



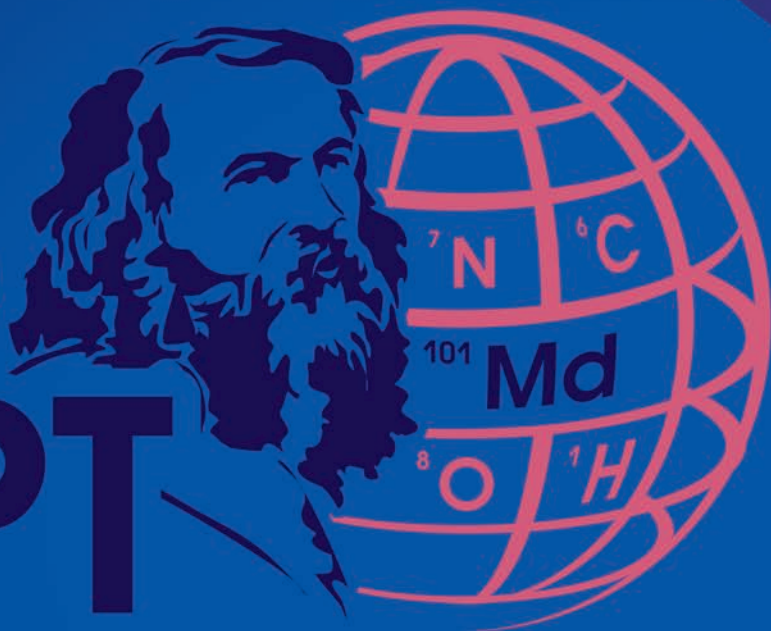
United Nations
Educational, Scientific and
Cultural Organization

2019
IYPT



International Year
of the Periodic Table
of Chemical Elements

2019
IYPT



**INTERNATIONAL YEAR OF THE PERIODIC
TABLE OF CHEMICAL ELEMENTS**

OPENING CEREMONY, UNESCO, PARIS, 29 JANUARY 2019

#iypt2019



**MESSAGE FROM MS AUDREY AZOULAY,
DIRECTOR-GENERAL**

At its 74th session, the United Nations General Assembly proclaimed 2019 as the International Year of the Periodic Table of Chemical Elements. Previously, this initiative was sponsored by the Russian Federation in collaboration with UNESCO and was approved at the 39th session of the General Conference of the Organization. UNESCO and the International Union of Pure and Applied Chemistry (IUPAC) will coordinate the International Year in cooperation with national, regional and international chemical societies and unions.

The Periodic Table of Chemical Elements is more than just a guide or catalogue of the entire known atoms in the universe: it is essentially a window on the universe and helps to expand our understanding of the world around us. This year will mark the 150th anniversary of its creation by Russian scientist Dmitry Ivanovich Mendeleev.

The launch of the International Year of the Periodic Table of Chemical Elements will provide an exciting opportunity to reflect upon many aspects of the periodic table, including its history, the role of men and women in research, global trends and perspectives on science for sustainable development, as well as its social and economic impacts. Beyond this launch, other activities will be implemented worldwide in celebration of the Year. I invite you to actively participate in and organize events and activities in your countries so that the role and significance of the Periodic Table is made visible worldwide, as a crucial pillar for scientific knowledge.

WELCOME

Excellencies, distinguished guests, colleagues, and ladies and gentlemen:

It is a great pleasure, on behalf of the International Steering Committee and the InterUnion Management Committee, to welcome you to the Opening Ceremony of the International Year of the Periodic Table of Chemical Elements.

On December 20th, 2017, the United Nations General Assembly during its 74th Plenary Meeting, at the 72nd Session proclaimed 2019 as the International Year of the Periodic Table of Chemical Elements (IYPT 2019). In proclaiming an International Year focusing on the Periodic Table of Chemical Elements and its applications, the United Nations has recognized the importance of raising global awareness of how chemistry promotes sustainable development and provides solutions to global challenges in energy, education, agriculture and health. Indeed, the resolution was adopted as part of a more general Agenda item on Science and Technology for Development.

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 other science areas, like physics and biology. It is a unique tool, enabling scientists to predict the appearance and properties of matter on Earth and in the rest of the Universe.

Great Russian scientist Dmitry Mendeleev is regarded as the pioneer of the Periodic Table. By 1860, only 60 elements had been discovered (we now know 118) and indeed some of the information about these 60 was wrong. It was as if Mendeleev was doing a jigsaw with one third of the pieces missing, and other pieces bent! Mendeleev had written the properties of elements on pieces of card, and tradition has it that after organizing the cards while playing patience, he suddenly realized that, by arranging the element cards in order of increasing atomic weight, certain types of element regularly occurred.

The greatness of Mendeleev was that not only did he leave spaces for elements that were not yet discovered, but he predicted properties of five of these missing-elements and their compounds. Three of these missing elements were discovered, by others within 15 years (i.e. within his lifetime).

1869 is considered as the year of discovery of the Periodic System by Dmitry Mendeleev. 2019 is the 150th anniversary of the Periodic Table of Chemical Elements. The International Year of the Periodic Table of Chemical Elements will be a worldwide initiative to highlight the importance of the Periodic Table in science, technology, and sustainable development of humankind.

The 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 2800, 350, 230, 190, 150, and 80 years. Indeed, around 800 BC, 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 Brandt (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 approximately the average of the first and the third (Law of Triads). In 1869, Dmitry Mendeleev (Russian) developed the modern periodic table as it is known today. In 1939, a French woman scientist, Marguerite Perey, discovered element francium based on filling gaps 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 on the site of Abydos (Egypt) dated circa 3800 BC.

March 1, 1869 is considered as the date of the discovery of the Periodic Law. That day Dmitry Mendeleev completed his work on «The experience of a system of elements based on their atomic weight and chemical similarity». This event was preceded by a huge body of work by the most outstanding chemists in the world. By the middle of the 19th century, 63 chemical elements were already discovered, and attempts to find regularities in this set had been made repeatedly. In 1829, Döbereiner published the «Law of Triads»: the atomic mass of many elements is close to the arithmetic mean of two other elements close to the original one in chemical properties (strontium, calcium and barium; chlorine, bromine and iodine, etc.). The first attempt to arrange

the elements in order of increasing atomic weights was undertaken by Alexandre-Émile Béguyer de Chancourtois (1862), who placed the elements along the helix and noted the frequent cyclic recurrence of their chemical properties along the vertical axis. Neither of these models attracted the attention of the scientific community.

In 1866, chemist and musician John Alexander Reina Newlands suggested that his version of the periodic system «Law of Octaves» looked a bit like Mendeleev's one. However, it was compromised by the author's persistent attempts to find mystical musical harmony in the table. In the same decade, several more attempts were made to systematize chemical elements. Julius Lothar Meyer was very close to the final version (1864). He published a table containing 28 of the 56 known elements using valency as the basis for periodicity. Dmitry Mendeleev published his first diagram of the periodic table in 1869 in the article «The Correlation of Properties with the Atomic Weight of Elements» (in the Journal of the Russian Chemical Society). A bit earlier he sent a scientific announcement of the discovery to leading chemists of the world. This table included all the 61 known elements and allowed chemical properties/valency to dominate over atomic weight. He challenged some of the known atomic weights and predicted that there were certain elements still to be discovered.

As has been mentioned above, March 1, 1869 is considered as the day of the discovery of the Periodic Law. That day Dmitry Mendeleev completed his work on «The experience of a system of elements based on their atomic weight and chemical similarity.». Meyer published an updated version of his table, which was very similar to that of Mendeleev, in December 1869. In the early days, both Mendeleev and Meyer were honored for their discovery of the "periodic relations of the atomic weights", sharing the Davy Medal of the Royal Society in 1882. Nowadays, Mendeleev is almost universally accepted as the originator of the Periodic Table of the Elements, perhaps because he included all known elements and because he used the Table predictively.

This International Year will bring together many different stakeholders including UNESCO, scientific societies and unions, educational and research institutions, technology platforms, non-profit organizations and private sector partners to promote

and celebrate the significance of the Periodic Table of Elements and its applications to society during 2019. The International Year of the Periodic Table of Chemical Elements will give a greater resonance to the celebration of the International Day of Women and Girls in Science on 11 February 2019 ("Setting their Table: Women and the Periodic Table of Elements", International Symposium at the University of Murcia (Spain) 11-12 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.

The International Year of the Periodic Table of Chemical Elements will 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 year 2019.



Jan Reedijk and Natalia Tarasova
co-chairs of the Inter-Union Management Committee
IYPT2019

THE MANAGEMENT COMMITTEE

IUPAC representatives

Natalia Tarasova - co-chair
Jan Reedijk - co-chair
Chris Brett
Chris Ober
Lars Öhrström
Mei-Hung Chiu

UNESCO representatives

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Rovani Sigamoney
Christin Ametodou

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Alinka Lepine-Szily - IUPAP
Jorge Rivero-Gonzalez - IAU
David Cole Hamilton - EuChemS
Brigitte van Tiggelen - IUHPST
Michele Zema - IUCr
Nicole Moreau - IBSP
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Jean Pierre Vairon - 2019 IUPAC World Chemistry Congress
Yulia Gorbunova - Mendeleev Russian Chemistry Society
Gemma Wood - RSC
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Hans-Georg Weinig - GDCh
Zhigang Shuai - CCS
Ken Sakai - JSC
Berhanu Molla Abegaz - Chemistry Across Africa
David Winkler - FACS
Lois Peterson - US NAS
Hanan Dowidar - 1001 Inventions
Veli-Jussi Haanpää - IAPS
Sofia Ferreira Teixeira - IAPS
Alice Soldà - EYCN

Managing assistant

Frank Sekeris - KNCV

PERIODIC TABLE OF CHEMICAL ELEMENTS

1	2																	18					
H Hydrogen 1.01 1s ¹																		He Helium 4.01 1s ²					
3	4																	5	6	7	8	9	10
Li Lithium 6.97 [He] 2s ¹	Be Beryllium 9.01 [He] 2s ²																	B Boron 10.81 [He] 2s ² 2p ¹	C Carbon 12.01 [He] 2s ² 2p ²	N Nitrogen 14.01 [He] 2s ² 2p ³	O Oxygen 15.99 [He] 2s ² 2p ⁴	F Fluorine 18.99 [He] 2s ² 2p ⁵	Ne Neon 20.18 [He] 2s ² 2p ⁶
11	12																	13	14	15	16	17	18
Na Sodium 22.99 [Ne] 3s ¹	Mg Magnesium 24.3 [Ne] 3s ²																	Al Aluminum 26.98 [Ne] 3s ² 3p ¹	Si Silicon 28.08 [Ne] 3s ² 3p ²	P Phosphorus 30.97 [Ne] 3s ² 3p ³	S Sulfur 32.07 [Ne] 3s ² 3p ⁴	Cl Chlorine 35.45 [Ne] 3s ² 3p ⁵	Ar Argon 39.95 [Ne] 3s ² 3p ⁶
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36						
K Potassium 39.1 [Ar] 4s ¹	Ca Calcium 40.08 [Ar] 4s ²	Sc Scandium 44.96 [Ar] 4s ² 3d ¹	Ti Titanium 47.87 [Ar] 4s ² 3d ²	V Vanadium 50.94 [Ar] 4s ² 3d ³	Cr Chromium 51.99 [Ar] 4s ¹ 3d ⁵	Mn Manganese 54.94 [Ar] 4s ² 3d ⁵	Fe Iron 55.845 [Ar] 4s ² 3d ⁶	Co Cobalt 58.93 [Ar] 4s ² 3d ⁷	Ni Nickel 58.69 [Ar] 4s ² 3d ⁸	Cu Copper 63.55 [Ar] 4s ¹ 3d ¹⁰	Zn Zinc 65.38 [Ar] 4s ² 3d ¹⁰	Ga Gallium 69.72 [Ar] 4s ² 3d ¹⁰ 4p ¹	Ge Germanium 72.63 [Ar] 4s ² 3d ¹⁰ 4p ²	As Arsenic 74.92 [Ar] 4s ² 3d ¹⁰ 4p ³	Se Selenium 78.98 [Ar] 4s ² 3d ¹⁰ 4p ⁴	Br Bromine 79.9 [Ar] 4s ² 3d ¹⁰ 4p ⁵	Kr Krypton 83.8 [Ar] 4s ² 3d ¹⁰ 4p ⁶						
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54						
Rb Rubidium 85.47 [Kr] 5s ¹	Sr Strontium 87.62 [Kr] 5s ²	Y Yttrium 88.91 [Kr] 5s ² 4d ¹	Zr Zirconium 91.22 [Kr] 5s ² 4d ²	Nb Niobium 92.91 [Kr] 5s ¹ 4d ⁵	Mo Molybdenum 95.95 [Kr] 5s ¹ 4d ⁵	Tc Technetium 98 [Kr] 5s ² 4d ⁵	Ru Ruthenium 101.07 [Kr] 5s ¹ 4d ⁷	Rh Rhodium 102.91 [Kr] 5s ¹ 4d ⁸	Pd Palladium 106.42 [Kr] 4d ¹⁰	Ag Silver 107.87 [Kr] 5s ¹ 4d ¹⁰	Cd Cadmium 112.41 [Kr] 5s ² 4d ¹⁰	In Indium 114.81 [Kr] 5s ² 4d ¹⁰ 5p ¹	Sn Tin 118.71 [Kr] 5s ² 4d ¹⁰ 5p ²	Sb Antimony 121.76 [Kr] 5s ² 4d ¹⁰ 5p ³	Te Tellurium 127.6 [Kr] 5s ² 4d ¹⁰ 5p ⁴	I Iodine 126.9 [Kr] 5s ² 4d ¹⁰ 5p ⁵	Xe Xenon 131.29 [Kr] 5s ² 4d ¹⁰ 5p ⁶						
55	56	57—71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86						
Cs Cesium 132.91 [Xe] 6s ¹	Ba Barium 137.33 [Xe] 6s ²	La — Lu Lanthanides	Hf Hafnium 178.49 [Xe] 6s ² 4f ¹⁴ 5d ²	Ta Tantalum 180.95 [Xe] 6s ² 4f ¹⁴ 5d ³	W Tungsten 183.84 [Xe] 6s ² 4f ¹⁴ 5d ⁴	Re Rhenium 186.2 [Xe] 6s ² 4f ¹⁴ 5d ⁵	Os Osmium 190.23 [Xe] 6s ² 4f ¹⁴ 5d ⁶	Ir Iridium 192.22 [Xe] 6s ² 4f ¹⁴ 5d ⁷	Pt Platinum 195.08 [Xe] 6s ¹ 4f ¹⁴ 5d ⁹	Au Gold 196.97 [Xe] 6s ¹ 4f ¹⁴ 5d ¹⁰	Hg Mercury 200.59 [Xe] 6s ² 4f ¹⁴ 5d ¹⁰	Tl Thallium 204.38 [Xe] 6s ² 4f ¹⁴ 5d ¹⁰ 6p ¹	Pb Lead 207.2 [Xe] 6s ² 4f ¹⁴ 5d ¹⁰ 6p ²	Bi Bismuth 208.98 [Xe] 6s ² 4f ¹⁴ 5d ¹⁰ 6p ³	Po Polonium 209 [Xe] 6s ² 4f ¹⁴ 5d ¹⁰ 6p ⁴	At Astatine 210 [Xe] 6s ² 4f ¹⁴ 5d ¹⁰ 6p ⁵	Rn Radon 222 [Xe] 6s ² 4f ¹⁴ 5d ¹⁰ 6p ⁶						
87	88	89—103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118						
Fr Francium 223 [Rn] 7s ¹	Ra Radium 226 [Rn] 7s ²	Ac — Lr Actinides	Rf Rutherfordium 267 [Rn] 7s ² 5f ¹⁴ 6d ²	Db Dubnium 268 [Rn] 7s ² 5f ¹⁴ 6d ³	Sg Seaborgium 271 [Rn] 7s ² 5f ¹⁴ 6d ⁴	Bh Bohrium 272 [Rn] 7s ² 5f ¹⁴ 6d ⁵	Hs Hassium 276 [Rn] 7s ² 5f ¹⁴ 6d ⁶	Mt Meitnerium 281 [Rn] 7s ¹ 5f ¹⁴ 6d ⁷	Ds Darmstadtium 281 [Rn] 7s ¹ 5f ¹⁴ 6d ⁹	Rg Roentgenium 280 [Rn] 7s ¹ 5f ¹⁴ 6d ¹⁰	Cn Copernicium 285 [Rn] 7s ² 5f ¹⁴ 6d ¹⁰ 7p ¹	Nh Nihonium 284 [Rn] 7s ² 5f ¹⁴ 6d ¹⁰ 7p ¹	Fl Flerovium 289 [Rn] 7s ² 5f ¹⁴ 6d ¹⁰ 7p ²	Mc Moscovium 288 [Rn] 7s ² 5f ¹⁴ 6d ¹⁰ 7p ³	Lv Livermorium 293 [Rn] 7s ² 5f ¹⁴ 6d ¹⁰ 7p ⁴	Ts Tennessine 292 [Rn] 7s ² 5f ¹⁴ 6d ¹⁰ 7p ⁵	Og Oganesson 294 [Rn] 7s ² 5f ¹⁴ 6d ¹⁰ 7p ⁶						

Metals Nonmetals

6														
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
La Lanthanum 138.91 [Xe] 6s ² 5d ¹	Ce Cerium 140.11 [Xe] 6s ² 4f ¹ 5d ¹	Pr Praseodymium 140.91 [Xe] 6s ² 4f ³	Nd Neodymium 144.24 [Xe] 6s ² 4f ⁴	Pm Promethium 145 [Xe] 6s ² 4f ⁵	Sm Samarium 150.36 [Xe] 6s ² 4f ⁶	Eu Europium 151.96 [Xe] 6s ² 4f ⁷	Gd Gadolinium 157.25 [Xe] 6s ² 4f ⁷ 5d ¹	Tb Terbium 158.93 [Xe] 6s ² 4f ⁹	Dy Dysprosium 162.5 [Xe] 6s ² 4f ¹⁰	Ho Holmium 164.93 [Xe] 6s ² 4f ¹¹	Er Erbium 167.26 [Xe] 6s ² 4f ¹²	Tm Thulium 168.93 [Xe] 6s ² 4f ¹³	Yb Ytterbium 173.05 [Xe] 6s ² 4f ¹⁴ 5d ¹	Lu Lutetium 174.97 [Xe] 6s ² 4f ¹⁴ 5d ¹
7														
89	90	91	92	93	94	95	96	97	98	99	100	101	102	103
Ac Actinium 227 [Rn] 7s ² 6d ¹	Th Thorium 232.04 [Rn] 7s ² 6d ²	Pa Protactinium 231.04 [Rn] 7s ² 5f ² 6d ¹	U Uranium 238.03 [Rn] 7s ² 5f ³ 6d ¹	Np Neptunium 237 [Rn] 7s ² 5f ⁴ 6d ¹	Pu Plutonium 244 [Rn] 7s ² 5f ⁶	Am Americium 243 [Rn] 7s ² 5f ⁷	Cm Curium 247 [Rn] 7s ² 5f ⁷ 6d ¹	Bk Berkelium 247 [Rn] 7s ² 5f ⁹	Cf Californium 251 [Rn] 7s ² 5f ¹⁰	Es Einsteinium 252 [Rn] 7s ² 5f ¹¹	Fm Fermium 257 [Rn] 7s ² 5f ¹²	Md Mendelevium 258 [Rn] 7s ² 5f ¹³	No Nobelium 259 [Rn] 7s ² 5f ¹⁴	Lr Lawrencium 262 [Rn] 7s ² 5f ¹⁴ 7p ¹

PROGRAMME

WELCOME

10:00 - 10:40

Audrey Azoulay, Director General UNESCO
Mikhail Kotyukov, Minister of Science and Higher Education of the Russian Federation
Pierre Corvol, Président de l'Académie des Sciences, Institut de France
Andrey Guryev, CEO, PhosAgro

MUSICAL PERFORMANCE

10:40 - 10:50

Mira Yevtich
Brahms Rhapsody opus 79 number 2

INTRODUCTION TO PROGRAMME

10:50 - 11:00

Prof. Natalia Tarasova, IYPT MC co-chair, Past-President of IUPAC

ELEMENTS FOR LIFE

11:00 - 11:30

ROUND TABLE
Moderator: Mr Philip Ball (UK)
Ms. Emelia Arthur, FAO/UCN/IIED STEM (women) education in Africa
Dr. Marco Mensink, CEO ICCA Chemical industry and UN SDGs
Prof. Alinka Lepine-Szily, Sao Paolo, Medical application of radioisotopes

NOBEL LAUREATE LECTURE

11:30 - 11:55

Introduction: Prof. Jan Reedijk
IYPT MC co-chair
Periodic Table for Society and the Future
Prof. Ben Feringa
Nobel Laureate in Chemistry 2016

PUBLIC ENGAGEMENT

11:55 - 12:05

INAUGURATION OF THE GLOBAL EDUCATIONAL INITIATIVE "1001 INVENTIONS: JOURNEYS FROM ALCHEMY TO CHEMISTRY"
Ahmed Salim, Co-Founder and Director, 1001 Inventions organization

PERIODIC TABLE: HAND-MADE ELEMENTS

12:05 - 12:25

Introduction: Prof. Bruce McKellar
Past President IUPAP
NEWCOMERS IN THE PERIODIC TABLE
Prof. Youri Oganessian
Scientific Director Flerov Laboratory, Dubna

LUNCH BREAK

12:25 - 14:00

Visit of the Periodic Table exhibition

PERIODIC TABLE AND EDUCATION OUTREACH

14:00 - 14:20

Introduction: Prof. Pilar Goya
President EuChemS
MENDELEEV'S GIFT TO EDUCATION
Prof. Martyn Poliakoff
University of Nottingham

YOUNG OUTSTANDING SCIENTISTS OF THE WORLD

14:20 - 15:00

Moderator: Michel Spiro
President Designate IUPAP
STANDUP 4 PERIODIC TABLE-DEDICATED ADDRESSES BY YOUNG SCIENTISTS FROM REGIONS OF THE WORLD
Africa Ms. Nozipho Gumbi
Asia Mr. Xuefeng Jiang
Asia-Pacific Ms. Thahira Begum
Latin America Ms. Kita Macario
Europe Mr. Patrick Steinegger
Arab States Ms. Nourtan Abdeltawab

ON THE ORIGIN OF ELEMENTS

15:00 - 16:00

ROUND TABLE

Moderator: Dr. Romain Murenzi

Executive Director TWAS

ORIGIN OF THE ELEMENTS IN OUTER SPACE

Prof. Ewine van Dishoeck

Kavli Prize laureate 2018; Leiden University

THE PERIODIC TABLE AND METEORITES

Dr. Maria Lugaro

Konkoly Observatory, Budapest

STARS FROM CRADLE TO GRAVE

Prof. Alexander Lutovinov

Space Research Institute RAS

COFFEE/TEA BREAK

16:00 - 16:30

Visit of the Periodic Table exhibition

**PERIODIC TABLE AND
INTERDISCIPLINARY CONCEPTS
FOR DEVELOPMENT**

16:30 - 17:20

ROUND TABLE

Moderator: Prof. Nicole Moreau

Chair of the International Scientific Board for the
IBSP at UNESCO

- Prof. Qi-Feng Zhou
President of IUPAC
- Prof. Kennedy Reed
President of IUPAC
- Prof. Aslan Tsivadze
President of the Mendeleev Russian Chemical
Society
- Dr. Bonnie Charpentier
President of the American Chemical Society
- Dr. Robert Parker
CEO of the Royal Society of Chemistry

**PERIODIC TABLE AND SUSTAINABLE
DEVELOPMENT GOALS SESSION**

17:20 - 18:20

ROUND TABLE

Moderator: Dr. Peggy Oti-Boateng UNESCO

- Prof. Daya Reddy
President ICS
- Prof. Wole Soboyejo
Worcester Polytechnic Institute
- Prof. Sandro Scandolo
ICTP
- Prof. Brigitte Van Tiggelen
On behalf of the President of the IUHSP
- Dr. Marc Cesa
OPCW Scientific Advisory Board
- Prof. Pietro Tundo
ICGCSD, IUPAC

MUSICAL PERFORMANCE

18:20 - 18:30

Mira Yevtich

Chopin Nocturne opus 15 number 2 + Scriabin Poem
opus 32 number 2

CLOSING REMARKS

18:30 - 18:40

ANNOUNCEMENT OF THE IYPT CLOSING
CEREMONY IN TOKYO, JAPAN ON
DECEMBER 5TH, 2019

Dr. Kohei Tamao

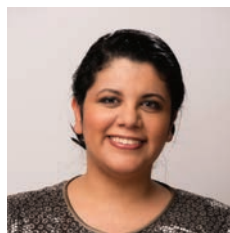
Chairman of the IYPT Closing Ceremony Committee
in Japan

CLOSING REMARKS FROM THE IYPT
MANAGEMENT COMMITTEE

Prof. Jan Reedijk and Prof. Natalia Terasova
IYPT MC co-chairs

BIOGRAPHIES

WE WOULD LIKE TO THANK ALL THE SPEAKERS FOR THEIR COMMITMENT AND PARTICIPATION IN THE INTERNATIONAL YEAR OF THE PERIODIC TABLE OPENING CEREMONY. BRIEF BIOGRAPHIES ARE LISTED BELOW IN ALPHABETICAL ORDER.



Nourtan Abdeltawab

Dr. Abdeltawab research interest focuses on the application of systems biology towards precision medicine. Dr. Abdeltawab earned her doctoral degree at the University of Tennessee Health Science Center, Memphis, TN, USA. Her doctoral research focused on the application of systems biology approaches to identifying genetic factors modulating the severity of infectious diseases. A recipient of 2014 L'Oréal-UNESCO For Women in Science Levant and Egypt fellowship award and 2015 L'Oréal-UNESCO For Women in Science International Rising Talent award for her project on studying pharmacogenetics of new direct antiviral drugs against hepatitis C virus (HCV), a health and economic burden in Egypt.



Emelia Arthur

Emelia Arthur, a Yale World Fellow, has many years of experience in Knowledge and Learning Management, working across governmental and non-governmental sectors at local, regional, national and international levels. She previously worked as Advisor to the President of Ghana after working as Deputy Minister and District Chief Executive. Emelia served on the board of the Open Society Initiative in West Africa; steering committee of FAO's Farm and Forest Facility, National Forest Program facility and steering committee of IUCN/IIED/FAO's Growing Forest Partnerships. She currently serves on the Steering Committee of the International Network of Resource Information Centers aka the Balaton Group.



Thahira Begum

Associate Professor Dr Thahira Begum is a lecturer at Universiti Putra Malaysia. She received her early education and her Bachelors in Science Education in Brunei Darussalam. Subsequently, she received her Masters and PhD in Malaysia. Her research interests are in the field of inorganic synthesis and crystallography with a focus on metal-organic frameworks. She is a fellow of the Royal Society of Chemistry and an Exco member of the Young Scientists Network in Malaysia where she is actively involved in the Science Integrity Working Group regarding the responsible conduct of research.



Marc Cesa

Dr. Mark C. Cesa was 2014-2015 President of the International Union of Pure and Applied Chemistry, IUPAC. He has been chair of the IUPAC Committee on Chemistry and Industry and of the U. S. National Committee for IUPAC. Dr. Cesa is an American Chemical Society Fellow. He was 2016-2018 chair of the Committee on Science, and has served as a member of the ACS Committee on Chemical Safety. Dr. Cesa is a physical organic and organometallic chemist with research interests in homogeneous and heterogeneous catalysis and organic reaction kinetics and mechanisms, and has carried out research in the chemical industry on new catalytic reactions, polymerization, chemical process optimization, and molecular and kinetic modeling of catalytic reactions.



Bonnie Charpentier

Dr. Bonnie Charpentier is President of the American Chemical Society. She previously served on the ACS Board of Directors, including as the chair of the Board. She is currently Senior Vice President of Regulatory and Compliance at Cytokinetics, Inc., in South San Francisco, California, a company dedicated to the discovery and development of novel small molecule therapeutics that modulate muscle function. In that role she is responsible for Regulatory, Quality and Drug Safety Departments. Prior to Cytokinetics, Bonnie worked in drug research and development at other companies, including Syntex and Roche, and as an analytical chemist at the Procter and Gamble Co. She holds a B.S. degree in anthropology and a PhD in Plant Physiology.



Ewine van Dishoeck

Ewine van Dishoeck is professor of molecular astrophysics at Leiden University. Following her graduation from Leiden, she held positions at Harvard, Princeton and Caltech from 1984-1990. Her research is at the boundary of astronomy and chemistry and uses ground- and space-based observatories to study the molecules interstellar clouds to planets. She holds many (inter)national science policy functions, including president of the International Astronomical Union. She has received many awards, including the Dutch Spinoza award, the 2015 Einstein World Award for Science and the Kavli 2018 Astrophysics Prize. She is a member of the Dutch, German, Norwegian and US National Academies of Sciences.



Ben Feringa

Ben L. Feringa obtained his PhD degree at the University of Groningen (NL) in 1978. After working as a research scientist at Shell (NL and UK), he joined the University of Groningen first as lecturer and in 1988 as full professor. He has served as member and vice-president of the Royal Netherlands Academy of Sciences. In 2008 he was appointed Academy Professor and was knighted by Her Majesty the Queen of the Netherlands. The research programme of the Feringa group include stereochemistry, organic synthesis, asymmetric catalysis, molecular switches and motors, self-assembly and molecular nanosystems. Feringa's research has resulted in many awards, including the Prelog gold medal (2005), Humboldt Award (2012), the Marie Curie medal (2013), the Nagoya Gold Medal (2013), culminating in the Nobel Prize of Chemistry in 2016.

BIOGRAPHIES



Philip Ball

Philip Ball is a freelance writer and broadcaster, and worked previously for over 20 years as an editor for Nature. He writes regularly in the scientific and popular media, and has authored many books on the interactions of the sciences, the arts, and the wider culture, including H₂O: A Biography of Water, Bright Earth: The Invention of Colour, The Music Instinct, and Curiosity: How Science Became Interested in Everything. His book Critical Mass won the 2005 Aventis Prize for Science Books. Philip is a presenter of Science Stories, the BBC Radio 4 series on the history of science. He trained as a chemist at the University of Oxford, and as a physicist at the University of Bristol. His latest book is Beyond Weird (2018), a survey of what quantum mechanics means.



Pilar Goya Laza

Pilar Goya Laza is currently the President of EuChemS, European Chemical Society. She is Research Professor of the Spanish Research Council (CSIC) at the Instituto de Química Médica, working in medicinal chemistry and drug design. She was a Humboldt postdoctoral fellow at the University of Konstanz, Germany and was Head of International Affairs of the Spanish Research Council. She has chaired the Chemistry Committee of the Marie Skłodowska-Curie Fellowships and directed the Instituto de Química Médica. She has been Vice President of the Spanish Royal Society of Chemistry (RSEQ) and the President of the Spanish Society of Medicinal Chemistry (SEQT).



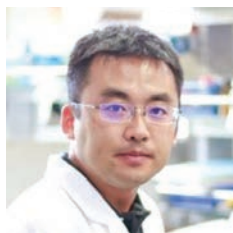
Nozipho Gumbi

Nozipho Gumbi is a final year PhD student from the University of South Africa with big dreams and hopes for a world that is free of water scarcity and poor water quality issues. Her doctoral research focuses on the unlimited possibilities offered by carbon nanotubes and seeks to exploit some of their features for enhanced water purification purposes. She was previously awarded a DAAD scholarship through the German academic student exchange programme, which allowed her to spend 6 months at Karlsruhe Institute of Technology. In 2016, she became the overall winner of FameLab South Africa, one of the biggest science communication competitions worldwide.



Andrey Guryev

Andrey Guryev was appointed CEO by PhosAgro's Board of Directors starting in August 2013. Prior to becoming CEO, he served as Deputy CEO of OJSC PhosAgro from April 2011. He was also Deputy CEO for Sales and Logistics of PhosAgro AG from October 2011 to June 2013. Mr. Guryev has worked at PhosAgro since 2004, holding various positions in the finance department and specializing in fertilizer exports. Mr Guryev graduated from the University of Greenwich in London with a BA in economics, and holds a Master's degree from the Academy of National Economy under the Government of the Russian Federation. He received a PhD in economics from the National Mineral Resources University (University of Mining).



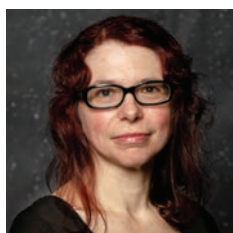
Xuefeng Jiang

Prof. Xuefeng Jiang is currently the “Shanghai Eastern” Professor at East China Normal University. He got his PhD at the Shanghai Institute of Organic Chemistry (SIOC), Chinese Academy of Sciences (Advisor: Shengming Ma). He was a postdoctoral researcher at The Scripps Research Institute (TSRI) in the field of natural product total synthesis (Advisor: K. C. Nicolaou). He started his independent career in 2011. His research interests focus on green sulfur chemistry and natural product total synthesis. In 2018, he was selected as ambassador of “Sulfur” in the “Periodic Table of Younger Chemists”.



Alinka Lépine-Szily

Alinka Lépine-Szily was born in Hungary has been living in Brazil since 1957. She obtained her PhD at the University of Sao Paulo (USP), where is currently a senior professor, where she now is senior professor. She served as Director of Nuclear Physics at the laboratory of USB from 2007-2011. Research interest: nuclear structure and reactions using stable and radioactive beams. She represented Brazil in the working group on NP of Global Science Forum of OECD (2006-2008), and she has been a member of WG9- IUPAP since 2005. She has also served as Co-Chair of the Latin American Nuclear Physics and Applications (ALAFNA). Since 2009 she has been a member of C12 (NP commission) of IUPAP, secretary from 2011-2014, chair from 2014-2017, vice-president, gender-champion and member of the executive council. 2014-2017 chair, vice-president, gender-champion and member of executive council. She is also a member of the Sao Paulo Science Academy and the Hungarian Science Academy, and has been awarded the Arany Janos Prize.



Maria Lugaro

Maria Lugaro was born in Torino (Italy), where she completed her degree in theoretical physics. She moved to Melbourne (Australia) to study at Monash University for her PhD on the production of the elements in stars and stardust from meteorites. After the PhD she moved to Cambridge (UK), then to The Netherlands with a Dutch Fellowship, and back to Australia with a Monash Fellowship. She received a Future Fellowship from the Australian Research Council in 2011 and a Momentum grant from the Hungarian Academy of Sciences in 2014. She moved to the Konkoly Observatory in Budapest in 2017 where she started a new project on the origin of radioactive nuclei in meteorites funded by the European Research Council.



Alexander Lutovinov

Alexander Lutovinov (Doctor of Sciences, Professor) is one of the world’s leading scientists in astrophysics and space research, an expert in the field of the analysis and interpretation of scientific data from space observatories, and author of than 150 publications, including two monographs. He is a laureate of the Bredikhin Prize from Russian Academy of Sciences (RAS) for outstanding achievements in Astronomy, and is also a member of the International Astronomy Union. At this moment Alexander Lutovinov holds the position of Deputy Director of the Space Research Institute of RAS. He is also chairman of the Coordinating Council of Professors of RAS.

BIOGRAPHIES



Kita Macario

Kita Macario has a PhD in Nuclear Physics and an MSc in Molecular Physics. She works with Applied Nuclear Physics, especially with Radiocarbon dating in both archaeological and environmental contexts. Currently Professor of the Physics Department at the Federal Fluminense University in Brazil, she supervises the research of postdoctoral, graduate and undergraduate students. Her roles and achievements include: Founder and head of the first Radiocarbon Accelerator Mass Spectrometry facility in Latin America; member of the university work group on women's research; member of the Brazilian Geology and Physics Societies; research fellow from CNPq and Faperj funding agencies. She has published more than 60 scientific papers in the last 10 years, and is a reviewer for over 10 international journals.



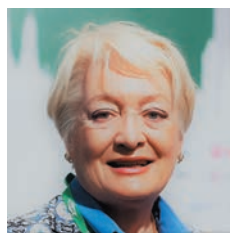
Bruce McKellar

Bruce McKellar is the Immediate Past President of the International Union of Pure and Applied Physics (IUPAP) and is Professor Emeritus of Physics at the University of Melbourne, Australia. He is a theoretical physicist who obtained his PhD at the University of Sydney. His research has covered nuclear physics, particle physics, especially neutrino physics and the asymmetry between matter and antimatter, in atmospheric optics and in topological phases in quantum physics. He is one of the discoverers of the He-McKellar-Wilkins phase. He has been a Vice President, and a Foreign Secretary, of the Australian Academy of Science.



Marco Mensink

Marco Mensink (1968) holds an MSc Degree in Forestry and Business Management (Agricultural University of Wageningen NL). He has been Director General of Cefic, the European chemical industry, since May 2016. He was Council Secretary of the global chemical industry association ICCA until December 2018, a two-year term of office. Before joining Cefic, Mensink was Director General of the Confederation of European Paper Industries (CEPI), representing the sector at European and global level. Mensink is a seasoned public affairs professional, who has worked in Brussels since 2006. He is active in several European Commission High Level Groups and is chair of ACEI, the Alliance for a Competitive European Industry formed by 11 major European industry sector associations and Business-Europe.



Nicole Moreau

Professor Moreau received an M.S. in physical chemistry followed by a doctorate in physical sciences (chemistry distinction) from Paris XI University. She worked as a Research Director at CNRS, then as a professor at Paris 6 University and at the Ecole Nationale Supérieure de Chimie de Paris. Her research began in organic synthesis, then she moved to the interface of chemistry and life sciences. She has been Deputy Director of the Chemistry Department of CNRS, President of IUPAC, Member of the Executive Committee of IS. She is now chair of the IBSP (International Basic Sciences Programme) of UNESCO.



Romain Murenzi

Romain Murenzi serves as Executive Director of TWAS. The Academy administers over 500 doctoral/postdoctoral fellowships yearly, from over 90 DCs, with currently 1,100 students on site, and offers research grants and other programmes. He also oversees the administration of OWSD, IAP and GenderInSITE. He initially joined TWAS in 2011 for five years before moving to UNESCO Headquarters as Director of the PCB Division. In 2017, he was transferred back to TWAS. He served as Rwanda's Minister of Education, S&T and Scientific Research (2001-2006), and as Minister in the President's Office in Charge of S&T, and Scientific Research (2006 - 2009). He also served as chair of the UNSG's High Level Panel on Technology Bank for LDCs and as part of the UN 10-Member Group to support the Technology Facilitation Mechanism.



Yuri Oganessian

Yuri Oganessian is a physicist and scientific director of the Flerov Laboratory at the Joint Institute for Nuclear Research (Dubna, Russia). He is a member of the Russian Academy of Sciences. His scientific achievements in nuclear physics are well known to the scientific community, most of which relate to the synthesis and study of the heaviest elements from 104 to 118 filling the 7th row of the Periodic Table. He developed and used methods for the synthesis of the heaviest nuclides which led to the discovery of the island of stability of super heavy elements. The element 118 was named "oganeson" in recognition of his research.



Peggy Oti-Boateng

Dr Peggy Efua Oti-Boateng is the Director for the Division of Science Policy and Capacity Building at UNESCO Headquarters, in Paris, France, with the responsibility for providing leadership and foresight for the global agenda on science technology and innovation and capacity building in science and engineering for sustainable development. From 2010-2018 she served as Regional Africa Senior Programme Specialist for Science and Technology in the UNESCO Regional Offices for Southern and Eastern Africa, in Zimbabwe and Kenya respectively. Until 2010, she was Director of TCC, College of Engineering, KN University of Science and Technology, Kumasi, Ghana, forging national and international strategic research and innovation alliances.



Robert Parker

After completing a PhD in chemistry, Robert joined the Royal Society of Chemistry working on physical chemistry journals. As he advanced in the organisation, he grew the RSC's publishing operation. Through his tenure as editorial director and then from 2007 as managing director of publishing, he cemented the RSC's position as a leading chemical science publisher. He became CEO of RSC in September 2011, having acted in the role as interim since February that year. During his time as CEO he has led a significant programme of change at the RSC. He is a member of the Executive Board of the European Association for Chemical and Molecular Science, the Chemical Weapons Convention Advisory Committee and the Science Museum Advisory Board

BIOGRAPHIES



Martyn Poliakoff

Sir Martyn Poliakoff is Research Professor of Chemistry at the University of Nottingham. After studying in Cambridge, he spent 7 years at Newcastle University before moving to Nottingham. His current research is in the area of Green Chemistry, devising cleaner processes for making chemicals and materials. From 2011-16, Martyn was Foreign Secretary of the Royal Society, the UK academy of sciences. He is a Foreign Member of the Russian Academy of Sciences. Since 2008, he began collaborating with video-maker Brady Haran to present videos on the Periodic Table and chemistry more widely. The Periodic Table of Videos is now one of the most popular chemistry channels on YouTube, www.periodicvideos.com.



Daya Reddy

Daya Reddy holds the South African Research Chair in Computational Mechanics at the University of Cape Town, South Africa. Following undergraduate studies in civil engineering at the University of Cape Town and a Ph.D. degree at Cambridge University in the UK, he spent a year as a postdoctoral researcher at University College London, then returned to the University of Cape Town, where he held a joint position in civil engineering and applied mathematics. He was appointed professor of applied mathematics in 1989. From 1999, he served a seven-year term as dean of the faculty of science.



Kennedy Reed

Kennedy Reed is President of the International Union of Pure and Applied Physics. His research at Lawrence Livermore National Laboratory focused on atomic processes in high temperature plasmas. He is active in several international scientific organizations, and has developed and directed programmes to encourage students pursuing advanced degrees and careers in STEM disciplines. He is a fellow of the American Physical Society (APS); fellow of the American Association for the Advancement of Science; and recipient of the APS John Wheatley Award for his contributions to Physics in Africa. President Obama awarded him the Presidential Award for Excellence in STEM Mentoring.



Jan Reedijk

Jan Reedijk has retired from Leiden University the Netherlands, where he held the chair of Inorganic Chemistry between 1979 and 2009. He was the founding Director of the Leiden Institute of Chemistry (1993) and served until 2005 in this job. He is a member of the Royal Netherlands Academy of Sciences, and also the Academia Europaea and the Finnish Academy of Sciences. He has been President of the Inorganic Chemistry Division of IUPAC from 2014-2017, and has been Past President of this Division since January 2018, when he also accepted to become a co-chair with Natalia Tarasova of the Interunion Management Committee for IYPT 2109.



Ahmed Salim

Ahmed Salim is a British entrepreneur and creator of high-profile social and educational initiatives that engaged more than 400 million people around the world. He is a producer of award-winning films, exhibitions, books, music and over 100 international live events. He is the Co-Founder and Director of 1001 Inventions, a UK-based science and cultural heritage organization. Under his leadership, 1001 Inventions established a global network of partnerships with public institutions, corporations as well as educational and media organizations including National Geographic. 1001 Inventions helps improve public science awareness and enrich education in schools around the world including refugee camps through a partnership with the United Nations World Food Programme.



Wole Soboyejo

Wole Soboyejo received a BSc in mechanical engineering from King's College London in 1985, and a PhD in materials science from Cambridge University in 1988. He worked as a Research Scientist at the McDonnell Douglas Research Labs (1988-1992). He has taught at The Ohio State University (1992-1999), MIT (1997-1998), Princeton University (1999-2016), the African University of Science and Technology (AUST) (2011-2014) and Worcester Polytechnic Institute (WPI) (2016-present). Soboyejo was President and Provost of AUST (2012-2014) and Dean of Engineering at WPI (2016-2018) before becoming Senior Vice President and Provost ad Interim at WPI.



Sandro Scandolo

Sandro Scandolo is a computational physicist studying the behavior of materials at the nanoscale. He co-developed one of the most popular softwares for quantum materials chemistry (Quantum-Espresso). He has been professor of condensed matter physics at the International School for Advanced Studies and visiting researcher at Princeton University. He received the J.C. Jamieson prize in 1998 and is a Fellow of the American Physical Society since 2016. His research papers have received more than 19,000 citations. He is currently the Head of Scientific Programmes and Outreach at the "Abdus Salam" International Centre for Theoretical Physics (ICTP), a UNESCO Category 1 Institute.



Michel Spiro

Michel Spiro is currently Emeritus Research Director at CEA. Past President of the French Physical Society and President Designate of IUPAP, he is fellow of the EPS, "Chevalier dans l'ordre de la Légion d'honneur" and "Officier dans l'Ordre du Mérite". His initial research in particle physics led him to participate in the discovery of intermediary W and Z bosons at CERN. He became involved in the study of particles from the cosmos and participated in the Gallex experiment for the detection and measurement of solar neutrinos. He was the spokesperson of the EROS pioneer experiment searching for massive astrophysical objects in the halo of our galaxy, a possible component of dark matter.

BIOGRAPHIES



Patrick Steinegger

Patrick Steinegger works as a staff scientist at the Flerov Laboratory of Nuclear Reactions (Joint Institute for Nuclear Research) in Dubna, Russia. His research focuses on the chemical characterization of the newly discovered Superheavy Elements, thereby addressing fundamental questions regarding the structure of the periodic table at its far end. Before joining the renowned Flerov Laboratory, Dr. Steinegger completed his PhD at the University of Bern and the Paul Scherrer Institute in Switzerland. His thesis on vacuum adsorption chromatography for transactinide elements was honoured by the German Chemical Society and awarded with the Eduard-Adolf-Stein Prize of the University of Bern.



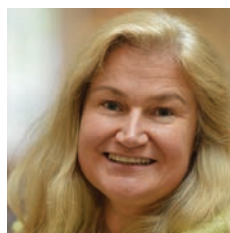
Kohei Tamao

Kohei Tamao is an organic chemist, receiving his doctoral degree from Kyoto University in 1971. After he spent 40 years as a faculty member at Kyoto University, he moved to RIKEN in 2005 and then to TOYOTA RIKEN in 2018, where he now serves as President, as well as a visiting researcher at RIKEN Nishina Center. He is a former president of the Chemical Society of Japan and is currently the chair of the Executive Committee of IYPT2019 Japan. He published the “Periodic Table in Every Home” and is also serving as Program Director of the “Element Strategy Initiative” project in Japan



Natalia Tarasova

Natalia Tarasova is the director of the Institute of Chemistry and Problems of Sustainable Development at D.Mendeleev University of Chemical Technology of Russia and the chairholder of the UNESCO Chair in Green Chemistry for Sustainable Development. She is a member of the Russian Academy of Sciences. She has more than 300 publications in radiation chemistry, green chemistry, and education for sustainable development. She has been President of IUPAC in 2016-2017 and is the Past President since January 2018. She is a member of the Governing Board of the ISC. She is the chair of the IYPT2019 Steering Committee and a co-chair of the IYPT2019 Interunion Management Committee.



Brigitte Van Tiggelen

Brigitte Van Tiggelen is Director for European Operations at the Science History Institute, Philadelphia, USA and member of the Centre de Recherche en Histoire des Sciences, Université catholique de Louvain, Louvain-la-neuve, Belgium. She graduated both in physics and history, and devoted her PhD to chemistry in the 18th century Belgium. She has authored and edited books on collaborative couples and women in science, domestic science and Belgian chemistry. She chairs the Working Party on the History of Chemistry (EuChemS) since 2013 and the Commission for the History of Chemistry and Molecular Sciences (IUHPST) since 2017. To promote history of science among the general public and especially among secondary school teachers, she has founded Mémosciences asbl.



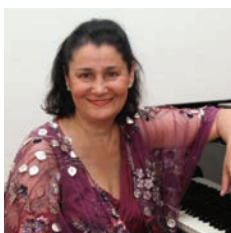
Aslan Tsivadze

Professor Aslan Tsivadze is the President of the Mendeleev Russian Chemical Society, full member of Russian Academy of Sciences, member of Presidium and chairman of Section of Material Sciences, Scientific Director of A.N. Frumkin Institute of Physical Chemistry and Electrochemistry of the RAS, Professor of Lomonosov Moscow State University, Head of the Chair of Inorganic Chemistry of Russia Technological University. A well-known scientist in the field of Inorganic and Physical Chemistry, Coordination and Supramolecular Chemistry, the author of over 500 scientific publications. Vice-Chairman of the Organizing Committee of the Mendeleev Congresses on General and Applied Chemistry.



Pietro Tundo

Professor Pietro Tundo is professor of Organic Chemistry at Ca' Foscari University of Venice, Italy. His main area of research is organic carbonates in the field of Green Chemistry. Prof. Tundo wrote more than 350 research papers, and owns 40 granted patents. Artificial photosynthesis and phase-transfer catalysis were also his research interests. He received many international awards, including American Chemical Society's Kendall Award in 1983, and was appointed as member of the bureau of IUPAC. Prof. Tundo has been establishing and directing eleven Summer Schools on Green Chemistry since 2007, financially funded by the EU, UNESCO, IUPAC and NATO. Out of eleven editions of Summer Schools, roughly 750 students all around the world benefited from this programme.



Mira Yevtich

World renowned concert pianist Mira Yevtich was born in Belgrade (Serbia). She started playing the piano when she was three years old. In addition to a prolific performance and recording schedule, Yevtich is passionately involved in the development and promotion of young musical talent. She is a Co-founder of the Mariinsky International Piano Festival held in St. Petersburg, with the world famous conductor and director of Mariinsky Theatre, Maestro Valery Gergiev. This festival is an important and inspirational musical event and is held twice a year with performances from the world's top pianists.



Qi-feng Zhou

Professor Qi-feng Zhou holds a BS degree from Peking University, MS and PhD from the University of Massachusetts, USA. As Academician of Chinese Academy of Sciences, Professor Zhou has been deeply involved in the study of liquid crystalline polymers with over 200 papers and books. He has also served as vice president of the Chinese Chemical Society, the President of Jilin University and the president of Peking University. For IUPAC, he has been an Elected Member of the Bureau, Member of the Executive Committee of the Bureau and the Vice President; and will serve as the President for 2018-2019.

1001 INVENTIONS: JOURNEYS FROM ALCHEMY TO CHEMISTRY

“1001 Inventions: Journeys from Alchemy to Chemistry” is a new public engagement with science initiative produced by 1001 Inventions in partnership with UNESCO to celebrate IYPT2019. Through live events, short films, science theatre, hands-on workshops and educational resources this global initiative aims to promote science education for all, raise awareness of the importance of chemistry and its applications while fostering diversity and intercultural appreciation.

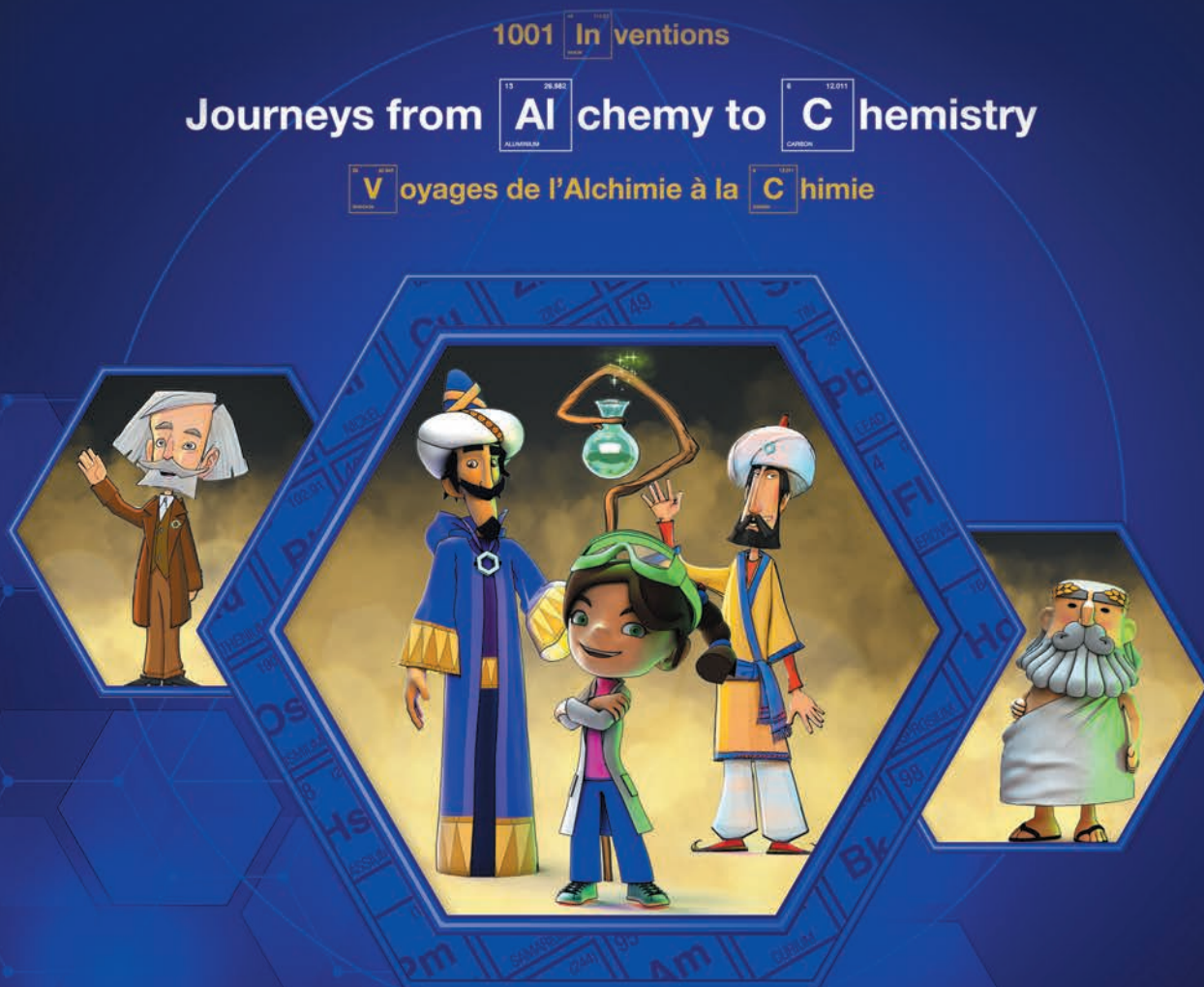
This first-of-its-kind initiative focuses on the contributions to the foundations of modern chemistry by lesser-known pioneers from ancient cultures and civilizations that still influence our world today. It brings to life stories from the history of science with a focus on the remarkable work of the pioneering polymath Jabir ibn Hayyan, also known as Geber, in the 8th century.

The highlight of the launch at UNESCO HQ is an event organized for primary school students in Salle IV. Thousands of children will be engaged over five days through a short animation video narrated by Professor Jim Al-Khalili, renowned scientist, author, broadcaster and the President of the British Science Association. Also through immersive on-stage experiments weaved in a theatrical performance as well as exciting hands-on workshops. Teachers will

receive educational material to help them continue the learning journey with their students. All activities, themed on IYPT2019, creatively introduce children to the Periodic Table and the fascinating journey from alchemy to chemistry, across the ages, by remarkable pioneers from different backgrounds and cultures.

From UNESCO HQ in Paris, the initiative then rolls out on a global tour in partnership with museums, science centres, festivals, schools, universities and libraries aiming to engage millions of young people around the world with IYPT themes, and inspire a future generation of chemists and scientists while promoting cross-cultural understanding.

About 1001 Inventions
1001 Inventions is an award-winning, British based organization that creates global educational campaigns and engaging transmedia productions that raise public awareness of historical contributions to science, technology and culture. The organization has engaged with over 400 million people and works with a network of international educational and institutional partners including UNESCO, World Food Programme and National Geographic. It produces interactive events, short films, live shows, books and exhibitions that have received more than 15 million visitors across 40 countries.
www.1001inventions.com





All-Russian
Science
Festival

NAUKA O+ SCIENCE FOR ALL: INTERACTIVE CHEMISTRY EXHIBITION

The Management Committee of the International Year of the Periodic Table of Chemical Elements (IYPT2019) in partnership with All - Russian Science Festival invites you to visit an Interactive Exhibition on Chemistry at UNESCO Headquarters from 28 to 30 January 2019.

Launched as part of the Opening Ceremony of the International Year of the Periodic Table of Chemical Elements (IYPT2019) on January 29th, this exhibition will travel around the world during the year 2019.

Science for All: Interactive Chemistry Exhibition - an exciting journey into the world of «living» Chemistry where you will have the opportunity to feel like a real scientist, to carry out a series of chemical experiments, discover the history, immerse yourself into virtual reality and explore outer space.



1. Historical zone. Take a selfie in Mendeleev's Cabinet

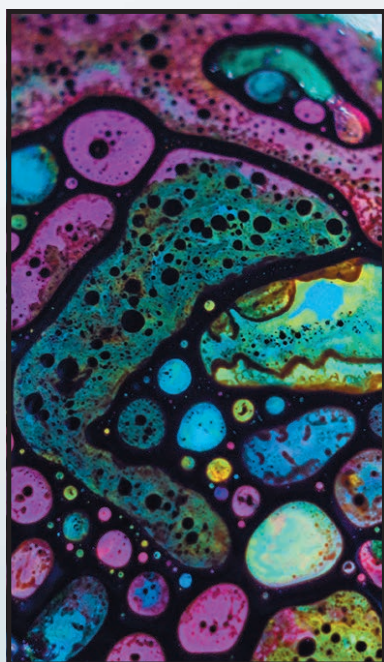
This year, it is a century and a half since the creation of the Periodic Table. In 1869 there were no Internet, computers, smartphones and many other modern devices. We reconstructed the study of a chemist who worked in the nineteenth century. In the exhibition, visitors can see the basic scientific tools of that time, look at the first publication of the Table, and even take a selfie with its creator, Dmitrii Ivanovich Mendeleev.

2. Zone of space. Find out where it all came from

How did hydrogen appear? And Iron? And what about Gold? Answers to these seemingly simple questions lie in the depths of the Universe. The birth of the chemical elements that surround us was due to Space. These were large-scale phenomena: the Big Bang, thermonuclear reactions in the depths of stars, supernova explosions, the merging of neutron stars. Right now, over our heads, huge pressures and temperatures convert Hydrogen into Helium, Helium into Carbon, Carbon into more heavy elements up to the Iron, and temperatures convert hydrogen into helium, helium into carbon, carbon into heavier elements including iron, and finally during the fireworks of neutron stars colliding, argon, gold and uranium are born.

3. Zone of novel elements. See how new elements are synthesized

No matter how powerful the Cosmos is, only chemical elements up to and including Uranium can appear in nature. Everything that goes in the Table after Uranium is man-made. Since the middle of the 20th century, scientists have been synthesizing new super heavy elements. In accelerators, the nuclei of some isotopes are accelerated and collided with targets made of other isotopes. At the exhibition, you can visit the stand of the famous Joint Institute for Nuclear Research located in the city of Dubna, Moscow Region. In recognition of the achievements of scientists of this institute, elements 105 (Dubnium), 114 (Flerovium), 115 (Moscovium) and 118 (Oganesson) have been named.



4. Zone of Education. Dive into virtual reality

Learning can be fun! You will have a chance to become acquainted with the latest training technologies. There will be immersion in virtual reality, vivid experiments and much more, after which you will never say that chemistry is boring.



5. ArtScience zone. Combine smart with beautiful

In this part of the Exhibition, you can see the artwork inspired by chemistry. Elements will appear before you in vivid images, where the human is intertwined with the scientific and strict facts, with creative imagination.

6. IT zone. Create your own Table

There are many versions of the Table of elements. Some variants are intended for younger students, some for high school students, and others for professional scientists. A team of chemists, designers and programmers gathered several thousand variants of the Table and made a system that can satisfy everyone. In interactive mode, one can receive one's preferred format of presentation of chemical elements - a simple table with pictures or a more complicated version with a larger set of parameters.

7.**Zone of experiments.
Take part in research**

Everything will be collected here that is attractive to students of chemistry. Anyone can become a participant of scientific experiments. All these experiments are very impressive: sounds, colours, violent reactions and ... a little bit of magic.

8.**Zone of green chemistry.
Make the Earth better**

At this stand, you can be acquainted with the works of the winners of the world young scientist competition. This competition was held under the slogan "Green Chemistry for life!" and focused on how to make our world cleaner and technologies, more environmentally friendly.

PERIODIC TABLE OF CHEMICAL ELEMENTS

										He Helium
										He Helium
										Ar Argon
Mn Manganese	Fe Iron	Co Cobalt	Ni Nickel	Cu Copper	Zn Zinc	Ga Gallium	Ge Germanium	As Arsenic	Se Selenium	Kr Krypton
Tc Technetium	Ru Ruthenium	Rh Rhodium	Pd Palladium	Ag Silver	Cd Cadmium	In Indium	Sn Tin	Sb Antimony	Te Tellurium	Xe Xenon
Re Rhenium	Os Osmium	Ir Iridium	Pt Platinum	Au Gold	Hg Mercury	Tl Thallium	Pb Lead	Bi Bismuth	Po Polonium	
Bh Bohrium	Hs Hassium	Mt Meitnerium	Ds Darmstadtium	Rg Roentgenium	Cf Californium	Fr Francium	Ra Radium	Ac Actinium		
Sm Samarium	Eu Europium	Gd Gadolinium	Tb Terbium	Dy Dysprosium						
Pu Plutonium	Am Americium	Cm Curium	Bk Berkelium	Cf Californium						

**9.****Molecular bar.
Taste science**

Chemistry surrounds us everywhere, even on our plate. You can take a break from lectures and excursions in the Molecular bar, where unusual dishes created using chemistry and physics technologies await you. For example, ice cream cooked directly at the exhibition using liquid nitrogen. Try it, it is tasty and, at the same time, informative.

**10.****Chemical robot.
Determine what you
consist of**

A special installation is brought to the exhibition, which allows you in a few seconds to determine the ratio of different chemical elements in a person. Anyone can pass such a test. Find yourself in the great Table!

PRACTICIPANTS OF THE UNESCO EXHIBITION

1. Alexandre Marciel
(The educational module)
Company SOVAMEP
2. American Chemical Society (ACS)
3. ArtLebedev Studio
4. Chinese Chemical Society
5. D. Mendeleev University of Chemical
Technology of Russia (Mendeleev
University)
6. European Chemical Society
(EuChemS)
7. Dr Hal Sosabowski
(Science show)
8. International Union of Pure and
Applied Chemistry (IUPAC10)
9. Joint Institute for Nuclear Research
10. Lomonosov Moscow State University
11. Newton Park
12. PJSC PhosAgro
13. King's College London: School of
Biomedical Engineering and Imaging
Sciences
14. Space Research Institute of the
Russian Academy of Sciences
15. Stardust Elements
16. State Atomic Energy Corporation
ROSATOM
17. State Memorial Museum
D.I. Mendeleev and A.A. Block
18. The Deutsche Museum in Munich
19. Theodore Grey
(Fountain of Elements)
20. UNC Charlotte Department of
Chemistry
21. Company Beauty of Science (BOS)
22. Company Mel Science
23. University of StAndrews



JOINT INSTITUTE for NUCLEAR RESEARCH

INTERNATIONAL INTERGOVERNMENTAL ORGANISATION

Science bringing nations together

JINR Laboratories

- Veksler and Baldin Laboratory of High Energy Physics
- Dzhelepov Laboratory of Nuclear Problems
- Bogolubov Laboratory of Theoretical Physics
- Frank Laboratory of Neutron Physics
- Flerov Laboratory of Nuclear Reactions
- Laboratory of Information Technologies
- Laboratory of Radiation Biology

JINR Research Areas

- Theoretical Physics
- Particle Physics
- Nuclear Physics
- Condensed Matter Physics
- Networks, Computing
- Applied Research

JINR in Figures

- 18 Member States
- over 5000 staff members
- 1200 researchers
- 1000 Doctors of Science and PhDs
- 2000 engineers and technicians
- 1500 scientific publications per year
- over 70 international conferences and workshops per year
- 800 partner universities, laboratories and research centres in 64 countries

Unique Park of Basic Facilities

- IBR-2 Fast Periodic Pulsed Reactor
- Nuclotron Strong-focusing Synchrotron
- SHE Super Heavy Elements Factory
- IREN Intense Neutron Source
- Babai DVD Project Neutron Detector
- NSC Neutron Scattering on Colloids
- 2000 computer workstations

THE PERIODIC TABLE OF NUCLEAR MEDICINE

150 YEARS

PERIODIC TABLE C

Laboratory

LABORATOIRE
LABORATORIO
LABORATORIA

La 139 Ruthenium

Ru 44 Hydrogen

H 1 Lithium

Li 3 Nitrogen

N 7 Phosphorus

P 15 Potassium

K 39

The purple tint of the cubes is a very t...
Exposed to air th...
Exposed to water...
sending off char...
flaming drops

SI, Mg, Ne

NEUTRON STAR

Be, C, O

MÉDECINE MEDICINA МЕДИЦИНА

دواء
藥

radionuclides with uses or identified potential uses in molecular imaging (PET), (SPECT), (positron emission tomography) and (gamma camera) and their importance (e.g. as parent radionuclides for direct radionuclide labelling, hence the "usefulness" is somewhat arbitrary).

Paul Blower
Professor of Imaging Chemistry
School of Biomedical Engineering and Imaging
King's College London, St Thomas' Hospital

SELECTION OF WORLDWIDE IYPT EVENTS IN 2019

- **Periodic Table Challenge.** This global, multilingual online competition will engage potentially millions of high school students (and the general public) and educate them not only on the Periodic Table, but also on many other related aspects of chemistry. IUPAC. Throughout 2019;
 - **Empowering Women in Chemistry: A Global Breakfast Event.** This global initiative will bring together women chemists and chemistry students from around the world for a breakfast celebration in recognition of IUPAC's centenary. The use of teleconference, skype, social media, and blogs will facilitate networking. This global "handshake" will begin in New Zealand and Australia, culminating twenty-four hours later in Hawaii, and the event will be tracked in real-time. 12 February 2019;
 - **International symposium on Setting their Table: "Women and the Periodic Table of Elements"** (Website <http://www.iypt2019women.es/>). A conference will be organized in Murcia, Spain dedicated to the International Day of Women & Girls in Science. 11 -12 February 2019;
 - **Periodic Table of Younger Chemists.** In celebration of the 100th anniversary of IUPAC and the International Year of the Periodic Table, IUPAC and IYCN announce the creation of a Periodic Table of Younger Chemists. Beginning in July 2018 and ending in July 2019 at the World Chemistry Congress and IUPAC General Assembly, we will honor a diverse group of 118 outstanding younger chemists from around the world who in embody the mission and core values of IUPAC. The resulting Periodic table will highlight the diversity of careers, creativity, and dedication of the young chemists leading us into the next century. Winners will be profiled on the IUPAC100 website and will receive a certificate from IUPAC. Approximately eight elements will be revealed each month beginning in July 2018 with the final elements being awarded at the IUPAC General Assembly and World Chemistry Congress in Paris, France in July, 2019;
 - **Opening Ceremony of the IYPT in Russia.** The birthday of Dmitry Mendeleev will be celebrated with an IYPT Opening ceremony in Moscow. 6 February 2019;
 - **JINR Foundation Day.** Joint Institute for Nuclear Research will launch Super Heavy Elements (SHE) Factor. 26 March 2019;
 - **Postgraduate Summer School on Green Chemistry in Africa (Tanzania).** The 2019 IUPAC Summer School on Green Chemistry will be the first held in Africa and managed by the IUPAC Interdivisional Committee on Green Chemistry for Sustainable Development (ICGCSD). Green Chemistry is one of the key sciences of a sustainable development on earth and required for reaching the 17 UN-Goals. 12 May 2019 -19 May 2019;
 - **The Periodic Table at 150.** High profile symposium at IUPAC World Chemistry Congress in Paris, France. 5 to12 July 2019;
 - **51st International Chemistry Olympiad** in Paris, France. 21-30 July 2019. Closing ceremony will take place at UNESCO HQ. 29July 2019;
 - **Mendeleev Congress on General and Applied Chemistry** dedicated to the International Year of the Periodic Table in Saint Petersburg, Russia. The program of the 21st Mendeleev Congress will include plenary and section lectures, poster presentations, symposia and round-table discussions on main areas of chemistry, chemical technology, and chemical education. <https://mendeleev2019.ru> 9 to 13 September 2019;
 - **Periodic Tables for high school students in Africa.** Personal size copies of the Periodic Table are to be distributed to high school students in Africa. 2019;
 - **Closing Ceremony.** Celebration of IYPT. Tokyo, Japan. 5 December 2019.
- For more information,
please visit IYPT official website:
www.iypt2019.org.

ALL-RUSSIA SCIENCE FESTIVAL 2019

IYPT Opening ceremony and Exhibition is supported by All-Russia Science Festival (<http://en.festivalnauki.ru>), launched thirteen years ago by Lomonosov Moscow State University. Now it is a grand Russian national and international event. Its mission is to promote science and encourage young people to study and dedicate their lives to academic research. This year more than 2.5 million people attended lecture and exhibition programs. Every year most prominent scholars, including Nobel Prize laureates share their knowledge and celebrate science during festival events and activities. This year Science Festival is dedicated to the International Year of the Periodic Table of Chemical Elements.





DMITRI IVANOVICH MENDELEEV
1834-1907

ART. LEBEDEV

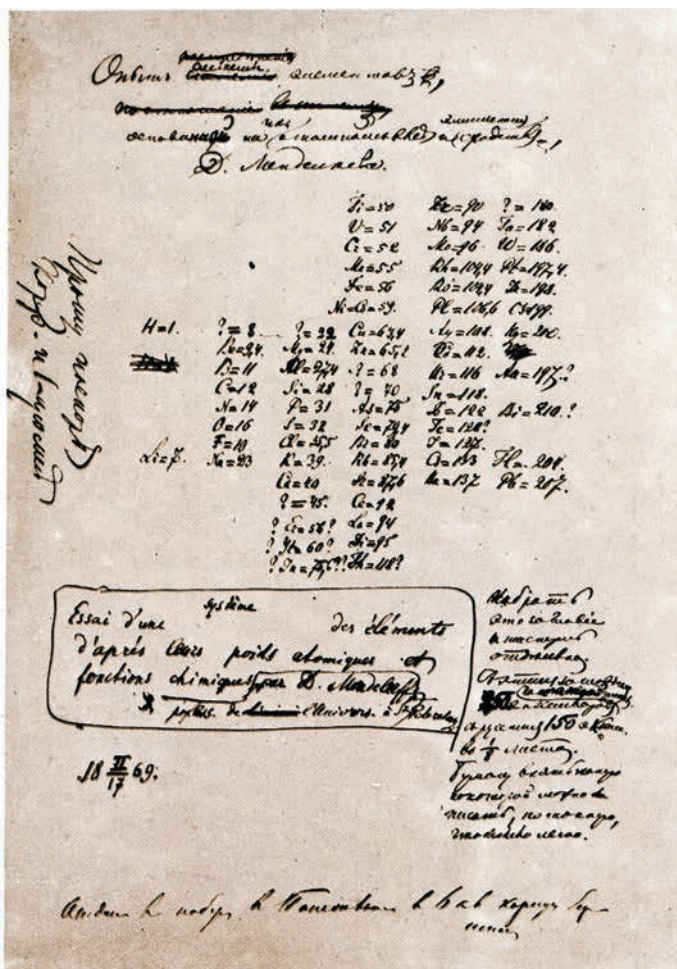
The law formulated by Dmitri Mendeleev established the periodic dependence between properties of chemical elements and their atomic weight. This discovery made a great contribution to science, defining the principles of the interrelation of element properties.

The Periodic Law gave scientists the key to unraveling the principles of the structure of matter leading to the rapid development of chemistry and other sciences.

In February 1869 Mendeleev formulated the idea that after a certain number of various elements in a row, their properties begin to repeat.

A month later, the presentation titled The Dependence between the Properties of the Atomic Weights of the Elements was made to the Russian Chemical Society containing the following basic statements:

- The elements, if arranged according to their atomic weight, exhibit an apparent periodicity of properties.
- Elements which are similar regarding their chemical properties either have similar atomic weights (e.g., Ir, Pt, Os) or have their atomic weights increasing regularly (e.g., K, Rb, Cs).



— 70 —

но въ ней, мнѣ кажется, уже ясно выражается примѣнность выставляемаго мною начала ко всей совокупности элементовъ, най которыхъ извѣстенъ съ достовѣрностію. На этотъ разъ я и желалъ преимущественно найти общую систему элементовъ. Вотъ этотъ опытъ:

H=1	Be=9,4	Mg=24	Al=27,4	Si=28	P=31	S=32	Cl=35,5	Br=80	K=39	Rb=85,4	Cs=133	Fr=201
Li=7	Na=23	Ca=40	Sr=87,6	Ba=137	Pb=207	Th=118?						

и потому приходится въ разныхъ рядахъ имѣть различное измѣненіе разностей, чего нѣтъ въ главныхъ числахъ предлагаемой таблицы. Или же придется предлагать при составленіи системы очень много недостающихъ членовъ. То и другое мало выгодно. Мнѣ кажется пріятно, насколько естественнымъ составить кубическую систему (предлагаемая есть плоская), но и попытка для ея образованія не повела къ надлежащимъ результатамъ. Слѣдующія двѣ попытки могутъ показать то разнообразіе сопоставленій, какое возможно при допущеніи основнаго начала, высказаннаго въ этой статьѣ.

Li	Na	K	Cu	Rb	Ag	Cs	—	Tl
7	23	39	63,4	85,4	108	133	—	204
Be	Mg	Ca	Zn	Sr	Cd	Ba	—	Pb
B	Al	—	—	—	—	—	—	Bi?
C	Si	Ti	—	Zr	Sn	—	—	—
N	P	V	As	Nb	Sb	—	—	Ta
O	S	—	Se	—	Te	—	—	W
F	Cl	—	Br	—	J	—	—	—
19	35,5	58	80	190	127	160	190	220.

INITIATOR OF THE YEAR



MENDELEEV RUSSIAN
CHEMICAL SOCIETY

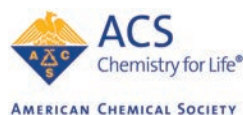
FOUNDING PARTNERS



PUBLIC ENGAGEMENT PARTNER

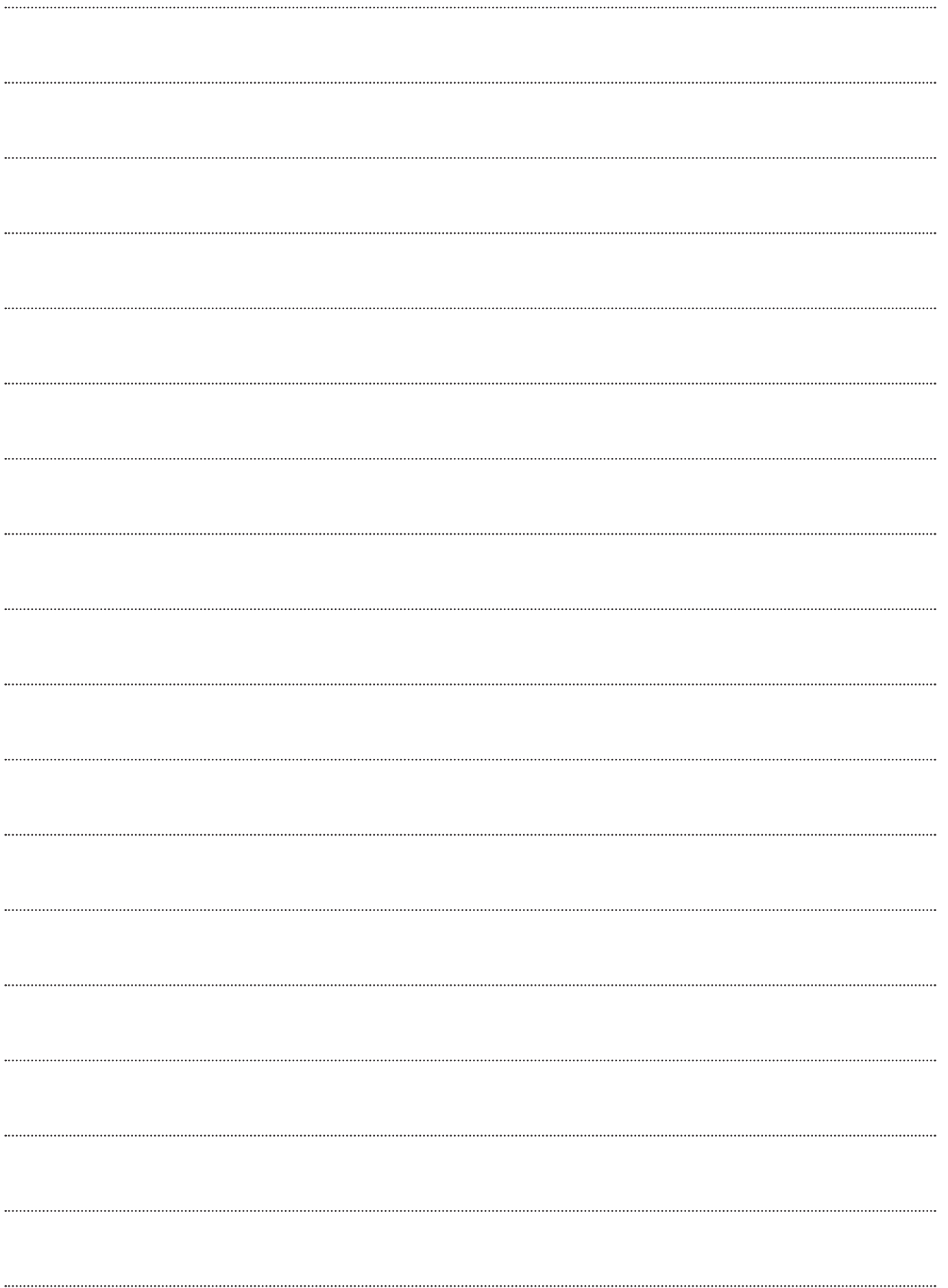


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