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PROPOSAL FOR THE PROCLAMATION BY THE UNITED NATIONS OF 2019 AS AN INTERNATIONAL YEAR OF THE PERIODIC TABLE OF CHEMICAL ELEMENTS

SUMMARY

This item has been included in the provisional agenda of the 202nd session of the Executive Board at the request of the Russian Federation.

An explanatory note, together with a proposed decision, is attached hereto.

Action expected of the Executive Board: proposed decision in paragraph 18.



Job: 201701687

EXPLANATORY NOTE

I. Introduction and background

1. The periodic table of chemical elements is one of the most significant achievements in science, capturing the essence not only of chemistry but also of physics, biology, etc. It is a unique tool enabling scientists to predict the appearance and properties of matter on Earth and in the rest of the Universe.
2. The periodic table of chemical elements is a uniting scientific concept, which promotes international cooperation in the basic sciences and catalyzes scientific breakthrough and excellence.
3. An International Year of the Periodic Table of Chemical Elements in 2019 is a recognition of the important role of the basic sciences, and especially chemistry and physics achievements, as fundamentals in providing solutions to many of the development challenges that the world is facing towards implementing the United Nations 2030 Agenda for Sustainable Development.
4. An International Year of the Periodic Table of Chemical Elements in 2019 will pay tribute to forefront discoveries recently made with the discovery and naming of four super-heavy elements of the Periodic Table of Chemical Elements of Mendeleev with atomic numbers 113 (Nihonium), 115 (Moscovium), 117 (Tennessine) and 118 (Oganesson) resulting from close international scientific cooperation.
5. An International Year of the Periodic Table of Chemical Elements in 2019 will celebrate the 150th anniversary of the establishment of the Periodic Table of Chemical Elements by the Russian scientist – Dmitri Mendeleev – who is regarded as one of the fathers of modern chemistry. The defining breakthrough of Mendeleev resides in the fact that he predicted properties of five elements and their compounds, and he left space in the periodic table for elements to be discovered later on.
6. An International Year of the Periodic Table of Chemical Elements in 2019 will commemorate a remarkable series of important milestones in the history of the periodic table of chemical elements dating back 1,200, 350, 230, 190, 150, and 80 years. Indeed, around 800 A.D., an Arab alchemist named Jabir ibn Hayyan first isolated the chemical elements arsenic and antimony. In 1669, phosphorus was the first element to be chemically discovered by Hennig Brand (German). In 1789, Antoine Lavoisier (French) published a list of 33 chemical elements grouped into gases, metals, nonmetals, and earths. In 1829, Johann Wolfgang Döbereiner (German) observed that when many of the elements were grouped in three (triads) based on their chemical properties and arranged by atomic weight, the second member of each triad was roughly the average of the first and the third (Law of Triads). In 1869, Dmitri Mendeleev (Russian) developed the modern periodic table as it is known today. In 1939, a French woman scientist, Marguerite Perey, discovered the element francium, thereby filling a gap in Mendeleev's periodic table. It is also believed that lead smelting began at least 9,000 years ago in Africa, and the oldest known artifact of lead is a statuette found at the temple of Osiris at the site of Abydos (Egypt) dated circa 3,800 B.C.
7. An International Year of the Periodic Table of Chemical Elements in 2019 will offer to UNESCO's International Basic Sciences Programme (IBSP) a novel and important opportunity to fulfil its mission of promoting international cooperation in science, technology and engineering for sustainable development, as well as in science education and capacity-building, namely through a Microscience Programme dedicated to the periodic table of chemical elements. This International Year will also trigger a wide range of cooperative undertakings within follow up of the 2011 International Year of Chemistry and the 2014 International Year of Crystallography.
8. The participation of UNESCO in the celebration of the International Year of the Periodic Table of Chemical Elements in 2019 will be financed mainly from extrabudgetary funding.

II. Rationale and goals of an International Year of the Periodic Table of Chemical Elements

9. An International Year of the Periodic Table of Chemical Elements will:

- serve as a focal point for activities by national and international chemical societies and unions, educational institutions and non-governmental and intergovernmental organizations;
- build worldwide educational capacities through basic sciences activities for young people, such as the IBSP's Microscience Programme, that helps to address issues of gender balance and focus in particular on developing countries and emerging economies;
- create opportunities for human and institutional capacity-development in the basic sciences for African countries, in line with the UNESCO Global Priority for Africa;
- give greater resonance to the celebration of the International Day of Women and Girls in Science on 11 February 2019 by highlighting female role models who contributed significantly to the discovery of elements of the periodic table. The examples of Marie Skłodowska-Curie, who was awarded Nobel Prizes in 1903 and 1911 for the discovery of radium (Ra) and polonium (Po), Berta Karlik for the discovery of astatine (At), Lise Meitner, who identified an isotope of protactinium (Pa), Ida Noddack for the discovery of rhenium (Re), and Marguerite Perey, who discovered francium (Fr), will be celebrated in line with the gender equality priority of UNESCO in view of the advancement of the 2030 Agenda for Sustainable Development.
- enhance the understanding and appreciation of periodic law and chemistry in general among the public;
- promote the role of chemistry in contributing to solutions to many global problems, such as climate change and the preservation of natural resources;
- promote awareness of the interdisciplinary nature of twenty-first century science, and emphasize how interactions between different thematic areas of the basic sciences will be increasingly needed in future research and education, and in the achievement of the 2030 Agenda for Sustainable Development;
- enhance international cooperation by coordinating activities between learned societies, educational establishments and industry, focusing specifically on new partnerships and initiatives in the developing world;
- establish durable partnerships to ensure that these activities, goals and achievements continue in the future beyond the International Year of Periodic Table of Chemical Elements.

10. The International Year of the Periodic Table will follow the International Year of Chemistry 2011 – a year-long commemorative event for the achievements of chemistry and its contributions to humankind. The International Year of the Periodic Table will be coordinated by the International Basic Sciences Programme (IBSP) of UNESCO and the International Union of Pure and Applied Chemistry (IUPAC) in collaboration with national, regional and international chemistry societies and unions.

III. Coordination of an International Year of Periodic Table of Chemical Elements and UNESCO's role

11. The International Year of the Periodic Table of Chemical Elements has built a long-lasting international partnership, by creating a Steering Committee composed, *inter alia*, of the International

Union of Pure and Applied Chemistry, learned societies, chemical organizations, as well as UNESCO's networks of partners. The Steering Committee will aim at fostering the implementation of science education, outreach, exhibitions and capacity development activities by the network of partners supporting the celebration in 2019. It will also ensure effective action at both national and international levels between a wide range of international partners including learned societies, science and technology platforms, educational institutions, non-governmental and inter-governmental organizations. The list of the partners is in the annex to this document.

12. The International Year of the Periodic Table of Chemical Elements is an initiative developed by many national, regional and international scientific societies and other organizations led by the International Union of Pure and Applied Chemistry (IUPAC) and IBSP. IUPAC was founded in 1919 by chemists from academia and industry as the successor to the International Association of Chemical Societies. IUPAC has a truly global reach with 53 national adhering organizations and 31 associated organizations. At its General Assembly in Sao Paulo, Brazil (July 2017) the IUPAC Council unanimously approved the resolution of the IUPAC Executive Committee (Beijing, China, November 2016) in favour of the proclamation of 2019 as the International Year of Periodic Table of Chemical Elements.

13. The coordination of the International Year of the Periodic Table of Chemical Elements will have no financial implications for UNESCO, as it will be covered by extrabudgetary contributions. It however offers UNESCO the opportunity to be an important champion in the promotion of the basic sciences for sustainable development, including within the International Basic Sciences Programme (IBSP) of UNESCO.

14. An International Year of the Periodic Table of Chemical Elements with the background and rationale outlined in paragraphs 1 to 10 above will contribute to achieving the aims of UNESCO's 39 C/5 Major Programme II in Natural Sciences, especially Main Line of Action 2, Expected Result 2. In addition, an International Year of the Periodic Table of Chemical Elements will bring strong focus on the promotion of UNESCO's global priorities of Gender Equality and Africa, with focus on basic sciences for sustainable development and Education for All. In addition, the areas where the International Year will bring especially strong focus are: (i) the advancement of science and technology for sustainable development; (ii) the promotion of women in science, through role models in chemistry; (iii) UNESCO's Global Priority Africa with focus on capacity building in the basic sciences through *inter alia* the Microscience Programme; and (iv) the harnessing of international cooperation for science and technology capacity building.

15. UNESCO has played a crucial role in the designation and celebration of the International Year of Light, the International Year of Crystallography, the International Year of Planet Earth, the International Year of Astronomy, the International Year of Chemistry, the International Year of Physics, and the International Year of Mathematics. Through the Executive Board, UNESCO will be the driving force to obtain the United Nations designation of an International Year of the Periodic Table of Chemical Elements.

IV. Conclusion

16. International Years may only be proclaimed by the United Nations during their annual General Assembly meetings, and only at the request of one (or more) of the United Nations Member States. The Russian Federation is taking the lead role in bringing this request forward, understanding that a significant number of other United Nations Member States will support this initiative.

17. An International Year of the Periodic Table of Chemical Elements will support and raise the profile of UNESCO in pursuing its global leadership in building capacity in science, technology and innovation for sustainable development. In this context, chemistry, which is a key cross-cutting discipline of science and engineering in the twenty-first century, is essential to global sustainable development and should be appreciated by everyone. It is vital that the best young minds continue to be attracted to science careers. It is equally important to pursue worldwide educational capacity-

building through activities targeted on science, technology and innovation for young men and women, addressing issues of gender equality, and focusing in particular on developing countries and emerging economies, and in Africa.

Proposed decision

18. In light of the above the Executive Board may wish to consider a decision along the following lines:

The Executive Board,

1. Recalling 201 EX/Decision 38,
2. Recognizing the importance of chemistry and the advances in research and discoveries on the periodic table of chemical elements for sustainable development and for the benefit of humankind,
3. Stressing that the periodic table is widely used in vital spheres of scientific knowledge such as chemistry, physics, biology, etc.,
4. Taking note of the contribution of the international scientific community, including chemists, physicists, biologists as well as representatives of other allied professions, to addressing global challenges such as climate change, sustainable sources of clean water, food and energy and preservation of a wholesome environment,
5. Being aware that the year 2019 provides the opportunity to observe the outstanding scientific achievements that humankind has made since the discovery of the periodic system by Dmitry I. Mendeleev in 1869,
6. Being also aware that the year 2019 coincides with the anniversaries of a series of important milestones in the history of the periodic table, specifically with the isolation of arsenic and antimony by Jabir ibn Hayyan circa. 1,200 years ago; the discovery of phosphorus 350 years ago; the publication of a list of 33 chemical elements grouped into gases, metals, non-metals, and earths by Lavoisier in 1789, the discovery of the Law of Triads in 1829 by Döbereiner; the establishment of the periodic table by Mendeleev 150 years ago; and the discovery of francium by Marguerite Perey in 1939. It is also worth recalling that lead smelting began at least 9,000 years ago in Africa, and the oldest known artifact of lead is a statuette found at the temple of Osiris at the site of Abydos (Egypt) dated circa 3800 BC. The celebration of these discoveries in 2019 will provide an unparalleled opportunity to highlight the continuous nature of scientific discovery in different contexts, with particular emphasis on promoting science education among young people and women, especially in developing [countries, states, regions?];
7. Welcoming international and interdisciplinary scientific cooperation that will be reinforced during the International Year,
8. Seeking to enhance global awareness of, and to increase education in, the basic sciences with special attention to the developing world to improving the quality of everyday life and, *inter alia*, for future advances in research and development,
9. Having examined document 202 EX/43;
10. Welcomes the resolution of the International Union of Pure and Applied Chemistry (IUPAC) Council at its General Assembly in Sao Paulo, Brazil (July 2017) and the leadership of IBSP, and the initiatives of the international scientific community through the large number of scientific societies, unions and institutions, to declare 2019 as the International Year of the Periodic Table of Chemical Elements;

11. Invites the Director-General to support all efforts leading the United Nations General Assembly to proclaim 2019 as the International year of Periodic Table of Chemical Elements;
12. Recommends that the General Conference adopt a resolution in this regard at its 39th session.

ANNEX

Supporting Organizations for International Year of the Periodic Table of Chemical Elements

Organization	Country
Asociación Química Argentina	Argentina
Australian Academy of Science	Australia
Austrian Chemical Society (GÖCH)	Austria
The Royal Academies for Science & the Arts of Belgium	Belgium
European Association for Chemical and Molecular Sciences (EuCheMS)	Belgium
International Organization for Chemical Sciences in Development (IOCD)	Belgium
Solvay S.A.	Belgium
Brazilian Chemical Society	Brazil
Bulgarian Academy of Sciences	Bulgaria
Chemical Society of Cameroon	Cameroon
Canadian National Committee for IUPAC	Canada
National Research Council of Canada	Canada
Chinese Chemical Society	China
Chemical Society Located in Taipei	China
Czech National Committee for Chemistry	Czech Republic
Eurachem	Czech Republic
Pancyprian Union of Chemists	Cyprus
Novozymes A/S	Denmark
Det Kongelige Danske Videnskabernes Selskab	Denmark
Egyptian National Committee for IUPAC	Egypt
Chemical Society of the South Pacific (CSSP)	Fiji
Finnish Chemical Society	Finland
French National Committee for Chemistry	France
International Astronomical Union (IAU)	France
European Chemistry Thematic Network Assoc. (ECTN)	France
French Chemical Society (SCF)	France
Gesellschaft Deutscher Chemiker e.V.	Germany
German Bunsen Society for Physical Chemistry	Germany
Gesellschaft Deutscher Chemiker	Germany
Indian National Science Academy	India
Royal Irish Academy	Ireland
Israel Academy of Sciences and Humanities	Israel
Israeli Chemical Society	Israel
National Research Council-Italy	Italy
International Federation of Clinical Chemistry & Laboratory Medicine	Italy
Science Council of Japan	Japan
Chemical Society of Japan	Japan
RIKEN Nishina Center for Accelerator Based Science	Japan
Institute of Chemistry Malaysia	Malaysia
Sociedad Química de México, A.C.	México
Royal Netherlands Chemical Society	Netherlands
International Association of Colloid and Interface Scientists	Netherlands

Royal Society of New Zealand	New Zealand
New Zealand Institute of Chemistry	New Zealand
Nicaragua Chemists Association	Nicaragua
Chemical Society of Nigeria	Nigeria
Norwegian Chemical Company	Norway
The Institute of Chemists Papua New Guinea(PNG)	Papua New Guinea
Chemical Society of Peru (SQP)	Peru
Federación Latinoamericana de Asociaciones Químicas (FLAQ)	Peru
Philippines Federation of Chemistry Societies, Inc.	Philippines
Integrated Chemists of the Philippines	Philippines
Polish Academy of Sciences	Poland
Portuguese Society of Chemistry	Portugal
Portuguese Society of Electrochemistry (SPE)	Portugal
International Chemistry Olympiad (IChO)	Republic of Korea
Korean Chemical Society	Republic of Korea
Joint Institute for Nuclear Research (JINR)	Russian Federation
Russian Academy of Sciences	Russian Federation
International Union of Pure and Applied Physics (IUPAP)	Singapore
Slovak National Committee of Chemistry for IUPAC	Slovakia
Slovenian Chemical Society	Slovenia
National Research Foundation (South Africa)	South Africa
Federation of African Societies of Chemistry (FASC)	South Africa
South African Chemical Institute	South Africa
Real Sociedad Española de Química (RSEQ)	Spain
Catalan Chemistry Society	Spain
Swiss Chemical Society	Switzerland
Department of Science Service	Thailand
Chemical Society of Thailand	Thailand
Society of Chemists and Technologists	The former Yugoslav Republic of Macedonia
Turkish Chemical Society	Turkey
Royal Society of Chemistry	United Kingdom of Great Britain and Northern Ireland
National Academy of Sciences	United States of America
Oak Ridge National Laboratory (ORNL)	United States of America
Lawrence Livermore National Laboratory	United States of America
American Chemical Society (ACS)	United States of America
Pedeciba Química	Uruguay
International Union of History and Philosophy of Science and Technology (IUHPST)	International organization