

The International Year of Chemistry and challenges in chemistry

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The history and background of the designation of the "International Year of Chemistry"

At the 72nd plenary meeting of the United Nations General Assembly (December 19, 2008), it was decided that 2011 would be designated as the International Year of Chemistry: IYC2011. The International Year of Chemistry was called for by the International Union of Pure and Applied Chemistry (IUPAC) and approved by the United Nations Educational, Scientific and Cultural Organization (UNESCO), then adopted at the 179th session of the Executive Board, proposed to the United Nations, and realized. The Committee for Chemistry of the Science Council of Japan (at the time, chaired by Yasuhiro Iwasawa), which was the contact point for IUPAC in Japan, and an IUPAC subcommittee (at the time, chaired by Teizo Kitagawa) agreed with IUPAC and made Japan another joint proposing country for the International Year of Chemistry by appeals to UNESCO's Japan branch. 2011 marks the 100th year since Maria Skłodowska-Curie (November 7, 1867 to July 4, 1934) received the Nobel Prize in Chemistry (in 1911, for discovering radium and polonium, and her research on the properties and compounds of radium), as well as the 100th anniversary of the founding of IUPAC's forerunner, the International Union of Chemistry (name changed to IUPAC in 1919), which is also worthy of celebration.

Radium is the element of atomic number 88. Polonium is the element of atomic number 84, named after Curie's native country of Poland. All isotopes of both elements are radioactive. Curie also received the Nobel Prize in Physics for "research on radioactivity." in 1903. It was Curie, too, who discovered that a radiation different from X-rays is released by uranium ore, and who proposed naming that property "radioactivity."

In *Nature*, 469, 7328 (Jan. 2011) there was an article titled "Celebrating the International Year of Chemistry: The Core and Future of Science," which brought expectations for the contributions of chemistry as the "central science."

Activities for the International Year of Chemistry

Under the unified theme of "Chemistry—our life, our future," the International Year of Chemistry involves conducting chemistry-related educational and popularization activities in coordination with each country of the world with the aims of (1) advancing society's understanding of chemistry, (2) getting younger generations interested in chemistry, (3) supporting the passionate contributions of chemists to a creative future, and (4) fostering an environment for women to participate in chemistry. The logo for the International Year of Chemistry is shown here.



While advancing society's understanding of the importance of chemistry, a re-appreciation of the role that chemistry plays in realizing a sustainable society will be sought, and the coordination and cooperation of industry, government, and academia on activities will be recommended under the banner of the International Year of Chemistry.

In Japan, chemistry-related academic societies, organizations, and others in academia and industry have already spent many years working with these focuses and objectives, such as periodically holding Chemistry Makes Our Dreams Come True campaigns, holding the International Chemistry Olympiad in Tokyo last July, and otherwise striving to enlighten the general public broadly—including high school students—about chemistry and to cultivate human resources.

To promote the International Year of Chemistry projects in Japan, on August 6, 2010 the International Year of Chemistry Japan Committee (chaired by Ryoji Noyori, President of RIKEN; vice-chaired by the author, Yasuhiro Iwasawa, President of the Chemical Society of Japan, and Makoto Misono, President of the Japan Union of Chemical Science and Technology) was established, a Planning Committee (chaired by Yasuhiro Iwasawa) and an Executive Committee (chaired by Hiroyuki Nishide, former President of the Society of Polymer Science, Japan) were formed, and a Secretariat was set up within the Japan Union of Chemical Science and Technology. The members are well-known representatives from all sectors, including former Education Minister Akito Arima, Keidanren (Japan Business Federation) Chairman Hiromasa Yonekura, National Museum of Emerging Science and Innovation Director Mamoru Mouri, National Museum of Nature and Science Director General Shinji Kondo, Japan Science and Technology Agency President Koichi Kitazawa, and IUPAC Vice President Kazuyuki Tatsumi. Various projects are formulated in coordination between the two committees, while substantively the Chemical Society of Japan and many other chemistry-oriented academic societies are executing their own events to mark the year. Universities, research institutions, businesses, and the media are also participating through independent projects. The IYC Management Committee set up within IUPAC oversees planning for the International Year of Chemistry projects all over the world. As of June, there are already 73 projects and events registered as International Year of Chemistry projects in Japan, with a variety of events being put on using the logo. There are all manner of plans being formulated at present, and below are listed several specific projects of IUPAC, the Chemical Society of Japan, etc.

December 2010: Countdown Memorial Symposium (Japan Union of Chemical Science and Technology)

December 2010: IYC Reception (The Chemical Society of Japan, Pacificchem 2010)

January 2011: IYC Opening Ceremony (IUPAC, UNESCO Headquarters in Paris)
June 2011: Japan-Germany Symposium (The Chemical Society of Japan, German Chemical Society)
August 2011: World Chemistry Leadership Conference (IUPAC, Puerto Rico)
August 2011: Marie Curie Reading Impression Essay Contest (Japan Union of Chemical Science and Technology)
September 2011: International Year of Chemistry Memorial Symposium (The Chemical Society of Japan)
September 2011: Exhibition on Japanese Chemists (National Museum of Nature and Science, The Chemical Society of Japan)
October 2011: Chemistry Communication Prize (Japan Union of Chemical Science and Technology)
November 2011: Chemistry Makes Our Dreams Come True Summer Vacation Kids Chemistry Experience Show (The Chemical Society of Japan, The Society of Chemical Engineers, The Association for the Progress of New Chemistry, Japan Chemical Industry Association)
November 2011: Your Magic: Chemistry "New" Discovery Expo (National Museum of Emerging Science and Innovation, The Chemical Society of Japan)
December 2011: Science Festival (Cabinet Office, IYC Japan Committee)
December 2011: IYC Closing Ceremony (IUPAC, Brussels)

In addition to organizational efforts, IUPAC maintains the IYC Network system that enables participation in the International Year of Chemistry at the individual level. Although the entries are limited to English, there are expected to be many "individual projects" entered and "thoughts about chemistry" disseminated from Japan as well, among other direct participation in international activities through the network.

Challenges in chemistry and culture of the mind

Within the past century, quantum chemistry, atmospheric nitrogen fixation (ammonia synthesis), polyethylene, nylon, conducting polymers, asymmetric synthesis of pharmaceuticals, enzyme catalysts and photocatalysts, chemical reactions (cross coupling, etc.), fullerenes, nanotubes, graphene, atomic and molecular measurement, molecular imaging, solar cells, storage cells, fuel cells, and other remarkable discoveries and inventions have happened in the field of chemistry, with these findings being utilized to create many superior technologies. Science and technology are expected to contribute to society at large more than just public policy and the economy, but this will necessitate even greater development of basic science and advanced technologies, which

will require supporting the promotion of science and technology that is rooted in the unrestrained creativity and diverse values of young people. This will also require the understanding of the general public. Humankind faces shortages and depletion of resources on a limited planet earth, energy issues, climate change and environmental degradation, water and food issues, medical, health, and safety issues, emerging and reemerging infectious diseases, major disasters, and other challenges on a global scale, and the expectations for science and technology to resolve those issues are ever growing. Contributions from chemistry are being sought for many of those challenges. This March 11, The Accident at TEPCO's Fukushima Nuclear Power Stations occurred in Japan, stemming from the Great East Japan Earthquake, posing grave problems for energy policy not only in Japan, but in countries all over the world. As the International Year of Chemistry, this year requires the chemistry society to tackle such problems seriously, and contribute to future resources, energy, and environmental needs through decontamination, energy strategies, and the formulation of a grand design for recovery. Cutting-edge science and sophisticated technology are intellectual activities that can be called a "culture of the mind" that humans have exclusively acquired through a long process of evolution. In 2011, when the International Year of Chemistry projects are being implemented all over the world, it is my hope that chemistry will advance even further, its importance will be widely diffused and understood in society, Japan's science and technology will continue to advance, the development and expansion of human resources to support a sustainable society will be undertaken, and this will be a shining year for chemistry in which Japan builds a dynamic future.

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