courses of academic institutes) eager to make a career in academic science queued for a job. That is why the decision taken by the government on the initiative of the country’s President about assigning to RAS funds in 2011 for 1,000 positions for young researchers is of high importance for us. It is also valuable that in order to make young academics stay in RAS research institutions the government adopts important decisions to guarantee favorable conditions for their housing facilities.

Finally, we cannot but stress the fact that a normal reproduction process of the cadre potential in academic science is seriously hampered by unsatisfactory level of pensions of the older generation of researchers.

(Slide 13). The second group of problems is connected with the situation that the level of tools and devices our researchers are equipped with is, for the time being, far from ideal, which is a problem of Russian science at large. The equipment value per researcher in the Russian Federation amounted by end-2008 to 40,000 rubles only and per RAS researcher to 52,300 rubles.

Unfortunately, in the recent two years the solution of the problem has decelerated significantly due to the world financial crisis. As a result, today three quarters of budgetary financing allocated for RAS are used to pay wages.

(Slide 14). The third group of problems is linked with greater flexibility to the structure of academic organizations, strengthening competitive principles in planning research and distributing budgetary means.

We cannot but acknowledge that today the stability-flexibility balance in the structure of RAS organizations is breached. Liquidation of research structures (laboratories, research institutes), which have lost their research potential runs with great difficulties and very slowly, which, in part, is due to institutional reasons beyond RAS competences. I shall cite the example of indefinite term employment agreements signed with the bulk of academic researchers, which complicates heavily the process of reasonable renovation of the research potential.

Problems, however, also exist on our side. A series of changes should be introduced into the process now in operation of designing research plans and the evaluation of their outcomes. We link stronger competition in selecting researches eligible for funding and an informal approach to the evaluation of the findings with a qualitatively higher level of expertise within the Academy. We shall, of course, take into consideration formal performance indicators, but apply them as a starting point for expert assessment only. Our skeptical attitude to the idea of a direct linkage between the level of these indicators and the volume of funding remains unchanged.

(Slide 15). The fourth group of issues is linked with the activity of our institutes in commercializing applied findings, which accompany basic researches.

One of the aspects of the problem refers to a strict delimitation in the use of financial flows into our organizations through budgetary and commercial channels. It is important that all doubts about governmental funds deployed for basic research being used for these goals exclusively are thrown away.

A separate case of the problem is the way grants received by our researchers from non-academic sources are made use of. We hold a transition to the practice adopted in the world as correct: these grants cannot be used to pay grantee's wages instead of buying necessary equipment and devices as well as attracting students and post-graduates to the research process. In this case grant claims to research planned topics would be quite justified. This is our stand. But it may be practiced only if the granting foundations introduce relevant changes into their grant provisions.

The second, more extensive area of activities to commercialize applied findings of our institutes is linked with setting up the so called "RAS innovative tier". We propose the following mechanism to solve the problem: In the framework of the Academy a 100% state holding company is founded, which, when needed, sets up branch societies to accomplish certain innovative projects based on applied results gained by academic institutes. This arrangement helps channel innovative activities into a natural commercial regime and in this way allows to, organically, attract private capital to realize large-scale projects. Apart from that, in case the proposal is approved by the state, the Academy would get an additional source of funding in form of dividends paid by the holding company.

(Slide 16). In conclusion about the attitude of RAS to international academic cooperation.

Of late we have to frequently hear the assertion the Academy purportedly strives to isolation from the world research community. Factors like our lacking intention to reduce research efficiency evaluation to the amount of publications and the citation index in prestigious international journals, our wish to retain national journal published in Russian, skeptical attitude to international expertise of our institutes are quoted. All this, according to our opponents, testifies RAS is afraid to openly compete on "the international market of scientific ideas".

What may be said in response? Yes, we have a stand with respect to optimal methods of organizing and funding basic research, which I have already mentioned. Yes, we hold the idea of transition to mass external expertise of researches carried out at our institutes to be sheer "Nozdrev-like" [Nozdrev, a character in Nikolai V. Gogol's "Dead Souls", symbol of boasting and obtrusiveness]. But we are aware of the fact that science is international in its essence. Precisely because of that RAS is actively cooperating with all main research organizations of the world, it is a noticeable player on the field of scientific exchanges. Every year our academics participate in very many international conferences held both abroad and in Russia. The great majority of Russian scientific journals included into prestigious international databases are

issued by the Russian Academy of Sciences. Our researchers are elected members of prominent foreign scientific organizations, receive prestigious international scientific prizes.

We sincerely hope in the nearest future scientific cooperation between RAS and researchers from the European Union will gain a new impetus in the framework of the EranetRus program of the EU. As you probably know this program envisages to set up a “virtual financial stock”, from which every party may use its deposited funds to finance its organizations to participate in projects selected by an international tender commission. I wish to inform you that we are willing to finance participants of our Academy for any projects, which have succeeded in passing the competition and live up to the topics included into the Program of Fundamental Researches approved by the Russian government. Moreover, we are ready to introduce special stimuli for our research structures, which carry out planned tasks in cooperation with European partners. This means the absolute limit of our input into the “virtual stock” is the total volume of financing of RAS research program.

These are the issues I wished to dwell in my report.

(Slide 17). Thank you for your attention.