JAPAN PRIZE NEWS

THE SCIENCE AND TECHNOLOGY
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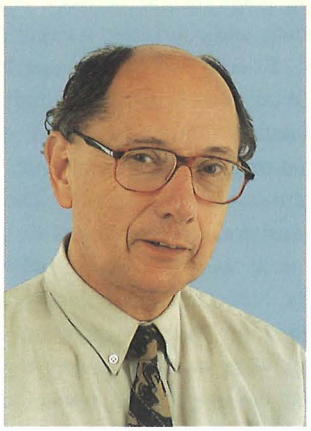
Japanese and Belgian Scientists Named as Laureates of the 1998 (14th) Japan Prize

Category of Generation and Design of New Materials Creating Novel Functions

Dr. Leo Esaki

Category of Biotechnology in Agricultural Sciences

Prof. Dr. Jozef S. Schell



Dr. Marc C. E. Van Montagu

The Science and Technology Foundation of Japan (Chairman: Jiro Kondo) announced that a Japanese scientist and two Belgian scientists have been named as laureates of the 1998 (14th) Japan Prize.

Dr. Leo Esaki (72), President of University of Tsukuba, Japan, will receive the Japan Prize in this year's category of "Generation and Design of New Materials Creating Novel Functions." He contributed to the creation and realization of the concept of man-made superlattice crystals which has led to generation of new materials with useful applications.

Dr. Jozef S. Schell (62), Director of Department of Genetic Principles of Plant Breeding, Max-Planck-Institut fuer Zuechtungsforschung, Germany, and Dr. Marc C. E. Van Montagu (64), Scientific Director of the Genetics Department, Flanders Interuniversity Institute for Biotechnology, Belgium, will receive the Japan Prize in this year's category of "Biotechnology in Agricultural Sciences." They contributed to the establishment of the theory and method of the production of transgenic plants.

These three scientists will be honored during a prize presentation ceremony scheduled to be held at the National Theater in Tokyo on Tuesday, April 28, 1998. All will receive a certificate of merit, commemorative medal, and a cash award of ¥50 million for each category.

JAPAN PRIZE

Category of Generation and Design of New Materials Creating Novel Functions

Reasons for Award: For the creation and realization of the concept of man-made superlattice crystals which lead to generation of new materials with useful applications

Dr. Leo Esaki (Japan)

President, University of Tsukuba, Japan
Born on March 12, 1925 in Osaka, Japan

Dr. Leo Esaki proposed in 1969 the concept of semiconductor "superlattice," man-made single-crystal with a periodic one-dimensional structural modification. He predicted that a superlattice would exhibit peculiar properties such as negative differential conductivity because the density of states has a short-period modulation in the k-space. He proposed to realize a superlattice by modulating either alloy composition or impurity density during thin-film crystal growth. His efforts on molecular-beam epitaxy paid off in 1972 when he discovered a negative differential conductivity in a GaAlAs superlattice. He also predicted a resonant tunneling phenomenon between adjacent potential wells in a superlattice, and confirmed it experimentally in 1973.

Dr. Esaki's work on superlattice had a tremendous influence on other scientists. Firstly, he suggested the concept of modulation doping (overflow of conduction electrons or holes that originate from impurities in a wide-bandgap region into a narrow-bandgap region). The HEMT, a high-speed field effect transistor, was developed in 1980 based on this concept, and is now widely used in wireless telecommunications. Secondly, semiconductor lasers and photo-detectors with superlattice (or multiple-quantum-well as it is often called) structures were invented during the 1980's and are now very important components in optical communications. Thirdly, GMR (Giant Magneto-Resistance) was discovered in the late 1980's in a superlattice structure consisting of magnetic and non-magnetic metals and are being pursued as sensors for magnetic recording.

Dr. Esaki's conception of superlattice has thus led to the discovery of many interesting new properties — electrical, optical, and magnetic — and their useful applications, which makes him well deserve the 1998 Japan Prize in the category of "Generation and Design of New Materials Creating Novel Functions." Dr. Leo Esaki was awarded a Nobel Prize in Physics in 1973 for his discovery of tunneling in semiconductor p-n junctions. Superlattice is another great accomplishment he has made.

Category of Biotechnology in Agricultural Sciences

Reasons for Award: Establishment of the theory and method of the production of transgenic plants

Prof. Dr. Jozef S. Schell (Belgium)

Director, Department of Genetic Principles of Plant Breeding, Max-Planck-Institute fuer Zuechtungsforschung, Germany
Born on July 20, 1935 in Antwerp, Belgium

Dr. Marc C. E. Van Montagu (Belgium)

Scientific Director of the Genetics Department, Flanders Interuniversity Institute for Biotechnology, Belgium
Born on November 10, 1933 in Gent, Belgium

Drs. Schell and Van Montagu together studied the molecular mechanisms of crown-gall formation in dicotyledonous plants infected with soil bactera, *Agrobacterium tumefaciens*. They presented abundant evidence to show that the tumor is formed due to insertion of a specific DNA region (T-DNA) of a plasmid (Ti plasmid) contained in the bacteria into the genome of the host plant. Taking advantage of this fact, they developed an efficient method for the transfer of a foreign gene into a plant genome.

They showed that the tumor is formed through the action of genes located on T-DNA; the genes encode enzymes involved in the synthesis of plant hormones and thus regulate the growth of infected cells. Then, they clarified the molecular mechanisms of the insertion of T-DNA into plant genomes; for example, they showed that even when the genes for plant hormones are deleted from T-DNA the modified T-DNA can still be inserted into plant genomes, but that 25-base-pair repeated sequences at both ends of T-DNA play essential roles in the insertion. In order to put the insertion system into practical use for production of transgenic plants, they first developed the method of infecting wounded tissues and protoplasts of dicotyledons with *Agrobacterium*. They then showed that when a foreign gene is inserted into the T-DNA part of a Ti plasmid, the infection of a plant with *Agrobacterium* carrying such a plasmid results in the introduction of the gene into the host genome. Thereafter, they separately conducted much work with transgenic plants and succeeded in trial production of transgenic plants with insect- or herbicide-resistance.

By now the introduction of foreign genes into plant genomes with *Agrobacterium* can be made not only with the dicotyledons but also monocotyledons. Recent development of the production of various transgenic plants has thus been based upon the work of Drs. Schell and Van Montagu. The method of gene transfer with *Agrobacterium* has also been widely used for basic studies on the functions and control mechanisms of plant genes by many plant molecular biologists, including Drs. Schell and Van Montagu. They have thus greatly contributed towards enhancing agricultural production, both directly and indirectly.

Members of The 1998(14th) Japan Prize Selection Committee

Name	Post
Chairman: Hiroshi Inose	Director General, National Center for Science Information Systems

Selection Panel for Generation and Design of New Materials Creating Novel Functions

Chairman: Toru Imura	Professor, Department of Mechanical Engineering, Aichi Institute of Technology
Acting Chairman: Naoya Ogata	Professor, Department of Chemistry, Sophia University
Members: Shojiro Asai	Director & General Manager,Corporate Research and Development Promotion Office, Hitachi Ltd.
Members: Kenichi Iga	Director, Professor,Precision and Intelligence Laboratory, Tokyo Institute of Technology
Members: Osami Kamigaito	Director & Chief Operating Officer on Board, Toyota Central Research and Development Laboratories, Inc.
Members: Kenji Suzuki	Director, Professor, Institute for Materials Research, Tohoku University
Members: Kin-ichiro Miura	Professor, Director of Institute for Biomolecular Science,Faculty of Science, Gakushuin University

Chairman Kondo receives the list of recommended candidates.

Selection Panel for Biotechnology in Agricultural Science

Chairman: Ikuo Takeuchi	Managing Trustee, Chiba-Geigy Foundation (Japan) for the Promotion of Science
Acting Chairman: Akinori Suzuki	Professor Emeritus, The University of Tokyo
Members: Tadashi Asahi	Professor, Faculty of Biotechnology, Fukui Prefectural University
Members: Akira Iritani	Professor,Faculty of Biology-Oriented Science and Technology, Kinki University
Members: Mituru Takanami	Professor Emeritus, Kyoto University
Members: Hiroshi Harada	Professor Emeritus, University of Tsukuba
Members: Hiroshi Fujimaki	Director General, National Agriculture Research Center

Dr. Kenji Isshiki

Foundation's Annual Science and Technology Seminar Held in Fukuoka

An annual special seminar to discuss science and technology in plain language was held on November 28, 1997, in Fukuoka, one of Japan's largest cities. This is the sixth year that this seminar has been held in Fukuoka.

The seminar began in 1990 with an agreement between the Foundation and the Fukuoka City Municipal Office to mark the establishment of the Fukuoka Asian Cultural Award.

The 1997 seminar was held at the Fukuoka City Women's Center, Amicas, and was attended by about 100 people. Lectures were delivered by the 1988 (4th) Japan Prize Laureate, Dr. Isao Arita, Chairman of the Agency for Cooperation in International Health; and by Dr. Kenji Isshiki, Associate Director of the Postharvest Technology Division of the National Food Research Institute. Dr. Arita's lecture was entitled, "How can we protect our children from infection?" Dr. Isshiki spoke on the topic of "Food safety maintenance — How can we secure the safety of our food?"

Dr. Isao Arita

Categories Selected for the 1999 (15th) Japan Prize

The Science and Technology Foundation of Japan has announced the two categories for the 1999 (15th) Japan Prize. The categories are "Information Technologies" and "Molecular Recognition and Dynamics in Bioscience."

Concepts of the Categories

Information Technologies

In accordance with the progress of digitalization, information technologies are increasingly playing an important role in modern society.

The prize for 1999 will be awarded for outstanding achievements in encoding and encryption technologies, reliability and security technologies, and related digital information technologies which are bases of efficient and secure information systems.

Molecular Recognition and Dynamics in Bioscience

Recent progress of bioscience owes much to understanding mechanisms of intermolecular interaction. In addition, technological developments to visualize (or recognize) molecular movements and interactions in living cells have also contributed to obtain deeper insights into the biological function of each molecule.

The Japan Prize for 1999 will be awarded for outstanding achievements in elucidation of the basic principle of molecular recognition as well as technological developments to visualize or recognize dynamics of biological molecules.

Members of The 1999(15th) Japan Prize Fields Selection Committee

Name	Post
Chairman: Hiroshi Inose	Director General, National Center for Science Information Systems

Category I (e.g. Mathematics, Physics, Chemistry and Engineering)

General Secretary: Toshio Sata	Vice President, Toyota Technological Institute
Members: Hideo Aiso	Chairperson and Professor,Graduate School of Media and Governance, Keio University
Members: Nobuaki Kumagai	Professor Emeritus, Osaka University
Members: Yasuharu Suematsu	President, Kochi University of Technology
Members: Yasuhiko Yasuda	Professor, School of Science and Engineering, Waseda University

Category II (e.g. Biology, Agriculture and Medicine)

General Secretary: Haruo Sugano	Director Emeritus, Cancer Institute, Japanese Foundation for Cancer Research
Members: Fumimaro Takaku	President, Jichi Medical School
Members: Kumao Toyoshima	President, Osaka Medical Center for Cancer and Cardiovascular Diseases
Members: Kiyoshi Hama	President, Okazaki National Research Institute
Members: Tasuku Honjo	Dean and Professor, Kyoto University Faculty of Medicine

Japanese students attend the Nobel Prize Award Ceremony

～JSTF sends two students to SIYSS～

Each year, The Science and Technology Foundation of Japan sends two Japanese students to the Stockholm International Youth Science Seminar (SIYSS), sponsored by the Swedish Federation of Young Scientists and supported by the Nobel Foundation. The participants attend various Nobel events including the Award Ceremony. This year, it sent Mr. Shohei Chida of the University of Tokyo and Miss Yuko Tabuchi of Sophia University to the SIYSS. Their report follows:

"We participated in the SIYSS which was held during the Nobel Week at the beginning of December 1997. There were 25 participants selected from 16 different countries. In the first part of the program we visited several laboratories and we made research presentations in the fields of science, economics and politics. Afterward, the Nobel Prize Award Ceremony was held with great dignity — it seemed like a dream come true. On the following day there was a TV debate among the Nobel laureates, an active discussion about the future of the Nobel Prize, and others topics. We had a special opportunity to put questions to the laureates as representatives of all the participants.

"We were surprised to find that interest in Japanese culture is very high among people of foreign countries. I (Miss Tabuchi) wore a kimono to the ceremony, and many people were delighted to see it. We learned from our stay in Stockholm that we can build better relationships by understanding and helping each other.

"It was a special experience and we are most grateful to the Foundation for giving us this opportunity."

Miss Tabuchi (front row, sixth from left) and Mr. Chida (back row, third from left)