



**BASIC SCIENCES
SUSTAINABLE DEVELOPMENT
BELGRADE 2022**



A G E N D A

**International Year of Basic Sciences for Sustainable Development
World Conference on Basic Sciences and Sustainable Development
September 19–22, 2022, Belgrade, Serbia**

Following the initiative of the Union for Pure and Applied Physics (IUPAP), the General Conference of UNESCO proposed in November 2019 to proclaim the year 2022 as **the International Year of Basic Sciences for Sustainable Development (IYBSSD 2022)**. The proposal was based on the facts that since 2005 six international years of basic sciences had been organized and that in September 2015 the United Nations General Assembly endorsed the resolution *Transforming Our World: the 2030 Agenda for Sustainable Development*, which included 17 Sustainable Development Goals, most of which are clearly connected to basic sciences. In December 2021, the United Nations General Assembly approved the proposal. The total number of organizations that participate in the organization of this series of events is 50. In addition, 112 science academies, learned societies, and scientific associations support the organization of **IYBSSD**.

The main aim of **IYBSSD 2022** is to mobilize national, regional, and global scientific institutions to clearly demonstrate to the public and especially to political and business leaders worldwide how basic sciences are helping us to establish an inclusive, balanced, and sustainable development of the planet. The main message of the series of events is that basic research is the important initial link in the chain of research and development that can, only as a whole, make nature and society sustainable.

The initial event within **IYBSSD 2022** was held on July 8, 2022 at the UNESCO Headquarters, in Paris, France, while the final event will take place at the European Organization for Nuclear Research (CERN), in Geneva, Switzerland, in the beginning of October 2023. One of the main events within the series of events will be **the World Conference on Basic Sciences and Sustainable Development**, to be held on September 19–22, 2022 in Belgrade, Serbia. The proposal was given by the World Academy of Art and Science and it was accepted by the Steering Committee of **IYBSSD**.

The agenda of **the Conference** contains the following:

- **Introductory Session**
- **Section 1:** *Importance of Basic Sciences for Sustainable Development*
- **Section 2:** *Advanced Basic Research in Mathematics and Physics*
- **Section 3:** *Advanced Basic Research in Chemistry and Biology*
- **Section 4:** *Advanced Multiple Disciplinary Basic Research*
- **Section 5:** *Connections of Basic Sciences with Other Sciences, Innovation, and Engineering*
- **Section 6:** *Contributions of Basic Sciences to Medicine, Healthcare, and Water and Food Security*
- **Section 7:** *Connections of Basic Sciences with Energy Technologies, Climate Action, and Protection of the Environment*
- **Section 8:** *Contributions of Basic Research to Advanced Education*
- **Poster Section:** *For Women in Science*
- **Concluding Session**

Special Session will be devoted to the latest report to The Club of Rome – *Limits and Beyond*. Sections 1–8 will include two sessions each and there will be 68 talks in all the sessions. The Poster Section will include three sessions. The authors of the posters are nine young scientists awarded within **For Women in Science National Program in Serbia**, established by the company **L'Oréal Balkan**, the **Commission of Serbia for Cooperation with UNESCO**, and the **Ministry of Education, Science and Technological Development of Serbia**.

Besides, two exhibitions will be going on during **the Conference**, prepared by **Matica Srpska**, the oldest Serbian cultural and scientific institution – on its past and present activities, and by the company **L'Oréal Balkan**, on the Sustainable Development Program of **L'Oréal Group**, the world's largest cosmetics company – **L'Oréal for the Future**.

September 19, 2022, Monday, Day 0

14:00–18:00 Early registration, Hotel Indigo in Belgrade

September 20, 2022, Tuesday, Day 1

08:30–09:00 Registration, Serbian Academy of Sciences and Arts

INTRODUCTORY SESSION, Serbian Academy of Sciences and Arts

09:00–09:10 **Words of welcome:**

Vladimir Kostić, President, Serbian Academy of Sciences and Arts

09:10–09:20 **Opening address:**

Marijana Dukić Mijatović, State Secretary for Education, Science and Technological Development, Government of Serbia (to be confirmed)

09:20–10:20 **Inaugural talks:**

Ezra Clark, Director, Division of Science Policy and Capacity Building, Natural Sciences Sector, United Nations Educational, Scientific and Cultural Organization (UNESCO), Paris, France

Michel Spiro, President, Steering Committee, International Year of Basic Sciences for Sustainable Development (IYBSSD 2022); President, International Union of Pure and Applied Physics (IUPAP)

Garry Jacobs, President and Chief Executive Officer, World Academy of Art and Science; Chairman of the Board of Directors and Chief Executive Officer, World University Consortium

10:20–10:45 *Coffee break*

SECTION 1. IMPORTANCE OF BASIC SCIENCES FOR SUSTAINABLE DEVELOPMENT, Serbian Academy of Sciences and Arts

10:45–12:25 **SESSION 1.1**

Moderation:

Garry Jacobs, President and Chief Executive Officer, World Academy of Art and Science; Chairman of the Board of Directors and Chief Executive Officer, World University Consortium

Talks:

Carlos Álvarez Pereira, Vice-President, The Club of Rome: *Learning what we already know: On the 50th anniversary of “The Limits to Growth”*

Amal Kasry, Chief, Section for Basic Science, Research Innovation and Engineering (RIE), Division of Science Policy and Basic Science (PBS), Natural Sciences Sector (SC), United Nations Educational, Scientific and Cultural Organization (UNESCO), Paris, France: *Strengthening basic sciences: Towards Sustainable Societies*

Maria da Graça Carvalho, Member of the European Parliament; Instituto Superior Técnico, University of Lisbon, Portugal: *The role of research and technological development in the energy transition: The European Union example*

Nebojša Nešković, Secretary General, World Academy of Art and Science; President, Serbian Chapter of The Club of Rome; Vinča Institute of Nuclear Sciences, University of Belgrade, Serbia: *New TESLA Project: Research, Development and Education for the Fourth Industrial Revolution*

Discussion

12:25–14:05 **SESSION 1.2**

Moderation:

Ugo Bardi, The Club of Rome

Talks:

Nebojša Nakićenović, Deputy Chair, Group of Chief Scientific Advisors, European Commission; Former Deputy Director General, International Institute for Applied Systems Analysis, Laxenburg, Austria; Former Professor of Energy Economics, Vienna University of Technology, Austria: *Transformative science and science transformation for sustainability*

Ioan Fazey, Department of Environment and Geography, University of York, UK: *The transformation of science for the future of humanity and life on Earth: A challenge for the basic sciences*

Luiz Oosterbeek, Instituto Politécnico de Tomar, Portugal; Geosciences Centre, Coimbra University, Portugal; International Council for Philosophy and Human Sciences: *Basic sciences and wicked problems: Towards an integrated understanding*

Dragan Đuričin, World Academy of Art and Science: *Impact of double paradigm change in Economics on Big Science*

Discussion

14:05–15:00 *Lunch break*

SECTION 2. ADVANCED BASIC RESEARCH IN MATHEMATICS AND PHYSICS, Serbian Academy of Sciences and Arts

15:00–16:40 **SESSION 2.1**

Moderation:

Stevo Todorčević, Serbian Academy of Sciences and Arts

Talks:

W. Hugh Woodin, Harvard University, Cambridge, MA, USA: *Beyond the infinite*

Avneet Singh, Albert Einstein Institute, Hannover, Germany: *Gravitational waves: A phase transition in fundamental physics*

Vladimir Kekelidze, Vice-Director, Joint Institute for Nuclear Research (JINR), Dubna, Russia: *NICA Project*

François Légaré, Energy, Materials and Telecommunications Research Center, Institut national de la recherche scientifique, Varennes, Québec, Canada: *Ultrafast science and technology at the Advanced Laser Light Source*

Discussion

16:40–17:05 *Coffee break*

17:05–18:45 **SESSION 2.2**

Moderation:

Luc Bergé, President, European Physical Society

Talks:

Eli Glasner, Department of Mathematics, Tel Aviv University, Israel: *Various views on how chaos should be defined mathematically*

Luka Č. Popović, Astronomical Observatory of Belgrade, Serbia; Department of Astronomy, Faculty of Mathematics, University of Belgrade, Serbia: *Supermassive black holes and the activity of galaxies*

Zhiyu Sun, Deputy Director, Institute of Modern Physics, Chinese Academy of Sciences, Lanzhou, China: *China's next generation high intensity ion beam accelerator facility and its research programs*

Michael Benedikt, European Organization for Nuclear Research (CERN), Geneva, Switzerland: *Future Circular Colliders: Planning a research infrastructure for the 21st century*

Discussion

September 21, 2022, Wednesday, Day 2

SECTION 3. ADVANCED BASIC RESEARCH IN CHEMISTRY AND BIOLOGY, Serbian Academy of Sciences and Arts

08:30–10:10 **SESSION 3.1**

Moderation:

Igor Pašti, Faculty of Physical Chemistry, University of Belgrade, Serbia

Talks:

Roman Jerala, Department of Synthetic Biology and Immunology, National Institute of Chemistry, Ljubljana, Slovenia: *Synthetic biology for engineering protein structure and function and cellular circuits*

Jan H. J. Hoeijmakers, Department of Molecular Genetics, Erasmus Medical Center, Rotterdam, The Netherlands; CECAD Research Center, Cologne, Germany; The Princess Máxima Center for Pediatric Oncology, Utrecht, The Netherlands: *DNA repair: The contribution of basic sciences to understand the process of ageing and promote healthy ageing*

Huimin Zhao, University of Illinois at Urbana-Champaign, IL, USA: *Directed evolution of enzymes and microorganisms for sustainable development*

Aleksandr Bugay, Director, Laboratory of Radiation Biology, Joint Institute for Nuclear Research (JINR), Dubna, Russia: *Radiation and human brain: Problems on Earth and in deep space*

Discussion

10:10–10:30 *Coffee break*

10:30–12:10 **SESSION 3.2**

Moderation:

Jelena Radulović, Department of Neuroscience, Psychiatry, and Behavioral Science, Albert Einstein College of Medicine, New York, NY, USA; Department of Biomedicine, Aarhus University, Denmark

Talks:

Tijana Rajh, School of Molecular Sciences, Arizona State University, Tempe, AZ, USA; Center for Nanoscale Materials & Nanoscience and Technology Division, Argonne National Laboratory, Lemont, IL, USA: *Manipulating nanoparticle reactivity through surface chemistry*

Tatjana N. Parac-Vogt, Department of Chemistry, Catholic University of Leuven, Belgium: *Chemical tools for designing artificial enzymes*

Richard B. Hoover, US Space & Rocket Center, Huntsville, AL, USA: *Meteorites, comets, rogue planets and the distribution of biosphere*

Miroslav Adžić, Department of Molecular Biology and Endocrinology, Vinča Institute of Nuclear Sciences, University of Belgrade, Serbia: *Therapeutic strategies against inflammation-associated depression*

Discussion

SECTION 4. ADVANCED MULTIPLE DISCIPLINARY BASIC RESEARCH,
Serbian Academy of Sciences and Arts

12:10–13:50 **SESSION 4.1**

Moderation:

Michel Spiro, President, Steering Committee, International Year of Basic Sciences for Sustainable Development (IYBSSD 2022); President, International Union of Pure and Applied Physics (IUPAP)

Talks:

Karine Chemla, Laboratoire SPHERE, UMR 7219, Centre national de la recherche scientifique, Université Paris Cité, France: *Forgetting the results of advanced knowledge: A historical perspective*

Alexander Karpov, Joint Institute for Nuclear Research, Dubna, Russia, *Island of stability in the periodic table of chemical elements*

Jüri Engelbrecht, Estonian Academy of Sciences; World Academy of Art and Science: *Modelling of complex signals in nerves*

Maurizio Bona, Former Senior Staff Member, European Organization for Nuclear Research (CERN), Geneva, Switzerland: *CERN, SESAME, and SEEIIST: Scientific research as promoter of intercultural dialogue and peace*

Discussion

13:50–14:40 *Lunch break*

14:40–16:20 **SESSION 4.2**

Moderation:

Aleksander Zidanšek, Jožef Stefan International Postgraduate School and Jožef Stefan Institute, Ljubljana, Slovenia; Faculty of Natural Sciences and Mathematics, University of Maribor, Slovenia; World Academy of Art and Science; The Club of Rome; President, Slovenian Association for The Club of Rome

Talks:

Ivan Gutman, Faculty of Science, University of Kragujevac, Serbia: *What is mathematical chemistry?*

László Forró, Stavropoulos Center for Complex Quantum Matter, University of Notre Dame, IN, USA: *How to do scientific research with responsibility?*

Yury Gogotsi, Department of Materials Science and Engineering, and A. J. Drexel Nanomaterials Institute, Drexel University, Philadelphia, PA, USA: *Synthesis and modification of inorganic nanomaterials for sustainable development*

Carlo Rizzuto, Chair, General Assembly, Central European Research Infrastructure Consortium (CERIC-ERIC): *Multidisciplinary and multiprobe research in materials science: The approach of CERIC-ERIC*

Discussion

16:20–16:40 *Coffee break*

SECTION 5. CONNECTIONS OF BASIC SCIENCES WITH OTHER SCIENCES, INNOVATION, AND ENGINEERING, Serbian Academy of Sciences and Arts

16:40–17:55 **SESSION 5.1**

Moderation:

Jüri Engelbrecht, Estonian Academy of Sciences; World Academy of Art and Science

Talks:

Vladimir Grujić, Faculty of Mathematics, University of Belgrade, Serbia: *Applied and computational algebraic topology*

Càndid Reig, Department of Electronic Engineering, University of Valencia, Burjassot, Spain: *Giant magnetoresistance: Science matters*

Frederica Darema, President and Chief Executive Officer, InfoSymbiotic Systems Society; Former Director, Air Force Office of Scientific Research, Arlington, VA, USA: *InfoSymbiotics/DDDAS for systems-analytics and autonomic capabilities*

Discussion

17:55–19:10 **SESSION 5.2**

Moderation:

Roman Balvanović, Vinča Institute of Nuclear Sciences Belgrade, Serbia

Talks:

Ian Freestone, Institute of Archaeology, University College London, UK: *The contribution of basic sciences to the analysis of archaeological materials*

Akio Matsumoto, Faculty of Economics, Chuo University, Tokyo, Japan: *Do the time delays matter? Traditional Cournot model revisited*

Veljko Milutinović, Indiana University, Bloomington, IN, USA; University of Belgrade, Serbia: *The ultimate SuperComputer on a chip and the DataFlow paradigm*

Discussion

September 22, 2022, Thursday, Day 3

SECTION 6. CONTRIBUTIONS OF BASIC SCIENCES TO MEDICINE, HEALTHCARE, AND WATER AND FOOD SECURITY, Serbian Academy of Sciences and Arts

08:30–09:45 **SESSION 6.1**

Moderation:

Goran Milašinović, President, Commission of Serbia for Cooperation with UNESCO

Talks:

Isaac P. Witz, The Shmunis School of Biomedicine and Cancer Research, The George S. Wise Faculty of Life Sciences, Tel Aviv University, Israel: *Cancer is sustained by its microenvironment*

Jelena Radulović, Department of Neuroscience, Psychiatry, and Behavioral Science, Albert Einstein College of Medicine, New York, NY, USA; Department of Biomedicine, Aarhus University, Denmark: *Advancing mental health through basic science*

Junguo Liu, Vice-President, North China University of Water Resources and Electric Power, Zhengzhou, China: *Water security and its linkage to sustainable development*

Discussion

09:45–11:00 **SESSION 6.2**

Moderation:

Thomas Reuter, World Academy of Art and Science; University of Melbourne, Australia

Talks:

Jules Beekwilder, Isobionics, Geleen, The Netherlands: *Biotechnology for producing essential oils and beyond*

Slobodan Vukičević, Laboratory for Mineralized Tissues, Center of Excellence for Regenerative Medicine and Center for Translational and Clinical Research, School of Medicine, University of Zagreb, Croatia: *First ever global biological drug from discovery to marketing in academic environment*

Nir Ohad, Head, Manna Center Program for Food Safety and Security, Tel Aviv University, Israel: *The role of academia in promoting sustainable food security: Lessons from the Manna Center at TAU*

Discussion

11:00–11:25 *Coffee break*

**SECTION 7. CONNECTIONS OF BASIC SCIENCES WITH ENERGY
TECHNOLOGIES, CLIMATE ACTION, AND PROTECTION OF
THE ENVIRONMENT**, Serbian Academy of Sciences and Arts

11:25–13:05 **SESSION 7.1**

Moderation:

Nebojša Nakićenović, Deputy Chair, Group of Chief Scientific Advisors, European Commission; Former Deputy Director General, International Institute for Applied Systems Analysis, Laxenburg, Austria; Former Professor of Energy Economics, Vienna University of Technology, Austria

Talks:

Dragoslav Ćirić, United Kingdom Atomic Energy Authority, Abingdon, UK:
Fusion energy: From JET via ITER to DEMO

Ugo Bardi, The Club of Rome: *A 100 % renewable society: Is it possible?*

Marina Frontasyeva, Joint Institute for Nuclear Research (JINR), Dubna, Russia:
Monitoring long-term and large-scale deposition of air pollutants based on moss analysis in the framework of the UNECE ICP Vegetation

Jinfeng Zhou, Secretary General, China Biodiversity Conservation and Green Development Foundation, Beijing, China: *How to make wise use of science to promote biodiversity conservation and ecological civilization*

Discussion

13:05–14:20 **SESSION 7.2**

Moderation:

Ioan Fazey, Department of Environment and Geography, University of York, UK

Talks:

Slobodan B. Marković, Serbian Academy of Sciences and Arts: *Milutin Milanković and future climate dynamics*

Anastassia Makarieva, Theoretical Physics Division, Petersburg Nuclear Physics Institute, Russia; Institute for Advanced Studies, Technical University of Munich, Germany: *Basic science to clarify the climate-regulating function of the world's pristine forests: Water is the key*

Tanja Ćirković Veličković, Faculty of Chemistry, University of Belgrade, Serbia; Serbian Academy of Sciences and Arts; Ghent University Global Campus, Incheon, South Korea; Faculty of Bioscience and Engineering, Ghent University, Belgium: *Micro- and nanoplastics in food and environment*

Discussion

14:20–15:15 *Lunch break*

SECTION 8. CONTRIBUTIONS OF BASIC SCIENCES TO ADVANCED EDUCATION, Serbian Academy of Sciences and Arts

15:15–16:55 **SESSION 8.1**

Moderation:

Janani Ramanathan, World Academy of Art and Science

Talks:

Anjum Halai, Vice-Provost and Dean, Faculty of Arts and Sciences, Aga Khan University, Karachi, Pakistan; Vice-President, International Commission of Mathematical Instruction: *Inclusive & quality mathematics education for all: Lessons from the CANP Project of ICMI*

Sascha Marc Schmeling, Head, Teacher and Student Programmes, European Organization for Nuclear Research (CERN), Geneva, Switzerland: *Science and education for peace and sustainable future*

Susan G. Clark, School of the Environment and Institution for Social & Policy Studies, Yale University, New Haven, CT, USA: *Integrating basic science and advanced education in our challenging times*

Pu Chen, Institute for History of Natural Sciences, Chinese Academy of Sciences (CAS), Beijing: *The importance of basic science talent cultivation to sustainable development: A historical perspective*

Discussion

16:55–17:20 *Coffee break*

17:20–18:35 **SESSION 8.2**

Moderation:

Alberto Zucconi, Chair, Board of Trustees, World Academy of Art and Science; Secretary General, World University Consortium

Talks:

Christophe Ritzenthaler, Centre International de Mathématiques Pures et Appliquées, Nice, France; Université de Rennes 1, France: *Cooperation in mathematics with developing countries: Successes and challenges*

John D. Bradley, Division of Science Education, School of Education, University of the Witwatersrand, Johannesburg, South Africa: *Basic sciences in education for sustainable development*

Aleksander Zidanšek, Jožef Stefan International Postgraduate School and Jožef Stefan Institute, Ljubljana, Slovenia; Faculty of Natural Sciences and Mathematics, University of Maribor, Slovenia; World Academy of Art and Science; The Club of Rome; President, Slovenian Association for The Club of Rome: *Systematic competence development for sustainability*

Discussion

CONCLUDING SESSION, Serbian Academy of Sciences and Arts

18:35–19:05 **Concluding remarks:**

Vladimir Kostić, President, Serbian Academy of Sciences and Arts

Nebojša Nešković, Secretary General, World Academy of Art and Science; President, Serbian Chapter of the Club of Rome

POSTER SECTION: FOR WOMEN IN SCIENCE, Serbian Academy of Sciences and Arts

September 20, 2022, Tuesday, Day 1

09:00–18:00 **SESSION P.1**

Posters:

Nevena Veličković, Laureate of the L'Oréal-UNESCO *For Women in Science* Award from Serbia: *Genetic diversity is crucial for species conservation and management*

Aleksandra Barać, Clinic for Infectious and Tropical Diseases, University Clinical Center of Serbia, Belgrade, Serbia: *A simple and low cost tetra-primer ARMS-PCR method for detection of triazole-resistant *Aspergillus fumigatus**

Tijana Šušteršič, Faculty of Engineering, University of Kragujevac, Serbia; Bioengineering Research and Development Center, Kragujevac, Serbia: *Application of artificial intelligence algorithms in biomedical image processing*

September 21, 2022, Wednesday, Day 2

09:00–18:00 **SESSION P.2**

Posters:

Emilija Stojanović, Faculty of Medical Sciences, University of Kragujevac, Serbia; Department of Sport, Exercise and Health, University of Basel, Switzerland: *Sport related differences in QT dispersion and echocardiographic parameters in male athletes*

Danica Pavlović, Institute of Physics, University of Belgrade, Serbia: *Natural waveguides on *Hoplia argentea* elytra*

Ana Tomas Petrović, Department of Pharmacology, Toxicology, and Clinical Pharmacology, Faculty of Medicine, University of Novi Sad, Serbia: *Antibiotic exposure at the site of infection: Role of microdialysis in treatment optimization*

September 22, 2022, Thursday, Day 3

09:00–18:00 **SESSION P.3**

Posters:

Jelena Vladić, Faculty of Technology, University of Novi Sad, Serbia: *Green solvents for sustainable processes*

Snežana Papović, Department of Chemistry, Biochemistry and Environmental Protection, Faculty of Sciences, University of Novi Sad, Serbia: *Improving the thermal and electrochemical stability of lithium-ion battery electrolytes safety*

Marija Ivanov, Institute for Biological Research “Siniša Stanković”, University of Belgrade, Serbia: *Role of natural products in novel antimicrobial strategies*