



JAPAN PRIZE

2013 (29th) Japan Prize Presentation Ceremony

Attended by His Majesty the Emperor of Japan
Prize awarded to three doctors from the United States



The 2013(29th) Japan Prize Presentation Ceremony was held on Wednesday, April 24, 2013 at the National Theatre of Japan in Tokyo. The prize is awarded to those whose original and outstanding achievements in science and technology are recognized as having advanced the frontiers of knowledge and served the cause of peace and prosperity for mankind.

This year, there were 242 nominations in the field of "Materials and Production" and 124 nominations in the field of "Biological Production and Biological Environment". From the total 366 nominations, the 2013 Japan Prize was awarded to three scientists.

In the field of "Materials and Production", it was awarded to Prof. C. Grant Willson, and Prof. Jean M. J. Fréchet for the development of chemically amplified resist polymer materials for innovative semiconductor manufacturing process. Dr. John Frederick Grassle received the prize in the field of "Biological Production and Biological Environment" for the contribution to marine environmental conservation through research on ecology and biodiversity of deep-sea organisms.

JAPAN PRIZE

The Japan Prize is awarded to scientists throughout the world who have been credited with original and outstanding achievements and have made major contributions to the advancement of science and technology, thereby manifestly furthering the cause of peace and prosperity of mankind.

While the prize encompasses all categories of science and technology, two fields of study are 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 prize medal. A cash prize of 50 million yen is also awarded to each prize field.

“Materials and Production” field



Development of chemically amplified resist polymer materials for innovative semiconductor manufacturing process



Prof. C. Grant Willson

Born: Mar. 30, 1939
 Professor of Chemistry and Chemical Engineering
 The University of Texas at Austin

Message from the laureate

I am extremely grateful, humbled and very proud to stand before His Majesty the Emperor of Japan, my family and so many famous scientists and dignitaries to share this honor with my friend Jean Fréchet. We have already had the good fortune of seeing our work go from test tubes to full scale manufacturing in factories all over the world. No scientist should ever hope for more than the satisfaction of seeing their work help others. Now we add to that, the recognition of the Japan Prize. This is remarkable thing and you see before you two very fortunate and grateful men.

The work being recognized resulted from a true team effort. Implementation of the invention in production could never have happened without the support and technical contributions of the late Dr. Hiroshi Ito and our colleagues

in IBM Research and Manufacturing and the help of many scientists and engineers in the resist supplier community both in Japan and the USA. I wish I could name each of these people. Many are in this room. I want them to know that Jean and I acknowledge their faith, support and important technical contributions. I sincerely thank the Japan Prize Foundation for conferring this honor exceeding any that I could imagine and I offer special thanks to my beautiful wife, Deborah for her patience and steadfast support during times when I was away from home trying hard to help make better computer chips and to Billy and Andrew, my sons who too often missed their father.

C. Grant Willson



Prof. Jean M. J. Fréchet

Born: Aug. 18, 1944
 Vice-President for Research
 King Abdullah University of Science and Technology

Message from the laureate

It is a great honor to be here today in the presence of His Majesty the Emperor of Japan with many distinguished guests and several of my dear Japanese friends and colleagues in attendance.

I thank the members of the Japan Prize Selection Committee for discovering the significance of the work honored here today. Because the invention of chemically amplified photoresists was made in the industrial environment of IBM, it was only described in a few rather obscure publications and it only became known to a select few in the scientific community and in the microelectronics industry.

As we stand here in Tokyo today, it is only fitting to mention that it is through the arduous development work of

several Japanese companies that the chemically amplified resist materials developed by Grant Willson, the late Hiroshi Ito and me were broadly commercialized and have since found near universal acceptance in the fabrication of the microprocessors, memory chips, phones, and other electronic devices we all use today.

Finally, and most importantly, I want to thank my wife Janet for making my life so joyful for so many years, and Grant Willson for his lasting friendship and for stimulating the work that led to this award.

Jean M. J. Fréchet

“Biological Production and Biological Environment” field



Contribution to marine environmental conservation through research on ecology and biodiversity of deep-sea organisms



Dr. Paul Snelgrove
 (Representing Dr. Grassle)



Dr. John Frederick Grassle

Born: July 14, 1939
 Professor Emeritus,
 Rutgers, The State University of New Jersey

Message from the laureate

Good afternoon to His Majesty the Emperor, distinguished guests, and ladies and gentlemen.

Though I cannot be there in person to share in this wonderful celebration, I am deeply humbled and grateful to join such a distinguished group of scientists who have been honoured with this great prize.

I sincerely thank the Executive membership and members of the Selection Committee for the Japan Prize for recognizing my research on marine biodiversity, and the importance and beauty of ocean life.

I have had the great privilege of diving to great ocean depths in submersibles, snorkeling on the Great Barrier Reef, and sampling in oceans around the world, but even after a lifetime of research and the global Census of Marine Life,

I am still amazed at the diversity of ocean life and the work that remains to be done.

The Imperial Family have long been great supporters of marine biology and research on marine organisms. Indeed, His Majesty, an expert on gobiid fishes, and his father, Emperor Showa, an expert on hydrozoan medusae, have both contributed significantly to our collective knowledge.

I know this award will help to communicate the importance of marine biodiversity to the world. My wife Judy, my son Tom and I would like to express our sincere appreciation to you all.

Thank you.

John Frederick Grassle

Presentation Ceremony



The Japan Prize Presentation Ceremony took place at the National Theatre of Japan, Tokyo, in the presence of His Majesty the Emperor, and with the attendance of the Speaker of the House of Representatives, the Chief Justice of the Supreme Court of Japan, foreign ambassadors and ministers, and about 1,000 notable figures including scholars, politicians, officials, business leaders and journalists.

Following the opening remarks by Dr. Yazaki, President of the Japan Prize Foundation, Dr. Komiyama, Chairman of the Selection Committee, reported on the results of the selection and explained the reasons why the laureates were chosen, and Prof. Yoshikawa, Chairman of the Japan Prize Foundation, presented the certificate of merit and the prize medal to each of the three laureates. After the laureates' acceptance speeches, Mr. Ibuki, Speaker of the House of Representatives gave a congratulatory address on behalf of the Three Branches of the Japanese Government. The ceremony ended with a commemorative concert by the Tokyo Geidai Symphony Orchestra.



Laureates of the year 2013



Prof. & Mrs. C. Grant Willson



Prof. & Mrs. Jean M. J. Fréchet



Dr. & Mrs. Paul Snelgrove
(Representing Dr. J. Frederick Grassle)



Congratulatory address
by H.E. Mr. Ibuki



Opening remarks
by Dr. Yazaki,
President of the
Japan Prize Foundation



Reporting on the selection
results by Dr. Komiyama,
Chairman of the Selection
Committee



Commemorative concert
by the Tokyo Geidai Symphony Orchestra

Banquet



Following the presentation ceremony, a banquet was held for the laureates at the Hotel New Otani Tokyo where it was attended by His Majesty the Emperor of Japan, the Chief Justice of the Supreme Court of Japan, foreign ambassadors and ministers, along with around 320 dignitaries from various fields.

The banquet was opened by His Majesty the Emperor proposing a toast in honor of the laureates. H. E. Mr. Takesaki, the Chief Justice of the Supreme Court of Japan, gave a congratulatory address. The banquet concluded with speeches of heartfelt gratitude by the laureates.



Toast by His Majesty Emperor of Japan



Congratulatory address by H.E. Mr. Takesaki



Opening address
by Prof. Yoshikawa
Chairman of the
Japan Prize Foundation



Acknowledgment
by Prof. C. Grant Willson



Acknowledgment
by Prof. Jean M. J. Fréchet



Acknowledgment
by Dr. Paul Snelgrove
(Representing Dr. J. Frederick Grassle)

Commemorative Lectures

On the following day of the presentation ceremony and the banquet, the Japan Prize Commemorative Lectures were held at "Ito Hall" of Tokyo University's Ito International Research Center.

The laureates of the "Materials and Production" field, Prof. Grant Willson and Prof. Jean Fréchet, took the rostrum and together gave a lucid lecture on the past, present and future of semiconductor integrated circuit technology.

Dr. John Frederick Grassle, the laureate of the "Biological Production and Biological Environment" field, could not come to Japan for health reasons. Instead, his longtime research partner Dr. Paul Snelgrove gave a lecture on Dr. Grassle's achievements and warned people of the serious condition of marine ecosystem caused by environmental pollution.

"Materials and Production" field



Prof. Fréchet (left) and Prof. Willson (right) giving a lecture

Theme

Chemistry for lithography

During a time when electron beam lithography was being considered, Prof. Willson, who was in charge of developing resists at IBM Almaden Research Center, challenged the development of a new type of resist called the chemically amplified resist together with Prof. Fréchet and the late Dr. Ito.

Prof. Fréchet discussed how the three of them, through numerous trials and errors, developed the first ever chemically amplified resist called the t-BOC resist, and explained the specifics of their research outcome.

The chemically amplified resist impressively overcame the limitations of semiconductor photolithography and enabled further integration of semiconductor integrated circuits as predicted by Moore's Law. Today, however, we face a new challenge.

Prof. Willson, having looked at EUV lithography which uses extreme-ultraviolet rays, and an atomic level processing technique that uses STM (scanning tunneling microscope), mentioned that these techniques face the dilemma of requiring ever more expensive manufacturing equipment to achieve higher resolution and a decrease in throughput (the processing capacity per unit of time).

Prof. Willson and Prof. Fréchet have high hopes for a printing technology called Nanoimprint technology. This technology can already achieve resolution double that of EUV lithography. The lecture was concluded by emphasizing that taking on new scientific and technological challenges in the field of semiconductors will no doubt lead to the creation of an innovative information society for the 21st century.

"Biological Production and Biological Environment" field



A lecture by Dr. Snelgrove

Theme

Marine ecosystems from a new perspective

During the 1970s, the deep sea was thought to be a desert-like environment with very few organisms that scavenged on food sinking from above. In 1979, while at the Woods Hole Oceanographic Institution, Dr. Grassle used a manned deep-ocean research submersible to conduct explorations of newly discovered hydrothermal vents near the Galapagos Islands. He discovered that the environment surrounding the hydrothermal vents was rich in diversity with creatures like tube worms and giant white clams.

From the 1980s to the 1990s, Dr. Grassle's studies off the east coast of USA revealed that deep sea ecosystems were as diverse as tropical rainforests.

In 2002 he co-founded the Census of Marine Life (CoML), a massive project with more than 2,700 scientists from over 80 different countries, and conducted research on marine life and its population in oceans around the globe. The research findings were then made publicly available through the Ocean Biogeographic Information System (OBIS) database.

Dr. Snelgrove concluded the lecture by saying that "of the 2 million marine species that are believed to exist, only 9 percent have been elucidated" and offered words of encouragement for young researchers to carry on Dr. Grassle's dream of elucidating the entire marine ecosystem.

The videos of the commemorative lectures are available online. www.japanprize.jp

Japan Prize Week

4/22
(Mon)

Welcome Reception



Reception hosted by U.S. Embassy



4/23
(Tue)

Courtesy Call on the Japan Academy



Academic Round Table Discussion



4/24
(Wed)

Presentation Ceremony



Banquet



4/25
(Thu)

Commemorative Lectures



4/26
(Fri)

Sightseeing in Kyoto



In Katsura Imperial Villa

In Matsushita Shinshin-An

Fields Eligible for the 2014 (30th) Japan Prize

Areas of
Physics, Chemistry and Engineering

Electronics, Information and Communication

Background and rationale:

Today, our world is in the midst of rapidly developing information and knowledge-based society. The advancement of essential technologies in electronics, information and communication have brought about dramatic improvement in productivity and have also revolutionized the speed, efficiency and the scope of information exchange, thereby contributing significantly to the evolution of human society through creation of new cultures and lifestyles. In addition, these advancements are also playing a significant role in the field of energy management by responding to the ever-increasing energy consumption.

Amid such changes, it is anticipated that further advancement of these technologies will not only improve its reliability and security but will also enable us to respond to new social issues, thereby contributing greatly to the sustainable development of human society.

Achievement eligible:

The 2014 Japan Prize in the field of “Electronics, Information and Communication” is awarded to individual(s) who has made significant contributions to society by achieving scientific and technological breakthroughs in creating new industries and improving productivity, developing essential technologies and systems that contribute to the realization of information and knowledge-based society, and developing fundamental science and technologies that have high potential to promote further advancement of our society.

Areas of
Life Science, Agriculture and Medicine

Life Science

Background and rationale:

In recent years, the drastic progress of life science has contributed significantly in understanding the complex functions of biological life including us human beings. Most notably, with revolutionary advancement in life science research technologies, things which were once considered technologically impossible, such as the mapping of genetic blueprints, are now becoming possible one after another. As a result, we are now making new discoveries that will significantly change our concept of life in the levels of molecules, cells, tissues, organs and whole body.

It is anticipated that such progress in understanding of life science will contribute towards the welfare of mankind by unlocking new possibilities in life forms including us human beings and help lead the way for the creation and promotion of future medicine.

Achievement eligible:

The 2014 Japan Prize in the field of “Life Science” is awarded to individual(s) who has made significant contributions to society by achieving scientific and technological breakthroughs of discovering new life phenomena, elucidating vital functions, developing revolutionary analysis technologies, and creating future medicine.

The Japan Prize Foundation

The Japan Prize Foundation was established in 1982, with the aim of contributing to the further development of science and technology. In addition to recognizing outstanding achievements with the Japan Prize, the Foundation has been promoting science and technology by hosting the "Easy-to-understand Science and Technology Seminars" and awarding Research Grants to help nurture young scientists.



Research Grants

The Foundation provides research grants to scientists and researchers who are under 35 years of age. Every year, the Foundation selects projects in the same fields as the Japan Prize and gives one million Japanese yen for a project. Each year, about 20 young scientists receive grants.



“Easy-to-understand Science and Technology Seminars”

The Foundation hosts a series of seminars on advanced technologies that are being used widely in our everyday life. The seminars are designed for students and the general public, and experts in the related fields explain in plain language. Over 200 seminars have been held across Japan since the first seminar was held in 1985.



Stockholm International Youth Science Seminar (SIYSS)

The Foundation sends two Japanese students to the annual Stockholm International Youth Science Seminar, which is held under the auspices of the Swedish Federation of Young Scientists with the support of the Nobel Foundation. Since the program started in 1987, more than 50 students from Japan have participated in this event.