

## EDUCATION AND SCIENCE

### EDUCATION SCIENCE AND INNOVATIONS

#### EDUCATION

The Republic of Belarus has entered the 21st century with a developed educational system. The adopted course for developing a social state has allowed the right strategy for the educational system to function and develop to be formulated. Such macroindicators as the level of the adult population literacy (99.6%) and coverage of the working population with basic, general secondary and vocational education (98%) are a vivid evidence. Belarus is at the level of the developed countries of Europe and USA in terms of indicators of children enrollment to the primary and secondary institutions of education and the number of students in the higher institutions of education.

The national policy in the education sphere is based on the following major principles: succession and continuity of education levels; compulsory basic (ten-year) education; national and cultural framework; priority of human values and human rights; humanism; scientific character, orientation to the world education level; environmental orientation; unity of teaching, moral and physical education; secular character; and education democratic administration.

The major priorities of the national education system in the Republic of Belarus are as follows: restoration of the national and cultural foundation of education; education of a free creative and moral personality; strengthening of physical and mental health of the nation and an individual; education democratization and humanization; interaction of education with science, production and social and spiritual sphere.

The structure of the national education system is based on the Constitution of the Republic of Belarus and on Laws On Education, On Vocational and Technical Education, On Educating Individuals with Disorders of Psychophysical Development (Specialized Education), On Languages in the Republic of Belarus, On National and Cultural Minorities, and On Rights of a Child. The Bills on higher, secondary specialized, and general secondary education are being drafted and the concept of the Draft Code of the Republic of Belarus has been formulated that will allow for a complete codification of the educational sphere legislation.

The institutions of education comprise as follows: preschool institutions, primary, basic, general secondary, vocational and technical, specialized secondary, higher and post-graduate, follow-up and retraining institutions of education, as well as specialized institutions of education for individuals with psychophysical development deficiency; out-of-school institutions of education; social and pedagogic institutions; and specialized training and educational institutions.

The education in the Republic of Belarus is administered by the state and society.

#### PRESCHOOL EDUCATION

4,166 preschool institutions of education teaching 372.5 thousand children were available in Belarus in 2006. The tendency of expanding the network of preschool institutions of various profiles develops. Actually, all regional education authorities formed the preschool-age children databanks. The new legal framework allows forms of preschool education with a short stay of children in the institutions (game grounds, family kindergartens) to be developed.

Payment for maintaining a child in a preschool institution and 40% of the meal cost is subsidized by the Government. The parents having children with physical and mental deficiencies are provided free-meal benefits for children in the preschool institutions. All this creates real conditions for expanding the preschool-education coverage of children that reached 80.6% in 2005 (91.5 — urban area, 50.5 — rural area).

Belarus has solved a critical problem of preschool training of the total children population at the age of 5 (89% — in preschool institutions, 11% — other types of preschool institutions), thereby providing equal starting opportunities for transition to the following level of education.

Belarus has created a unique system of teaching and methodical support of the preschool education — a teaching and methodical system Praelaska comprising over 188 manuals for pedagogues and parents.

The preschool institutions create conditions for care and medical service. In 2005, 14.3% of the institutions had swimming pools. All preschool institutions have playgrounds. It should be specifically noted that some preschool institutions have an extensive experience in creating landscape/planting sites within their area.

#### GENERAL SECONDARY EDUCATION

The general education secondary school is the foundation of the national education system mainly predetermining the level and quality of education provided by the following education components.

To increase the quality of the general secondary education, the reform was launched in 1998 to shift over to the 10-year general basic education starting from 6 years of age and to 12-year general education secondary school.

The structure of the general secondary education to be reformed comprises 3 stages: 1–4 years of education (I stage), 5–10 years of education (II stage) and 11–12 years of education (III stage).

Instruction starts from 6 years of age or over based on the medical certificate of readiness to education in school and consent of the parents. The general basic education is compulsory.

The III stage education finalizes the general education of students, formation of a rightful and responsible citizen capable of consciously selecting his/her professional activity.

The general basic and secondary education culminates in certification (school-leaving examination) after which the 10-grade leavers are granted the certificates of the general basic education, while the 12-grade leavers — the certificates of general secondary education.

4,111 general education schools, gymnasiums and lycees were available in Belarus as of 1.1.2006 training 1.283 million students. The institutions of education are funded from the budgets of local governments to which they report.

Two state languages are used for teaching and training: Belarusian and Russian. The parents of students of other nationalities residing in Belarus have an option sending their children to classes to be taught the native language, history and culture; schools and classes teaching disciplines in the native language are available.

Content of the general education is defined by a Standard Curriculum comprising state and school components. The state component defines the mix of disciplines and public/humanitarian, mathematical, natural scientific and esthetic and other courses, being compulsory for learning in all types of general education institutions.

The school component allows the students to exercise the right to select the education content to meet their individual demands and abilities (higher or advanced level of teaching disciplines and courses provided for by the state component), the optional courses, structure of motivating and supporting classes and individual and group consultations. The ratio between the state and school components changes depending on the student's age. Therefore, the school component makes up 14% of the academic time at the I stage, while at the III — up to 21%.

Each institution of education designs its own curriculum based on the Standard Curriculum, given the available capacities, requirements and interests of the students. This allows for independence of the institutions of education and differentiation in education.

35.7% of 1–10 grade students and 70.4% of senior students were covered by various types and forms of the differentiated education in 2005/2006. 35% of senior students were given different qualifications of workers (employees).

Introduction of the 10-mark system of assessing the student's progress was aimed to improve the individual work with students.

Such forms as competitions, contests of research papers, and arranging summer discipline-oriented research schools to develop abilities of talented students are being extensively disseminated.

Participation of Belarusian students in international contests and the results they demonstrate is an evidence of the improved quality of the general education. 23 students participated in them in 2005 and 19 of them were prize-winners.

The general education schools are provided with a complete set of textbooks and teaching-methodical aids. 174 titles of manuals with the total run of 3.7 million copies were published in 2005/2006 academic year alone.

#### SPECIALIZED EDUCATION

The Republic of Belarus pays great attention to the fact that handicapped children and children with mental and physical deficiencies exercise their rights to general and vocational education. Legal, economic, social and institutional framework of the specialized education was defined. Having signed the Convention On Child's Rights and having approved the Law of the Republic of Belarus On Education of Persons with Physical and Mental Deficiencies (Specialized Education) in 2004, the government not only recognizes, but also guarantees the right of each child to be educated in accordance with cognitive abilities and health status.

The national policy in the specialized education sphere is based on the idea of integrating children with development deficiencies into the society, educating them not separately, but jointly with healthy students of equal age. For this purpose, integrated education classrooms, special class-rooms, and correction/pedagogical assistance centers are being set up in general education schools in the communities where children reside. 53.2% of the total number of children with physical and mental deficiencies are integrated into general secondary education system to have a specialized education.

Handicapped children and children with specifics of mental and physical development are enrolled to the vocational and technical and specialized secondary and higher institutions of education on privileged terms depending on medical indications.

A novel activity in the sphere of the specialized education is providing a post-school guidance of the students to monitor the activity of each leaver of the specialized institutions of education and his/her employment for two years.

The out-of-school education and training is an integral part of the unified education system intended for upgrading intellectual level, meeting interests, bent and abilities of students, their self-education and creative work, identifying professional inclinations, reasonable leisure and recreation. 359 out-of-school institutions of education functioned in Belarus in 2005: out-of-school activities, children and youth art creativity, tourism/regional studies and ecological/biological education, technical creativity centers (palaces, houses, association), clubs, children studios and parks attended by nearly 362 thousand children and students. 44 children and youth fitness clubs are available in the country. 144 specialized training and sport institutions are available in Belarus (children and youth sports schools, children and youth sports schools of the Olympic reserve) in which over 69.9 thousand children and students are being trained in different sports.

Belarus has restored the children health rehabilitation system. During the 2005 summer rehabilitation campaign, 486.2 thousand children were rehabilitated, including 239.7 thousand children in day-and-night camps and 246.5 thousand children in day camps.

#### VOCATIONAL AND TECHNICAL EDUCATION

It is one of the critical components of the national education system intended for forming an accessible, open and continuously developing system to provide free-of-charge vocational and technical education and general secondary education and allowing the economy and social/cultural sphere to fully meet the needs in qualified workers and employees.

229 vocational and technical institutions of education training 114.7 thousand students were available in Belarus as of 1.3.2006. The students are trained in more than 300 professions. In the majority of institutions of education students are given instructions both in professional and general educational disciplines. 148 (64.6%) institutions of education train, retrain and upgrade the qualification of the adult population.

Currently, the vocational and technical institutions of education are changing over to training versatile workers of integrated professions simultaneously phasing out training of single-profession workers.

To improve the vocational and technical education system and integrate it in the specialized secondary education, 53 vocational and technical colleges combining vocational/technical and specialized secondary education were set up; 61 vocational lycees provide general education and vocational training at a higher level.

Specialized Secondary Education. 140 public and 10 private specialized secondary institutions of education are available in Belarus (technical schools, vocational schools, colleges). 4 higher colleges, 53 vocational and technical colleges and 6 education and pedagogical centers based on the general education schools train specialists with the specialized secondary education.

The specialized secondary institutions of education train nearly 154.2 thousand students including 112.3 thousand full-time students. The students are trained in over 150 specialities and 250 majors for all sectors of the national economy.

Special attention is paid to developing a new type of specialized secondary institutions of education — colleges — to provide an advanced specialized theoretical and practical training of students. Being college students, they may master several majors within one speciality allowing them to adapt to the professional sphere and social security in the labor market. The college graduates may enter the higher institutions of education and receive a higher education within a shorter period of time.

In their turn, some institutions of education created conditions for receiving the specialized secondary education by leavers of the vocational and technical institutions of education within a shorter period of time.

#### HIGHER EDUCATION

43 public higher institutions of education were available in Belarus in 2005: 31 universities, 6 academies, 2 institutes,

4 higher colleges and also 10 private higher institutions of education.

In 2005, 383.4 thousand students studied in the institutions of higher education, that is, there are 390 students for 10 thousand population.

The higher school trains students in 360 specialities and in over 2000 majors allowing the national economy actually to fully meet its needs in the specialists.

Transition to the mass higher education necessitated a more stringent control over the quality of providing educational services. All higher institutions of education, irrespective of their ownership category, were examined in terms of meeting the education licensing criteria. The institutions of higher education may issue the governmental standard documents of education only after passing the state accreditation.

Stable Rules of enrollment to the institutions of higher and secondary specialized education were developed. Subject to the new Rules, the entrants should take three entrance exams, two of them in the form of centralized testing, the third one — in the form to be established by an entrance commission of an institution of higher education.

The program of shifting over to differentiated time of training specialists with higher education was approved. Ideas with respect to two-stage higher education structure were refined. The first-stage education is to be completed by passing the state examinations and/or defending a diploma thesis. The students who successfully completed the education, are issued a diploma and awarded a qualification. Master's Degree courses to train students for the post-graduate courses were opened from September 2005.

The institutions of education have been trainings specialists for foreign countries since 1961. More than 25 specialists with higher, secondary specialized and vocational education were trained for 102 foreign countries over the period of 45 years.

Currently, 6,391 foreign citizens from 73 countries, including 3,833 from non-CIS countries and 2,508 from CIS countries, are being trained in the institutions of education.

The largest number of students is from People's Republic of China (1,011), India (540), Syria (354), Lebanon (281) and Iran (191).

The leaders among the institutions of higher education training foreign specialists are the Belarusian (in Minsk) and Vitebsk State Medical Universities, Belarusian State University, Belarusian National Engineering University, Minsk State Linguistic University and Grodno State Medical University.

43% of foreign students study medicine, 22% — university general scientific disciplines, 17% — engineering disciplines, 11% — humanities and 7% — economic disciplines.

The National Program for Development of Education Services Export is being effectively implemented. Enrollment of foreign citizens to the institutions of education is to be increased by 56% by 2010, the training aids and equipment in the institutions of education training foreign students and conditions of life are being improved.

The scientists efficiently implement researches jointly with foreign specialists within the framework of over 600 agreements with universities and research organizations from 48 countries. The researchers of the institutions of higher education are involved in implementation of more than 100 projects under international programs.

**Personnel Follow-up and Retraining.** The national policy in the sphere of follow-up education is based on the principles of completely meeting the needs of institutions in highly qualified personnel, forming the advanced follow-up and retraining system and ensuring economic, legal, institutional and other guarantees in this sphere.

326 follow-up institutions of education (and their branches) were available in Belarus in 2005 in which 652 thousand persons were retrained and upgraded.

The head advanced training and retraining institutions are available in each sector of Belarus being responsible for scientific, educational/methodical and institutional management and development of sectoral subsystems. The list including over 400 specialities was drawn up according to which the specialists with the specialized secondary and higher education require retraining. Special attention is paid to the advanced training and retraining of the education personnel. To meet this objective, the advanced training system for education managers and specialists and state-of-the-art systems of the scientific/methodical and informational/methodical support of the pedagogic activity were developed.

The Procedure of Enrollment of Foreign Citizens from Non-CIS Countries to the Institutions of Education of the Republic of Belarus. It is governed by the Regulation On Educating Foreign Citizens in the Republic of Belarus (No.1117 of 29.8.2002) approved by the Resolution of the Council of Ministers of the Republic of Belarus.

The foreign citizens are enrolled subject to the international treaties of the Republic of Belarus, inclusive of intersectoral treaties, and also subject to the agreements between Belarusian institutions of education and foreign citizens or intermediaries providing for tuition compensation.

The students are trained in the Belarusian and Russian languages. The tuition for foreign citizens is from USD 800 to USD 3,500 per academic year depending on the speciality and level of education. The tuition for each speciality is set by the institution of education based on the inter-national practice.

To be enrolled to the institution of higher education, an entrant should submit documents confirming the general secondary education. The foreign citizens are enrolled, provided that they have a medical certificate confirming that an entrant can be trained in climatic conditions of Belarus and in the respective institutions of higher education, with the certificate being issued by healthcare authorities of the country from which the entrant arrived. The foreign citizens are enrolled to the institutions of higher education after a compulsory medical examination in the territorial healthcare facilities to be specified by the university/institute which confirm the absence of contraindications to training in the Republic of Belarus.

A passport or a document substituting it, visa and compulsory medical insurance contract, executed subject to the procedure established by the legislation of the Republic of Belarus are necessary conditions for enrollment of the foreign citizens.

The foreign citizens to be enrolled to the institutions of education take one-year pre-training courses to learn the Russian language and also other disciplines required for a successful study of specialized disciplines in the curriculum.

The institutions of education enroll and train foreign citizens. The Ministry of Education of the Republic of Belarus is in charge of education and guidance management related to training of foreign citizens in all institutions of education and also of control over enrollment and training of foreign citizens in private institutions of education.

Diplomatic and consular organizations of the Ministry of Foreign Affairs of the Republic of Belarus issue education visas upon invitations of the institutions of higher education subject to the legislation of the Republic of Belarus. In issuing visas, a special attention is paid to authenticity of documents confirming the previous background of the entrant candidates.

Currently, the Guidelines On Procedure of Issuance of Visas of the Republic of Belarus to Foreign Citizens and Persons without Citizenship is being drafted subject to which the invitations for training are to be agreed upon not in the Ministry of Education, but in Citizenship and Migration Divisions servicing the area in which the institution of education is located.

The institution of education registers the foreign students in the Internal Affairs Departments at the place of residence and also assists in addressing accommodation problems.

Currently, the following public and private institutions of higher education licensed by the Ministry of Education of the Republic of Belarus may train foreign citizens from the non-CIS countries and issue the governmental standard diplomas upon graduation:

- Academy of Management of the President of the Republic of Belarus;
- State Universities: Belarusian State University; Brest State University named after A.S. Pushkin, Gomel State University named after Francysk Skaryna, Grodno State University named after Yanka Kupala, Vitebsk State University named after P.M. Masherov, Polotsk State University;
- Belarusian National Technical University, Belarusian State Economic University, Maxim Tank Belarusian State Pedagogical University, Belarusian State Technological University, Minsk State Linguistic University, International State Ecological University named after A.D. Sakharov, Belarusian State University of Informatics and Radioelectronics, Belarusian State University of Transport, Gomel State Technical University named after P.V. Sukhoi, Belarusian-Russian University;
- medical universities: Belarusian (Minsk), Vitebsk, Gomel and Grodno State Medical Universities;
- Belarusian State Agricultural Academy, Belarusian State Agrarian Technical University, Vitebsk State Academy of Veterinary Medicine; Belarusian State University of Physical Culture, Belarusian State Academy of Arts, Belarusian State Academy of Music, Belarusian State University of Culture and Arts, Minsk State Higher Aviation College, Vitebsk State Technological University, Republican Institute of Vocational Education, Belarusian Medical Academy of Follow-Up Education, International Institute of Labor and Social Relations, Minsk Institute of Management, Institute of Modern Knowledge, Female Institute ENVILA and Belarusian Institute of Jurisprudence.

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Additional information:

- Ministry of Education of the Republic of Belarus  
<http://www.minedu.unibel.by>

SCIENCE AND INNOVATIONS

As far back as in the early 20th century, institutions of higher education and research institutes were nonexistent in Belarus, but currently the Republic of Belarus possesses substantial intellectual and scientific/engineering potential capable of extremely efficiently addressing scientific problems in the interests of developing the national economy and social sphere, and furthering progress of education and culture. The efficient use of this potential is considered by the Belarusian higher authorities as a critical factor contributing to a sustainable socio-economic development of the state and higher competitiveness of the national economy through developing high technologies and introducing innovations.

Among the new independent states formed on the post-Soviet space, the Republic of Belarus managed to a greater extent to maintain the scientific sphere potential. Belarus provides a scientific support actually to all lines of activity in the production and social sphere and in administration. In 2005, 299 research, designing and technological organizations, universities and industrial enterprises were involved in research and development; of them, private organizations make up 10%. The main scientific center of Belarus is Minsk — 191 organizations in the capital, or 63.9% of the total research organizations in the country are involved in research and development.

The size of the research personnel doing research and development in Belarus amounted to about 29.4 thousand people in 2005, of this number, 72.5% had a higher education, over 3.2 thousand persons had a scientific degree of a Candidate of Sciences and nearly 770 — Doctor of Sciences. Of the total number of the scientific personnel, researchers account for nearly 59.9%, technical and auxiliary staff — 26.3%. 46.9% of the total number of researchers and developers worked in the private sector, 43.3% in the public sector and 9.8% in the higher education sector. Although the tendency of reduction in the number of researchers in the science sector, which emerged in the 1990s, has not been reversed, the rate of this reduction somewhat slowed down.

The Belarusian scientists are involved in research and development in the spheres of scientific and scientific/engineering activity being of priority for the country. This includes as follows: resource-saving and energy-efficient competitive products technology, innovative materials and new energy sources, medicine and pharmacy, information and telecommunication technologies, technologies of production, processing and storing agricultural produces, commercial biotechnologies, ecology and rational nature management. The priority is given to research and development in the sphere of engineering, natural and social sciences: the share of researchers involved in them made up 53.2%, 25.0% and 9.9%, respectively in 2004. The share of the fundamental research in the structure of internal current expenditure for research and development accounted for 20.3%, applied research — 30.2%, and developments — 49.5.0%.

The resources of the republican budget and innovation funds annually established in the republican state administrative bodies through allocations from organizations and enterprises reporting to them are mainly used to finance scientific, scientific/engineering and innovative activity in the Republic of Belarus. In 2005, the research and development expenditure amounted to BYR 430.9 billion and increased by 37.4% compared to the previous year. Budgetary appropriations making up 47.7% of the total expenditures for this purpose were the major financing source.

The work performed by the research and development organizations in 2004 was estimated to be BYR 533.5 billion, of this amount, research and development made up 71.0%, scientific and engineering services — 7.2%. The cost of research and developments done and scientific/engineering services provided stabilized at the level of 0.7% of the gross domestic product of Belarus exceeding that in the majority of the CIS countries.

In accordance with the framework Law of the Republic of Belarus On Fundamentals of the State Scientific and Engineering Policy adopted in 1993 and playing the primary role in the scientific and engineering sphere, a critical importance is attributed to continuously improving the system of the governmental regulation of the scientific activity. The Decree of the President of the Republic of Belarus On Improving the State Administration in the Science Sphere (No.7 of 5 March 2002) became a next step in this direction. In accordance with this Decree, the

Science and Technologies Committee of the Republic of Belarus, the National Academy of Sciences of Belarus (NASB) and the Highest Certifying Commission of the Republic of Belarus, the functions and authorities of which are distinctly defined, currently form the system of the state administrative bodies in the science sphere.

The Science and Technologies Committee formed in 1993 reports to the Government of the Republic of Belarus and is a republican body pursuing the national policy and effecting the state regulation in the sphere of the scientific, scientific/engineering and innovation activity, as well as protecting intellectual property rights. The Committee comprises the Belarusian Innovation Fund and National Center of Intellectual Property performing governmental functions in examining scientific and engineering decisions, trade marks and service marks, issuing protection documents, providing patent and information documentation and training personnel in the intellectual activity sphere.

To legally protect the results of intellectual work and their commercialization, the Belarusian authorities created the necessary conditions and adopted and put into effect the Laws On Patents for Inventions, Useful Models and Designs, On Trademarks and Service Marks, On Geographical Indications, On Legal Protection of Integrated Circuits Topology and On Patents for Plant Varieties. In addition to the national patent laws, the relations in the sphere of industrial property protection are regulated by international agreements which the Republic of Belarus being the party to. Over the period from 1993 to 2005, more than 11.6 thousand patents for inventions, useful models and designs, over 75.4 thousand trademarks, and about 120 new plant varieties have been registered over the period of 1995–2005. Totally, over 67.9 thousand trademarks and service marks are in effect in the Republic of Belarus, sales of industrial property objects through licensing agreements are being expanded both in external and domestic markets. To improve the national policy in this sphere, the Government approved the Concept of Developing the Intellectual Property Protection System in the Republic of Belarus for a period 2004–2005 which is being implemented.

The Highest Certifying Commission reporting to the President of the Republic of Belarus that began its activity in 1992 and is in charge for the state regulation in the sphere of certification of the scientific and scientific/pedagogical personnel of the higher qualification, awards academic degrees of the Candidate and Doctor of Sciences and titles of an assistant professor and a professor. Over the period from 1992 to 2005, the academic degree of the Doctor of Sciences was awarded to 1,540 and that of Candidate of Sciences to 7,560 candidates for academic degree, the title of the professor and assistant professor was awarded to nearly 1,200 and over 4,700 scientists and specialists, respectively.

The republican authorities take the necessary actions to build up the scientific potential of the state and socially protect scientific workers. The Belarusian Government approved the National Program Scientific Personnel for 2002–2006 providing for target training of specialists based on the state order, better training of specialists in the innovation management sphere, development of effective mechanisms of stimulating scientific and innovation activities, more extensive involvement of the Belarusian specialists in international research and educational programs.

The National Academy of Sciences of Belarus (NASB) is the highest national scientific organization of the Republic of Belarus reporting to the President of the Republic of Belarus and accountable to the Council of Ministers of the Republic of Belarus. The Academy of Sciences founded in 1929 and awarded the status “National” in 1997 comprises 88 full members (academicians), 126 corresponding members, 3 honorary and 15 foreign members of the NASB, scientific organizations and other legal entities reporting to it. The NASB comprises about 140 organizations, including 60 research institutes, divisions and centers, about 50 scientific and production, designing and implementing enterprises, experimental stations and pilot facilities. It employs 15.3 thousand people including nearly 2.0 thousand Candidates of Sciences and about 560 Doctors of Sciences.

In accordance with the Law of the Republic of Belarus On the National Academy of Sciences of Belarus and the NASB Statute approved by the President of the Republic of Belarus, the Academy of Sciences functions by combining principles of the state administration of the scientific, scientific and technical and innovation activity with the creative initiative of research teams and freedom of scientific search. The main scientific and organizational NASB subdivision, incorporating academicians and corresponding members of one or several science spheres, is a science division which is in charge of scientific and other organizations. The Academy of Sciences comprises as follows: Departments of Physics, Mathematics and Informatics; Department of Physical and Engineering Sciences; Department of Chemical Sciences and Earth Sciences; Department of Biological Sciences; Department of Medical Sciences; Department of Agrarian Sciences; Department of Humanitarian Sciences and Arts.

The Academy of Sciences is headed by the NASB Presidium Chairman who is the member of the Council of Ministers of the Republic of Belarus and is appointed to the office by the President of the Republic of Belarus. The activity of the Academy of Sciences is administered by collective bodies, namely, the General Meeting and NASB Presidium. The General Meeting is the highest NASB administrative body comprising NASB Chairman and Presidium members, NASB academicians and corresponding members, Heads and representatives of the NASB scientific organizations, as well as representatives of scientific organizations of ministries, other republican state administrative bodies and institutions of higher education. The General Meeting is a representative body of the entire Belarusian scientific community and its decisions relating to organization and coordination of research and development are binding for all research entities. The NASB Presidium, accountable to the General Meeting, is formed from among scientific workers of the Academy of Sciences, institutions of higher education and Belarusian research organizations, Heads of the state administrative bodies and main specialists of the economy sectors. The numerical composition and personnel membership of the Presidium of the Academy of Sciences are approved by the President of the Republic of Belarus.

The NASB is in charge of administering, conducting and coordinating research and development in most critical spheres of natural, engineering, the humanities and social sciences and arts. The major objectives of the Academy of Sciences are also to provide a scientific support of the economic, social and state-legal development of Belarus, its culture, natural resources management and environmental protection; to identify principally new ways of scientific and technical progress, participate in preparing recommendations for practical use of achievements of the national and world science; to create environment for development of scientific schools, train high-skilled personnel, and upgrade qualification of scientists and specialists, etc. Functions of the national state administrative body were imposed on the NASB to address specific issues of funding scientific and innovation activities, supervising efficient spending of the governmental resources appropriated to finance research and developments, conducting scientific and engineering examinations and also functions of the leading agency responsible for providing the scientific and methodical support to promoting informatization.

The research and development activities in the Republic of Belarus are administered in accordance with the priority directions approved by the President of the Republic of Belarus and the Government and this administration is traditionally based on program and target methods, thereby guaranteeing a target spending of resources and orienting them to the priority spheres. The program and target methods of managing the research have been in use in Belarus for over 25 years. They have been mainly implemented through the state programs of research, the procedure of designing, funding and executing of which was approved by the Council of Ministers of the Republic of Belarus. In 2005, more than 230 Belarusian organizations implemented 50 state programs of fundamental, oriented fundamental and applied research, which yielded a number of important theoretical and practical scientific results.

The Belarusian scientists reached a significant progress in the different spheres of research. Achievements of scientific schools in the sphere of mathematics, theoretical physics,

spectroscopy and luminescence, laser physics, electronics, automation, thermophysics, material science, machine building, geology, bioorganic chemistry, physiology, genetics, selection, soil science, cardiology, surgery, linguistics, etc. are known world-wide and have been highly appraised in Belarus and enjoyed an inter-national recognition. Findings of some researches have the highest rank of significance and are registered as scientific discoveries. This includes ultrasonic capillary effect, phenomenon of mobility of double bonds in cyclic diene compounds, phenomenon of stabilization-labilization of electron-excited polyatomic molecules, phenomenon of nuclear pre-cission of neutrons, phenomenon of lateral displacement of a light beam upon reflection, phenomenon of plane-of-polarization rotation of hard gamma-quanta, phenomenon of regulation of hyperparasitism by immunity of vertebrates, phenomenon of formation of hydrogen-saturated zone in a metal subsurface layer during friction, protective property of shielding pigments of organs of vision of humans and animals, regularity of change in brain natural acoustic oscillations, and property of synovial medium contributing to high antifrictional characteristics of cartilage of joints of humans and animals.

In 1993, the Republic of Belarus was the first among the CIS countries to develop a legal framework and the framework-based system of program and target administering applied research and scientific and engineering developments through state scientific and technical programs which be-came the major tool for addressing priority targets of the scientific and engineering activity. Implementing these programs have contributed to the progress over the recent years in Belarus in the motor and tractor industries, in microelectronics, to development of the urban transport, equipment for liquidation emergencies, sophisticated TV sets, medical equipment, pharmaceuticals, artificial diamonds, sensory equipment, etc. In 2005, 10 sectoral and 6 regional scientific and engineering programs, 2 presidential and over 20 governmental national economy and social programs having sections of scientific support were under implementation in addition to 23 state scientific and technical programs aimed at addressing most critical national economy, environmental and social targets.

In 2004 alone, in the course of addressing targets set by the programs, 213 new types of machines, equipment and instrumentation, 167 types of tools, materials and substances, 190 processes, 50 automated systems and complexes and over 280 other units of innovative equipment were developed and found use in the practical application. These developments are aimed at increasing labor productivity and improving products quality, promoting resource saving and import substitution, building up the export potential by developing novel competitive products and addressing most critical social problems. The serial production of new microelectronic devices, machines and instruments, agricultural produces, pharmaceuticals and other products was launched based on the above developments.

The Republic of Belarus has embarked on the innovation way of its development which is based on extensive utilization of the research and development results by the industries. Intensification of the innovation activity is identified as one of the priorities of the state, and the Government approved and put into effect the Innovation Policy Concept in the Republic of Belarus for 2003–2007. As it was emphasized by the President of the Republic of Belarus A.G. Lukashenko in April 2004 in his annual address to the National Assembly of the Republic of Belarus and Belarusian nation, the strategic objective is to create a unique enabling environment in Belarus for developing high technologies — a sort of the Silicon Valley in which a combination of economic, social and legal conditions of activity will surpass the level that is currently achieved in the world. This ambitious goal was embodied in the National Park of High Technologies in 2005.

The goal-oriented national policy of supporting the innovation activity allowed high-tech and export-oriented production facilities to prevail in the economy structure of Belarus. Over 15.9 thousand advanced technologies are applied in different sectors of the Belarusian economy, of them, 29.6% were implemented in 2003–2005. Utilizing the results of research and developments allowed 112 organizations and enterprises to develop 370 advanced technologies in 2005, of which, 332 are novel in Belarus, 35 are novel abroad, and 3 are principally novel.

The Belarusian industry spent BYR 1.8 trillion for technological innovations in 2004, of this amount, 74.9% — out of own funds of organizations and enterprises. The cost of shipped innovation products reached BYR 4.35 trillion, or 11.9% of the total products shipped by industrial enterprises. It should be noted that newly implemented or substantially technologically modified products within the last three years made up 27.0%. The innovation products estimated at BYR 2.2 trillion were shipped to the non-CIS countries.

The information support of the scientific, scientific and engineering and innovation activity in Belarus is provided in accordance with the Law of the Republic of Belarus On Scientific and Engineering Information adopted 5 May 1999 defining the fundamentals of the national policy in the sphere of scientific and engineering information, the procedure of formulating and pursuing it in the interests of scientific and technical, economic and social progress of the country. The NASB Central Scientific Library, Republican Scientific and Technical Library of Belarus, Republican Scientific Medical, Pedagogical and Agricultural libraries, Universities' and other libraries provide researchers and specialists with the needed scientific literature. Scientific papers, periodicals, collections, popular-scientific and reference literature relating to an extensive range of science and engineering sectors are published by the specialized NASB Publishing House "Belaruskaya Navuka", publishing centers of scientific organizations and universities.

Over 170 competent scientific journals, including international ones, are published in Belarus. Among them, Belarusian Linguistics, Belarusian Medical Journal, Belarusian Economics Journal, Computational Methods in Applied Mathematics, Doklady of the National Academy of Sciences of Belarus, Proceedings of the National Academy of Sciences of Belarus (7 thematic series), Journal of Applied Spectroscopy, Engineering and Physics Journal, Informatics, Lithosphere, Materials-Technologies-Tools, Science and Innovations, Nonlinear Phenomena in Complex Systems, News in Biomedical Sciences, News of Beam Diagnostics, Socio-logy, Friction and Wear, etc. Part of them is published in English or either translated, reissued and distributed all over the world by foreign scientific publishers. Much attention is paid to the development of the scientific and engineering information system based on the state-of-the-art information technologies. To popularize achievements of the Belarusian scientists, research institutions, institutions of higher education and scientific societies efficiently use capacities of the global information computer network — the Internet.

An integral part of the national scientific and technical policy of the Republic of Belarus is the international scientific cooperation, the legal framework of which is formed by the international intergovernmental treaties and agreements. The Republic of Belarus concluded and executes over 40 bilateral agreements on cooperation in the science and technologies sphere within the framework of which Belarusian scientists and specialists conduct research and development jointly with foreign counterparts and establish strong relations with international academic organizations.

The collaboration is being intensified with the World Intellectual Property Organization, International Association for Promotion of Cooperation with Scientists from the New Independent States of the Former Soviet Union (INTAS), International Science and Technology Center, International Center for Scientific and Technical Information, Joint Institute of Nuclear Research, European Center for Nuclear Research, NATO Science Committee, etc. The NASB organizations alone implemented international projects and contracts jointly with foreign partners from 70 countries, including within the framework of 55 agreements on cooperation in the sphere of science and technologies concluded between the NASB and Academies of Sciences and similar scientific centers worldwide.

The scientific and engineering cooperation with CIS countries and Russian Federation within the framework of the Belarus-Russia Union State is prioritized by Belarus and is rather efficient. A SKIF K-1000 cluster-level supercomputer was produced within the framework of the Belarus-Russia Union State's program for developing and pioneering the serial production of a family of high-performance parallel-architecture computer systems ranking 98th among 500

most high-performance computer systems in the world and 1st among 50 most powerful computers in the CIS. Having developed it, Belarus proved that it has capacities to find its own way of developing competitive and high-performance equipment the level of which meets the requirements of a wide range of users worldwide.

Belarusian and Russian scientists plan to make a cardinal breakthrough in the sphere of gene engineering and develop highly efficient and biologically safe new-generation drugs and also special food products using human proteins produced from milk of transgenic animals for the first time in the CIS countries within the framework of the Union State's Program BelRosTransgen to be completed up to the end of 2006.

The first national Antarctic expedition was organized in close cooperation with Russian specialists in February–April 2006 to select a possible base area for a Belarusian Antarctic station which is to contribute greatly to the Belarusian science development after it has been established.

In the recent years, Belarus has been actively involved in space re-search to develop the Belarusian space-based system for the Earth remote probing. The Belarusian space vehicle BelKA designed to conduct geodesic, mapping and meteorological surveys is to become one of its components. The vehicle, the main science-intensive instrumentation of which is manufactured at the Belarusian enterprises, is being developed by the Russian Rocket and Space Corporation Energiya. The Republic of Belarus will acquire the status of a space power after the vehicle has been launched presumably in 2006, while satellite specifications will promote the country's competitiveness in the world space services market.

The Program of Social and Economic Development of the Republic of Belarus for 2001–2005 approved by the Second Belarusian People's Meeting and approved by the President of the Republic of Belarus spells out objectives, targets and priorities of the social and economic development of the country for the first 5-year period of the new century, substantiates the set of actions for improving mechanisms to implement them in which the science is to play a major role. The main goals of developing the scientific sphere are to increase the level of fundamental and applied research and development, improve the scientific and technological support of the accelerated social and economic development of the state, maintain and build up scientific and intellectual potential of the Belarusian society, improve the system of training of the scientific, scientific/engineering and scientific/pedagogical personnel and keep them committed to science. Attaining these goals would create the necessary conditions and prerequisites for forming a highly technological sector of the national economy and its transition to the innovation way of development, thereby allowing Belarus to adequately integrate into the world division of labor and domestic needs of the country and its citizens to be met.

N.N. Kostyukovich

Additional information:

- National Academy of Sciences of Belarus  
<http://www.nasb.gov.by>
- State Science and Technologies Committee of the Republic of Belarus  
<http://www.gknt.org.by>
- High Certification Commission of the Republic of Belarus  
<http://www.vak.org.by>