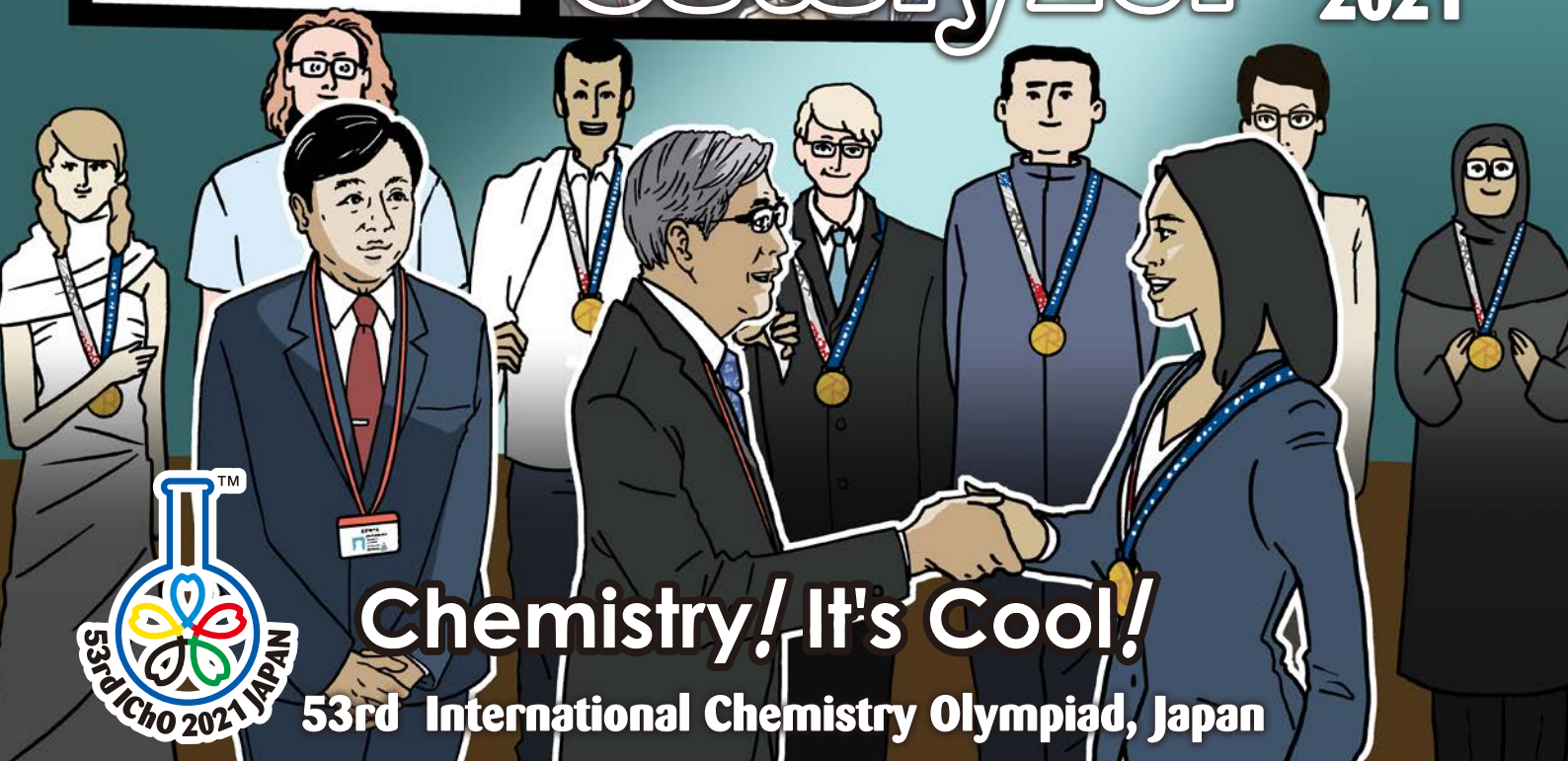


Presentation of
Gold Medals

IchO2021 Catalyzer

No. **8**
Aug. 1
2021



Cover illustration : Award Ceremony

Medal Design Concept: “The Chemical Vortex Leading to the Future”

Designer: Sakiko Matsumoto

From the center to the edge, the entire medal forms the shape of a vortex, giving the impression of a whirling motion. This movement represents the global impact and upcoming success of young students, originating at IchO2021 Japan. Through the designs found on both sides of the medal, IchO2021 supports the bright future of the contestants.

The obverse side features three kinds of popular auspicious patterns to express aspects of Japanese culture.

The reverse side contains the logo, which is represented in a simple and emphatic way through an image that spreads across the world.



Seigaiha (青海波) translates to blue ocean waves. The endlessly calm waves are a prayer for long-lasting happiness and a peaceful life.



Shippō Tsunagi (七宝つなぎ) is a pattern of connecting circles, expressing a wish for happiness, harmony, and connection. This connection is as valuable as the Seven Treasures of Buddhism: gold, silver, lapis lazuli, agate, seashell, amber, and coral.



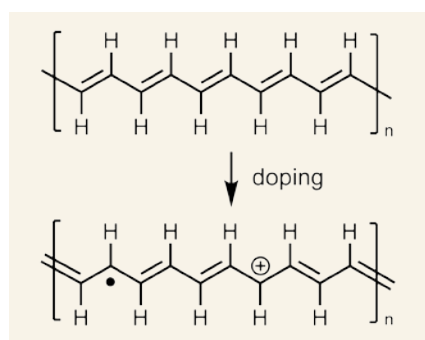
Asanoha (麻の葉) is a pattern representing hemp leaves. Because hemp is resilient, grows vigorously, and requires little care, it is often used as a pattern in the *kimono* of young children in the hope that they grow up big and strong. It is also meant to ward off evil.



The ribbon represents the image of a whirlpool flowing from the medal in indigo, black, and vermillion, which is the color of Japan. The design also expresses the impact that the students will have in the world.

Discovery and Development of Conductive Polymers... Hideki Shirakawa

Plastics (polymers) are used in all aspects of our daily living and enrich our lives with their low cost, light weight, and flexible formability. Initially, plastics were thought not to conduct electricity and were used as insulators. However, various conductive polymers have now been developed and boast a wide range of applications, including touch panels for smartphones and electrodes for lithium-ion batteries. The development of conductive polymers that led to innovation in the world of plastics



was triggered by a serendipitous (unexpected) discovery by Hideki Shirakawa. When a student in his laboratory accidentally used one thousand times the required amount of catalyst to synthesize

polyacetylene, he obtained a shiny, film-like material that was completely different from the conventional black powdery polyacetylene. Although polyacetylene has many π -electrons, they cannot move freely, and the film-like polyacetylene did not show sufficient conductivity in its original state. However, through trial and error, they came up with a method to dope carriers that act as electron acceptors, and when they added a small amount of bromine or iodine, the conductivity surged 10 million times. This discovery led to a dramatic development in research on conductive polymers. For this series of achievements in laying the foundation for the development of conductive polymers, which became indispensable to modern society, Hideki Shirakawa was awarded the Nobel Prize in Chemistry in 2000, together with Alan Jay Heeger and Alan Graham MacDiarmid.



Photo by Kazuhiko Sugano

Dr. Hideki Shirakawa
(1936–)

Japan is a “fermentation powerhouse”

Japan, with its warm and moist climate, is a “fermentation powerhouse” where microorganisms are very efficacious. Fermented foods such as soy sauce, *natto* (fermented soybeans), and *katsuobushi* (dried bonito flakes), which are made by growing mold on fish to remove moisture, are world-famous.



Soy sauce



Natto



Katsuobushi

Kansai is also home to many fermented foods rooted in the local climate. In Wakayama, facing the Pacific Ocean, “*Nare-zushi*”, salted fish wrapped in plant leaves with rice and then lacto-fermented, is served on celebratory occasions. “*Funa-zushi*”, a kind of *Nare-zushi*, is made along the shoreline of Lake Biwa. *Funa-zushi* is made by marinating spawning crucian carp in salt and fermenting it with rice for one to three years. The



lactic fermentation gives it a novel cheese-like flavor and sourness, and the acidity increases its shelf life. There are two types of pickles in Japan: those made of lacto-fermented vegetables, and those made by soaking veges in *koji* (rice malt) or sake lees to add to their flavors. For example, “*Suguki-zuke*” is a lacto-fermented turnip and “*Nara-zuke*” is a type of cucumber or squash pickle that has been pickled in sake lees for years.



Suguki-zuke

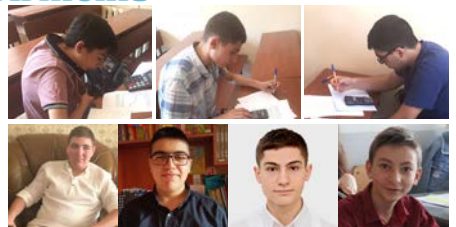


Nara-zuke

Koji and yeast are crucial for making sake and basic seasonings such as soy sauce, miso, mirin, and vinegar. Jokichi Takamine who succeeded in crystallizing adrenaline (Catalyzer No. 6), devised a method to extract a type of diastase (digestive agent), named Takadiastase later, during the process of growing *koji*. *Koji* is deeply connected to the history of biochemical research in Japan. Against this background, *Aspergillus oryzae*, the main body of *koji* that supports Japanese food culture, was designated as Japan’s national fungus in 2006 by the Brewing Society of Japan.

ICCh02021 Participating Teams

Armenia



Belgium



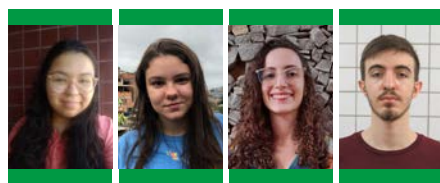
Costa Rica



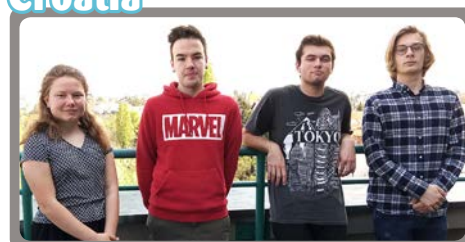
Australia



Brazil



Croatia



Austria



Bulgaria



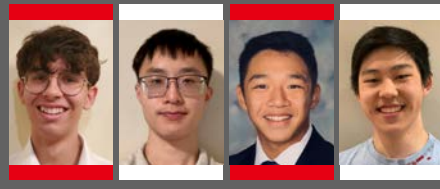
Cyprus



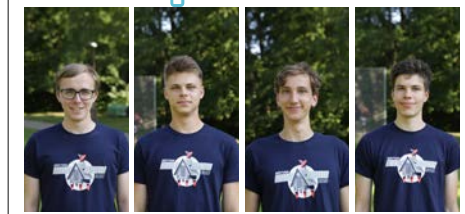
Azerbaijan



Canada



Czech-Republic



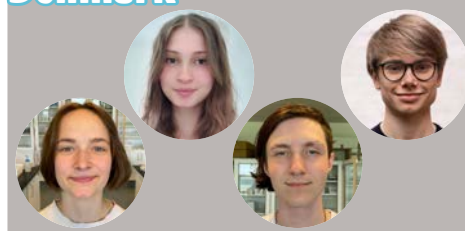
Bangladesh



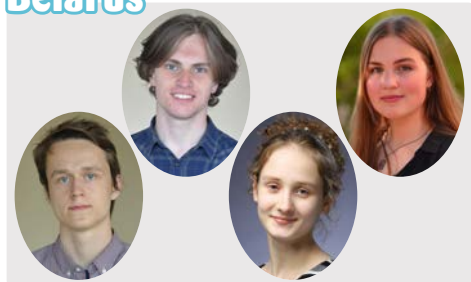
China



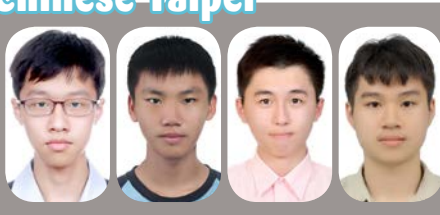
Denmark



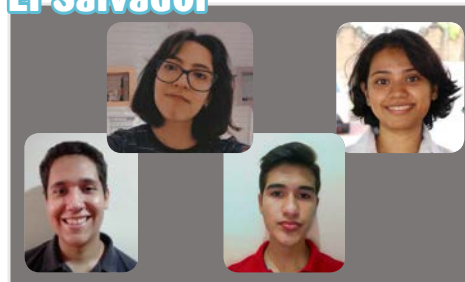
Belarus



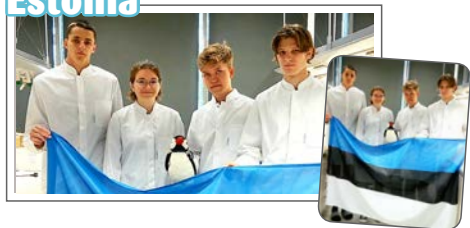
Chinese Taipei



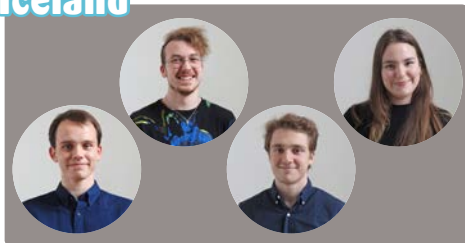
El Salvador



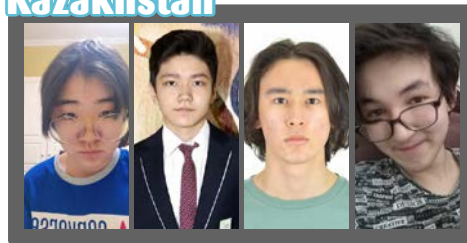
Estonia



Iceland



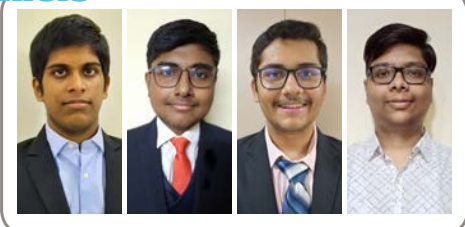
Kazakhstan



Finland



India



Korea



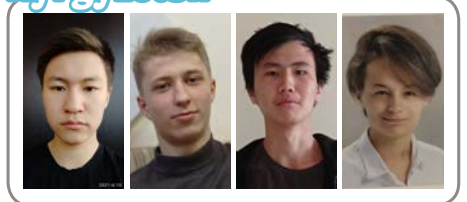
France



Indonesia



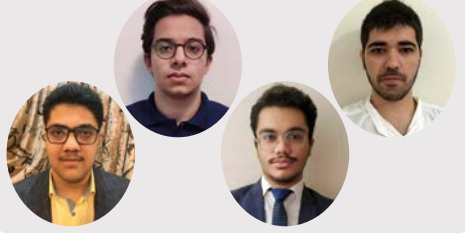
Kyrgyzstan



Georgia



Iran



Latvia



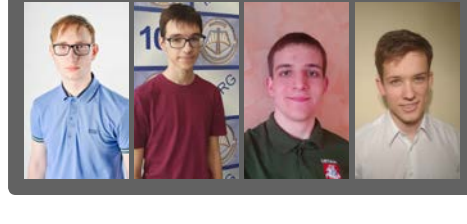
Germany



Ireland



Lithuania



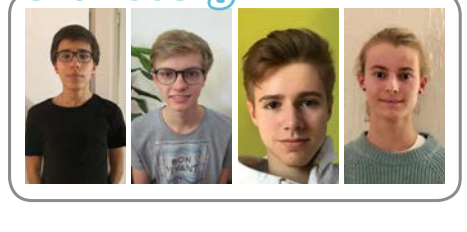
Greece



Israel



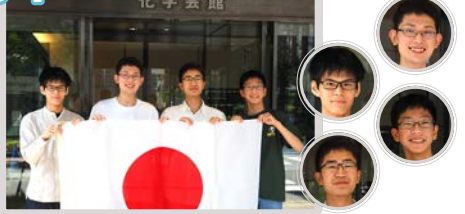
Luxembourg



Hungary



Japan



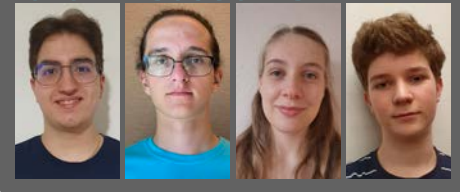
Malaysia



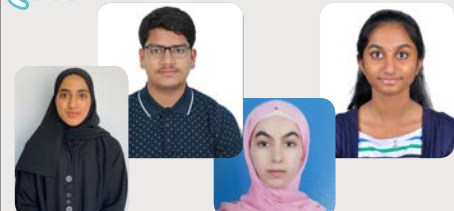
Mexico



North Macedonia



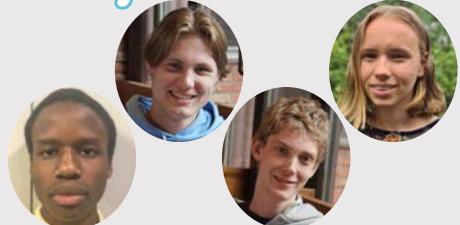
Qatar



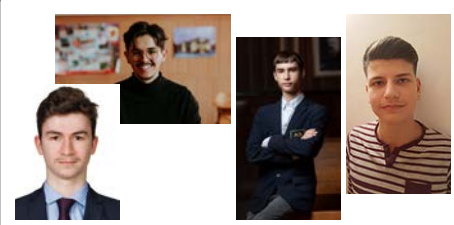
Moldova



Norway



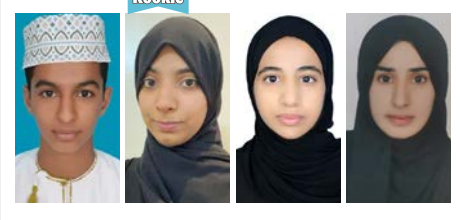
Romania



Mongolia



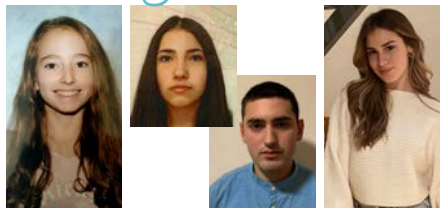
Oman



Russian Federation



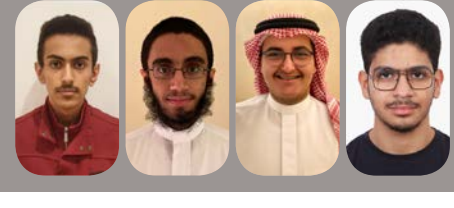
Montenegro



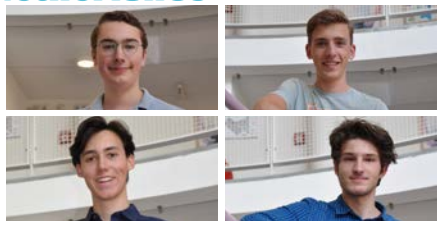
Pakistan



Saudi Arabia



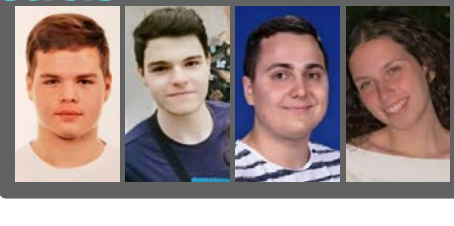
Netherlands



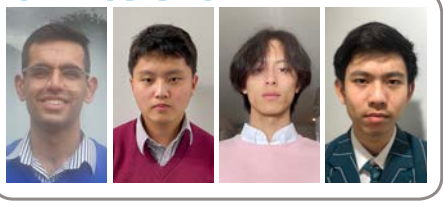
Philippines



Serbia



New Zealand



Poland



Singapore



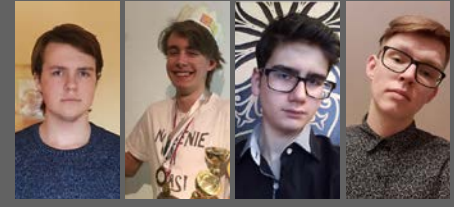
Nigeria



Portugal



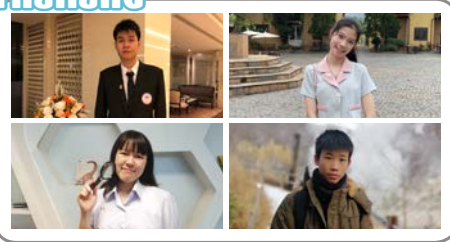
Slovakia



Slovenia



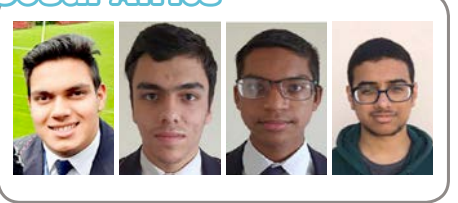
Thailand



United States of America



South-Africa



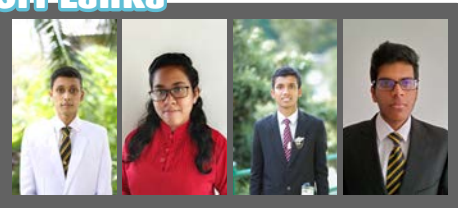
Trinidad and Tobago



Uruguay



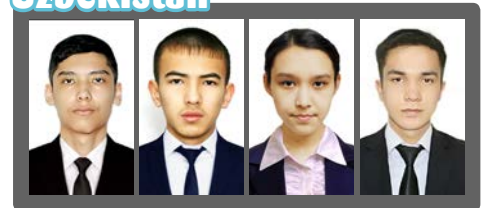
Sri Lanka



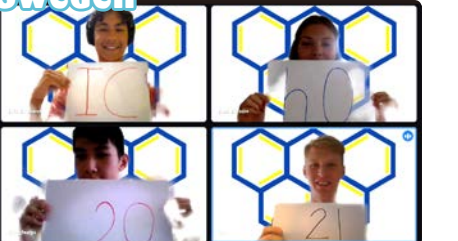
Turkey



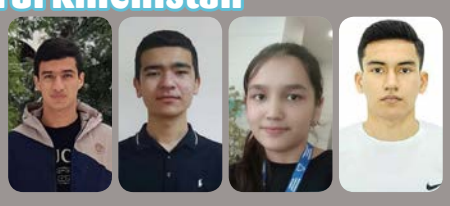
Uzbekistan



Sweden



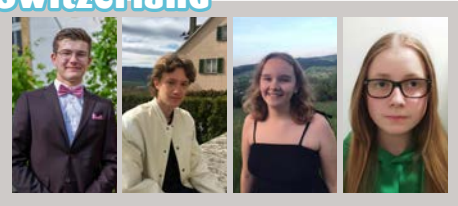
Turkmenistan



Venezuela



Switzerland



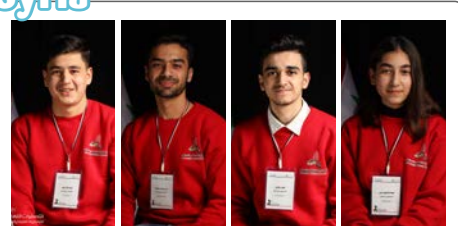
Ukraine



Vietnam



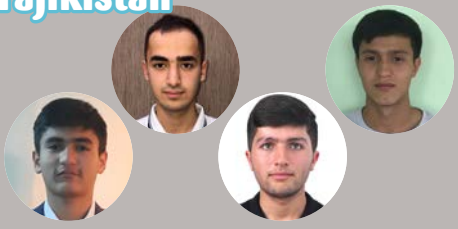
Syria



United-Arab Emirates



Tajikistan



United Kingdom



Looking Back Remote IChO2021



Nobuhiro Kihara

Vice-chair of Executive Committee,
Vice-chair of Science Committee
for the 53rd IChO2021, Japan

The 53rd International Chemistry Olympiad (IChO) 2021 Japan was originally planned to follow the 2020 Olympic and Paralympic Games in Tokyo, Japan. The interest to chemistry from the people was expected to be enhanced when a scientific Olympiad would be held after the excitement of a sporting Olympiad.

When we heard the first reports of COVID-19 early in 2020, it appeared to be a minor concern. Despite the virus being thought of as causing a new kind of cold, we knew that the common cold is inactive in summer, when the IChO was to be held. However, shortly after the pandemic spread across the globe, it became evident that COVID-19 was active in summer, too. The 2020 Olympics and Paralympics were postponed, and the 52nd IChO2020 in Turkey was held remotely, because the University venue could not be used for an in-person event in the period of IChO.

The IChO is composed of three key elements:

(1) Examination

Chemistry is an experiment-based science, with every theory coming out of the laboratory. Therefore, both theoretical and practical examinations play important roles in the IChO.

(2) Communication

Talented students from all over the world come together to take part in the IChO. Conversation, cooperation, and communication with each other provide a great opportunity for promising youngsters to enjoy international experiences and to make friends with other participants via their common interest, chemistry.

(3) Culture

The venue chosen for IChO2021 Japan was the ancient capital of Japan, where the first government of Japan was established 2681 years ago (according to Japanese legend). Several places were to be visited, including not only very old temples but also state-of-the-art scientific institutes.

In the middle of January 2021, the Organizing Committee of IChO2021 Japan met with the Steering Committee (SC) of the IChO. We discussed two proposals; for an in-person IChO and a remote IChO. Unfortunately, it was already clear that all the elements of the IChO described above could not be included in an in-person IChO during the COVID-19 pandemic, due to difficulties in immigration control and of the need for social distancing.

The first priority of IChO is, of course, the safety of all participants. After our meeting with the SC, we finally decided to hold IChO2021 Japan as a remote event. At the end of February, when we had a second meeting with SC, the holding of a remote IChO was approved.

Even in a remote format, all elements essential to the IChO had to be maintained as much as possible:

(1) Examination

The competition involves theoretical problems, and was strictly monitored to avoid cheating. However, in order to reinforce the importance of laboratory work, an activity was developed in which the practical tasks prepared for IChO2021 Japan were demonstrated. We are delighted if those who are inspired by the demonstration can prepare and submit original videos in which they attempt the practical tasks and discussions. Reports on the tasks will also be highly welcome.

(2) Communication

We prepared avatars for all participants. Everyone participated in events and activities via their avatars. We also prepared virtual venues in which avatars can enjoy close conversation, cooperation, and communication with others. Some events also took place in such virtual venues.

(3) Culture

IChO participants were offered the opportunity for virtual visits to several locations. As well as those locations that had been planned for the in-person IChO, we have added several that are very interesting to experience but not suitable for in-person visits due to hazards, sensitivity, space limitations, or language difficulties. However, the participants' avatars can readily visit such restricted locations. The menu of cultural tours for our remote IChO holds more interest than would otherwise be possible.

This remote IChO has given us the chance to make the latest technology to provide great opportunities and special experiences to all participants.

Organizing Committee

Chair



Kohei
Tamao

Vice Chairs



Kyohei
Takahashi



Yoshiki
Chujo



Tadao
Kondo



Teiji
Koge



Hiroshi
Nishihara

Finance Committee



Chair
Tadao
Kondo



Chair
Teiji
Koge

Executive Committee



Chair
Yoshiki
Chujo



Vice
Chair
Nobuhiro
Kihara

Science Committee



Chair
Hiroshi
Nishihara



Vice
Chair
Nobuhiro
Kihara

Fundraising Committee



Chair
Kyohei
Takahashi



Tetsuzo
Ishikawa

Technology Subcommittee



Chair
Yasushi
Tsuji



Vice
Chair
Tetsuaki
Fujihara



Yoshiaki
Nakao



Kazuo
Tanaka

Event Subcommittee



Chair
Kunihiro
Yokoi



Vice
Chair
Seijiro
Matsubara



Keisuke
Asano



Ken-ichi
Fujita



Nobuaki
Kambe



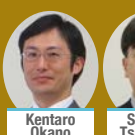
Yasutaka
Kataoka



Tsumoru
Morimoto



Masahiro
Nakagawa



Kentaro
Okano



Satoshi
Tsuchida

Practical Problem Subcommittee



Chair
Takayoshi
Kuroda



Takamitsu
Fukuda



Hiroshi
Kominami



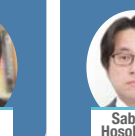
Tsukasa
Matsuo



Shin-ichi
Naya



Naoki
Noma



Atsushi
Sudo



Yusaku
Suenaga



Yoshiro
Yamagiwa

Theoretical Problem Subcommittee



Chair
Hideki
Yorimitsu



Takeshi
Hasegawa



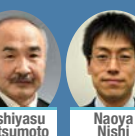
Takashi
Hiroi



Satoshi
Horike



Saburo
Hosokawa



Yoshiyasu
Matsumoto



Naoya
Nishi



Hiroshi
Okuyama



Hayate
Saito



Takahiro
Sasamori



Hirofumi
Sato



Jun
Shimokawa



Ryo
Shintani



Takayuki
Tanaka



Kazunori
Tsubaki



Sayaka
Uchida



Hiroyasu
Yamaguchi

Venue Subcommittee



Chair
Hisashi
Fujihara



Manabu
Ishifune



Yoshihiro
Yamaguchi



Makoto
Yasuda

Public Relations Subcommittee



Chair
Yoshito
Tobe



Vice
Chair
Atsunori
Mori



Vice
Chair
Yuki
Yamasaki



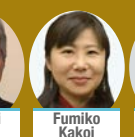
Vice
Chair
Akihito
Konishi



Hayanon



Akiko
Ikeda



Yasushi
Imada



Fumiko
Kakoi



Teruhisa
Kaneda



Kensuke
Kiyokawa



Syozo
Koshino



Yoshiyuki
Manabe



Yutaka
Nishiyama



Chigusa
Rao



Yoshiyasu
Tanaka



Akihiro
Tsurusaki

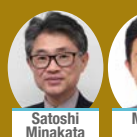


Takuya
Yamakado

General Affairs Subcommittee



Chair
Masahiro
Miura



Satoshi
Minakata



Makoto
Uchi



Yasutaka
Sumida



Takashi
Uemura

Secretariat



Masaya
Sasaki



Hiroshi
Seta



Junko
Kotoku

Today's schedule Aug. 1

Student

- Activity Video: Himeji Castle, Osaka, and Kyoto

Mentor


- Receive final results J 09:00 C 02:00 E 20:00 (Jul. 31)
- Activity Video: Himeji Castle, Osaka, and Kyoto

Have a nice day!

J: JST = UTC + 9
 C: CET = UTC + 2 (summer time)
 E: EST = UTC - 4 (summer time)



**ELEMENT
QUIZ**
Q8



① The term “atom” is said to have been derived from a Greek word “atomos”, which literally means “something that cannot be divided”. What is the origin of the term “electron”?

- 1 amber
- 2 something that shines
- 3 musical instrument
- 4 something like water

② Which country is the largest producer of selenium in the world?

- 1 USA 2 Japan 3 Mexico 4 China

Answer for Q7

3 (Ni, Ti)

Zinc-copper alloy is brass, aluminum-copper alloy is duralumin, and nickel-iron alloy is called permalloy. A nickel-titanium alloy that consists of same ratio of the two metals is called a shape-memory alloy because it has the property of returning to its original shape when heated above a certain temperature, even after deformation.

Element # 7 Japanese mineral resources Silicon

Basic Information

Origin of the name: Latin word *silex* (hard stone, flint)
 Discovered by: J. J. Berzelius (Sweden) [1823]
 Global production: 8 million tons
 Major producers: China, Russia, Brazil

Silicon does not exist in its pure metal form in nature; however, massive amounts of silicon can be found in soil, stones, and minerals in oxide forms, typically SiO_2 , a major constituent of sand. Yamanashi Prefecture in Japan is famous for its natural quartz crystal. Silicon metal is a very important material for industry today, used widely in semiconductors, microchips, and photovoltaic panels.



© The Courtyard of our Minerals



Daisenryo Kofun



The *Daisenryo Kofun*, located in the city of Sakai in Osaka Prefecture, was built in the early to mid-5th century and is considered to be Japan's largest *kofun* (Emperor's tomb). It is one of the more than 200 burial mounds that make up the Mozu Tumulus Group, which were built between the late 4th and early 6th centuries. The three-tiered, keyhole-shaped tomb is 486 meters in length and 654 meters at its widest, and is surrounded by a three-tiered moat. Although the actual identity of the Emperor buried there is unknown, the *Daisenryo Kofun* was recorded as the tomb of Emperor Nintoku in a collection of laws compiled by the Imperial Household Agency in the early 10th century. The *Daisenryo Kofun* is one of the three largest tombs in the world, together with the pyramid of King Khufu in Egypt and the tomb of Qin Shi Huang in China. It was designated as a UNESCO World Heritage Site in 2019.



Chemistry! It's Cool!



IChO2021 8 Catalyzer No.

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



**Aug. 1
1774**

Discovered!

Oxygen
by Joseph Priestley

Contact Information

IChO2021 Office
 1-5 Kanda-Surugadai, Chiyoda-ku,
 Tokyo 101-0062, Japan
 E-mail: contact@icho2021.org
 Edited by the Team Catalyzer IChO2021
 English Editor: Maiko Katayama
 Illustration: Science Manga Studio