ISSUE 6

Friday, July 14th

IPhO 2023 TOKYO JAPAN

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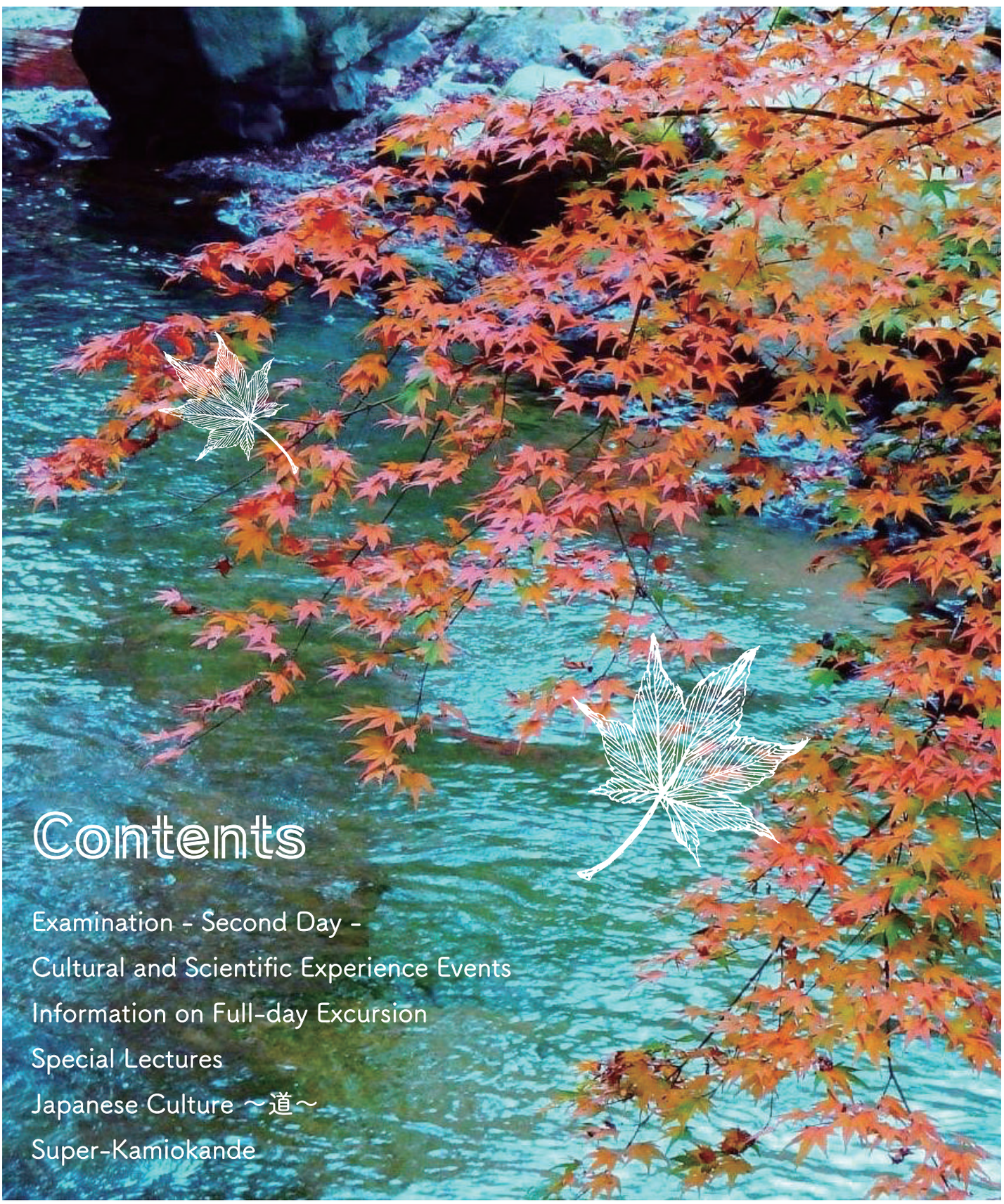


Contents

Examination - Second Day - ～THEORY～

Latvia:
OZOLINS Toms

The exam was harder than I expected, but at the same time, I managed to do something in all five hours. I think it was OK, but it could have been worse. I could have done better, but sadly, maybe my brain didn't work as I wanted. I did 80% or 90% out of my maximum capacity, but I'm happy about the exams. Today it was not as hot as before, so I don't think the weather affected my condition.

Slovakia:
HARMANSKY Adam

Today's theory problems were really surprizing to me. They were a lot more about math than about physics. But I liked the third problem on "Water and Object". I think the first one was OK but the second one was a little bit weird. Unfortunately, I don't think I did really well. However, the exams went well, the corrections to the tests were taken care of efficiently, and the test procedure was well-organized. It was funny to take the exams in the card-board booth, though.

Cultural & Scientific Experience Events

Austria :
LUN Pascal &
VOGRINCIC Neza

We tried calligraphy and had a lot of fun doing it. We find it so cool to use brushes but what we drew with a brush looked worse than the model drawing, We wrote our names and "physics (butsuri)" in Japanese. All in all drawing with brushes was very enjoyable. We also tried making "Watoji" notebooks, which we found very interesting as well. We used traditional Japanese paper which normally we don't choose. In addition, we enjoyed the Japanese tea ceremony. We felt the Japanese culture in it.

Portugal:
PINTO Ivan

I played with a spinning top, "Koma." Since we have a similar toy in Portugal, I have some experience. But it was very different from Portuguese's one: the Japanese tops are sharp, while the Portuguese tops are tall and round. I like playing with a koma. It's fun.

Tajikistan:
SALIMOV Husanjon

Japanese cultural experience booths were really good. I made a "watoji" notebook using some paper for myself. The process was really interesting and people at the booth helped me. I drew a picture on the notebook with the name of my country Tajikistan in Japanese letters and the logo of IPhO. In writing in Japanese, people at the booth helped me. It was really good. I learned a lot from this, like how to make my own notebook.

Nepal:
RAUT Manish

I tried calligraphy, which was fun and a great experience. I wanted to write my first name in Japanese characters, so I asked the attendant to help me out.
Unfortunately, my name was written as Manis, not the correct name Manish, probably because my pronunciation was not so good. However, it was not really difficult to write with brushes and I really like it.

Excursion Information

July 15th (Sat)

July 16th (Sun)

HAKONE

Courtyard of Building A at 7:45

"Hakone" means a box-shaped mountain: "Hako" means a box and "ne" means a root. It is the area around Mt. Hakone that straddles Kanagawa and Shizuoka prefectures. Weather permitting, from the ropeway, you can see Mt. Fuji, Japan's tallest mountain. Also, Hakone has been famous as a hot spring resort.

NIKKO

Courtyard of Building A at 7:45

At Nikko Toshogu Shrine, you can find a lot of colorful sculptures. The most famous one is statue of the three wise monkeys. It represents the teaching of "See no evil, hear no evil, speak no evil." Also, you can see another famous sculpture of the sleeping cat designated as a national treasure.

KAMAKURA

Courtyard of Building A at 9:15

Kamakura is a historical city where the shogunate was established by samurai during the Kamakura period (1185-1333). Hence, you can enjoy its historical heritages and samurai culture, while being surrounded by rich nature. You can also enjoy Enoshima Island, sightseeing spot.

TSUKUBA

Courtyard of Building A at 8:45

It is the largest academic city in Japan. At KEK (High Energy Accelerator Research Organization), the development of accelerator technology, such as super KEKB, is being carried out. Also, Mt. Tsukuba is a famous mountain. Weather permitting, you can enjoy the view of Lake Kasumigaura.

Special Lectures
by two Nobel Laureates in Physics

KAJITA Takaaki
President, Science Council of Japan
Distinguished University Professor
The University of Tokyo
2015 Nobel Laureate in Physics

Neutrinos
– key particles for the understanding of the smallest particles and the largest Universe –

Neutrinos are remarkably interesting particles. Neutrinos have three types, i.e., electron-neutrinos, muon-neutrinos, and tau-neutrinos. They have no electric charge and interact with matter very rarely. Because of the last nature, neutrinos can easily pass through even the Earth or the stars. One can study the interior of stars by detecting neutrinos from these stars, although the detection of neutrinos is difficult. Neutrinos have been assumed to be massless. However, if neutrinos have mass, they may change their type while propagating in a medium. For example, a muon neutrino may change to a tau-neutrino. These phenomena are called neutrino oscillations. Twenty-five years ago, neutrino oscillations were discovered, and therefore it was found that neutrinos have tiny mass. I will discuss the studies of neutrinos focusing on our experiments that have been carried out in Kamioka, Japan.

Message to students:

Physics is really a fascinating scientific field. Through collaborations of theoretical and experimental studies, we understand the smallest elementary particles and the largest Universe. However, our understanding of these smallest and largest scales is still incomplete. We believe that many more fundamental discoveries await us. Young students, join us on our journey to understand the smallest and the largest world.

Don´t waste your gifted talents

AMANO Hiroshi
Professor, Nagoya University
2014 Nobel Laureate in Physics

Sometimes, I am asked by students or young researchers, “What are the most important characteristics of a scientist?” . I would answer, a scientist should have (1) a future vision, (2) enthusiasm, and (3) patience. Your future vision leads you to concentrate on reaching your goal, and enthusiasm is essential for you to be able to continue your effort until you have reached your goal. As for patience, if you are under some pressure, for example, when you have to obtain PhD degree as soon as possible, it is rather easy to do things that are not so meaningful to you but are merely convenient to quickly solve an urgent problem. You may feel relieved after solving a problem, but in such a case, you may not be satisfied with the results. It is difficult not to do so. However, during your effort, sometimes you should be patient and wait until you find the real route to your goal. You do not need to compromise.

Message to students:

I presume that you have done extremely well in physics so far. I think your achievements until today owe much to your gifted talents. After this Physics Olympics, however, your situation may change. You may attract the attention of many people, and you may feel you have to do something big. If you already have your future vision, this is not a problem for you. However, if you still do not have a clear image of your future, please listen to my talk. In this presentation, I would like to share my experiences with you. I hope this presentation gives you some hints for your future life.

Japansese Culture

道 DOU

What is “道”？

The process of training to improve traditional techniques. To master a technique, one begins with “kata” (it means form), and beginners practice basic kata repeatedly without reason until their bodies learn them. The purpose of most "dou" is to grow as a person through training and to become a person of character. In Japan, there are many "dou" that have been handed down to people for hundreds of years.

① Kendo(剣道): Kendo is a sport in which players in kendo uniform face each other one-on-one and compete to win or lose by striking or thrusting a shinai (bamboo sword) at a predetermined spot. ② Sado(茶道): In Sado, the master prepares tea in the traditional Japanese style and serves it to guests, who then enjoy it while being entertained by the master.③ Kado(華道): Kado is the act of cutting seasonal trees, branches, and flowers and arranging them in vases to express and appreciate the beauty of their appearance and the preciousness of life. ④ Shodo(書道): Shodo (Japanese calligraphy) is a way of expressing oneself by writing letters on paper using a brush and ink and conveying one's thoughts through the letters and styles of writing. ⑤ Kyudo(弓道): Kyudo is a Japanese martial art that trains the body and mind through a series of movements that involve shooting an arrow with a Japanese bow and hitting a target.

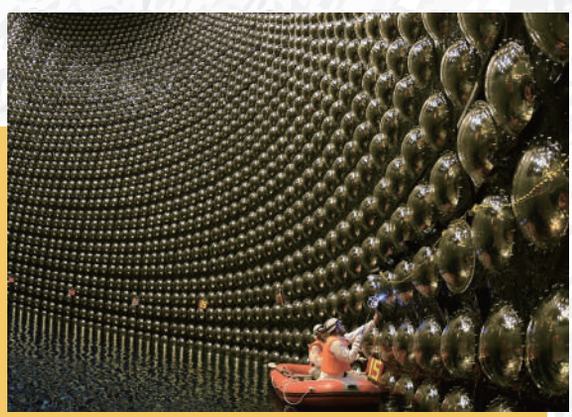
Super-Kamiokande

- Uncovering the nature of neutrinos and the mysteries of elementary particles and the universe -

Super-Kamiokande (SK) is the world's largest water Cherenkov observatory operated by the Institute for Cosmic Ray Research at the University of Tokyo, located 1,000 m underground in the former Kamioka Mine in Hida City, Gifu Prefecture, in the central part of Japan. The purpose of SK is to study elementary particle physics and astrophysics through neutrino detection and proton decay searches.

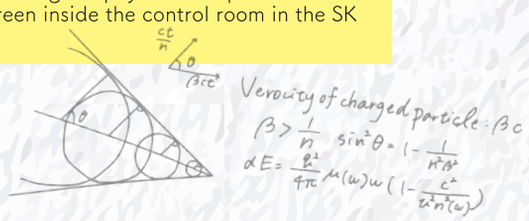
SK is a 50,000-ton cylindrical water Cherenkov detector, 40 m in height and 40 m in diameter, whose operations began in 1996. It is equipped with over 11,000 50-cm photomultiplier tubes (PMTs) to observe various elementary particle interactions in the detector. SK observes neutrinos produced both in the Sun (solar neutrinos) and by the interactions of cosmic rays in the atmosphere (atmospheric neutrinos). In 1998, SK observed a clear anisotropy in the zenith angle distribution in its atmospheric neutrino data, thereby establishing the existence of neutrino masses and mixing, a phenomenon known as "neutrino oscillations." For this result, the Nobel Prize in Physics was awarded to Prof. Takaaki Kajita in 2015. Furthermore, accurate measurements of the solar neutrino flux using neutrino electron scattering data in SK, in conjunction with the results from the SNO (The Sudbury Neutrino Observatory) experiments in Canada, led to the discovery of oscillations among neutrinos produced in the center of the Sun.

All materials in the universe are made of atoms, which consist of nuclei and electrons. Furthermore, the nucleus is a composite of protons and neutrons. It has been thought that protons are stable; however, Grand Unified Theory, which unifies strong, weak, and electromagnetic interactions, predicts protons will decay into lighter particles like mesons and leptons. To confirm this prediction, we have been measuring proton lifetime using SK with 50,000 tons of pure water containing 7×10^{33} protons. (a huge number of protons!) Although SK has been running for more than 20 years, any evidence of proton decay has not been observed yet. From this result, the proton lifetime is estimated to be more than 1,034 years. Just as has been done until now, Super-Kamiokande will keep running towards a new horizon of the world of particle physics in the future as well.



Inside picture of Super-Kamiokande' s cylindrical water Cherenkov detector.

Researchers discussing the physics of experimental data shown on the screen inside the control room in the SK facility.



SCHEDULE

TODAY
Friday, July 14th

24 ℃
31 ℃

Students

7:15-8:00	Breakfast	NYC
9:00-15:00	Half-day Tokyo Excursion	
16:00-17:40	Special Lectures	NYC
18:00-19:30	Dinner Party	NYC

Leaders & Observers

7:00-8:00	Breakfast	NSH
12:00-13:30	Lunch	NSH
16:00-17:40	Special Lectures	NYC
18:00-19:30	Dinner Party	NYC

TOMORROW
Saturday, July 15th

26 ℃
34 ℃

Students

7:15-8:00	Breakfast	NYC
8:00-19:00	Full-day Kanto Excursion	

Leaders & Observers

7:00-8:00	Breakfast	NSH
12:00-13:30	Lunch	NSH
14:00-15:00	Board Meeting	NSH
18:00-19:30	Dinner	NSH

NYC: National Olympics Memorial Youth Center
NSH: Nippon Seinenkan Hotel

The Physical Society of Japan
Japan Society of Applied Physics
The Physics Education Society of Japan
The Biophysical Society of Japan
Japan Science and Technology Agency (JST)
National Institution for Youth Education (NIYE)
National Museum of Nature and Science
Japan Arts Council
Tokyo National Museum
The University of Tokyo
Tokyo University of Science
Tokyo City University
Tokyo University of Foreign Studies
International Christian University
Sophia University
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