JAPAN PRIZE NEWS

THE SCIENCE AND TECHNOLOGY
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Scientists from France, Germany and U.K. Awarded 2007 (23rd) Japan Prize

The Science and Technology Foundation of Japan (Chairman: Hiroyuki Yoshikawa) announced that French, German and U.K. scientists have been named as laureates of the 2007 (23rd) Japan Prize.

Prof. Albert Fert, 68, of France and Prof. Dr. Peter Grünberg, 67, of Germany, will receive the Japan Prize in this year's category of "Innovative Devices Inspired by Basic Research." They discovered the phenomenon of giant magneto-resistance (GMR) and contributed to development of innovative spin-electronics devices.

Dr. Peter Ashton, 72, of the U.K. will receive the Japan Prize in the category of "Science and Technology of Harmonious Co-Existence." He contributed to the conservation of tropical forest.

Innovative Devices Inspired by Basic Research

Prof. A. Fert

Prof. Dr. P. Grünberg

Science and Technology of Harmonious Co-Existence

Dr. P. Ashton

Japan Prize

The Japan Prize is awarded to world-class scientists and technologists who were credited with original and outstanding achievements and contributed to the advancement of science and technology, thereby furthering the cause of peace and the prosperity of mankind. In principle, original achievements in science and technology are given priority during the selection process.

No distinction is made as to nationality, occupation, race, or sex. Only living persons may be named.

Fields of study for the prize encompass all categories of science and technology, with two categories designated for the prize each year in consideration of developments in science and technology.

Each Japan Prize laureate receives a certificate of merit and a commemorative medal. A cash award of 50 million yen is also presented for each prize category. The award is intended for a single person, in principle, but small groups of researchers are also eligible.

Inovative Devices Inspired by Basic Research

Achievement :
The discovery of giant magneto-resistance(GMR) and its contribution to development of innovative spin-electronics devices

Prof. Albert Fert (France)
University of Paris-South

Prof. Dr. Peter Grünberg (Germany)
The Research Center of Solid State Physics

<Summary>

Computer hard discs, which store vast amounts of memory, are improving year by year and at a faster rate than ever before. Now, however, these memory storage discs are not limited to computers, but are also being used in such electronic appliances as mobile music devices and video cameras. The reason behind the great increases in memory storage capacity and the rapidly diversifying use of hard discs is the discovery of giant magneto-resistance (GMR), a groundbreaking technological innovation. The men responsible for this astonishing discovery are Prof. Albert Fert and Prof. Dr. Peter Grünberg.

The memory storage capacity of hard discs is increasing year by year and at an ever accelerating rate. Laptop computers in the early 1990s generally had a memory storage capacity of several dozen megabytes. Now, however, memory storage capacity of around 100 gigabytes (one gigabyte = 1000 megabytes) is the norm. In recent times, personal computers are able to store vast amounts of image and musical data, and hard discs are now able to store hours and hours of television programs. The reason behind the great increases in memory storage capacity of hard discs and the diverse usage of hard discs in many other types of electronic appliances is the development of a magnetic head which utilizes giant magneto-resistance (GMR) effect.

The magnetic head that utilizes GMR effect

Hard discs use a magnetic head to store data and read it. In the hard disc is a thin magnetic disc called a platter, and this records data. The platter approaches a component known as the magnetic head, and through a process of electric current transformation, the magnetic head reads bits (units of data) of stored information.

To increase the storage capacity of hard discs, it is necessary to cram a large amount of data into a small space. In order to do this, the volume of the magnetic body per bit must be reduced. However, this reduction of the volume of the magnetic body weakens the magnetic field of each bit of data, and this makes it difficult for the head to read the stored magnetic information.

What was required was a component that could read the weakened magnetic field, or more specifically, a head that could convert small amounts of data into electric signals. And this heralded the appearance of the GMR element.

In previous magnetic heads used for reading data, magneto resistance (MR) components had been used. Magneto resistance is the phenomenon of the change to electrical resistance when subject to a magnetic field. As the electrical resistance change causes the electrical current change, the data written on the hard disk can be read by detecting the electrical current. The resistance change ratio when using the MR component is at most only a few percent.

In contrast to this, when the GMR component is used resistance ratio rises to several tens of percentage. In other words, even a responsibility to a weak magnetic field leads to a vast increase in sensitivity. This means that even when a large amount of magnetic data is stored on a small sized hard disc it is easy to read, and this has resulted in the memory storage capacity of hard discs undergoing great improvements. Thanks to the development of the magnetic head which utilizes GMR effect in the late 1990s, the performance and effectiveness of hard discs is being enhanced at a faster and faster rate.

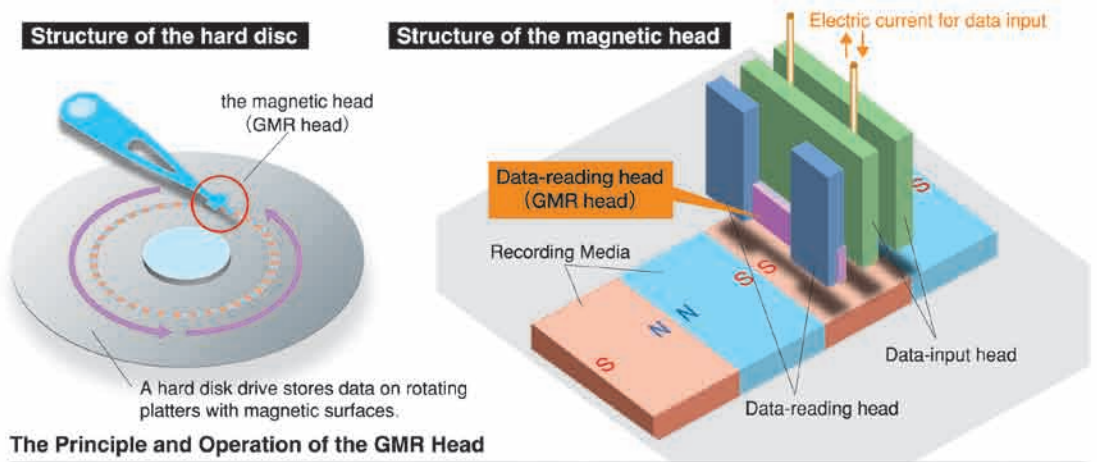
The Development of GMR and the Japan Prize Winners

The departure point for GMR, which has resulted in the high density hard discs in use today, was the discovery of Giant Magnetoresistant effect back in the late 1980s. In 1988, Prof. Albert Fert and his team at Univercity of Paris-South in France, discovered GMR by placing alternate layers of thin films of iron (Fe) and chrome (Cr) and building up a multilayered film consisting of dozens of thin film layers of both metals at the low temperature (4.2K) of liquid helium, and noticing the highly unusual results for the time of approximately 50% magnetoresistive effect.

At the same time, an independent research project led by Prof. Dr. Peter Grünberg at Research Center for solid state physics in Germany discovered approximately 1% GMR effect after placing a thin film of iron both on top and beneath a thin film layer of chrome at room temperature. The research team then found that when building up alternate thin film layers with transition metals (e.g. Fe or Ni) and nonmagnetic metals, the majority of these showed GMR effect.

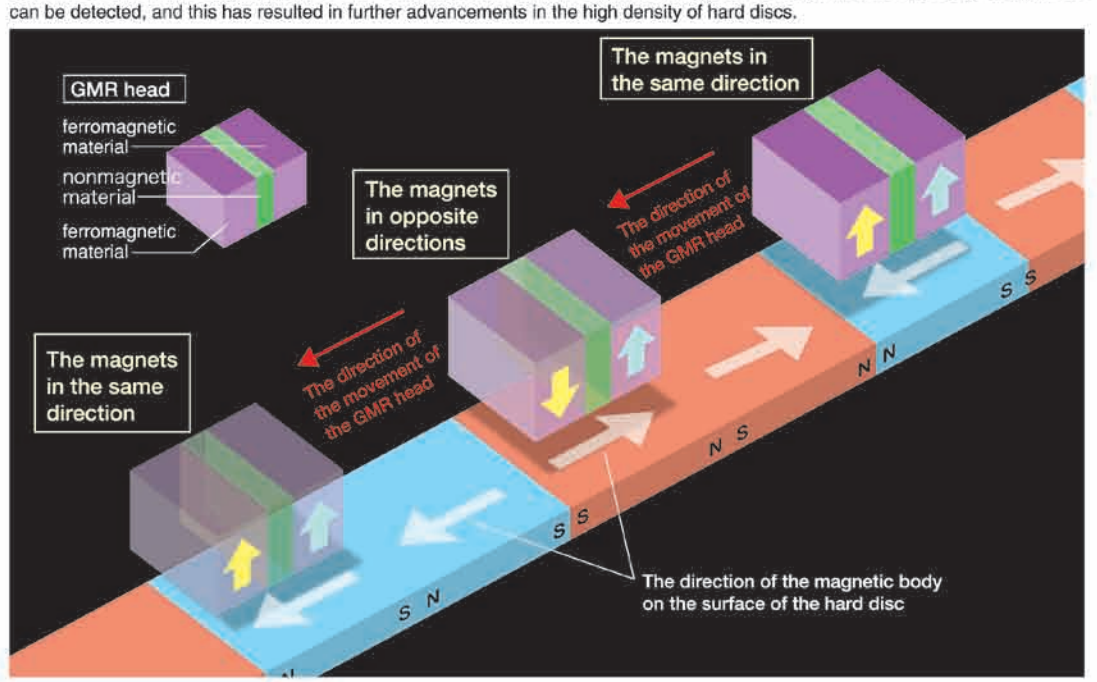
The landmark GMR component which proved a major breakthrough for magnetic memory is the result of discoveries made by both these researchers (the GMR component employs the characteristics of the electron spin , and is therefore known as one of the spin electronics device, or spintronics devices).

Currently, a product that utilizes Tunneling Magnetoresistance (TMR) is under development which will further improve Giant Magnetoresistance. The discovery of GMR effect has, in a short period of time, greatly enhanced the memory storage capacity and effectiveness of the hard discs used in both computers and in many other types of electronic appliances. The fundamental research undertaken by both Prof. Albert Fert and Prof. Dr. Peter Grünberg has made a major contribution to the advancement of information technology. Their achievements are of inestimable importance and richly deserve their place in the annals of scientific discovery.



The Principle and Operation of the GMR Head

When the GMR head moves, the direction of the magnet of the GMR element is altered by the change in the direction of the magnet on the surface of the disc. As the resistance of the element changes in accordance with GMR effect, it is able to be detected as an electric signal. Thanks to the GMR element, even the slightest change to the magnetic field caused by a minute bit can be detected, and this has resulted in further advancements in the high density of hard discs.



JAPAN PRIZE

Science and Technology of Harmonious Co-Existence

Achievement : Contribution to the conservation of tropical forest

Dr. Peter Ashton (United Kingdom)
Charles Bullard Professor of Forestry

<Summary>

In recent times, the destruction of tropical forests has been progressing at an alarming rate. Tropical forests are a veritable treasury of a diverse array of many forms of life, and it is widely believed that the loss of this environment would have a major impact on the ecosystem of the entire planet. Dr. Peter Ashton has been awarded the 2007 Japan Prize in the category of "Science and Technology of Harmonious Co-Existence" for his expansive research into the phylogenetic systemization of flora and ecological studies in the tropical forests of Southeast Asia, and the contribution his findings have made to tropical conservation efforts.

The Current Status of Tropical Forests

Tropical forests cover large tracts of warm climate areas with vast amounts of fall, and are primarily found in Southeast Asia, Central Africa and Central and South America. Due to this, the forests play host to many species of flora and fauna—although tropical forests account for only 12% of the total land area of the earth, it is believed that they are home to over 50% of all known forms of life. However, these tropical forests are now disappearing at an alarming rate. This trend is particularly prominent in Asia—from the 1960s to the 1990s, while the world's tropical forests were decreasing at a rate of about 20%, the tropical forests in Asia were decreasing at a rate of approximately 30%.

Tropical Forests in Asia and Dr. Peter Ashton

Dr. Peter Ashton, the 2007 Japan Prize laureate in the category of "Science and Technology of Harmonious Co-Existence" has done much to research, identify and systematize the dipterocarpaceae and other species of tree prominently found in Asian forests. The dipterocarpaceae species is also known as *lauan* timber, or tropical plywood, and is imported as plywood by Japan. As the trunk of this tree is straight, and it is a light yet hard wood, it is seen as a material that can be put to a diverse range of uses, and the tree has thus been felled in large numbers. Despite being the most important tree of the region, its reproductive powers are relatively weak and the indiscriminate felling of this tree has had a profound impact on the tropical forests of the Asian region. Large scale deforestation in the region is also progressing to make way for oil palm and rubber plantations, and this is causing the destruction of the complex ecosystem that is found in the tropical forests.

To address this situation, the Center for Tropical Forest Science (CTFS), an affiliated facility of the Smithsonian Tropical Research Institute, is collaborating with other research centers to implement a long-term continual observation project covering wide areas in 18 different locations in 14 countries in Central and South America, Central Africa and Southeast Asia. Dr. Peter Ashton is in charge of 11 locations in the Asian region and has been leading a team of researchers from around the world to further the project, which reviews the observed changes on a five-yearly basis.

Establishment of the Tropical Forests Survey

The long-term continual observation project for tropical forests covers 18 different locations across the world. It is a global-scale forestry survey that conducts continual long-term observations of tropical forests. It is thought that the project observes approximately 6,000 species encompassing some 3 million trees. Tropical forests are made up of an extremely large number of species of tree. The reason that such a large-scale survey is necessary is because small-area surveys would not include many trees of the same species and would not yield an accurate picture of the role of the trees in the ecosystem. Such a large-scale survey, however, is an undertaking of major proportions.

Let us examine a survey that Dr. Ashton carried out with other reseachers in Malaysia. Firstly, a survey area of 50 hectares (500mX1000m) was marked out in five-meter sections, measurements of the topographical features were taken, and a map was drawn up. Next, a tag was attached to each tree of at least chest height and with a diameter of over 1cm to differentiate between the species of tree; the diameter of each tree was then accurately measured and the species identified. These findings were then added to the map. The area is revisited every five years with the same operation conducted to allow the researchers to gauge the growth of the trees and catalog those trees that are unable to survive.

To undertake such a major research project requires passion, dedication and leadership—qualities that Dr. Ashton possesses in abundance. Since the late 1980s, he has worked tirelessly convincing the world of the need for an effective survey, collecting funds to finance the survey, getting the survey up and running, nurturing young researchers, and devoting himself fully to the project.

Immense Contribution to the Conservation of Tropical Forests

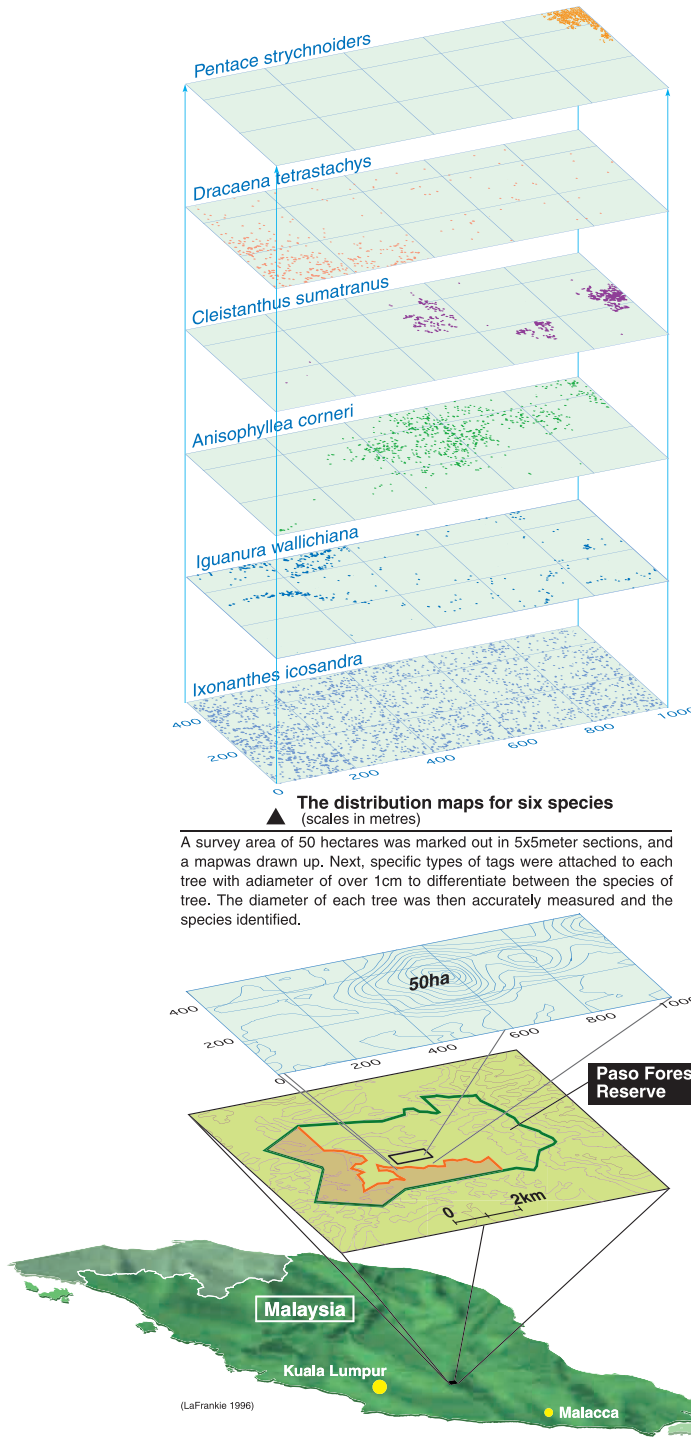
As has been noted, tropical forests are made up of an extremely large number of species of tree. The trees come in a variety of shapes and sizes, and each plays host to and supports a plethora of other life forms. However, the trees of the secondary forests that replace the original primary forests after deforestation has taken place lack the diversity of their predecessors. This, in turn, adversely affects the forms of life that made their homes in and were supported by the trees of the primary forest. When photographed from the air, there would appear to be little difference between primary and secondary forests. However, for the diverse array of organisms that make their homes in the forest, the difference is immense.

The CTFS project strives not only at raising awareness of the current predicament faced by tropical forests and the effect that this has on the wider global environment, but also aims to encourage examination of how people who rely on the forests for their livelihoods can interact more harmoniously with their natural surroundings.

The vast body of ecological knowledge that Dr. Peter Ashton has acquired over his many years of research form the foundation for the current global research project, and his leadership has attracted many talented researchers from around the world.

The contribution of Dr. Ashton to the conservation of tropical forests, and particularly those in the Asian region, has been immeasurable. He has gained a glowing reputation among fellow Japanese researchers as "the most trustworthy of all fellow scientists," and his unceasing efforts toward achieving a sustainable environment have been greeted with the highest possible praise from the international scientific community.

A Large-scale Survey (Paso Forest Reserve)



▲ **The distribution maps for six species** (scales in metres)

A survey area of 50 hectares was marked out in 5x5meter sections, and a mapwas drawn up. Next, specific types of tags were attached to each tree with adiameter of over 1cm to differentiate between the species of tree. The diameter of each tree was then accurately measured and the species identified.

Members of the 2007 (23rd) Japan Prize Selection Committee

	Name	Post
Chairman	Nobuaki Kumagai	President of University of Hyogo, Professor Emeritus of Osaka University
FieldⅠ Innovative Devices Inspired by Basic Research		
Panel Chairman	Koichi Kitazawa	Senior Executive-Director, Japan Science and Technology Agency (JST)
Acting Chairman	Takehiko Ishiguro	Fellow, Office for Research Initiatives and Development, Doshisha University
Members	Hidetoshi Fukuyama	Professor, Faculty of Science, Tokyo University of Science
〃	Tatsuo Izawa	Executive Counselor, NTT Electronics Corporation
〃	Tetsuya Osaka	Professor, Faculty of Science and Engineering, Waseda University
〃	Katsuaki Sato	Professor, Vice President for Education, Tokyo University of Agriculture and Technology
〃	Junichi Sone	General Manager, Fundamental and Environmental Research Laboratories, NEC Corporation
〃	Kohei Tamao	Director, Frontier Research System, RIKEN
FieldⅡ Science and Technology of Harmonious Co-Existence		
Panel Chairman	Kunio Iwatsuki	Director, The Museum of Nature and Human Activities, Hyogo
Acting Chairman	Kazutake Kyuma	Professor Emeritus, Kyoto University, Professor Emeritus, The University of Shiga Prefecture
Members	Haruhiko Fujiwara	Professor, Graduate School of Frontier Sciences, The University of Tokyo
〃	Mitsuyasu Hasebe	Professor, The National Institute for Basic Biology, National Institutes of Natural Sciences
〃	Isao Inouye	Provost, Graduate School of Life and Environmental Sciences, University of Tsukuba
〃	Aikichi Iwamoto	Director, Research Hospital & Advanced Clinical Research Center, The Institute of Medical Science The University of Tokyo
〃	Naomasa Nakajima	Vice President, National Institute of Advanced Industrial Science and Technology
〃	Tohru Nakashizuka	Professor, Graduate School of Life Sciences, Tohoku University
Advisors	Taiji Kikuch	Professor Emeritus, Kyushu University
〃	Shinji Tsuyumu	Director, Graduate School of Science and Technology, Shizuoka University

(Title when serving on the committee)

Categories Selected for the 2008 (24th) Japan Prize

The Science and Technology Foundation of Japan announced the two categories for the 2008 (24th) Japan Prize, and determined their definition as follows.
Letters have been sent to scholars and rescarchers throughout the world, requesting nominations in the fields in which the award is being made. The selection committee will then recommend candidates to the Board of Directors of the Foundation, and make their decisions.

Field I: Information･Communications

"Information Communication Theory and Technology"

The advance and wide-spread use of computers and networks has brought about a cyberspace heretofore unknown to humankind. It has made the social structure flexible and promoted borderless economic activities, extensively widening the living space of people. Based on this trend, the 2008 Japan Prize will be awarded to a researcher who has made a significant contribution to the field of information communication theory and technology.

This includes theory of computation, algorithm, computer software, computer systems, computer architecture, human interface, Internet, search technology, information security, visualization technology, information theory, data compression, cryptology, coding theory, radio and optical communication systems, wireless communication systems, and quantum communication.

Field II: Life Science (Medicine)

"Medical Genomics and Genetics "

Recent advances in genome science and molecular genetics that disclosed 3 billion nucleotides of human genome have led us to a better understanding of molecular mechanisms underlying various biological phenomena. Particularly, they have contributed to the discovery of genes responsible for or susceptible to various diseases as well as those related to efficacy or adverse reactions of drugs.

The Japan Prize for 2008 will be awarded to a scientist who made outstanding achievements in the field of medical genomics and genetics, including establishment of fundamental principle for genetic/genomic analysis, construction of basic infrastructure like genetic maps and genomic sequences, and development of essential technologies.

Members of Fields Selection Committee

	Name	Post
FieldⅠ Information･Communications		
Chairman	Shigeo Tsujii	President, Institute of Information Security
Members	Norihisa Doi	Professor, Department of Information and System Engineering, Faculty of Science and Engineering, Chuo University
〃	Osamu Hirota	Professor and Director, Research Center for Quantum Information Science, Tamagawa University
〃	Yasuyoshi Inagaki	Professor and Dean, School of Information Science and Engineering, Aichi Prefectural University
〃	Kohichi Sakaniwa	Professor, Department of Communications and Integrated Systems, Graduate School of Science and Engineering, Tokyo Institute of Technology
FieldⅡ Life Science (Mdicine)		
Chairman	Ichiro Kanazawa	President, National Center of Neurology and Psychiatry
Members	Yo-ichi Nabeshima	Professor, Graduate School of Medicine, Kyoto University
〃	Yusuke Nakamura	Director, Human Genome Center, Institute of Medical Science, The University of Tokyo
〃	Takehiko Sasazuki	President, International Medical Center of Japan
〃	Naoyuki Taniguchi	Endowed Chair Professor, Research Institute for Microbial Diseases, Osaka University

(Title when serving on the committee)

Japanese Students Attend the Nobel Prize Award Ceremony

In 1987, the Science and Technology Foundation of Japan (JSTF) instituted a program which began sending two Japanese students to the annual Stockholm International Youth Science Seminar (SIYSS). The event is held during Nobel Prize Week as a means of promoting the international exchange of young scientists, and is conducted under the auspices of the Swedish Federation of Young Scientists and with the support of the Nobel Foundation.

This year, it sent Ms. Zeenia Kaul of Intemational Christan University and Mr. Takamasa Horiuchi of Wakayama Medical University to the 31st SIYSS. Their report follows;

2006 SIYSS family of young scientists from various countries

We attended the 31st Stockholm International Youth Science Seminar (SIYSS) held from December 4-10, 2006. SIYSS is a weeklong seminar held in connection with the Nobel Prize celebrations. It was an inspiring opportunity to learn, interact with fellow students, make friends and enjoy ourselves. The Science and Technology Foundation of Japan (JSTF) allowed us this priceless opportunity. We were very fortunate to spend this valuable time with 22 other participants, young student scientists from 16 different countries, and eight coordinators from Sweden.

The program included attending the Nobel speeches and lectures, conversing with Nobel laureates, visits to the world-renowned universities and institutions of Sweden, and interacting with other participants from all over the world. Opportunity to talk and learn from the vanguard of contemporary science and technology, and witnessing the historical award ceremony for the highest achievements, was highly inspiring and stimulating. The SIYSS symposium also provided us with a great platform to present our own research work to our fellow participants, young students and professors and researchers in Sweden. Besides exploring science and technology, such experiences have enabled us to make international friends as well.

With Prof. George F. Smoot (Nobel Laureate in Physics 2006) at the Nobel Museum

The seminar ended with the Nobel Award ceremony. It was a wonderful experience to be the part of the formal (award ceremony and Nobel banquet) and informal (night cap) parts of this celebration. Wearing the traditional Japanese Kimono and Haori Hakama costumes during the event was highly enjoyable.

SIYSS has been a wonderful experience filled with educational, inspirational and social opportunities that will greatly influence our scientific career and development.

Introducing Fukuwarai, a traditional Japanese game, during the International evening

Dressed in traditional Japanese costumes to attend the Nobel Award Ceremony