

**PROJECT 2022**



**IYBSSD 2022**

**International Year of Basic Sciences  
for Sustainable Development**



United Nations  
Educational, Scientific and  
Cultural Organization



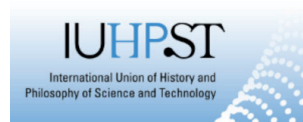
**IYBSSD2022**

International Year  
Basic Sciences  
for Sustainable Development

# Founding Unions and Partners

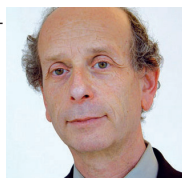


International Science Council



# Basic sciences are the sine qua non for sustainable development

Photo credit: Michel Spiro



**Michel Spiro**  
President of IUPAP,  
Chair of IYBSSD 2022

## **Agenda 2030 for Sustainable Development is the ambitious program that the Member States of the United Nations have agreed upon to ensure a balanced, sustainable and inclusive development of the planet.**

Basic sciences have an important contribution to make to the implementation of this programme. They provide the essential means to face crucial challenges such as universal access to food, energy, health coverage and communication technologies. They enable us to understand the impacts of the currently nearly 8 billion people living on the planet, and to act to limit and reduce these impacts.

Indeed, contrary to our use of natural resources, the development of basic sciences is sustainable par excellence: from generations to generation, it builds a pool of knowledge that the next generations can use to apply to the problems they will have to face, which we may even not know today. We are presently living such a situation:

how could we fight the SARS-CoV-2 pandemic without the contributions of basic biology, physics, mathematics

or chemistry accumulated for the decades?

The International Year of Basic Sciences for Sustainable Development, that we propose to organize in 2022, with the recommendation of a resolution voted by the UNESCO General Conference during its 40<sup>th</sup> session, will focus on these links between basic sciences and the Sustainable Development Goals. This will be a unique opportunity to convince all stakeholders that through a basic understanding of nature, inclusive (especially by empowering more women) and collaborative well informed actions will be more effective, for the global common interest.

The basic sciences, guided by curiosity, are a perfect model for a development that is sustainable: through their scientific curiosity, each generation increases the pool of knowledge built by their predecessors, bringing more resources for future generations to seek solutions to the problems they will face. This is the opposite of what we are doing today with the planet's natural resources.

We will also need science to achieve the Sustainable Development Goals: its results, their transformation into innovations, but also its methods of cooperation.

# Basic sciences

## at the heart of Agenda 2030

**Several of the 17 Sustainable Development Goals (SDGs)**, adopted in 2015 by the United Nations General Assembly as the agenda for the sustainable development of all the world's populations, are explicitly linked to scientific advances: Health and well-being (SDG 3); Clean water and sanitation (SDG 6); Affordable and clean energy (SDG 7); Climate action (SDG 13); Life below water (SDG 14); Life on land (SDG 15). But in fact all SDGs require the input of science and technology.

**Basic sciences help to identify mechanisms** to adequately use knowledge and transfer technology. The UN

Member States recognize the importance of this, since they have created the Technology Facilitation Mechanism.

**Basic sciences also provide essential tools** to ensure multicultural dialogue, political stability and peace, essential to the implementation of the SDGs. They provide the training skills and know-how necessary for the application of innovations that countries need to move from general goals to effective actions. The operational models and practical ways of networking developed by the basic sciences community are also of primary importance for this aim.



*“Basic science entails thinking out of the box; it leads to new knowledge and offers new approaches which, in turn, may lead to practical applications. This takes patience and time and, thus, constitutes a long-term investment but basic research is the prerequisite for any scientific breakthrough. [...] Basic science and applied science thus complement each other in providing innovative solutions to the challenges humanity faces on the pathway to sustainable development.”*

UNESCO Science Report 2015: Towards 2030



A close-up, low-angle shot of a diver underwater. The diver is wearing a black wetsuit, a diving mask, and a regulator. A large, red, cylindrical buoyancy device (BCD) is visible in the foreground, partially obscuring the diver's face. The BCD has a white label that reads "IRD Institut de Recherche pour le Développement". The background is a clear blue ocean with some small fish visible. The overall lighting is bright and natural, typical of an underwater environment.

## Basic sciences in our lives

- **The WEB** was invented at CERN from the need for global collaboration for experiments in fundamental physics and it has been developed thanks to powerful algorithms.
- **Vaccination** has been strengthened and developed through the identification of the viral origin of many diseases.
- **GPS** would not have been possible without Einstein's theory of General Relativity and Quantum Physics.
- **Our mobile phones** would not exist without material sciences that enabled the invention and miniaturization of the transistor, and mathematics that are the basis of all software.
- **HIV/AIDS treatments** significantly extend the lives of people infected through an understanding of how retroviruses work.

## And in our future

- **Artificial intelligence**, which is based on theories and methods developed in mathematics, statistical physics and signal processing, will have an influence on all aspects of our societies.
- **Progress in DNA sequencing**, thanks to biomathematics, chemistry and physics, is now guiding medicine towards more effective individualized treatments, against cancer, for example.
- **Renewable energy production and storage** depend on advances in physics, chemistry and material sciences.
- **Pollution reduction** as well as sustainable and healthy nutrition all depend on green chemistry.
- **The fight against non-communicable diseases**, such as diabetes or obesity, which are spreading across the planet, will depend on knowledge from fundamental biology.



# An international year: what for?

The International Year of Basic Sciences for Sustainable Development will mobilize stakeholders at all levels for a better integration of scientific results into public decision-making processes and for the inclusive development of basic sciences.

## Enhancing inclusive participation in science

The participation of all individuals who wish to, whatever their origin, their social or geographical position, or their gender, is essential for the progress of basic sciences.

### The International Year will:

- affirm the need for inclusive research and lead initiatives to advance it;
- highlight women scientists at the highest level;
- invite political leaders to facilitate the circulation of all scientists, to attend science conferences and for fellowships and exchange programmes.

## Strengthening education and scientific training

Science education from an early age gives appetite for research and encourages people to pursue scientific careers, which is essential for the development of humanity. Moreover, the scientific methods and curiosity can be brought to many other areas of personal, professional and social life, which contributes to the education of responsible and autonomous citizens.

### The International Year will:

- promote basic sciences education and teacher training;
- promote the dissemination of good practices;
- highlight the successful stories from countries that have significantly developed this area.

## Financing basic science

In many regions of the world, countries have committed to devote up to 1% or even 3% of their GDP to financing R&D programmes. Indeed, some examples show that such expenses allow the development of the economy and of the international influence. However, most are far from their goals.

### The International Year will:

- highlight examples of financial support to basic sciences;
- showcase their results;
- invite political leaders to reach their own commitments to finance basic sciences.

## Generalize open access

Open science is primary to the development of scientific research and innovation, to meet the Sustainable Development Goals all over the world. Dissemination of basic science results and all the documents necessary for their production is of major importance.

### The International Year will:

- spotlight successful open science initiatives;
- promote the global circulation of knowledge and encourage interaction and sharing between scientists;
- give opportunities for governments, international organizations and editors to continue to work towards the publication in open access at acceptable costs.



Photo credit : Robert Hradil, Monika MajorProStudio22.ch



Photo credit: One Laptop per Child

# Themes

The International Year of Basic Sciences for Sustainable Development will be developed on the basis of themes identified as priorities by UNESCO and the United Nations.

**Donna Strickland,**

*Nobel Prize in Physics 2018*



Photo credit: Bloomsberries

**Frances H. Arnold,**

*Nobel Prize in Chemistry 2018*



Photo credit: Bengt Nyman



Photo credit: Andrea Kane/  
Institute for Advanced Study

**Karen Uhlenbeck,**

*Abel Prize 2019*



Photo credit: Bengt Nyman

**Tu Youyou,**

*Nobel Prize in Physiology  
or Medicine 2015*

## Women in the basic sciences

Less than 30% of scientists worldwide are women, according to the UNESCO Institute for Statistics. The gender gap is particularly wide in many developing countries. Scientific progress is thus deprived of the creativity of a significant part of humanity.

- What are the social, psychological and economic barriers to women's academic success and scientific careers?
- Among the initiatives geared toward empowering girls and women in basic sciences, which ones have proved successful, and can they be replicated in different contexts?
- How should we change the narratives of science to better recognize the important contributions by women?

# Basic sciences as sources of international dialogue and peace

International scientific facilities and international collaborations bring together scientists from countries that have few other relationships. Examples are CERN, in Europe, and SESAME, in the Middle East. And also initiatives that try to get scientists from North and South Korea to collaborate, together with colleagues from other countries.

- How can the dialogue initiated by scientists contribute to supporting diplomacy and peace?
- How could this model inspire, in other areas, collaborations that would aim at being effective, inclusive and multicultural?
- Could diplomats, politicians and scientists be inspired by each other to fulfill their missions?

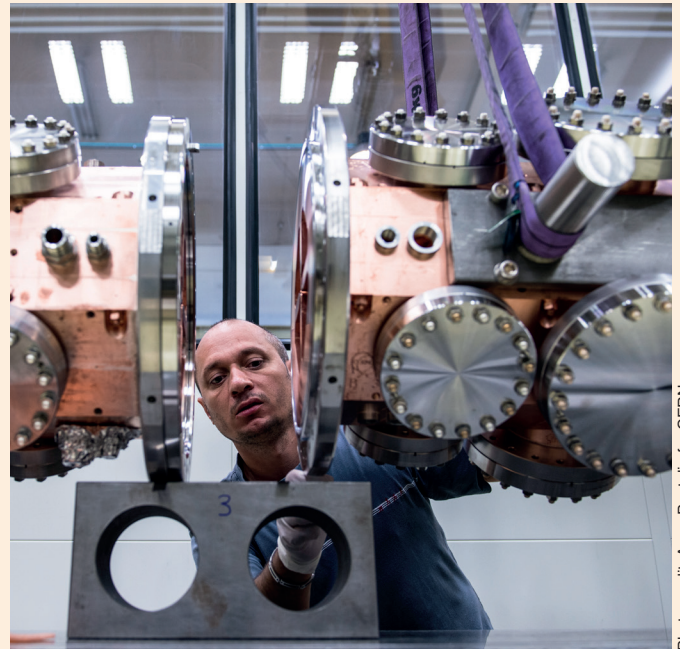


Photo credit: Anna Pantelija for CERN

# Basic sciences is a global public good

Over time, scientists have learned that no ambitious effort can achieve its results without involving all stakeholders. From the beginning of the process, other scientists, policy makers, financial and economic communities, groups and associations, and individual citizens should participate. The more all these stakeholders use sciences, the more they contribute to their enrichment and to reducing inequalities in the world

- How can the different levels of society, different people groups and different genders be more involved in the scientific process?
- How can citizens and their organizations use more basic sciences for education, innovation and prosperity?
- How should open science be implemented so that methods and results are widely available?



Photo credit: Kevin Gill



# The role of basic sciences in innovation and economic development

Technological innovations that we use on a daily basis draw their origin in discoveries in the basic sciences. Moreover, innovation and entrepreneurship can be inspired by scientific methods and practices, such as not giving up, and changing one's course in acknowledging one's past mistakes and wrong hypothesis.

- Could telling innovation stories that involve basic sciences help to convince funding authorities and also the public of the importance of sciences?
- How can scientific methods be better deployed to develop business and the economy?
- To what extent could the shared and open source knowledge model of science replace intellectual and industrial secrecy? How can this move foster healthy co-opetition between companies to promote sustainable development?



Photo credit: Ness Keriton for AusAID

# Basic sciences education and human development

Science in the classroom should be a moment of curiosity and joy. Moreover, students, especially the youngest ones, are key agents to create a better world. They should not only be taught science and technology, they should also be exposed to circumstances that will inspire the desire to act on the world using their knowledge.

- What are the best ways to develop the interest for scientific careers among children and teenagers, so that every country can train enough engineers, scientists or physicians?
- How can we help those who are not destined to become scientists to nonetheless be well informed citizens about sciences, their methods, their applications and their limits?
- How could scientists better assist teachers to develop resources that make the scientific process more understandable?



Photo credit: Thiyagu Ganesh

# Basic sciences to meet global challenges

Today, human impacts on the biosphere is at the heart of complex negotiations. Scientists gathered for instance in the auspices of the Intergovernmental Panel on Climate Change (IPCC) or in the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) have an important part to play. The current COVID-19 pandemic is a reminder that we face challenges on a global scale, and that sciences play a central role as we face off these challenges. Could a “CERN model” be considered for targeted health research?

- How can scientists be better listened to and sought to inform decisions on these questions that concern us all?
- Can we put in place on different topics mechanisms such as those that enabled the signing of the Montreal Protocol in 1987, only three years after the seasonal hole in the atmospheric ozone layer above Antarctica has been fully confirmed by scientists?
- How do basic sciences contribute to the development of common values and codes of conduct on the planet?



Photo credit: Lemasson, Jean-Jacques for IFD

# A long record of international cooperation

Science has been bringing people together across borders for a long time.

Scientists and scholars have always developed links with their counterparts, both near and far away, making progress by sharing their discoveries and inventions, and sometimes their mistakes. In the 19<sup>th</sup> century, with the creation of the International Polar Year, this cooperation has taken a global dimension.

Scientific exchange and collaboration, and the relationship between science and society, have changed scale in the 20<sup>th</sup> and 21<sup>st</sup> centuries. Shortly after its creation, the UN promulgated International Years on themes considered as priorities. In the scientific field, already in 1961, the International Health and Medical Research Year was intended to develop international collaboration, under the aegis of WHO.

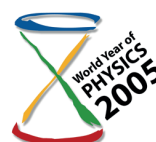
Since 1998, technology and science have regularly been at the origin of international years organized under the authority of UNESCO, or with its very active participation.

**1998**

*International Year of the Ocean*

**2003**

*International Year of Freshwater*



**2005**

*International Year of Physics*



**2008**

*International Year of Planet Earth*



**2009**

*International Year of Astronomy*



International Year of  
**CHEMISTRY**  
2011

**2011**

*International Year of Chemistry*



**2014**

*International Year of Crystallography*



INTERNATIONAL  
YEAR OF LIGHT  
2015

**2015**

*International Year of Light and Light-based Technologies*



**2019**

*International Year of the Periodic Table of Chemical Elements*

The International Year of Basic Sciences for Sustainable Development, that UNESCO proposes to promulgate for 2022, will complement and broaden this picture, while giving great importance to the social role of science. As countries around the world are committed to achieving the Sustainable Development Goals, scientists must play their part.



# The International Year **events**

## Opening ceremony

Paris, France, UNESCO Headquarters

**Panels will present iconic advances in the field of sustainable development** due to research in basic sciences. Nobel Prize laureates, Fields medallists, and brilliant young scientists from all over the world will present their work and explain the importance of basic sciences, and how they empower them to answer to sustainable development challenges. The role of women will be particularly highlighted.



Photo credit: Fred Romero

## The development of basic sciences in the Global South

Addis Ababa, Ethiopia

**Basic sciences need the Global South and its brains,** especially Africa, where half of the world's people under 25 years of age will live by 2050. This event will highlight the scientific achievements of scientists from the Global South, and the role of centers of excellence set up by international cooperation. It will also showcase successful initiatives in education, higher education and international cooperation, especially south-south cooperation.

Organized in collaboration with the African Union and UNESCO, this event will have a general public component, aimed at inhabitants of the Ethiopian capital city.



Photo credit: VBzi

# International high-level symposium

Quy Nhon, Vietnam, ICISE

**Leading scientists and decision-makers from the world**, in particular from developing countries, as well as representatives of companies and non-governmental organizations will meet for several days to exchange and debate on the different ways in which basic sciences are factors for peace at the national, regional and international levels, factors of social and economic prosperity, and they allow the improvement of the conditions of living of populations. Participants will propose, at the end of this meeting, recommendations on the achievement of the Sustainable Development Goals.

Organized in cooperation with the Rencontres du Vietnam.



Photo credit: ICISE

## Closing conference

Geneva, Switzerland, CERN

**At the end of the International Year**, international scientific unions delegates and partners representatives will gather with delegates of national committees, governmental leaders and non-governmental organizations to assess the outcome of events organized around the globe. A special emphasis will be put on science education and the conference will examine what methods and practices should be disseminated in order to progress toward the Sustainable Development Goals.



Photo credit: Dennis Jarvis

## All over the world

Events organized at national, regional or local level will be coordinated by the secretariat of the International Year of Basic Sciences for Sustainable Development. The aim is to share examples of good practices and achievements around the world, to inspire new initiatives everywhere science contributes to the achievement of the SDGs.

All or part of these events will be broadcast live on the Internet, then published online in several languages, so that the International Year can stimulate reflection and inspire action around the world.



# A year for celebrations

## IUPAP Centenary

Communication on on-going projects and programmes around the world is crucial. However, there are obstacles to the free flow of scientists, information and ideas. The challenges are most often of financial or logistical nature, but sometimes political, legal or administrative causes are contributing factors. Contributing to the lowering of these barriers and promoting trade and circulation is the aim of the International Union of Pure and Applied Physics (IUPAP). Founded in 1922 in Brussels by physicists from thirteen countries, it now has 57 national members.



## International Year of Mineralogy

Mineralogy is one of the oldest branches of science. It plays a key role in the deciphering of the structure of matter and in the development of science and technology. The year 2022 will mark the bicentennial celebration of the death of René Just Haüy, acknowledged as one of the fathers of modern mineralogy, as well as the publication of two of his major works. IYBSSD will specially highlight the importance of this discipline for sustainable development.

## International Year of Glass

The International Commission on Glass, the Community of Glass Associations and the Glass Art Society are proposing together to organize the International Year of Glass in 2022. Steps are made to strengthen links with this initiative and to coordinate actions. Common events with IYBSSD 2022 are already envisioned.

## Centenary of the 1922 Nobel Prize awards

### Physics

To the Danish physicist Niels Bohr “for his services in the investigation of the structure of atoms and of the radiation emanating from them”. Not only did he proposed the model of the atom that is taught still today in the first physics classes: Niels Bohr was also among the founding fathers of the quantum theory. He also had a decisive influence during and after the Second World War in the protection of scientists and in scientific diplomacy.



Photo credit: Nobel Archives

### Chemistry

To the English chemist Francis William Aston “for his discovery, by means of his mass spectrograph, of isotopes, in a large number of non-radioactive elements, and for his enunciation of the whole-number rule”. His work is at the base of many advances in physics, chemistry and also biology.

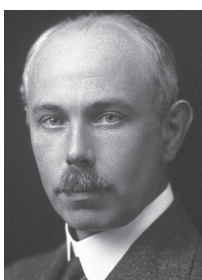


Photo credit: Nobel Archives

### Physiology/Medecine

To the English physiologist Archibald Vivian Hill “for his discovery relating to the production of heat in the muscle”. His work explored biophysics and biochemistry and has had many application for the understanding of physical exercise. He also served into politics, notably as a Member of Parliament of his country.

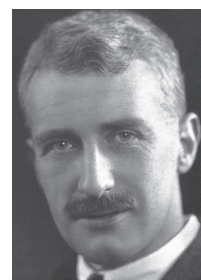


Photo credit: Nobel Archives

To Otto Fritz Meyerhof “for his discovery of the fixed relationship between the consumption of oxygen and the metabolism of lactic acid in the muscle”. The biochemical reactions he discovered with his colleagues are still today taught at school. He was also one among many other scientists who had to flee their country because of persecutions.



Photo credit: Nobel Archives

# Governance and organization

## Steering Committee

### Chair

Michel Spiro, President of IUPAP.

### Co-chairs

Lily Rodriguez, Secretary of the Centre for the Conservation, Research and Management of Natural Areas – Blue Cordillera (CIMA) and former member of IUBS Executive Committee.

Trần Thanh Văn, founder of the Rencontres du Vietnam.

The Steering Committee members represent the founding scientific unions and partners (see page 2).

### Mission

- Overview of the International Year.
- Coordination and organization of international events.
- Within it, an Executive Steering Committee will ensure the effective day-to-day management with the help of the international secretariat.

## International High Patronage Committee

### At the date of publication, the members are:

Barry Barish (Nobel Prize, Physics, 2017); Françoise Barré-Sinoussi (Nobel Prize, Physiology or Medicine, 2008); Claude Cohen-Tannoudji (Nobel Prize, Physics, 1997); François Englert (Nobel Prize, Physics, 2013); Jerome Friedman (Nobel Prize, Physics, 1990); Sheldon Glashow (Nobel Prize, Physics, 1979); David Gross (Nobel Prize, Physics, 2004); Richard Henderson (Nobel Prize, Chemistry, 2017); Gerard t'Hooft (Nobel Prize, Physics, 1999); Takaaki Kajita (Nobel Prize, Physics, 2015); Makoto Kobayashi (Nobel Prize, Physics, 2008); Michel Mayor (Nobel Prize, Physics, 2019); Gérard Mourou (Nobel Prize, Physics, 2018); Ngô Bao Châu (Fields Medal, 2010); Paul M. Nurse (Nobel Prize, Physiology or Medicine, 2001); James Peeble (Nobel Prize, Physics, 2019); Didier Queloz (Nobel Prize, Physics, 2019); Carlo Rubbia (Nobel Prize, Physics, 1984); Dan Shechtman (Nobel Prize, Chemistry, 2011); Samuel Ting (Nobel Prize, Physics, 1976); Cédric Villani (Fields Medal, 2010); Klaus von Klitzing (Nobel Prize, Physics, 1985); Frank Wilczek (Nobel Prize, Physics, 2004); Kurt Wuthrich (Nobel Prize, Chemistry, 1990); Ada Yonath (Nobel Prize, Chemistry, 2009).

### Mission

- Provide comments and ideas for the program and validate its scientific content.

## International Secretariat

Luc Allemand, director of Afriscitech.com, is in charge of the General Secretariat.

Project delegates, professionals of project management, communication, etc., will bring their experience on needs basis, in a decentralized way.

### Mission

- Coordination of international events.
- International public and media relations.
- Website production and management.
- Resource and linkage centre for the network of national nodes and for local event organizers.

## International Advisory Committee

### At the date of publication, the members are:

The World Academy of Sciences; Global Young Academy; All European Academies; European Academies Science Advisory Council; Network of African Science Academies; The Interacademy Partnership; The Association of Academies and Societies of Sciences in Asia; Inter-American Network of Academies of Science; World Academy of Art and Science; African Academy of Sciences; Academy of Scientific Research and Technology (Egypt); The Nigerian Academy of Science; Academia Brasileira de Ciências; International Younger Chemists Network; International Science Programme (Uppsala Universiteit); Rencontres du Vietnam; African Mathematical Union; African Physical Society; Indian National Science Academy; Indian Academy of Sciences; Hassan II Academy of Sciences and Technology; National Academy of Sciences, Arts and Literature of Burkina Faso; Ghana Academy of Arts and Sciences; Colombian Academy of Exact, Physical and Natural Sciences; Macedonian Academy of Sciences and Arts; The Council of Finnish Academies; Ethiopian Academy of Sciences; Royal Society Te Apārangi; Royal Spanish Academy of Exact, Physical and Natural Sciences; Czech Academy of Sciences; Slovak Academy of Sciences; Academy of Sciences of Albania; Accademia Nazionale dei Lincei; Academy of Medical, Physical and Natural Sciences of Guatemala; Royal Netherlands Academy of Arts and Sciences; Academia Chilena de Ciencias; National Academy of Sciences of Belarus; Kenya National Academy of Sciences; Montenegrin Academy of Sciences and Arts; Serbian Academy of Sciences and Arts; Nepal Academy of Science and Technology; Turkish Academy of Science; Chinese Academy of Sciences; Singapore National Academy of Science; Georgian National Academy of Science; Vietnam Academy of Science and Technology.

### Mission

- Make proposals on the IYBSSD program.
- Implement IYBSSD 2022 activities by taking into account needs and characteristics of the different countries and regions.



United Nations  
Educational, Scientific and  
Cultural Organization



**IYBSSD**2022

International Year  
Basic Sciences  
for Sustainable Development

The General Conference of UNESCO

[...]

*Considering* the Organization's Global Priority Africa, and recognizing that science, as a universal public good is an important tool for the achievement of the African Union Agenda 2063,

*Stressing* the need to build on the potential of UNESCO's International Basic Sciences Programme (IBSP),

*Also considering* the high value for humankind of basic sciences, and that enhanced global awareness of, and increased education in, the basic sciences is vital to attain sustainable development, and to improve the quality of life for people all over the world,

*Stressing* that the applications of basic sciences are vital for advances in medicine, industry, agriculture, water resources, energy planning, environment, communications and culture, and that basic sciences rupture technologies respond to the needs of humankind by providing access to information and increasing societal wellbeing, and promoting peace through improved collaboration,

*Noting* the broad and significant impact of recent initiatives of UNESCO's International Basic Sciences Programme (IBSP) and the enthusiastic support for an international year of basic sciences for sustainable development,

*Recognizing* that it is essential to ensure that existing gains from previous initiatives of UNESCO in science and education are effectively followed up and strengthened,

*Emphasizing* the importance of basic sciences to launching rational and innovative thinking and a knowledge-based society,

1. *Invites* the Director-General to support all efforts leading the United Nations General Assembly to proclaim 2022 as international year of basic sciences for sustainable development, emphasizing a broader participation of women;

2. *Recommends* that the United Nations General Assembly at its 75<sup>th</sup> or 76<sup>th</sup> session, adopt a resolution declaring 2022 as United Nations international year of basic sciences for sustainable development.

**Resolution adopted on the report of the SC Commission at the 16<sup>th</sup> plenary meeting, on 25 November 2019.**

**Contact: [info@iybssd2022.org](mailto:info@iybssd2022.org)**

**[www.iybssd2022.org](http://www.iybssd2022.org)**

**[Twitter](#), [Facebook](#), [LinkedIn](#) & [Instagram](#) : [@iybssd2022](#)**