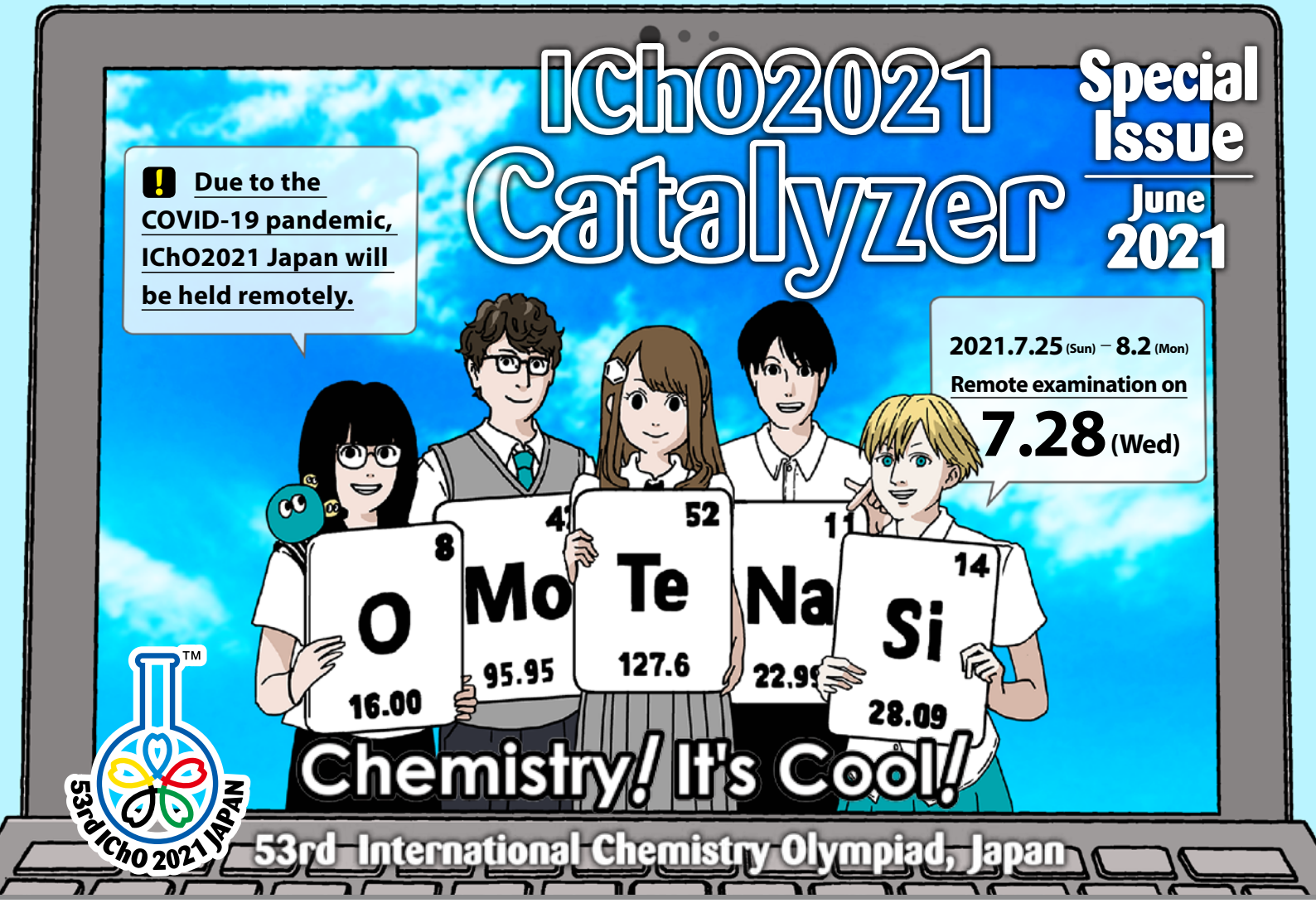


Dear Students, Mentors, Guests, Distinguished Scholars, Observers, SC Members and Colleagues:

Welcome to the IChO2021 Japan 53rd International Chemistry Olympiad. I am delighted to serve as the Chair of the Executive Committee of IChO2021, a very important scientific event especially for students at secondary school level.

This past January, we carefully discussed whether we could hold a real or remote Olympiad in 2021. We eventually decided to hold a remote Olympiad this summer, owing to the ongoing global COVID-19 pandemic. The most important priority was to be able to organize IChO2021 safely and smoothly. Our remote IChO2021 will be held from 25 July to 2 August, 2021. The three key concerns of the Chemistry Olympiad are as follows: (1) The safety of all participants, including secondary school students; (2) Equal opportunity for every student; and (3) International experiences via competition and cooperation, despite the Olympiad being held remotely.

I hope you have already visited our website, https://www.icho2021.org. There you can find our motto for IChO2021, "Chemistry*!* It's Cool*!*", as well as our first Catalyzer newsletter. We are sure that you can still enjoy chemistry and experience O-Mo-Te-Na-Si during this remote Olympiad.

The opening ceremony will be held online on our website on 25 July, 2021, and the examination will be conducted in each country on 28 July. Students will be able to take the examination in their home countries. The duration of the examination is five hours. The examination may start at any time between 4:00 pm and 9:00 pm JST, and each country can decide the starting time that suits them.

After grading is complete, an online closing and award ceremony will take place on 2 August. Students may attend the ceremony with their avatars. Medals and the certificates will be sent to participants via surface mail together with commemorative gifts.

Between the opening and closing ceremonies, Olympiad participants can enjoy a series of remote events. These include virtual visits to tourist spots such as Himeji Castle and other famous world-heritage temples and shrines in the Kansai region (Kyoto, Nara, Osaka, and Kobe). Interesting cultural events are also planned, including a visit to a special site at which repair work to an ancient Buddha statue is being carried out. Students can take part in a scientific virtual visit to SPring-8, the world's largest synchrotron radiation facility. Communications among participating students are also important. Virtual reality avatars will be available for all students to enhance their remote communication experiences. We also plan to make the practical examination available to the general public so they can try their own experiments.

We will make every effort to make our remote IChO2021 Japan a resounding success. On behalf of the executive committee, I sincerely hope you all enjoy the Chemistry Olympiad this summer.

Dr. Yoshiki Chujo
Chair of the Executive Committee,
IChO2021 Japan

Remote Examination FAQ

Due to the COVID-19 pandemic, IChO2021 Japan will be held remotely. The safety of every participant is our first priority. Even though we might be far apart, we still aim to provide special experiences to the participants in July.

Several changes to regulations for the examination are listed below. For more details, please see website.

Q What are the time zones for the remote IChO?

A All dates and times on this document are based on Japan Standard Time (JST), which is Coordinated Universal Time (UTC) +9 hours. Japan does not use daylight saving time during the summer.

Q When is the date for the examination?

A The theoretical examination will take place on 28 July, 2021.

Q How long is the examination?

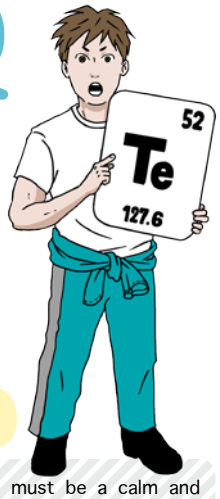
A The duration of the examination is 5 hours. The details of the examination must be reported by invigilators. A report form to be completed by invigilators will be provided with the student examination papers.

Q What is the start time of the examination?

A The examination may start at any time between 16:00 and 21:00 JST, and each country can decide its own starting time. However, all competitors in each country must have the same examination timetable to avoid ill-intentioned communication among competitors. Countries with multiple time zones must set their timetable on the basis of one specific time zone and conduct the examination accordingly.

Q How will be the examination conducted remotely?

A The preparation of the examination (discussions, voting, translation, printing) will be done using Oly-Exam software. Mentors will read, comment and vote on, and translate the examination text using the Oly-Exam software.



Q Where should the examination be located?

A The examination location must be a calm and quiet room with electricity, and equipped with a computer or smartphone, web camera, microphone, high quality printer, scanner with PDF-conversion software, and stable internet connection. Each location will be checked via Zoom before the examination.

A single location for the full number of 4 students is highly preferred. If legal travel restrictions in the country forbid a single location, multiple locations for one country are acceptable.

Q What help/tools are allowed for the examination?

A Only a non-programmable calculator, good writing pen and a ruler can be used during the examination. Students should write their answers only using a pen with dark ink.

Q What are the important dates for the IChO2021?

A See the following Table.

Schedule of Remote IChO2021 (Tentative)

J: JST C: CET E: EST

Date	Student	Mentor
Jul 23, Fri		Training of Oly-Exam (J 21:00 C 14:00 E 8:00)
Jul 25, Sun	Opening Ceremony (Start time to be determined)	
		Receive the problem (J 21:00 C 14:00 E 8:00)
Jul 26, Mon		Deadline of feedback (J 9:00 C 2:00 E 20:00)
	Activity (To be announced)	Jury meeting (J 21:00 C 14:00 E 8:00)
Jul 27, Tue	Activity (To be announced)	Receive the authorized problem Translation/submission (J 9:00 C 2:00 E 20:00)
Jul 28, Wed	Start remote examination at (J 16:00–21:00 C 9:00–14:00 E 3:00–8:00)	Deadline of translation (J 9:00 C 2:00 E 20:00) [Invigilator] Receive and print out the problem (J 14:00 C 7:00 E 1:00) [Invigilator] Submit the solutions (Within one hour after the end of the examination)
Jul 29, Thu		Receive the solution and the grading scheme (J 9:00 C 2:00 E 20:00)
	Activity (To be announced)	
Jul 30, Fri	Activity (To be announced)	Receive grading (from Organizer, Request arbitration) (J 9:00 C 2:00 E 20:00) Deadline of request, Jury meeting (J 21:00 C 14:00 E 8:00)
Jul 31, Sat		Arbitration (J 9:00 C 2:00 E 20:00) America(west) ▸▸▸ Asia ▸▸▸ Europe ▸▸▸ America(east)
Aug 1, Sun		Receive final results (J 9:00 C 2:00 E 20:00)
	Activity (To be announced)	
Aug 2, Mon	Closing Ceremony	(J 21:00 C 14:00 E 8:00)

Seimi-kyoku

sei 舎 mi 密 kyoku 局

the Origins of Modern Chemistry in Japan

During the Edo period (1603 to 1868), when the Tokugawa shoguns ruled the country, Japan adopted a policy of seclusion and closed its borders to the outside world for more than 250 years; international trade was allowed only with China (mainly under the Qing dynasty) and the Netherlands. Any information on the natural sciences that emerged in Europe in the early 18th century came only from the Netherlands through *Dejima*, a small artificial island in the bay of Nagasaki on the west end of Japan.

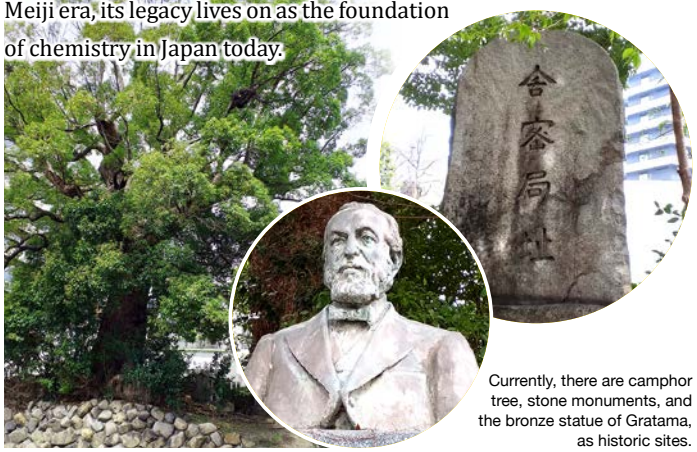
The first systematic chemistry lectures in Japan were given by Johannes Lijdius Catharinus Pompe van Meerdervoort, a physician who came to Japan in 1857. Pompe began teaching Western medicine in Nagasaki, and after he found that the students lacked fundamental knowledge in science, he also started teaching a course in basic science. After Pompe left Japan, Dr Anthonius Franciscus Bauduin was invited to succeed him, and taught chemistry as well as medicine. Following Bauduin, the Dutch chemist Koenraad Wolter Gratama was invited to teach in Japan as a specialist in science and chemistry teaching.

In 1867, Gratama was set to be transferred to the *Kaiseijo*, the shogunate's Western education and research center located in Edo (present-day Tokyo), but this plan was thwarted when the shogunate collapsed during the Meiji Restoration in 1868. The new Meiji government, however, established a college called the *Seimi-kyoku* in Osaka to replace the *Kaiseijo*, and welcomed Gratama as head lecturer there. The word *seimi* was a transliteration of the Dutch word *chemie*, though it is no longer used today. One reason behind the new government's move to establish the *Seimi-kyoku* in Osaka is said to have been their initial intention to move the capital from Kyoto to Osaka, rather than to Tokyo. Ultimately, however, the Emperor moved to Edo Castle where the Tokugawa shogunate was based, after the castle was surrendered bloodlessly to the new government. Eventually, Edo was renamed Tokyo and became the new capital city of Japan.

In 1868, the new *Seimi-kyoku* (also known as the *Osaka Seimi-kyoku*) was completed, and Gratama started teaching physics and chemistry there. Gratama not only taught students, but also initiated training programs for physics and chemistry teachers. The following year, a medical school and hospital were established nearby, where Bauduin also taught. Many students from the medical school also came to attend the lectures at the *Seimi-kyoku*, among them Jokichi Takamine, who later became well-known for his research on adrenaline (Catalyzer, No. 2). Kikunae Ikeda, who discovered the "umami" ingredient *Ajinomoto* (Catalyzer, No. 6), studied chemistry under the tutelage of Jiro Murahashi, Gratama's assistant at the *Seimi-kyoku*. Hiroakira Akashi, who worked at the medical school hospital, deepened his knowledge by listening to Gratama's lectures, and eventually established the *Kyoto Seimi-kyoku* in his home town Kyoto, with the support of the Kyoto prefectural government. Genzo Shimazu, a blacksmith who had been a contractor at the *Kyoto Seimi-kyoku*, was taught by the German teacher there, and later established Shimadzu Corporation, the chemical equipment manufacturer (Catalyzer, No. 5). These are just a few examples of the many students and teachers who received direct or indirect instruction from foreign teachers and who later drove the development of medicine, chemistry, and pharmacy in Japan.

Koenraad Wolter Gratama
(1831-1888)

In 1870, Gratama completed his term of office and returned to the Netherlands the following year. The German chemist Georg Hermann Ritter was invited to replace him. In 1872 however, all the personnel and assets of the *Seimi-kyoku* were transferred to the *Tokyo Kaisei Gakko* school, which later became the University of Tokyo. The *Seimi-kyoku* underwent several organizational and name changes, finally becoming the Third Higher School in 1889, which would later be merged into Kyoto University. At the site of the former *Osaka Seimi-kyoku* near Osaka Castle, there is a large camphor tree in a corner surrounded by a stone wall that appears to block the walkway, and at the base of the tree stands a stone pillar and monument that reads "Site of the Former *Seimi-kyoku*." On the reverse side of the monument is a majestic bust of Gratama. Although the *Seimi-kyoku* disappeared in the turbulent times for Japanese society in the early Meiji era, its legacy lives on as the foundation of chemistry in Japan today.



Currently, there are camphor tree, stone monuments, and the bronze statue of Gratama, as historic sites.

Element #1

Japanese mineral resources Au, Ag, and Cu

Today, Japan depends mostly on imports of the mineral resources it needs, but in the past it used to produce large amounts of gold, silver, and copper. Marco Polo, the 13th-century merchant and explorer who travelled throughout Asia, introduced Japan to Europe as "Japan, Land of Gold" in his travelogue *The Travels of Marco Polo*, which later became the driving force for adventurous explorers during the Age of Discovery.

Long ago, gold mines such as those on the island of Sado (part of Niigata prefecture today) and in Koshu (Yamanashi prefecture) produced significant amounts of gold. In the Edo era, from the 16th to the 19th centuries, the Tokugawa bakufu (shogunate) established an official gold guild known as the Kin-za, and gold coins called Keicho Koban and Oban were issued.

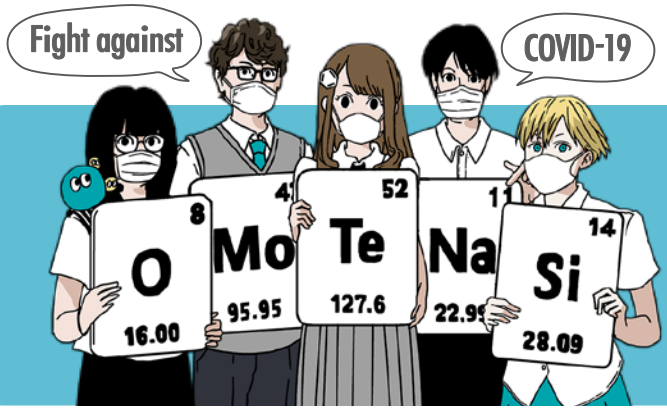
In terms of silver production, one of the major operations was the *Iwami Ginzan* silver mine, where production of silver continued for approximately 400 years from the 16th century. The *Iwami Ginzan* silver mine was located in what is the city of Oda in Shimane Prefecture today, and production reached its peak during the Edo period, when the mine was directly managed by the *bakufu*. Production then gradually decreased until the mine was closed in 1923. The *Iwami Ginzan* silver mine site was registered as a UNESCO World Heritage (Cultural) Site in 2007, listed as the Iwami Ginzan Silver Mine and its Cultural Landscape, with special mention made of its environmentally friendly operation.

Iwami Ginzan Silver Mine

Keicho Oban


Minetopia Besshi

The Besshi copper mine located in what is the city of Niihama in Ehime Prefecture, discovered in 1690, produced a total of 700,000 tonnes of copper in 283 years until it was closed in 1973. The former mine site is now the location of Minetopia Besshi, a historical theme park where people can learn how the mine operated in the olden days.



These five elements spell "OMoTeNaSi", the Japanese word for hospitality. It means to wholeheartedly take care of guests without expecting anything in return. Attention is paid to even the smallest details in order to bring guests the best experience possible. As you make your way across Japan, you will find ***omotenasi*** everywhere.

Chemistry! It's Cool!

53rd IChO 2021 JAPAN™

ICh02021 Special Issue
Catalyzer June 2021

Official Website
https://www.icho2021.org/

icho2021

Contact Information

ICh02021 Office
1-5 Kanda-Surugadai, Chiyoda-ku,
Tokyo 101-0062, Japan
E-mail: contact@icho2021.org
Edited by the Team Catalyzer ICh02021
English Editor: Maiko Katayama