United Nations
Educational, Scientific and
Cultural Organization

International Basic Sciences Programme: Harnessing cooperation for capacity building in science and the use of scientific knowledge

IBSP: what it is, what it does

IBSP
International Basic Sciences Programme

International Basic Sciences Programme:
Harnessing cooperation
for capacity building in science
and the use of scientific knowledge

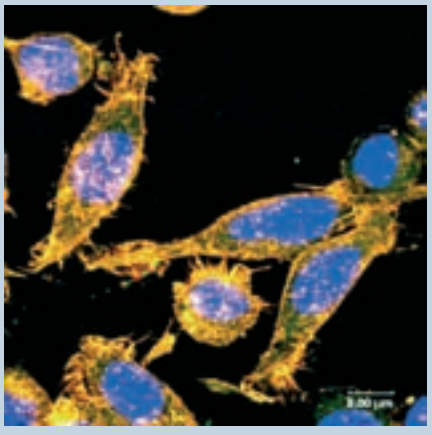
IBSP : What it is, what it does . Issue 1

Published by:
UNESCO
Natural Sciences Sector
Division of Basic and Engineering Sciences

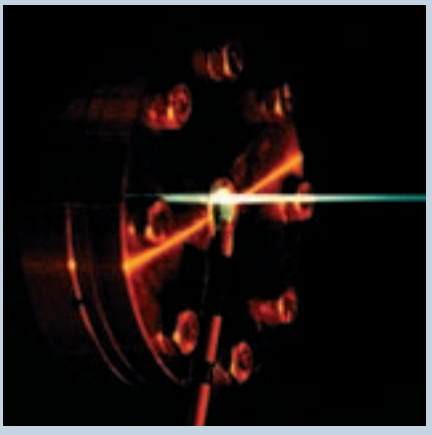
1 rue Miollis,
75732 Paris Cedex 15,
France

SC-2008/WS/1 CLD 3325.7

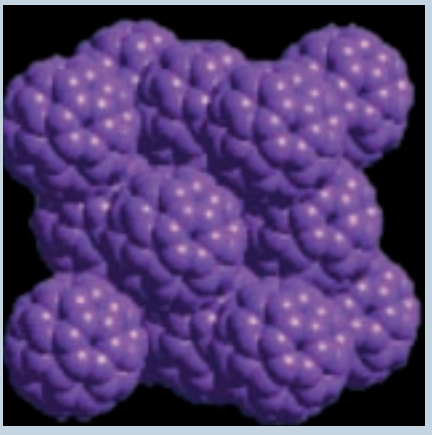
From the realm of the basic sciences



Cancer cells derived from a human brain tumour, as seen under a fluorescence microscope (*Photo by courtesy of Katarzyna Nalecz*)



Synchrotron light: X-rays causing a visible air fluorescence as an intense X-ray beam emerges from a beryllium window at the end of a beamline



A face-centred cubic crystal made up of C_{60} molecules, a more common name for which is "buckyballs". (*Photo by courtesy of Boris Pevzner*)

Table of Contents

United Nations
Educational, Scientific and
Cultural Organization

International Basic Sciences Programme: Harnessing cooperation for capacity building in science and the use of scientific knowledge

IBSP: what it is, what it does

Issue I

I. Motivation

ICTP: Lecture given by Noble Laureate Carlo Rubbia
(*Photo by courtesy of ICTP photo archives*)

By virtue of their inherent function, the basic sciences bring new knowledge of natural phenomena and deepen understanding of them. They also give rise to discoveries that offer novel opportunities and methods for the experimental study of nature and the practical use of scientific findings. All this in turn leads to the educational, cultural and intellectual enrichment of humanity, and provides the science basis for human activity. Advancement in the basic sciences underlies technological breakthroughs and offers unique opportunities to meet basic human needs, produce economic benefits, and promote science-based sustainable development. Nowadays, the basic sciences are at the root of the progress made in medicine, information and communication technologies, space technologies, bio- and nano-technologies, lasers, and material sciences, as well as in environmentally-sound industry and agriculture, to cite but a few of the many areas in which the fruits of science are enjoyed by society. The basic sciences also form the cornerstone of education that provides scientific and technological knowledge and the skills needed by every citizen in order to meaningfully participate in the emerging knowledge-based society.

Although the basic sciences have become an indispensable science lever for development, their benefits are still unevenly distributed, and many countries find themselves excluded from the endeavour to create, and consequently, profit from scientific knowledge. The divide in the basic sciences cannot but deepen the divide in science education, technology, agriculture, health care, information technologies and, ultimately, between the North and the South. Although adequate national capacity in the basic sciences constitutes a major prerequisite for harnessing science in the service to society, there is a lack of support for the basic sciences in many countries, including in developed ones. Yet, a strategy of investment exclusively in favour of applied research, which seeks immediate short-term returns, has an adverse long-term effect on national science and development, and requires determined remedial action.

Within the United Nations system, UNESCO has a unique mandate for the basic sciences and the promotion of cooperation in this field constitutes one of the principal elements of its action under its “S”. In a historical context, over the years the Organization has provided training within this action for roughly 500,000 researchers and university teachers - the majority of them young scientists from developing countries. It has also established and/or promoted many regional and international science centres of excellence and networks, and a number of non-governmental scientific organizations that cooperate with national institutions all over the world. Examples are the European Organization for Nuclear Research (CERN) in Geneva (Switzerland), the Abdus Salam International Centre for Theoretical Physics (ICTP) in Trieste (Italy), the International Centre for Pure and Applied Mathematics (CIMPA) in Nice (France), the International Centre for Membrane Science and Technology in Kensington (Australia), the International Institute for Molecular and Cell Biology in Warsaw (Poland), the Synchrotron-light for Experimental Science and Applications in the Middle East (SESAME) Centre in Allan (Jordan), the International Biosciences Networks (IBNs), the Microbial Resources Centres Network (MIRCENs), the International Brain Research Organization (IBRO),

and other bodies promoting North-South, South-South and West-East cooperation in the physical and biological sciences.

Based on the experiences gained within UNESCO's science programme and prompted by the needs of national science and technology, UNESCO's Member States decided to further develop intergovernmental cooperation for the strengthening of national capacities in science and science education. They did so through the launching of the International Basic Sciences Programme (IBSP), which has become a new operational platform to fulfil UNESCO's mandate in the basic sciences and science education.

This brochure seeks to provide basic information that may be useful for all stakeholders in science who are interested in cooperation for scientific capacity-building, and may wish to take part in the IBSP activities at the national, regional or international level.

2. Objectives

Continued cooperation and dialogue within UNESCO's programme led Member States and partner organizations to reach consensus on the principal objectives to be embraced by the IBSP, namely:

- building national capacities for basic research, training, science education and popularisation of science through international and regional cooperation in development-oriented areas of national priority;
- transfer and sharing of scientific information and excellence in science through North-South and South-South cooperation; and
- provision of scientific expertise for, and advice to, policy- and decision-makers, and increasing public awareness of ethical issues that progress in science entails.

To attain these objectives, the IBSP seeks to build major region-specific actions in cooperation with partner organizations and networks of national, regional and international centres of excellence or benchmark centres already in existence or to be created in the basic sciences. Such a strategy of action strives to foster wide participation in the programme of national and regional institutions, ensure a high scientific standard of activities, and make efficient use of UNESCO's experience in harnessing partnerships for responding to the needs and expectations of Member States.

International Institute for Molecular and Cell Biology (IIMCB) (Warsaw, Poland) set up under the auspices of UNESCO

3. Monitoring of the Programme

The International Scientific Board of IBSP set up within UNESCO, advises on, and monitors the programme activities. Members of the Board, who hail from all regions and major partner organizations, are scientists actively engaged, in their countries, regions or organizations, in activities that relate to the objectives of the IBSP in the basic sciences, science education, science management and the promotion of international cooperation. Professor Herwig Schopper, former Director-General of CERN, is the elected Chairperson of the Scientific Board. He is a world-renowned German physicist specialized in nuclear physics, elementary particle physics, accelerator engineering and optics.

Discussion on IBSP strategy of action at 3rd meeting of the IBSP Scientific Board, March 2007 (left to right: Shinichi Yamamoto (Japan), Mariana Weissmann (Argentina), Shem Wandiga (Kenya) and Harold Ramkissoon (Trinidad & Tobago))

4. IBSP in its Early Days

Compared with other intergovernmental/international science programmes of UNESCO, such as the International Hydrological Programme (IHP), the International Geosciences Programme, or the Man and Biosphere Programme (MAB), the IBSP is but a young programme. It became operational in 2005, and has only just completed its initial phase. Nonetheless, early IBSP activity provides useful examples of projects that could be undertaken within the IBSP, and serves to illustrate the orientation of the programme.

Three projects, as in the case of many others which have been launched and are being carried out, can serve as useful examples. They are the:

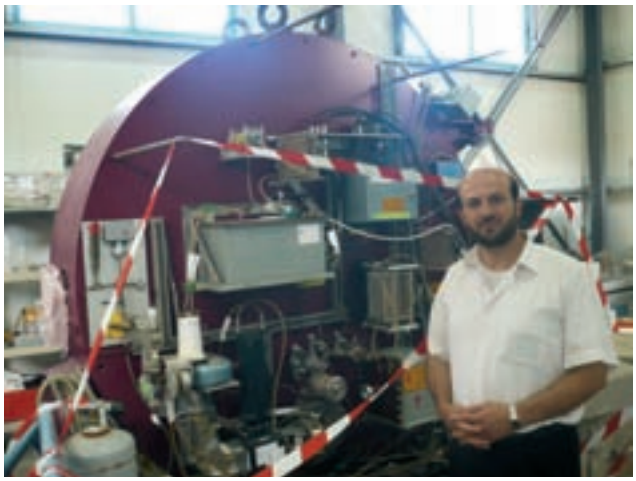
- *Project on Development of mathematical physics in Africa: International workshops and schools on contemporary problems in mathematical physics* (initiated by institutions from Benin, Belgium and the USA);
- *Project on Establishment of the East African Biological Resource Centre for the Conservation and Sustainable Utilization of Microbial Diversity* (initiated by institutions from Kenya and the UK); and
- *Project on Educational and fundamental study of plasma in nature, laboratory and applications* (initiated by institutions from India, Kazakhstan, the Russian Federation, and Viet Nam).

Evaluation of proposals for IBSP projects at 3rd meeting of the IBSP Scientific Board, March 2007 (left to right 1st row: József Hámori (Hungary), Jens Jorgen Gaardhøje (partially visible, Denmark), Galal Hamza Elgemeie (Egypt), Saïd Belcadi (Morocco), Dorairajan Balasubramanian (India), Jorge Allende (Chile); 2nd row: Vasily Popov (Russian Permanent Delegation to UNESCO), Vladimir Fortov (Russia), Joseph Niemela (ICTP), Hans Hoffmann (CERN), Manjit Dosanjh (CERN))

As a follow up to proposals received from Member States, some 40 IBSP projects were carried out in the period 2005-2007. These projects received support from UNESCO and focused on capacity-building through regional or international cooperation and the pooling of intellectual, material, and financial resources of participating institutions in two or more countries. During this period, a number of noteworthy projects have also been identified as priority projects to be supported by the IBSP within its forthcoming activity.

Students at work at 2nd COPROMAPH International School *Quantization Techniques: Mathematical and Physical Aspects* (Cotonou, Benin, 11-16 December 2006) (IBSP Project 5-BJ-01)

One of these projects is the intergovernmental SESAME Centre that was established under the auspices of UNESCO in Allan (Jordan) and provides a new synchrotron radiation facility in the Middle East. The project seeks to foster scientific cooperation and solidarity in the Middle East, and to use the promising opportunities that synchrotron light offers for research in the physical, biological and chemical sciences, as well as in health care, high technology, the environment and the cultural heritage.



Maher Attal, SESAME Microtron Coordinator, at the SESAME Centre in Allan, Jordan, starting work on the installation of the microtron and testing of its subsystems

Another project is that aimed at the establishment and networking of electronic libraries and repositories for African universities and scientific institutes. This project, which opens a new vista for cooperation between CERN and UNESCO, is designed to create a substantial prerequisite for training students in the physical sciences and includes activities in information and communication technology (ICT), such as Grid computing, accelerator and detector technologies, in particular with applications to medicine, and other important fields of societal concern.

SLAC equipment being sent to SESAME. In the rear is the PEP 2 m long permanent magnet undulator. In front is the water-cooled double-crystal Brown-Hower X-ray monochromator (left to right are Richard Boyce, Charles Troxel Jr, and Herman Winick from SLAC) (*Photo by courtesy of Stanford Linear Accelerator Center (SLAC) in the USA*)

5. Scientific fields

Routed in UNESCO's longstanding activity in the basic sciences, the IBSP has a multidisciplinary profile that principally encompasses the mathematical, physical, chemical and biological sciences, while also focussing on science education and cross-disciplinary areas. However the programme is not designed to necessarily cover all the numerous areas of the basic sciences. Instead, the IBSP seeks to identify and address those selected areas of the basic sciences that play a key role for capacity-building in science, science education, the advancement of scientific knowledge, and the use of this knowledge to meet societal needs.

Secondary school teachers discovering the Microscience Experiments methodology in chemistry using microscience kits in Lebanon during a workshop organized together with ISESCO, the UNESCO Field Office and local authorities

For this reason, UNESCO is, for example, fostering partnerships in cell and molecular biology, biotechnology, genetics, microbiology, neurobiology, biomedical sciences, bioinformatics, biochemistry and biophysics. It is doing this in view of the profound impact that contemporary biological sciences and their alliance with physics and chemistry have on the quality of life and sustainable development. Similarly, special priority is given to projects in chemistry of natural products, green chemistry, nanotechnology and solid state physics, as well as to some areas of theoretical physics and pure and applied mathematics. In science education, the IBSP aims to promote education at university and post-university levels, as well as the linkage between university education and other levels of education.

These areas of IBSP's realm do not, of course, exclude emerging areas of the basic sciences to be addressed in response to national needs, Moreover, the IBSP is developing cross-disciplinary actions relating to the advocacy for science and the provision of science expertise to policy- and decision-makers. On the other hand, activities related to the earth sciences, oceanography and the environmental sciences are not covered by the terms of reference of the IBSP. Instead, they are being dealt with within other international/intergovernmental programmes of UNESCO's Natural Sciences Sector.

Collecting samples of *Arthrospira* from Anasagarh Lake (India): Demonstration to students and staff members of Rajastan Universities and Colleges (*IBSP Project I-DE-09*) (*Photo by courtesy of Lothar Krienitz*)

6. Centres of excellence and benchmark centres

The cooperation that IBSP is developing with centres of excellence is motivated by the fact that in UNESCO's experience national, regional and international centres of excellence or benchmark centres and their networks have proved to be among the major actors in promoting national research capacities and the use of scientific knowledge for societal needs. By relying on the services of many existing centres, as well as those to be established, the IBSP will foster excellence in national, regional and international institutions, and involve them in international cooperation for strengthening national capacities in science.

Interpretation of the definition of centres of excellence or benchmark centres may be sufficiently broad to embrace the specific criteria of excellence in the regions. Hence, in general, reference to a centre of excellence or benchmark centre could embrace a variety of national, regional or international institutions able to provide services at a standard sought by Member States of UNESCO or regions, and to offer satisfactory incentives for investment in their activity by interested customers. More explicitly, the role of such a centre could be played by a research or training institution, a university or one of its departments, a laboratory, science museum, library, etc.

A student working on molecular aspects of signal transduction at the molecular biology laboratory of the International Institute for Molecular and Cell Biology (IIMCB) (Warsaw, Poland) set up under the auspices of UNESCO

A centre that has successfully participated in the implementation of an IBSP project may eventually be granted the status of IBSP centre of excellence or affiliated UNESCO centre in the basic sciences, a status that UNESCO grants in order to stimulate further support to the centre from UNESCO's partners and other stakeholders in science, and to incorporate the centre into a network that provides viable scientific services to the Organization's Member States through international cooperation.

7. Major priority actions

In the framework of UNESCO's Medium-Term Strategy for 2008-2013, the IBSP seeks to consolidate and streamline its activities, and focus them on five Major Priority Actions (MPAs) in the basic sciences, namely:

(I) Institutional capacity-building;

(II) Human resources development in research and advanced training;

(III) Promotion of science education;

(IV) Leverage and transfer of scientific knowledge; and

(V) International science expertise and advocacy for science.

This strategy implies that each of these MPAs brings together, within tangible, goal-oriented IBSP projects, activities that strive to meet common objectives. In other words, each MPA provides a strategic

Newly appointed inspectors of science technology education being trained in the use of Microscience Experiments in Biology using microscience kits during a national workshop in Mbou'o-Bandjoun organized together with the Centre of Excellence in Microscience in Cameroon

guideline for shaping IBSP projects, and fostering the concentration of the programme. In this framework, an IBSP project is a set of concerted activities designed to make a tangible contribution to one (or more) MPAs through international or regional cooperation based on the pooling of intellectual resources, research facilities and funds available at national, regional and international levels.

8. Profile of Projects

Member States of UNESCO and the IBSP Scientific Board have identified a number of optimum criteria to be applied for the design, evaluation and selection of priority projects. These criteria suggest that a project:

- demonstrates scientific excellence;
- may have a real impact on national capacity-building, brings added value and results in lasting benefits;
- is endorsed by the National Commission for UNESCO of the countries involved and/or by pertinent authorities of the partner organizations;
- is relevant to regional development goals and/or Millennium Development Goals (MDGs);
- involves national institutions, science networks, centres of excellence or benchmark centres and partner organizations;
- entails and encourages the participation of at least two countries, one of which must necessarily be a developing one (the greater the number of countries involved in a project the higher is the priority it is likely to be given);
- encourages more particularly the participation of least developed countries;
- effectively uses the IBSP umbrella for catalyzing partnerships and extra-budgetary support from national, regional or international institutions or sponsors; and
- has potential for growth and for raising funds for further self-sustained action.

A proposal for a long-term project embracing more than one of UNESCO's biennial planning and budgeting exercises is to be divided into biennial phases. (A UNESCO biennium starts in an even year)

An IBSP project may, of course, use various modalities of action necessary to attain its objectives. Examples are:

- setting-up centres of excellence or networks and development of their activity;
- regional or international research collaboration within a network of national research institutions/ universities;
- research training at centres of excellence or benchmark centres;
- advanced training courses, workshops, and seminars organized in cooperation with regional/ international non-governmental scientific organizations;
- activities of regional or international teams promoting science education and public awareness of science;
- visiting professorships;
- fellowships for young scientists;
- activities against brain drain and the isolation of researchers in southern countries, in particular through support for research at home institutions, and South-South and North-South cooperative initiatives;
- provision of scientific expertise for decision- and policy-makers; and
- promotion of internet access to electronic scientific journals, and databases.

Since these modalities of action are not exhaustive, when selecting those best suited to attain the objectives of a project, other modalities for regional or international cooperation may also be proposed if more effective.

9. How to Participate?

Since 2008, the programme maintains a continuous dialogue with National Commissions for UNESCO, partner organizations, national institutions, science networks and research and training centres interested in the programme. In this framework, there will be no set deadline for the submission to UNESCO of proposals for the initiation of new IBSP projects or activities, or for the participation in, or development of, existing projects. When national institutions wish to propose a new initiative, they should first consult the relevant National Commission for UNESCO to identify the priority given to it by the governmental authorities, and their commitment to providing national support for it.

Initially, it is the outline of a proposal that is to be submitted. This outline should be drafted on the form specially prepared for this entitled *Outline for an IBSP project proposal* that may be downloaded from the IBSP website (http://portal.unesco.org/science/en/ev.php-URL_ID=3208&URL_DO=DO_TOPIC&URL_SECTION=201.html), or obtained from the Executive Secretary of IBSP whose address is given at the end of this brochure. The outline of proposals will be examined by the IBSP Scientific Board and those for which it gives priority will then be subject of consultation between the proposing bodies and the IBSP Secretariat so that an optimum, elaborate project proposal may be prepared and, if appropriate, the proposal may be joined to other proposals received so that together they may be consolidated within a reinforced cooperative project and

Herwig Schopper, Chair, and Maciej Nalecz, Executive Secretary, of IBSP Scientific Board at 4th meeting of the Board (March 2008)

integrated, in a concerted way, into the framework of IBSP's Major Priority Actions. The content and format for an elaborate project proposal that sets up a practical framework for action will be identified in pursuance of *ad hoc* consultation between project leaders and the IBSP Secretariat.

The Scientific Board will examine the elaborate proposals and will recommend to the Director-General of UNESCO the priority they should be given, and advise him on their optimum role within the IBSP Major Priority Actions. Once the Director-General takes a decision on a project, the project will be launched and carried out within the biennial programme of the Organization.

10. Support for Projects within the IBSP

A network of institutions participating in an IBSP project constitutes a considerable pool of institutional, intellectual and material resources, which is to be fostered by the IBSP. This will be done through a number of supportive actions.

As a rule, the budget of an IBSP project is to consist of funds from UNESCO's budget and extra-budgetary resources from the participating institutions, governmental establishments and sponsoring bodies. As Member States of UNESCO are well aware, the Organization is not a funding agency and its budgetary resources are limited. By virtue of its mandate, it therefore acts principally as a promoter of intellectual cooperation and as a purveyor of seed resources that help catalyse collaborative action and funds from national and other sources. This is why in any IBSP project proposal there is a need for evidence of the participation of Member States and/or international partners on a cost-sharing basis. This evidence is essential for assessing the feasibility of a project and identifying the contribution that may be made from UNESCO's budget. Moreover, this evidence serves as an important indicator of Member States' real commitment to the project and the practical use of its outcome.

The IBSP strategy to develop regional and international cooperation as an instrument for capacity-building in science implies *inter alia* that UNESCO's contribution to an IBSP project should preferably be used to promote collaboration between scientists in research, training, scientific expertise and science education, while the acquisition of equipment, chemicals, and scientific literature could be obtained from the extra-budgetary resources allocated to the project, and possibly the Participation Programme of UNESCO, which is designed to respond to specific needs of national and regional institutions, particularly those of the least developed and developing countries, post-conflict and post-disaster countries, small island developing states and countries in transition. All requests for support from the Participation Programme are to be submitted to UNESCO by National Commissions for UNESCO.

Other forms of support that IBSP may provide for projects embrace:

- assistance for widening participation in the project of Member States, non-governmental scientific organizations and networks involved in the IBSP;
- help, in cooperation with the IBSP Scientific Board, in obtaining external scientific expertise that may be required in the project from world-leading scientists or institutions;
- provision of information concerning UNESCO's programme activities and other IBSP projects that can be used for project implementation;
- granting, to a research centre or science education centre participating in the IBSP, the status of an IBSP centre of excellence recognized by UNESCO, or an affiliated UNESCO centre in the basic sciences;
- assistance to integrate institutions participating in the project into regional or international networks cooperating with UNESCO;

- support for fund-raising efforts to obtain funds for the project from governmental authorities, donor agencies or individual benefactors, non-governmental scientific organizations, research and educational institutions, fellowships committees, and world-renowned science leaders;

- increasing awareness of the returns of the project, its findings and recommendations, in particular as regards bringing this information to the attention of governmental authorities and international organizations; and

- assistance to promote follow-up to the project and the use of its results in developing countries.

Accomplishments resulting from IBSP projects are to be regularly reported to governments at the General Conference of UNESCO. Institutions having successfully participated in the IBSP and having been granted the status of UNESCO associated centre of excellence in the basic sciences will be able to develop their activity within an IBSP network of centres of excellence whose services to Member States will be promoted through intergovernmental cooperation in the framework of UNESCO.

II. Seeking for information

Requests for further information, and inquiries and proposals concerning the IBSP should be addressed to Mr Nalecz, Executive Secretary of the IBSP, Director, Division of Basic and Engineering Sciences at UNESCO.

Address:
1 rue Miollis, 75732 Paris Cedex 15, France
Fax: (+33-1) 45.68.58.21
E-mail: m.nalecz@unesco.org

Collaborating partners

The Academy of Sciences for the Developing World (TWAS), Trieste (Italy)

European Organization for Nuclear Research (CERN), Geneva (Switzerland)

International Centre for Genetic Engineering and Biotechnology (ICGEB), Trieste (Italy), New Delhi (India), Cape Town (South Africa)

Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste (Italy)

International Centre for Pure and Applied Mathematics (CIMPA), Nice (France)

International Centre for Synchrotron-light for Experimental Science and Applications in the Middle East (SESAME), Allan (Jordan)

International Brain Research Organization (IBRO), Paris (France)

International Union of Biochemistry and Molecular Biology (IUBMB)

International Union of Pure and Applied Chemistry (IUPAC), Research Triangle Park (USA)

International Union of Pure and Applied Physics (IUPAP), College Park, MD (USA)

Federation of African Societies of Chemistry (FASC), Addis Ababa (Ethiopia)

Network of R&D and Science Programmes in the Caribbean (CARISCIENCE), St. Augustine (Trinidad and Tobago)

International Commission on Mathematical Instruction (ICMI), Québec (Canada)

Microbial Resource Centres' Network (MIRCEN)

American Society for Microbiology, Washington (USA), and

Other specialized scientific organizations and networks

SCIENTIFIC BOARD OF IBSP

(First term)

Professor Herwig Schopper, Chair of IBSP, European Organization for Nuclear Research (CERN) (*former Director-General*), Germany

Professor Maciej Nalecz, *Executive Secretary of IBSP*, Director, Division of Basic and Engineering Sciences, UNESCO

Professor Fayzah M. Al-Kharafi, *Co-Vice-Chair of IBSP*, Kuwait University, Kuwait

Professor Vladimir E. Fortov, *Co-Vice-Chair of IBSP*, Academician-Secretary, Russian Academy of Sciences, Russian Federation

Professor Jorge E. Allende, President, Corporation RELAB, Chile

Professor Dorairajan Balasubramanian, Director of Research, L.V. Prasad Eye Institute (LVPEI), India

Dr Saïd Belcadi, Director, Centre National pour la Recherche Scientifique et Technique, Morocco

Professor Galal Hamza Elgemeie, Cultural Bureau and Educational Mission, Embassy of the Arab Republic of Egypt, Germany

Professor Jens Jorgen Gaardhøje, Niels Bohr Institute, Denmark

Professor József Hámori, Chairman, Hungarian National Commission for UNESCO, Hungary

Professor Mohamed H.A. Hassan, Executive Director, Academy of Sciences for the Developing World (TWAS)

Professor Norbert Hounkonnou, President, International Chair in Mathematical Physics and Applications (ICMPA), Benin

Professor Andrzej B. Legocki, Chairman, Department of Life Sciences, Polish Academy of Sciences, Poland

Professor Lydia Makhubu, Third World Organization for Women in Science (TWOWS) (*former President*), Swaziland

Dr John H. Moore, President Emeritus, Grove City College, United States of America

Professor Harold Ramkissoon, Executive Secretary, CARISCIENCE, Trinidad and Tobago

Professor Annick Suzor-Weiner, Vice-President, Université Paris-Sud I I, France

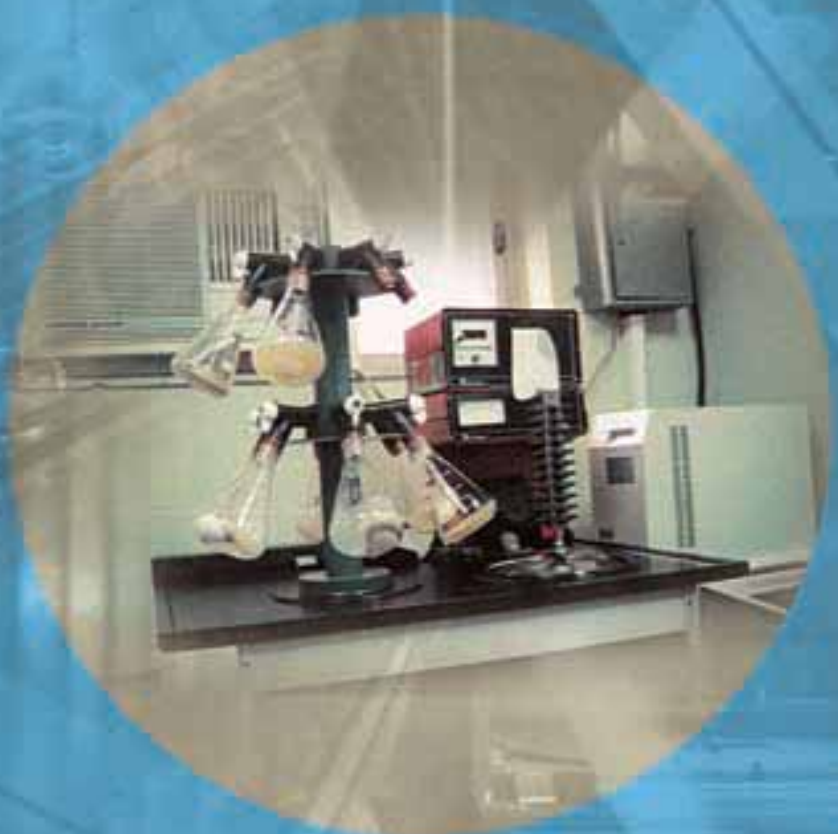
Professor Shem O. Wandiga, Director, Centre for Science and Technology Innovation, Kenya

Professor John Webb, Emeritus Professor of Chemistry, Murdoch University, Australia

Professor Mariana Weissmann, National Atomic Energy Center (CNEA), Argentina

Professor Shinichi Yamamoto, Hiroshima University, Japan

Professor Zhang Jie, President, Shanghai Jiaotong University, Peoples' Republic of China



United Nations
Educational, Scientific and
Cultural Organization

Natural Sciences Sector
Division of Basic and Engineering Sciences