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**REPORT BY THE DIRECTOR-GENERAL ON
UNESCO'S MANDATE FOR THE BASIC SCIENCES:
CHALLENGES AND PROSPECTS FOR ACTION ON THE
THRESHOLD OF THE NEW MEDIUM-TERM STRATEGY**

SUMMARY

This report has been prepared as a follow-up to 181 EX/Decision 10, paragraph 12 (g). It presents the role of UNESCO in the basic sciences and the type of activities and services the Organization has been successfully carrying out for over sixty years in response to proposals and/or guidelines put forward by Member States. The Report summarizes the Organization's mandate in the basic sciences and suggests elements that could be included in the preparations of the next Medium-Term Strategy.

There are no financial or administrative implications.

Action expected of the Executive Board: proposed decision in paragraph 15.

I. Introduction

1. At its 181st session, the Executive Board examined the report by the Director-General on the development of the International Basic Sciences Programme (IBSP) during the first biennium of the current Medium-Term Strategy (34 C/4) and on measures to be taken to promote the services and efficiency of IBSP. By 181 EX/Decision 10, the Executive Board took note of the positive impact of IBSP in the 2008-2009 biennium, as well as of the opportunities the Programme offers and the budgetary constraints it is facing. After introducing some innovative modifications, the Board approved the measures the Director-General proposed to further develop IBSP and its services to Member States (para. 15 of 181 EX/10). In view of the forthcoming consultation on the Medium-Term Strategy of UNESCO for 2014-2019, and its preparation, the Executive Board invited the Director-General to submit to it at its 185th session, and subsequently to the General Conference at its 36th session, a report on UNESCO's mandate for the basic sciences: challenges and prospects of action on the threshold of the new Medium-Term Strategy (181 EX/Decision 10 paragraph 12 (g)). The present report is a follow-up to this decision of the Executive Board. It also takes account of the views expressed by Member States at the subsequent 182nd session of the Executive Board and 35th session of the General Conference, as well as the recommendations of the IBSP Scientific Board elaborated at its 6th meeting in March 2010.

II. The basic sciences: a science lever for development

2. Held in conjunction with the 33rd session of the General Conference, the Ministerial Round Table on The Basic Sciences: The Science Lever for Development called upon UNESCO to "*place greater emphasis on promoting the basic sciences and science education with a view to the attainment of a science culture as a precursor of a knowledge-based society worldwide, through various means available at UNESCO, and in particular the recently launched flagship International Basic Sciences Programme*" [Communiqué, paragraph 26 (a)]. At the 34th session of the General Conference, the Ministerial Round Table on Science and Technology for Sustainable Development and the Role of UNESCO reconfirmed this appeal to the Organization [Communiqué, paragraph 1(g)].

3. This call by high-level policy-makers of Member States stems from the fact that the basic sciences bring new scientific knowledge leading to the educational, cultural and intellectual enrichment of humanity, and providing the science basis for human activity. Advancement in the basic sciences underlies technological breakthroughs and innovation and offers unique opportunities to meet basic human needs, produce economic benefits, and promote a science-based economy and sustainable development. The basic sciences are not only a set of purely academic disciplines, but also disciplines that have a very substantial beneficial effect on the day-to-day life of humankind. Indeed, in many respects, modern society as we know it today is the direct result of the fruits of the basic sciences. The progress made in medicine, information and communication technologies, space technologies, bio- and nano-technologies, lasers, and materials science, as well as the increase in agricultural output and progress in industry are but a few of the many science areas of which society benefits. The basic sciences also form the cornerstone of modern science education that provides scientific and technological knowledge and the skills needed by every citizen in order to meaningfully participate in the emerging knowledge society.

4. Although the basic sciences have become an indispensable science lever for development, their benefits are unevenly distributed, and many countries find themselves excluded from both the creation and benefits of scientific knowledge. Any divide in the basic sciences between North and South will have a negative impact on science education, technology, agriculture, health care, information technologies, and prosperity. Given that adequate national capacity in the basic sciences is a prerequisite enabling science to render service for society, there is a need to overcome a lack of support for the basic sciences in many countries, including in developed ones. UNESCO can help respond to this challenge through the promotion of international and regional cooperation in science in response to the needs and expectations of its Member States. The first World Conference on Science (WCS) convened by UNESCO and ICSU (Budapest, 1999) called

for necessary actions. Ten years later, the World Science Forum (Budapest, 2009) reaffirmed the WCS recommendations and the need for UNESCO to promote international scientific cooperation in accordance with the WCS Science Agenda-Framework for Action (para. 92).

III. Fostering the basic sciences at national, regional and global levels

5. The activities successfully carried out by UNESCO over past decades in the basic sciences go beyond the scope of the present report.¹ However, it may be expedient to recall the essence of this important programme activity that receives support from Member States, as noted in 182 EX/Decision 14, paragraph 8.

6. UNESCO's activity in the basic sciences has remained steadfast in its goals and intrinsic scientific structure. It embraces those priority areas of the physical and biological sciences that play a key role for capacity-building in science; the transfer, advancement and use of scientific knowledge for development; and the promotion of higher science education and its link to preceding levels of education.

7. Throughout the entire duration of the programme, some 500,000 research workers and university teachers – the majority of them young scientists from developing countries – received training through *inter alia* long- and short-term training courses, workshops, and seminars organized in cooperation with non-governmental science organizations, centres of excellence, science networks and universities. This was accompanied by the transfer of scientific information and advanced research techniques in selected areas of mathematics, physics, chemistry and the biological sciences which not only underlie national capacity in science and science progress, but also offer novel responses to challenges faced by society. To cite but a few of these areas: molecular and cell biology, including their application to combat HIV/AIDS and emerging diseases; applied microbial and environmental biotechnologies; genomics and bioinformatics; chemistry of natural products and green chemistry; contemporary optics for communication technologies and the use of synchrotron radiation and plasma; as well as applied mathematics, including mathematical modelling. In science education, some 2,000 basic science-related activities were supported by UNESCO focused on the introduction of innovations in university science teaching through teacher training, curricula development, fostering the quality of university foundation courses and the use of new methods of science experiments, and the promotion of inquiry-based science education.

8. From the outset, UNESCO gave priority to institutional capacity-building and it has established, developed or supported many centres of excellence throughout the world. The list of these centres in physics and mathematics includes, for example, the world-renowned European Centre for Nuclear Research (CERN, Geneva, Switzerland), the Abdus Salam International Centre for Theoretical Physics (ICTP, Trieste, Italy), the Latin American Centre for Physics (CLAF, Rio de Janeiro, Brazil), and the recently created Centre for Synchrotron-light for Experimental Science and Applications in the Middle East (SESAME, Allan, Jordan), as well as the International Centre for Pure and Applied Mathematics (Nice, France). In the chemical and biological sciences, UNESCO promoted the establishment of the International Centre for Membrane Science and Technology (Kensington, Australia), the International Centre for Cell and Molecular Biology (ICCMB, Warsaw, Poland), and a number of the Biotechnology Education and Training Centres (BETCENs) such as those situated in China, Hungary, Mexico, the Palestinian Authority, and South Africa, as well as the recently established UNESCO category 2 Regional Centre for Biotechnology Training and Education in New Delhi, India, and the UNESCO category 2 International Bioinformatics, Genomics and Proteomics Training Centre in Rehovot, Israel (International BIOmics Centre).

9. UNESCO has also developed some 20 science networks to promote South-South and North-South cooperation for capacity-building in science and science education and for harnessing the basic sciences for development. Among them are the Arab Physics Education Network, the Latin-

¹ For more information see for example: *Sixty years of Science at UNESCO: 1945-2005*, Paris, UNESCO, 2006.

American Biology Network, the network of Microbial Resources Centres (MIRCENS), the Regional Network for Microbiology in South-East Asia and the Regional Network for Chemistry of Natural Products in South-East Asia. Moreover, it was on UNESCO's initiative or with its support that a number of science NGOs were created. Among them are IBRO and TWAS² which are longstanding partners of UNESCO in capacity-building in science in the developing countries, particularly in Africa.

10. Since 2005, UNESCO pursues its basic science activities within the framework of IBSP. The strategy of IBSP approved by the Executive Board and pursued by the programme highlights its concentration on five major priority actions and the further development of the cost-sharing partnerships with UNESCO's principal partners in science, including CERN, IBRO, ICGEB, ICTP, IUBMB, IUPAC³ and TWAS. The pooling of intellectual and budgetary resources of partners helps reinforce the outreach of the programme and further develop its efficient services in line with the ten measures the Executive Board endorsed in its 181 EX/Decision 10.

IV. Preparing for the new Medium-Term Strategy

11. At its 6th meeting in March 2010, the IBSP Scientific Board elaborated a set of recommendations relating to UNESCO's mandate for the basic sciences based on an analysis of the Organization's longstanding activity. It did so within the framework of the mandate given to IBSP by Member States and in view of 181 EX/Decision 10 (para. 4) according to which UNESCO should not limit its role to that of a forum for policy debates, but should also foster high-impact action for harnessing international and regional cooperation in capacity-building in science and technology, science education and the use of scientific knowledge for sustainable development.

12. Based on UNESCO's mandate in the basic sciences, the recommendations of the IBSP Scientific Board and the guidelines given by the Executive Board,⁴ UNESCO's future engagement with the basic sciences would fall into four areas:

- (a) building capacities in the basic sciences for research, training and the popularization of science in development-oriented areas;
- (b) sharing and transfer of scientific information and excellence in science, and the use and advancement of scientific knowledge for development;
- (c) the integration of basic sciences into science education through international and regional cooperation, as well as UNESCO's intersectoral action; and
- (d) the provision of scientific expertise for decision-makers and advocacy of science, and increasing public awareness of issues that progress in science entails.

13. The IBSP Scientific Board further recommended certain lines of action for UNESCO, which are contained in an order of priority in the annex to this document. This is not intended to suggest that UNESCO should carry out all these lines of action at once or at the same time. Rather, they offer options for the preparation of subsequent biennial programme and budget documents, including those under the Participation Programme. The lines of action may also be complemented or modified in the future.

14. It is understood that any future orientation for the basic sciences will have to be aligned with the overarching structure and content of the future Medium-Term Strategy and its strategic priorities. More specific action will then be determined in the context of subsequent biennial Programmes and Budgets. 182 EX/Decision 14, paragraph 11 invites the Director-General to consult Member States on the strategic direction of the International Basic Sciences Programme,

² IBRO: International Brain Research Organization; TWAS: Academy of Sciences for the Developing World.

³ ICGEB: International Centre for Genetic Engineering and Biotechnology; IUBMB: International Union of Biochemistry and Molecular Biology; IUPAC: International Union for Pure and Applied Chemistry.

⁴ 176 EX/Decision 11, 181 EX/Decision 10 and 182 EX/Decision 14.

and to report to it thereon at its 190th session in the autumn of 2012 in the context of the preparation of the Organization's next Medium-Term Strategy.

Action expected of the Executive Board

15. The Executive Board may wish to adopt a decision along the following lines:

The Executive Board,

1. Recalling 181 EX/Decision 10 and 182 EX/Decision 14,
2. Having examined document 185 EX/11,
3. Endorsing the Director-General's views expressed in the report,
4. Reiterating that institutional and human capacity-building remains a major challenge to be addressed by UNESCO in order to overcome present divides in science, science education and technology between the North and South,
5. Appreciating the contribution of the International Basic Sciences Programme thus far, and the opportunities it offers for action,
6. Reaffirming that UNESCO should not only serve as a forum for policy debates, but also foster high-impact action for harnessing international and regional cooperation in capacity-building in science and technology, science education and the use of scientific knowledge,
7. Calling for intensified international collaboration through cost-sharing partnerships in the basic sciences and their use in response to societal needs and environmental challenges,
8. Appreciating the Director-General's initial reflections for the role of the basic sciences in the context of preparing the next Medium-Term Strategy,
9. Invites the Director-General to:
 - (a) further develop the International Basic Sciences Programme in line with the recommendations of UNESCO's Ministerial Round Tables on "The Basic Sciences: The Science Lever for Development" (2005) and "Science and Technology for Sustainable Development and the Role of UNESCO" (2007), and in line with 181 EX/Decision 10, and 182 EX/Decision 14;
 - (b) ensure that the International Basic Sciences Programme and its specific mission are duly reflected in the next Medium-Term Strategy, based on the consultation she will carry out with Member States in line with 182 EX/Decision 14;
 - (c) take into consideration the four areas of engagement by the Organization in the basic sciences, as expressed in paragraph 12 of document 185 EX/11.

ANNEX
LINES AND MODALITIES OF ACTION

(a)	Building capacities in the basic sciences for research, training and the popularization of science in development-oriented areas
	Human capacity-building through advanced post-graduate training of young researchers from universities, research institutions and laboratories, particularly in developing countries, through international training courses, summer schools, workshops, etc.
	Institutional capacity-building and fostering of research infrastructures through the establishment and/or development of the activity of science networks and centres of excellence or benchmark centres for training and research in the physical and biological sciences in the regions and on the international stage
	Research and training fellowships granted within fixed-term goal-oriented projects of the science programme of UNESCO
	Development of North-South and South-South cooperation
	Sharing of research and training facilities within UNESCO science networks
	Stimulating and monitoring intergovernmental cooperation in capacity-building in science
	Promotion of gender equality in science
	Promotion of cost-sharing partnerships with scientific NGOs, including ICSU scientific unions, IGOs and international and regional science centres concerned with capacity-building in science
	Counteracting brain-drain and encouraging the mobility of scientists to assist scientifically less advanced countries
	UNESCO chairs and professorships
	<i>Ad-hoc</i> assistance for local universities in the Least Developed Countries
	Fostering help from, and cooperation with, the industrial sector
	Assistance to establish science literature and equipment donation programmes
(b)	Sharing and transfer of scientific information and excellence in science, and the use and advancement of scientific knowledge for development
	Fostering collaboration in the identification and execution of promising projects that could yield considerable returns through the pooling of international or regional intellectual and material resources
	Holding or supporting regional and international major scientific conferences that offer Member States unique opportunities for national or regional development
	Sharing of advanced scientific information within collaborative programmes of science networks, scientific unions, centres of excellence and UNESCO partners in science
	Development of electronic networks, repositories and libraries for sharing scientific information and publications
	Sharing of research facilities within the activity of UNESCO science networks and centres of excellence
	Promoting the use of satellites and space technologies for basic research and science education
	Holding of International Science Years such as the International Year of Astronomy, International Year of Chemistry, etc.
	Provision of international advisory services required for national research institutions
(c)	Integration of basic sciences into science education through international and regional cooperation, as well as UNESCO intersectoral action
	Fostering interest in science of young generations
	Fostering the use of information and communication technologies
	Development of South-South and North-South networks of universities and science teaching centres of excellence
	Provision of an intergovernmental forum to address the problems being faced by science education
	Training science teachers for pre-university educational institutions
	Innovation in methodology of science teaching and science experiment
	Promotion of low-cost and safe science teaching equipment
	Fostering partnerships between NGOs, InterAcademy bodies, science centres and IGOs
	Training university science teachers
	Provision of expertise and policy advice for the development of a national science education system
	Modernization of university foundation courses in the basic sciences
	Bridging higher, secondary, and primary science education
	Fostering infrastructures for life-long science education
	Curricula development
(d)	Provision of scientific expertise for decision-makers, advocacy of science, and increasing public awareness of issues that progress in science entails
	Promotion of public understanding of the cultural value of science, its role in the everyday life of a citizen in the knowledge-based society and its role in fostering a culture of peace and intercultural dialogue
	Holding regular Ministerial Round Tables on Science and the use of scientific knowledge for development
	Assisting in the assessment of national capacity in science and advising on policy decisions to be taken for its reinforcement and use to meet national needs
	Science prizes, including those for women scientists
	Provision of <i>ad-hoc</i> scientific expertise in various areas of the basic sciences
	Science museums and science parks
	Organization of events in the basic sciences associated with the World Science Day
	Travelling science exhibitions
	Public lectures on advances in science, opportunities they offer and precautions and ethical constraints they call for