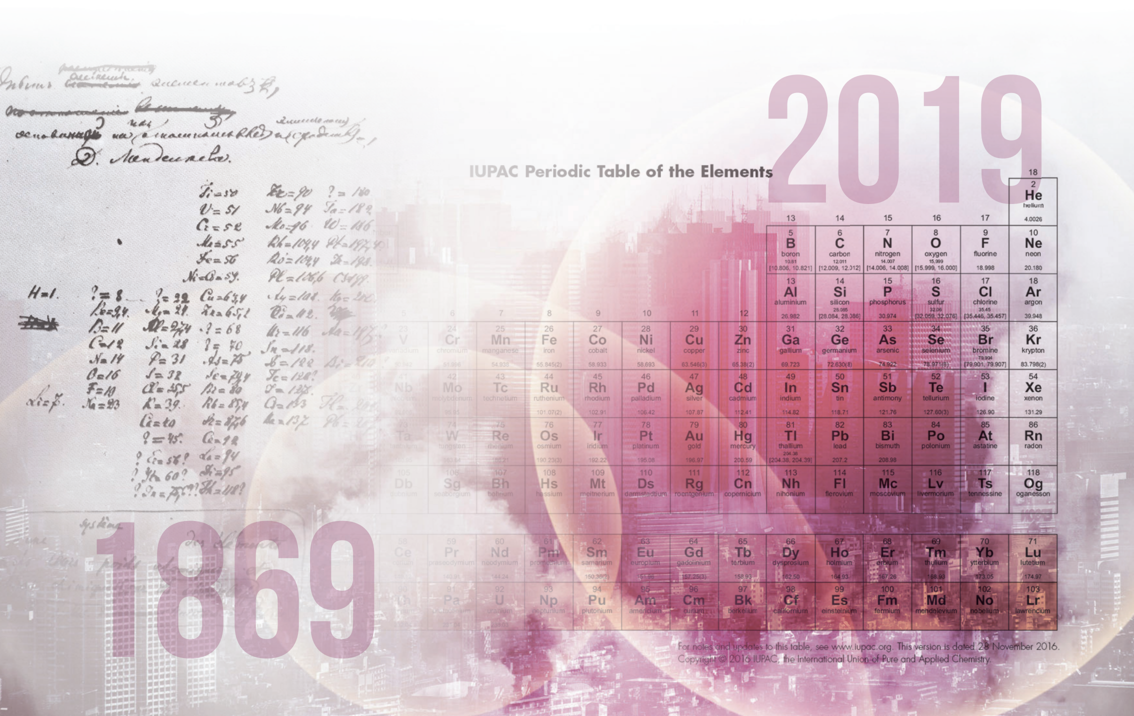
International Year
of the Periodic Table of Chemical Elements

2019
IYPT

SCIENCE — SOCIETY — WORLD — SUSTAINABLE DEVELOPMENT



PARTNERS

The initiative of the International Year of the Periodic Table of Chemical Elements is supported by the International Union of Pure and Applied Chemistry (IUPAC), International Union of Pure and Applied Physics (IUPAP), European Association for Chemical and Molecular Sciences (EuCheMS), The International Council for Science (ICSU), International Astronomical Union (IAU), The International Union of History and Philosophy of Science and Technology (IUHPS).

MOTIVATION

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 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 father 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 will be the 150th anniversary of the Periodic Table of Chemical Elements!

The International Year of the Periodic Table of Chemical Elements will be a world-wide initiative to highlight the importance of the Periodic Table in science, technology, and sustainable development of humankind.

A giant periodic table at the University of Murcia (Spain)

HISTORY OF DISCOVERY – MENDELEEV AND THE PERIODIC TABLE

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.

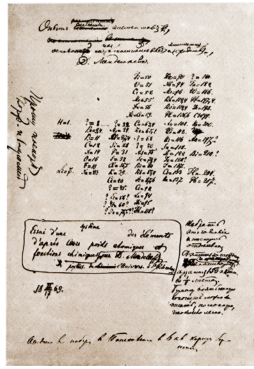
By the middle of the 19-th century, 63 chemical elements were already discovered, and attempts to find regularities in this set had been made repeatedly. In 1829, Döbereiner published the «Law of Triads»: the atomic mass of many elements is close to the arithmetic mean of two other elements close to 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 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 know 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 know atomic weights and predicted that there were certain elements still to be discovered.

As has been mentioned, 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. Subsequently, the unknown elements he had predicted, gallium (1875), scandium (1879) and germanium (1887) were discovered and had the properties he predicted for them.

According to legend, the idea of a system of chemical elements came to Mendeleev in a dream, but it is known that when asked how he discovered the periodic system, the scientist replied: «I've thought about it for twenty years, but you think: he was sitting and suddenly… it's ready».



ОПЫТ СИСТЕМЫ ЭЛЕМЕНТОВ,
ОСНОВАННОЙ НА ИХ АТОМНОМ ВЕСЕ
И ХИМИЧЕСКОМ СХОДСТВЕ

			Ti = 50	Zr = 90	? = 180.
			V = 51	Nb = 94	Ta = 182.
			Cr = 52	Mo = 96	W = 186.
			Mn = 55	Rh = 104,4	Pt = 197,4
			Fe = 56	Ru = 104,4	Ir = 198.
			Ni = Co = 59	Pl = 106,6	Os = 199.
H = 1			Cu = 63,4	Ag = 108	Hg = 200.
	Be = 9,4	Mg = 24	Zn = 65,2	Cd = 112	
	B = 11	Al = 27,4	? = 68	Ur = 116	Au = 197?
	C = 12	Si = 28	? = 70	Sn = 118	
	N = 14	P = 31	As = 75	Sb = 122	Bi = 210?
	O = 16	S = 32	Se = 79,4	Te = 128?	
	F = 19	Cl = 35,5	Br = 80	J = 127	
Li = 7	Na = 23	K = 39	Rb = 85,4	Cs = 133	Tl = 204.
		Ca = 40	Sr = 87,6	Ba = 137	Pb = 207.
		? = 45	Ce = 92		
		?Er = 56	La = 94		
		?Yt = 60	Di = 95		
		?In = 75,6	Th = 118?		

Д. Менделеев.

FROM CLASSIFICATION TO LAW, FROM LAW TO SYSTEM AND FINALLY FROM SYSTEM TO TABLE

The Periodic Table (System) was discovered in an era when atomic structures and electrons where not known, and equipment to purify and separate elements was still primitive. The discoveries of Mendeleev, Meyer and others are therefore to be seen as immense. After the first International Conference of Chemists in 1860 (Karlsruhe), which both Mendeleev and Meyer attended, it became clear that a number of scientists had noted some regularities between chemical elements. The discoveries published in 1869 by Mendeleev, first in a vertical order, later that year in a horizontal arrangement, were preceded by discoveries of similar "regularities" from Béguyer de Chancourtois, Newlands, Odling, Hinrichs and Lothar Meyer. Only Meyer produced a quite similar tabular arrangement, in fact just after Mendeleev. There is little discussion that Mendeleev published his system noting that there was a periodic classification, i.e. the periodic law and the systematic arrangements of the elements, including some of the not yet discovered elements for which he even predicted chemical properties. Despite the fact that some of these predictions were incorrect and that in his system there was no place for the Noble Gases, he is still generally accepted as the chief architect, since he discovered the "system"; only later it was changed to "Table" as we now use in Periodic Table of Elements. Remarkable, the word "System" is still used as in "Periodic System" in a number of languages, e.g. Danish ("Periodiske system"), Dutch ("Periodiek systeem") and German ("Periodensystem"), just as Mendeleev and Meyer used it in their papers.

DISCOVERY OF NEW ELEMENTS OF THE PERIODIC TABLE OF ELEMENTS

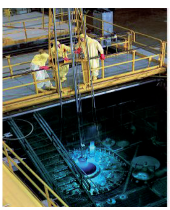
After the discovery in 1940-41 of the first artificial elements – neptunium and plutonium – the problem of the boundaries of the periodic table, the nuclear and chemical properties of the extremely heavy nuclei turned out to be of fundamental interest for natural scientists. Studies have now been carried out for many years in the major research nuclear centers in Germany, the USA, Japan, France, China and in the Flerov Laboratory of nuclear Reactions of the Joint Institute for Nuclear Research in Dubna, Russia.

By the beginning of the 1950 all available cells in the Periodic table of chemical elements had been filled and 8 transuranic elements have been synthesized. New elements were synthesized by the successive capture of neutrons by uranium nuclei in nuclear reactors, or by prompt capture of 15 – 20 neutrons in thermonuclear explosions.

A fundamentally new approach to the synthesis of elements in fusion reactions of heavy nuclei was proposed independently by professors A. Ghiorso and G. Seaborg at the Berkeley National Laboratory, USA and by professor G. Flerov in the Laboratory No. 2 of the Academy of Sciences in Moscow, USSR (now it is the National Research Center «Kurchatov Institute»).

On the initiative of Prof. G. Flerov the Laboratory of Nuclear reactions was founded in the Joint Institute for Nuclear Research (JINR), organized at Dubna near Moscow in 1956. The new laboratory was equipped with a heavy-ion accelerator U300. This was the start of a new direction in nuclear physics – heavy ion physics.

The International Unions of Pure and Applied Physics (IUPAP) and Chemistry (IUPAC) recognized the priority of Dubna in the discovery of elements 102-105 and marked the great contribution of JINR in the discovery of elements 106-108. In 1997 at the general Assembly of IUPAC element No 105 was named “Dubnium” as a sign of recognition of the key role of the Laboratory of Nuclear Reactions in the outlining of the scientific strategy and synthesis of superheavy elements. Like berkelium and dubnium, the element 110 darmstadtium honors the city of Darmstadt (Germany) which houses the Helmholtz Centre for Heavy Ion Research GSI where 6 new elements (107 – 112) had been discovered.



By the end of the last century, 20 artificial transuranic elements had been discovered. It was found that the nuclear stability and the probability of formation of transuranic elements decrease dramatically with increasing atomic number. It was thought that even a modest advance into the region of even heavier elements would lead to the limit of their existence.

By the end of the 1990s, the scientists in the Dubna Laboratory of nuclear reactions managed to make a break-through in the synthesis of superheavy elements and in the understanding of the problem of their stability. Due to the achieved high efficiency of heavy ion beams acceleration and the considerable improvement of the experimental methods, the new elements with atomic numbers 113 - 118 were synthesized for the first time.

For the element with atomic number 113 the discoverers at RIKEN Nishina Center for Accelerator-Based Science (Japan) proposed the name nihonium and the symbol Nh. Nihon is one of the two ways to say "Japan" in Japanese, and literally mean "the Land of Rising Sun".

For the element with atomic number 114 the discoverers proposed the name flerovium and the symbol Fl. For the element with atomic number 115 the name proposed was moscovium with the symbol Mc. These names are in line with tradition of honoring a place or geographical region and are proposed jointly by the discoverers at the Joint Institute for Nuclear Research, Dubna (Russia), Oak Ridge National Laboratory (USA), Vanderbilt University (USA) and Lawrence Livermore National Laboratory (USA). For the element with atomic number 116 the name proposed is livermorium with the symbol Lv. This is again in line with tradition and honors the Lawrence Livermore National Laboratory (1952).

For the element with atomic number 117 the name tennessine with the symbol Ts was accepted. Tennessine is in recognition of the contribution of the Tennessee region, including Oak Ridge National Laboratory, Vanderbilt University, and the University of Tennessee at Knoxville, to superheavy element research, including the production and chemical separation of unique actinide target materials for superheavy element synthesis at ORNL's High Flux Isotope Reactor (HFIR) and Radiochemical Engineering Development Center (REDC).

For the element with atomic number 118 the collaborating teams of discoverers at the Joint Institute for Nuclear Research, Dubna (Russia) and Lawrence Livermore National Laboratory (USA) proposed the name oganesson and symbol Og. The proposal is in line with the tradition of honoring a scientist and recognizes Professor Yuri Oganessian for his pioneering contributions to transactinoid elements research. His many achievements include the discovery of superheavy elements and significant advances in the nuclear physics of superheavy nuclei including experimental evidence for the "island of stability".

The discovery of element 118 completes the 7th row of the periodic table. Scientists accociate the further progress in the synthesis of the 8th row elements with the creation in Dubna of the modern accelerator complex - the world's first factory of superheavy elements. The question of the boundaries of the Periodic table of elements remains open.

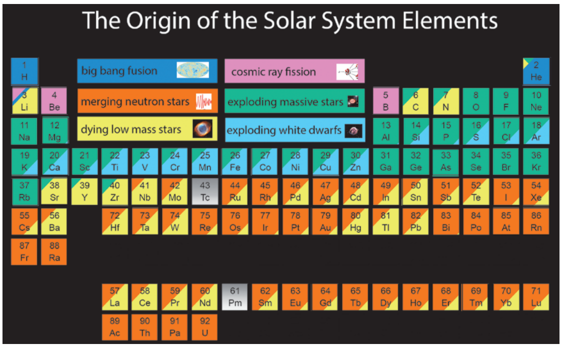
PERIODIC TABLE AND SOCIETY

RADIOCHEMISTRY - NUCLEAR MEDICINE

At the end of the 19th and the beginning of the 20th century, apart from the discovery of the Periodic Law of chemical elements by Dmitry Mendeleev, there was another equally important discovery that determined to a large extent the development of humanity: the discovery of the phenomenon of radioactivity, as well as new, previously unknown radioactive elements. The sources based on these elements, primarily radium, were used by Marie Skłodowska Curie and Irene Curie to conduct the first diagnostic procedures for wounded and shell-shocked soldiers in mobile front-line hospitals. In fact, this was the first medical application of radiation. Since then, many new radioactive elements and radionuclides have been discovered, some of which have found application in nuclear medicine. Modern nuclear medicine involves first of all an effective and personalized diagnosis and therapy of socially significant diseases. Other applications of nuclear medicine include targeted delivery of diagnostic or therapeutic radiopharmaceuticals to pathological organs and tissues. This, on the one hand, makes it possible to carry out a molecular visualization of these drugs in the lesions, and on the other hand, to carry out the local irradiation of the lesions without affecting healthy tissues. Nuclear medicine today is a modern interdisciplinary field related to the development of methods for obtaining and isolating radionuclides, analytical chemistry, biochemistry, cellular biology, and medicine.

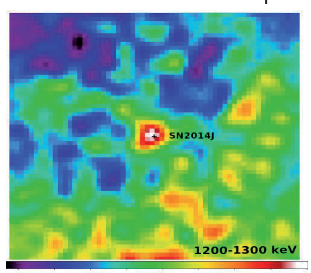
CHEMICAL ELEMENTS AND COMPOUNDS IN SPACE

Chemical elements, that is, ordinary (baryonic) matter consisting of protons, neutrons and electrons, correspond to only a small part of the Universe. Modern observations can serve as a basis for an assumption that they account for about 5% of the total mass-energy of the Universe, and most are provided by "dark" energy (69%) and "dark" matter (26%), the nature of which is still unknown. Nevertheless, it is from baryons that stars, planets and their satellites, asteroids, comets and many other objects are composed. The prevalence of various chemical elements outside the Earth is determined, as a rule, from the absorption or emission lines in the spectra of stars and the interstellar medium.



The physical picture leading to this distribution is very beautiful. The lightest elements, in particular, helium arose in the process of primary nucleosynthesis during the Big Bang. This allows us to use the abundance of helium to determine the properties of our Universe. Heavier elements, beginning with carbon and ending with a peak on the elements of the iron group, are naturally synthesized during thermonuclear burning in the bowels of ordinary stars and during supernova explosions. The peak of iron abundance is related to the fact that the iron nuclei have the maximum binding energy per nucleon. To create even heavier elements, special conditions are needed, for example, an excess of neutrons.

In addition to individual chemical elements, more than one hundred and fifty different molecules are known in space. About one third of them are complex polyatomic molecules, the basis of which is carbon. Particularly rich in molecular compounds are the regions of star formation and planetary nebulae. Recent discoveries of organic compounds in the interstellar medium support the argument that life, although originating on Earth, has deep cosmic roots in the form of prebiotic compounds found in interstellar space, protoplanetary disks, comets, and meteorites.



The image of supernova SN2014J as obtained by the INTEGRAL observatory in the energy range containing the decay line of the radioactive ^{56}Co with an energy of 1237 keV. Ordinary iron ^{56}Fe arises during the decay of ^{56}Co.

Spectral lines associated with transitions in atoms and molecules are the most important source of information about all types of objects in the Universe, from the determination of distances to remote objects by the redshift and the measurement of the magnetic fields by the Zeeman effect, to the search of organic compounds in the atmospheres of exoplanets.

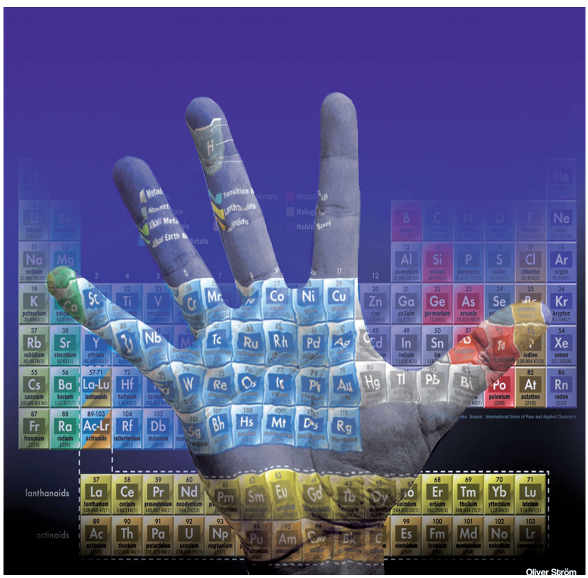
CHEMISTRY – OUR LIFE, OUR FUTURE

International Year of CHEMISTRY 2011

The International Year of the Periodic Table will be closely related to the International Year of Chemistry 2011 (IYC 2011), a year-long commemorative event for the achievements of chemistry and its contributions to humankind. The global significance of chemistry was officially recognized in a resolution adopted by the United Nations during its 63rd General Assembly in December 2008. Events for IYC 2011 were coordinated by IUPAC, the International Union of Pure and Applied Chemistry, and by UNESCO, the United Nations Educational, Scientific, and Cultural Organization. IYC 2011 was aimed to raise awareness of chemistry among the general public and to attract young people into the field, as well as to highlight the role of chemistry in solving global problems. The theme of IYC2011 was "Chemistry – our life, our future".

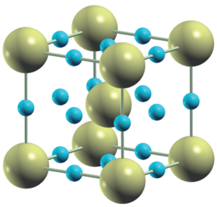
The official launch ceremony of the IYC 2011 took place on 27–28 January, 2011 in Paris at the headquarters of UNESCO. More than 1 000 delegates from 60 countries participated in the ceremony. Four Nobel Prize Winners attended. UNESCO Director General Irina Bokova delivered the opening address. She emphasized that chemistry connects all the other sciences. It explores the building blocks of life, it investigates the materials that constitute it and it explores the energy that drives it. Chemistry provides openings to understanding our planet and cosmos. Its responsible development and use is part of the answer to core questions we face today – questions of how to feed people, improve health, protect the environment and develop sustainably.

An important event of IYC 2011 was the inauguration of two super heavy elements with atomic numbers 114 and 116, flerovium and livermorium. The inauguration was held in 2012 in Moscow, Russia with the participation of the Joint Research Institute for Nuclear Research in Dubna (Russia), the Oak Ridge National Laboratory (USA), Vanderbilt University (USA), Lawrence Livermore National Laboratory (USA). Professor Nicole Moreau, IUPAC President, attended. This event confirmed once again the significance of the Periodic Law and Periodic Table of Elements.



GRAND CHALLENGE: PREDICTION OF NOVEL MATERIALS

Throughout the 20th century, physicists worked out theories to calculate properties of materials, knowing only their crystal structures. Armed with these theories, today's researchers can predict many properties of a material, real or hypothetical, just from the knowledge of atomic positions and from the fundamental laws of physics. Later, in the 21st century, methods for predicting crystal structures were developed, enabling screening for novel materials on the computer and thus accelerating the path to materials discovery.

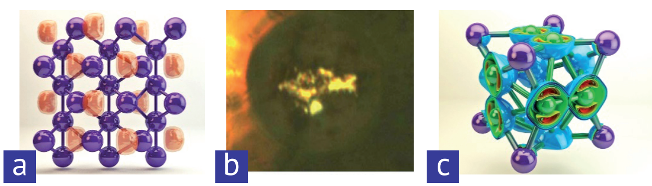


Crystal structure of H_3S, the highest-temperature known superconductor. Its discovery was one of triumphs of modern chemistry and physics.

To spur these efforts and link theory, experiment and industry, the USA President's Administration has announced in 2011 the Materials Genome Initiative, which soon thereafter was replicated by the Chinese government. Within several years, many exciting discoveries were made – both of new materials and new phenomena, hitherto unsuspected. For example, computational prediction has paved the way to the new record of high-temperature superconductivity – exotic material H_3S, defying standard rules of chemistry and formed under pressure, was experimentally shown to be a near-room-temperature superconductor (Tc=203 K). Novel polymers, magnets, thermoelectrics etc. are now predicted and experimentally studied at an unprecedented pace.

Such predictive methods open new chapters of science, enabling matter and extreme conditions of high pressure (such as those that reign in planetary and stellar interiors) and nanomaterials to be more systematically explored. Little by little, the nature of unexpected carcinogenicity of many nanoparticles is becoming clear. We also learn about the matter of the Universe and chemical processes inside heavenly bodies and our own Earth. Helium, the second most abundant element in the Universe, was thought to be chemically inert – but recently shown to have a chemistry of its own under pressure. While classical chemistry does not foresee such compounds as Mg_3O_2 or FeO_2, these turn out to be stable, and may play a role in planetary evolution (e.g. cyclic "great oxygen events" that played a pivotal role in the evolution of life and mass extinctions). The simple alkali metal sodium, Na, under planetary pressures turns out not to be simple, alkali, or metallic – for example, becoming transparent and forming such "forbidden" compounds as Na_3Cl and $NaCl_3$.

The continual quest for new materials has resulted in powerful quantum predictive methods, which not only lead to new materials, but also uncover novel chemical phenomena, pointing to the limitations of the existing rules of chemistry and extending the boundaries of the known ones.



Examples of unusual forms of matter formed under pressure: a) structure and b) optical microphotograph of transparent form of sodium; c) structure of non-conventional compound $NaCl_3$.

ACTIVITIES AND EVENTS

Activities related to planning and promoting the International Year of the Periodic Table of Chemical Elements were launched in 2017. On March 2, 2017 a ceremony of inauguration of the elements with atomic numbers 113, 115, 117, and 118 was held in Moscow, Russia with the participation of the Joint Research Institute for Nuclear Research in Dubna (Russia), the Oak Ridge National Laboratory (USA), Vanderbilt University (USA), Lawrence Livermore National Laboratory (USA). RIKEN Nishina Center for Accelerator-Based Science (Japan).

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 by highlighting women role models who substantially 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.

On July 29th, 2019, IUPAC will celebrate its' 100th anniversary. The anniversary theme is A Common Language of Chemistry. The events of IUPAC100 and the IYPT will 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.

EVENTS 2019

The preliminary programme includes the following events and it is intended that many others will be added across the globe as 2019 approaches.

- The opening ceremony for the International Year of the Periodic Table of Chemical Elements is planned for February, 2019
- Special Symposium during IUPAC 2019, Paris: The Periodic Table at 150
- 51st International Chemistry Olympiad, July 2019
- Mendeleev International Chemistry Olympiad, April, 2019
- Markovnikov Congress (150 Anniversary of Markovnikov's rule), June 2019
- EuCheMs Inorganic Chemistry conference EICC-5, June 2019
- Celebration of the 150th anniversary of Mendeleev Table of Chemical Elements during the 47th World Chemistry Congress
- The jubilee Mendeleev Congress on General and Applied Chemistry related to the International Year of the Periodic Table

CONTACTS & ORGANIZATION

STEERING COMMITTEE

Professor Qi-Feng Zhou, Vice -President (President-Elect) of the International Union of Pure and Applied Chemistry, China
Professor John Dudley, University of Franche-Comté, France
Professor Hideyuki Sakai, RIKEN Nishina Center, Japan
Professor Sergey N. Dmitriev, Joint Institute of Nuclear Research, Russia
Professor James B. Roberto, Oak Ridge National Laboratory, USA
Academician Yuri Ts. Oganessian (Element 118 – Oganesson), Joint Institute of Nuclear Research, Russia
Sir Martyn Poliakoff, lead presenter of the Periodic Table of Videos, the University of Nottingham, UK
Professor Tebello Nyokong, Rhodes University, South Africa
Professor Bruce H.J. Mckellar, President of the International Union of Pure and Applied Physics (IUPAP), Australia
Professor Natalia P. Tarasova, President of the International Union of Pure and Applied Chemistry (IUPAC), Russia
Professor Silvia Torres-Peimbert, President, International Astronomical Union (IAU), Mexico
Emeritus Professor David J. Cole-Hamilton, President, European Association for Chemical and Molecular Sciences (EuCheMS), UK
Professor Efthymios Nicolaidis, President, the International Union of History and Philosophy of Science and Technology (IUHPST), Greece

SECRETARIAT

The acting Secretariat for the International Year of the Periodic Table of Elements is located within the office of the Mendeleev Russian Chemical Society, 31-4 Leninsky pr. 31, 119071, Moscow, Russia. An International Secretariat will operate from 2018.

ADVISORY BOARD

In addition to the Steering Committee members listed above, the International Year of the Periodic Table of Elements project is supported by a large and inclusive International Advisory Board that will ensure links with other societies with regional centres of science and science education, and which contains representatives spanning broad areas of science, history of science, technology, art history, cultural heritage and education etc.

GLOBAL SUPPORTING ORGANIZATIONS FOR INTERNATIONAL YEAR OF THE PERIODIC TABLE OF CHEMICAL ELEMENTS

Australian Academy of Science	Australia
The Royal Academies for Science & the Arts of Belgium	Belgium
Brazilian Chemical Society	Brazil
Bulgarian Academy of Sciences	Bulgaria
Canadian National Committee for IUPAC	Canada
National Research Council of Canada	Canada
Chinese Chemical Society	China-Beijing
Chemical Society Located in Taipei	China-Taipei
Czech National Committee for Chemistry	Czech Republic
Det Kongelige Danske Videnskabernes Selskab	Denmark
Egyptian National Committee for IUPAC	Egypt
Finnish Chemical Society	Finland
French National Committee for Chemistry	France
Gesellschaft Deutscher Chemiker e.V.	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
Science Council of Japan	Japan
Korean Chemical Society	Korea
Institute of Chemistry Malaysia	Malaysia
Royal Netherlands Chemical Society	Netherlands
Royal Society of New Zealand	New Zealand
Chemical Society of Nigeria	Nigeria
Norwegian Chemical Company	Norway
Polish Academy of Sciences	Poland
Portuguese Society of Chemistry	Portugal
Colegio de Químicos de Puerto Rico	Puerto Rico
Slovak National Committee of Chemistry for IUPAC	Slovak Republic
Slovenian Chemical Society	Slovenia
National Research Foundation (South Africa)	South Africa
Real Sociedad Española de Quimíca (RSEQ)	Spain
Swiss Chemical Society	Switzerland
Department of Science Service	Thailand
Chemical Society of Thailand	Thailand
Turkish Chemical Society	Turkey
Royal Society of Chemistry	United Kingdom
National Academy of Sciences	United States of America
Pedeciba Química	Uruguay

Solvay S.A.	Belgium
Novozymes A/S	Denmark
Chemical Society of Japan	Japan

European Association for Chemical and Molecular Sciences (EuCheMS)	Belgium
International Organization for Chemical Sciences in Development (IOCD)	Belgium
Eurachem	Czech Republic
International Astronomical Union (IAU)	France
European Chemistry Thematic Network Assoc. (ECTN)	France
German Bunsen Society for Physical Chemistry	Germany
International Federation of Clinical Chemistry & Laboratory Medicine	Italy
RIKEN Nishina Center for Accelerator Based Science	Japan
International Chemistry Olympiad (IChO)	Korea
International Association of Colloid and Interface Scientists	Netherlands
Federación Latinoamericana de Asociaciones Química (FLAQ)	Peru
Portuguese Society of Electrochemistry (SPE)	Portugal
Joint Institute for Nuclear Research (JINR)	Russia
International Union of Pure and Applied Physics (IUPAP)	Singapore
Federation of African Societies of Chemistry (FASC)	South Africa
Oak Ridge National Laboratory (ORNL)	United States of America
Lawrence Livermore National Laboratory	United States of America
International Union of History and Philosophy of Science and Technology (IUHPST)	

Asociación Química Argentina	Argentina
Austrian Chemical Society (GÖCH)	Austria
Chemical Society of Cameroon	Cameroon
Pancyprian Union of Chemists	Cyprus
Chemical Society of the South Pacific (CSSP)	Fiji
French Chemical Society (SCF)	France
Gesellschaft Deutscher Chemiker	Germany
Society of Chemists and Technologists of Macedonia	Macedonia
Sociedad Química de México, A.C.	México
New Zealand Institute of Chemistry	New Zealand
Nicaragua Chemists Association	Nicaragua
The Institute of Chemists Papua New Guinea(PNG)	Papua New Guinea
Chemical Society of Peru (SQP)	Peru
Philippines Federation of Chemistry Societies, Inc.	Philippines
Integrated Chemists of the Philippines	Philippines
Russian Academy of Sciences	Russia
South African Chemical Institute	South Africa
Catalan Chemistry Society	Spain
American Chemical Society (ACS)	United States of America

International Year of the Periodic Table of Chemical Elements

2019