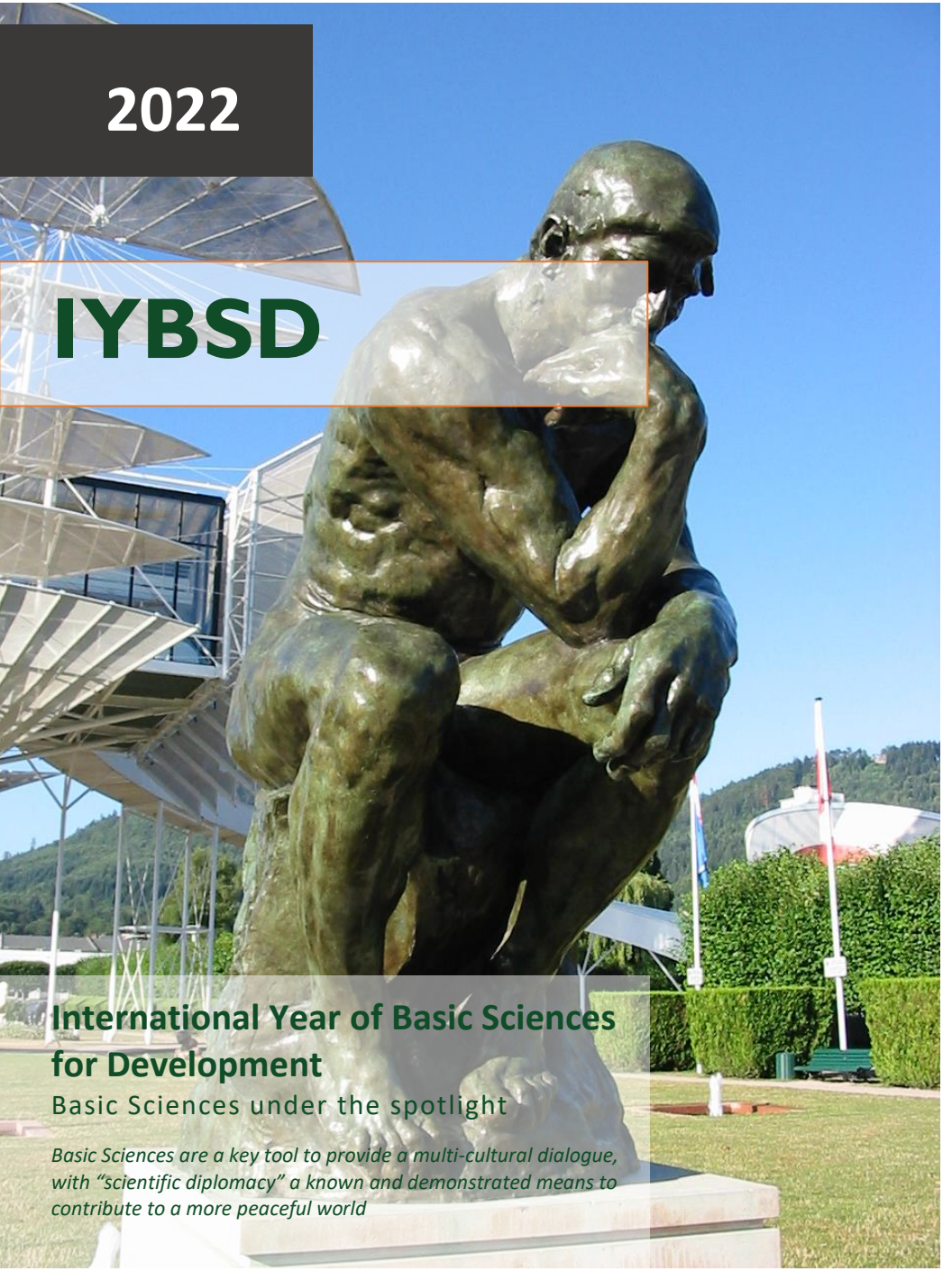
2022

# IYBSD



## International Year of Basic Sciences for Development

Basic Sciences under the spotlight

*Basic Sciences are a key tool to provide a multi-cultural dialogue, with "scientific diplomacy" a known and demonstrated means to contribute to a more peaceful world*

# Our partners

IUPAP’s centenary and the centenary of the Nobel Prize award to Niels Bohr

# Why do we bother?

Science and technology are key elements of modern society. They provide the means necessary to address critical challenges such as energy, health, communications, and climate change. While applications of technology are relatively easy to recognize, the crucial role that fundamental or basic sciences play in the process is often only poorly appreciated, if at all. To address this shortcoming, bridges need to be established between politicians, scientists, diplomats, international organizations, entrepreneurs and policy makers and with society at large in order to provide an accurate understanding of the ways in which science, technology, and society are connected within a healthy, innovative eco-system. It is especially important to emphasize the role that curiosity driven basic sciences play for this eco-system. Not only do they underlie major advances in technology driving innovation, but they are also key to the education and training of future professionals as well as the nurturing of an informed citizenry capable of participating in decisions affecting its future.

# Basic Sciences and United Nations

At the end of 2015 the United Nations adopted the 2030 Agenda for Sustainable Development, an ambitious program for the next 15 years aimed at ensuring a balanced, sustainable and generalized development of the planet. From our perspective, the basic sciences have a central role to play in the implementation of the agenda in many different ways. Basic Sciences are a key tool to provide a multi-cultural dialogue; indeed, "scientific diplomacy" is a known and recognised way to contribute to a more peaceful world. Basic sciences can provide the training capabilities and know-how required to enable the application of critical innovations that countries need to move from the definition of general objectives to the concrete implementation of effective actions. Basic sciences can help identifying mechanisms to correctly use knowledge and carry out technology transfer. Operational networking models developed by the world of basic sciences, will help ensuring the effective implementation of the objectives and targets defined at the global level by Agenda 2030 at the national level, especially in developing countries.

# Advancement of the project and why the 2022 target

The IUPAP (International Union for Pure and Applied Physics) at the 10th Scientific Board of the International Basic Sciences Programme (IBSP) of UNESCO on 24 January 2017, proposed that the year 2022 be designated as the International Year of Basic Sciences for Development. The proposal was very well received by the Board and received the formal support of ICSU (International Council for Science), ISSC (International Council of Social Sciences), IUPAC (International Union for Pure and Applied Chemistry), IMU (International Mathematical Union), IUBS (International Union of Biological Sciences), IAU (International Astronomical Union), ICTP (Abdus Salam International Center for Theoretical Physics), EPS (European Physical Society) and CERN (the well-known European Organization for Nuclear Research). Soon after, the proposal was presented to the French and Swiss Ambassadors to UNESCO and also received firm support. It was also discussed with UNESCO's director of Science Policy and Capacity Building, Executive Secretary of IBSP, who was very supportive of the initiative.

The choice of the year 2022 to celebrate the International Year for Basic Sciences for Development is motivated by IUPAP's centenary and the centenary of the Nobel Prize award to Niels Bohr. Hence a celebration, planned to be held in Geneva, will provide an excellent opportunity to showcase the International Year themes and events to a UN audience.

# Content

The International Year for Basic Sciences for Development would consist of a large number of initiatives and events worldwide covering many aspects and engaging with the public:

- Basic Sciences and Multicultural Dialogue
- Basic Sciences, Education and Human Development
- Basic Sciences and Women (figures, empowering women, role models)
- Basic Sciences, Innovation and Economy
- Basic Sciences and Life Sciences
- Basic Sciences and Global Challenges
- Basic Science as a Global Public Good…
- Basic Sciences and the sustainable development goals

## Basic Sciences and Multicultural Dialogue

Scope: show how science can contribute to development via its established capabilities to foster dialogue and peace. An example is SESAME, the synchrotron-light project for experimental science and applications in the Middle East. Another example could be the ongoing effort that the Inter Parliamentary Union (with the support of scientists) is producing to favor development projects (e.g. supply of water) in the Middle East region thanks to a better dialogue, though science, among Parliaments of the region. The projects UNESCO is supporting to promote common and sustainable use of transboundary water could also be an example to discuss.

Topics:

- Can fundamental science help create the conditions for multicultural dialogue (and peace)?
- Can fundamental science help develop common values and codes of conduct?
- Can the dialogue help support development and peace policies?
- Dialogue between developed and developing countries and among developing countries.
- Science as a support to regional dialogue.
- Ongoing and new initiatives.
- Science diplomacy / water diplomacy

## Basic Sciences, Education and Human Development

Education inequalities are all limits to the harmonious development of societies and, in its largest extent, to democracy. Science at school is too often perceived as irrelevant, boring, and learned passively with no engagement, which produces scientifically illiterate societies. But this is not a fatality. Science in the classroom should and can be a moment of curiosity and joy.

The key to the success of science education is the teacher, and teachers can be greatly helped by scientists who develop dedicated high-quality resources designed to make the scientific process more understandable.

Students, in particular the youngest, also have a role to play. Children are critical agents of change, in their infinite capacity for activism for the creation of a better world. Not only should one transfer to children the capability of understanding science and technology, but also the desire to act on the basis of this knowledge.

## *Basic Sciences and Economy (Source of Disruptive Innovations, Model of Organization...)*

*A question that all researchers involved with Basic Sciences face is: 'What is your research good for?' Very often, in basic research, there is no answer to that question, because basic research is exploratory. It is very well known that the discovery of electricity was not the consequence of improving candles! Indeed, science takes lots of byways and requires many mistakes, and young researchers have to understand to learn from their mistakes. 'Learning from failure' is kind of a cultural element that basic research brings to the rest of the innovation community. Basic research is about failing: learning from failure is a way to success.*

*Basic Sciences are promoting open access, open data and even open lab and open innovation. This is quite in contrast with the world of patents, which dominates applied sciences and private economy. It turns out more and more that Open Innovation is much more boosting growth and knowledge and technology transfer, benefitting the entire world.*

*Based on past experience, scientists have been able to construct effective "micro-society", which are based on a collaborative - yet competitive - substrate of multicultural approaches to problem solving. They have built multifaceted laboratories in which they train the new generations in a border-free environment that is competence, goal and innovation oriented. This model could be inspiring to other types of collaborations, which are not necessarily focused on its aims but aspire to be effective, inclusive and multicultural.*

## Basic Sciences and Life Sciences

In the last century, experimental sciences and cooperation between different disciplines, such as medicine, mathematics, informatics, biology and physics, have led to huge advances that have practical applications in health, sustainable agriculture, ecosystem management, etc.

Biology helps understanding the functioning of infectious diseases at the level of the body and developing new vaccines, while mathematical modeling helps understanding the spreading of pandemics and how to control them.

The fight against cancer involves many disciplines. For instance, hadrontherapy – the use of accelerated protons and other heavy particles to kill cancerous cells – has made its way into not just Europe and the US but also Asia and Africa.

Breakthroughs in medical imaging come from advances in mathematics and physics while chemistry is involved in drug design.

Bacteria are used to clean materials, etc.

## *Basic Sciences and Global Challenges*

*Scope: discuss the key role of science in the sustainable development scenario, as it can help detect risks and provide with mitigation measures. The success story is the springtime Antarctic Ozone Hole, detected by scientists in 1984, and solved thanks to the Montreal Protocol signed in September 1987. More controversial stories are the environmental agreements, and in particular the one signed in December 2015 in Paris, its implementation being subject to fluctuating political support.*

*Topics:*

- *the Ozone Hole*
- *global warming*
- *ocean rise*
- *biodiversity*
- *health*
- *energy scarcity and renewable energies*
- *weapons of mass destruction*
- *international agreements*
- *are scientists adequately listened to when they launch alerts?*

## Basic Science as a Global Public Good

Basic Science is a common Global Public Good, which citizens, states and future generation can use for education, innovation and prosperity. It brings universal values of integrity, critical approach, creativity, and friendship in sharing the ideal of knowledge and discoveries. It is a global public good in the sense that the more you use it, the more you participate to enrich it and more you contribute to reduce inequalities worldwide.

Over the years, scientists have learnt not only how to collaborate peacefully in the name of a common (and apolitical) goal, but they have also learnt that no challenging endeavor can possibly achieve its results without involving all the stakeholders since the beginning of the process. They include not only scientists, but also policy makers, society at large and the field of finance and economics, from developed and developing countries.

## Basic Sciences and the sustainable development goals

The International Year of Basic Sciences for Development will emphasize the connection of Basic Sciences and the 2030 sustainable development goals agenda. This would be a unique opportunity to show that basic knowledge and basic understanding is a necessary cultural condition to address global challenges and foster sustainable development.

# Events

Events would follow the model of previous successful UNESCO-led international years such as the International Year of Physics, The International Year of Chemistry, the International Year of Astronomy, the International Year of Crystallography and the International Year of Light. There will be centralized global initiatives (the roles of the unions will be important) and many national initiatives.

Three major events are planned:

- one in Geneva in connection with CERN
- one in Addis Ababa (Ethiopia) in connection with UNESCO and the African Union
- one in Asia (Vietnam in connection with ICISE, the International Center for Interdisciplinary Science and Education, and the UNESCO scientific centers in Vietnam)

IUPAP will organize its centenary event in connection with the International Year of Basic Sciences for Development. The centenary symposium, very likely in Geneva, will have a large audience session to show how much Basic Physics irrigates other fields and contributes to peace and development.
IMU will advertise IYBSD in its Newsletter and through invitations to its members to participate. IMU and its International Commission for Mathematical Instruction (ICMI) are already very involved in developing mathematics and mathematical education in developing countries. The activities of 2022 will have special emphasis on the applications of mathematics to the Sustainable Development Goals (SDG) of 2030. Also, IMU is leading the project of an International Day of Mathematics celebrated on March 14 of every year with a theme. The theme of 2022 will be “Mathematics and science for development”. The website of the International Day of Mathematics will propose some activities related to SDG and invite countries to post theirs.

In addition we propose a plan of actions, which should start during and go on after this International Year of Basic Sciences for Development and be monitored:

- Institutionalize full implementation of open access publishing for all research papers connected to Fundamental Research, i.e. curiosity driven. This will allow free access to Universities to all published material in Basic Sciences
- More generally promote Open Science in all Basic Sciences.

- Promote inclusive collaboration in Fundamental Research (teams from developed countries together with teams from developing countries, gender balance…)
- Organize top level international scientific conferences in developing countries with many side events. International Scientific Unions should be mobilized for that purpose.
- Promote training to Basic Sciences, at all levels, in developing countries

# Governance and Organization

The governance and Organization would consist of:

- A **Steering Committee** to deal with organizational matters, overview and steer the global event, with representatives of International Unions (Learned Societies and Academies), International Governmental Organizations, Non-Governmental International Organizations, Inter-Parliamentary Unions…. A restricted subset of the steering committee will play the role of the executive steering committee.
- An **International Advisory Committee**, with representatives of countries, worldwide will be solicited for comments about the program
- An **International Scientific Committee** consisting of high-level recognized scientists will be asked to provide input and ideas for the program, and validate the scientific content
- A network of **national nodes** will be formed in different countries to implement IYBSD 2022 activities, taking into account the needs and characteristics of different regions around the world.
- A **global secretariat** would be implemented, like for the IYL 2015, probably distributed between UNESCO (headquarters and regional offices), CERN, SESAME and Vietnam (ICISE) and the ISC (International Science Council) regional offices. There must be a consolidated secretariat in charge also of global outreach. A website committee should be put in place.

Sponsors will be solicited actively and will be made very visible.

Media partners will be selected to promote the dialogue between science and society, to strengthen the public understanding of science and scientific education

# Some examples of success stories of Basic Sciences for Development:

- The WEB was born at CERN from the needs of global collaboration for fundamental science.
- The success of Google, the second largest company in the world, comes from a brilliant mathematical idea.
- Artificial intelligence relies on statistical methods and will have an influence on all aspects of society.
- Cellular phones come from the discovery of transistors.
- GPS accuracy is a spin-off of Einstein General Relativity, and the improvement in accuracy of atomic clocks based on quantum technology
- The discovery of DNA has revolutionized Medicine

The Genome Project has opened the way to gene therapies.

- The development of innovative instrumentation for Basic Sciences has many impacts for Health and Development: PET, MRI, Adaptative Optics.
- The rapid uptake of the generation and storage of renewable energy depends on advances in physics, chemistry and materials science.
- Reduction in pollution and green chemistry

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**Contact us at: info@iybsd2022.org**

**Visit: www.iybsd2022.org**

# International Year of Basic Sciences for Development

Steering Committee:
International Advisory Board:
International Scientific Committee: