



## JAPAN PRIZE

### 2014 (30th) Japan Prize Presentation Ceremony

Awards were presented to two laureates from the U.S. and Japan  
in the presence of Their Majesties the Emperor and Empress



The 2014 (30th) Japan Prize laureates were honored at an award presentation ceremony held on April 23 at the National Theatre in Tokyo in the presence of Their Majesties the Emperor and Empress. The Japan Prize is awarded annually to scientists and researchers in two fields who made substantial contributions to their fields as well as society to serve the cause of peace and prosperity of mankind. Dr. Yasuharu Suematsu of Japan, the laureate in the “Electronics, Information and Communication” field, was recognized for his pioneering research on semiconductor lasers for high-capacity, long-distance optical fiber communication, which led to a breakthrough in optical fiber communication technology. Dr. C. David Allis of the United States, the laureate in the “Life Science” field, elucidated the role of histones, proteins in chromosomes that regulate gene expression. Japan Prize laureates are selected from among the candidates who are recommended by prominent researchers and scientists around the world. For the 2014 Japan Prize, 189 recommendations were sent in for the “Electronics, Information and Communication” field, and the “Life Science” field received 354 recommendations during the three months through February last year. Dr. Suematsu and Dr. Allis were deemed well worthy of the prize after almost a year-long, fair and rigid selection process.

#### JAPAN PRIZE

The Japan Prize is awarded to scientists and researchers, regardless of nationality, who have made significant contributions to the progress of science and technology as well as society to serve 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.

“Electronics, Information and Communication”

## Pioneering research on semiconductor lasers for high-capacity, long-distance optical fiber communication



**Dr. Yasuharu Suematsu**

Born: September 22, 1932  
Honorary Professor, Tokyo Institute of Technology

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### Message from the laureate

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It is truly an honor to stand before Their Majesties the Emperor and Empress of Japan and everyone here to receive the internationally recognized Japan Prize.

All of the former laureates of this award have been renowned figures who have laid the foundation of the world's science and technology of today. Therefore, I cannot help but feel extremely humbled and proud to be included in the list.

My research was a basic study with engineered approach to realize the unprecedented high-capacity, long-distance optical fiber communication. To elaborate, I developed the dynamic single-mode laser, a form of semiconductor laser, to achieve optimal fiber-optic communication. In 1980, while optical technology and electronics were making remarkable progress, the development of this new laser provided the momentum to realize optical fiber communication by allowing a high volume of information to travel long distance.

By the late 1980s, this technology began to be used around the world. I'm thrilled to hear people say that the coinciding development of the Internet would not have progressed as much as it did without these lasers working

as a central core. We expect that remarkable progress will continue to be made.

I was able to achieve my research thanks to the support of many people. With generous financial supports both from the Ministry of Education, Culture, Sports, Science and Technology and from the Japan Society for the Promotion of Science, strong unconditional corporate support, and the friendly academic and industry competition that has accompanied the progress in optical and electronic technology, I feel very fortunate to have had the pleasure to work with the tireless co-researchers at the Tokyo Institute of Technology, and teachers from whom I have learned. Consequently, I feel great joy to have been able to make this small contribution to the world.

Last but not least, I would like to express my gratitude and sincere appreciation to the members of the Japan Prize Selection Committee and the Japan Prize Foundation for choosing my research, and casting light on the field of fiber-optic systems. I would like to conclude by wishing the Japan Prize Foundation and everyone here continued success and prosperity.

Thank you.

“Life Science”

## Discovery of histone modifications as fundamental regulators of gene expression



**Dr. C. David Allis**

Born: March 22, 1951

The Joy and Jack Fishman Professor, The Rockefeller University

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### Message from the laureate

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To Their Majesties the Emperor and Empress of Japan, distinguished dignitaries and scientists, The Japan Prize Foundation and my family, I wish to express my sincere gratitude for making all of today’s events possible.

Career prizes, like The Japan Prize, require a career’s worth of people to thank. I am confident that Dr. Suematsu agrees. My own research program rests heavily upon those who came before me, those who believed that “chromatin,” as the physiologically-relevant form of our genome, plays a critical role in determining how genes are regulated. They and their work inspired me.

Many more scientists world-wide continue to unlock chromatin’s secrets, and I know that this will continue with future generations. This includes my own lab members, past and present. I am grateful to all of them for their many insights and discoveries that continue to shape our work. Their contributions have been remarkable and deserve being recognized. I enjoy “sharing science” and

genuinely feel that, communicating results face-to-face, without secrecy, leads to a “sum-greater-than-the-parts” outcome.

In keeping, I have always felt that one of the best parts of doing science is “the people.” Here I have been very blessed. I also consider “teachers” as the unsung heroes of my career. I owe special thanks to all of those who have dedicated themselves not only to teaching me scientific facts, but also inspired me to reach higher, to strive to do more. This includes my scientific mentors, parents and family. I would not be here had it not been for them.

In closing, words cannot express how deeply honored and humbled I am to be receiving The Japan Prize with Dr. Suematsu. Your warm hospitality and your wonderful culture and country have made this an unforgettable experience for all of us.

Thank you.

# Presentation Ceremony



Dr. Yasuharu Suematsu and Dr. C. David Allis each received a certificate of recognition and a commemorative gold medal during the Japan Prize Presentation Ceremony on April 23, which was graced with the presence of Their Majesties the Emperor and Empress. Dr. Hiroyuki Yoshikawa, Chairman of the Japan Prize Foundation, also presented bouquets of flowers to Mrs. Suematsu and Mrs. Allis, who were on the stage as well. By holding the medals high, the laureates acknowledged the applause of the audience that numbered approximately 1,000 consisting of dignitaries from industry, academia and government, including Mr. Bunmei Ibuki, Speaker of the House of Representatives, Mr. Itsuro Terada, Chief Justice of the Supreme Court and Mr. Hakubun Shimomura, Minister of Education, Culture, Sports, Science and Technology, as well as families of the laureates. In the commemorative concert following the award presentation, the Tokyo Geidai Symphony Orchestra played five songs requested in advance by the laureates, including the overture to “Die Fledermaus” by Johann Strauss and “Imagine” by John Lennon. To commemorate the 30th edition of the Japan Prize, a video summarizing its history since 1985 was played to the audience before the ceremony started.



Dr. & Mrs. Yasuharu Suematsu



Dr. & Mrs. C. David Allis



Their Majesties the Emperor and Empress attend the commemorative concert



Congratulatory address by H.E. Mr. Bunmei Ibuki, Speaker of the House of Representatives



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



Selection results by Dr. Hiroshi Komiya, Chairman of the Selection Committee



Commemorative concert by the Tokyo Geidai Symphony Orchestra

## Banquet



Following the Presentation Ceremony, a banquet was held at a hotel in Tokyo. The banquet, which was attended by more than 300 people, was opened by His Majesty the Emperor proposing a toast to the laureates and concluded with acknowledgements by the laureates. Dr. Suematsu said he was especially thankful for receiving the award at this time, taking into consideration that it took a quarter-century until his research and the resulting product began to be used and that it was only a few years ago when a semiconductor laser he had deemed the ultimate goal became wide-spread. Dr. Allis made a speech with humor, referring to traffic congestion caused by President Barack Obama of the United States, who was arriving in Tokyo around the time the banquet began. In his speech, Dr. Allis revealed that he will come back to Tokyo in August to team up with Dr. Suematsu to hold seminars for young students. The two gentlemen discussed it back in January, Dr. Allis said. They met for the first time then when a press conference was held in Tokyo to introduce them as this year's winners. As they got to talking, they found they share the same passion and mission: passing down their knowledge and expertise to the next generation.



|| Toast by His Majesty the Emperor of Japan



|| Congratulatory address by H.E. Mr. Masaaki Yamazaki,  
President of House of Councillors



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



|| Acknowledgment  
by Dr. Yasuharu Suematsu



|| Acknowledgment  
by Dr. C. David Allis

## Commemorative Lectures

On April 24, Dr. Suematsu and Dr. Allis gave lectures commemorating their receipt of the Japan Prize at Ito Hall on the campus of the University of Tokyo. Before a packed audience of about 300, Dr. Allis took the stage first. Showing slides full of photos and illustrations, he explained in simple terms about epigenetics, which explores the inheritance of physical changes that cannot be traced back to mutations in the DNA sequence, and gave examples of how and what this relatively new field of study has helped or is expected to help in the development of advanced medicine. Dr. Suematsu's lecture was centered around the theme of "Optical Fiber Communication, Semiconductor Lasers and Our Society." With interesting behind-the-scene anecdotes, he started with why he had decided to focus on light as a measure to transmit data. He went on to describe the path to achieving the "dynamic single mode laser" as he stuck to his beliefs and got support from academia, industry and government along the way. Meanwhile, the laureates joined President Barack Obama, who was in Japan as a state guest, in his visit to the National Museum of Emerging Science and Innovation earlier in the afternoon, prior to the commemorative lectures.

### "Life Science" field



A lecture by Dr. Allis

### Theme

#### Beyond the Double Helix: Varying the Terrain of Epigenetic Landscapes in Development & Disease

In his lecture "Beyond the Double Helix," Dr. Allis, first of all, cited examples of how drosophila with the same genes may have different colored eyes, and how only one of the identical twins develops autism, and explained that the academic discipline studying the mechanism in which changes in organisms occurring without changes in the DNA base sequence continuing after cell division, is called epigenetics.

The concept of epigenetics came into existence long ago in 1942, and many researchers were focusing on proteins called histones. When DNA is stretched out in a cell, it becomes approximately two meters long. Histones play a vital role in containing this long, string-like DNA into the small nucleus. Of the DNA, the region not used in cell activity binds strongly to histones, and when the information is being used, it unwinds loosely from histones. What substance regulates the bond between the DNA and histones? Dr. Allis' research team conducted a study using a unicellular organism called a tetrahymena, and in 1996, proved that histone acetyltransferases, which bind the acetyl group, are active in histones in the region where the genetic information is read.

With this research as a catalyst, the epigenetics research made great progress. In recent times, changes in the characteristics of organisms are attributed, not only to DNA mutation, but also to DNA methylation, histone acetylation and methylation, clarifying that vital role of epigenetics. In addition, diseases caused by abnormalities in histone chemical modification have also come into light, leading to the development of drugs which control the acetylation and methylation of histone.

Lastly, Dr. Allis presented the several latest findings, such as how the physique resulting from dietary habits during the growth period in humans and susceptibility to diseases actually have great impact on our progeny, and also how changes in characteristics of organisms are related to the mutations of histones themselves. Presently, epigenetics is bringing transformative changes to a wide range of fields, from basic life science to health promotion.

### "Electronics, Information and Communication" field



A lecture by Dr. Suematsu

### Theme

#### Optical Fiber Communication, Semiconductor Lasers and Our Society

In his lecture "Optical Fiber Communication, Semiconductor Laser and Society," Dr. Suematsu first spoke about the indispensable "ties" among people in research and development. There are ties among researchers and ties with society.

For example, any leading edge technology has, as its foundation, past discoveries. Dr. Suematsu referred to many examples, such as the glassworks in ancient Egypt as the origin of optical fiber, and the relationship between mathematician John von Neumann and semiconductor lasers. In addition, he also mentioned that his being able to exert effort in research was owing to the support from business leaders, academic circles and government offices.

Dr. Suematsu's research was the forerunner of "problem-solving studies," the concept in which performance constantly demanded by society is achieved by the combination of forecast, theory and experiments. In his early days, Dr. Suematsu had in his head three points required of optical communication semiconductor lasers. The first point was "long-wavelength property" to minimize optical fiber loss. The second point was "single-wavelength property" to stabilize laser movement, and the third point was "wavelength tunability" to achieve multiplex communication.

Dr. Suematsu embarked on a challenge which was thought to be far beyond reach at the time. However, by combining laser oscillation at the 1.5  $\mu\text{m}$  band which minimizes optical loss, with integrated laser technology which incorporates a period structure-type reflector in order to achieve single wavelength, he presented the world's first "dynamic single-mode laser" in 1981. With this technology as a foundation, the commercial transmission capacity of optical fiber increased dramatically.

Dr. Suematsu also engaged in "wavelength tunability," the third goal of semiconductor lasers, and in 1983, he achieved the world's first wavelength tunable semiconductor laser which electrically controls oscillation wavelength. This groundbreaking technology took a long time to be applied since it was far ahead of its time. However, from 2000 onward, as large-volume data communication came into demand, it finally became mainstream technology. Dr. Suematsu concluded his presentation by commenting, "above all else, that made me happy."

# Japan Prize Week

J A P A N P R I Z E W E E K P H O T O S

4/21  
(Mon)

Welcome Reception



4/22  
(Tue)

Courtesy Call on the Japan Academy



Courtesy Call on the Prime Minister



Academic Round Table Discussion



4/23  
(Wed)

Presentation Ceremony



Banquet



4/24  
(Thu)

Commemorative Lectures



4/26  
(Sat)

Sightseeing in Kyoto



In Katsura Imperial Villa



In Matsushita Shinshin-An

## Fields Eligible for the 2015 (31st) Japan Prize

Area of  
Physics, Chemistry and Engineering

### Resources, Energy and Social Infrastructure

#### Background and rationale:

As global population continues to grow, the biggest challenge of this century is guiding human society towards balanced development while overcoming environmental and resource constraints, and reducing inequalities.

In order to achieve this, innovative base technology is required in such areas as resource and energy utilization, water resources management, material circulation, urban development, and traffic and transportation.

Particularly important are issues such as the creation of new technology for resource development and utilization, promotion of household and industrial energy conservation, and development of alternative energy technology, as well as renovation of social infrastructure technology such as disaster mitigation and safety measures.

#### Achievement eligible:

The 2015 Japan Prize in the field of “Resource, Energy and Social Infrastructure” will be awarded to an individual(s) who has made significant contributions to society by improving the sustainability of human society and the global environment through scientific and technological breakthroughs, such as the creation, innovation and dissemination of resource utilization technology, energy technology and infrastructure formation technology.

Area of  
Life Science, Agriculture and Medicine

### Medical Science and Medicinal Science

#### Background and rationale:

Advancement of modern science has brought about tremendous progress in the field of medical and medicinal sciences. Elucidations of various diseases and their pathological mechanisms have led to continuous development in the establishment of new prophylaxes, diagnostic methods and treatments.

Amid such circumstances, developed countries are experiencing a rise in diseases brought about by increased longevity and lifestyle changes. In contrast, many regions around the world still have little or no access to adequate medical care. Furthermore, emerging and re-emerging infectious diseases are becoming a major issue worldwide with the onset of globalization.

Therefore, it is anticipated that medical and medicinal sciences will further contribute towards the well-being of people in today's changing times. Those contributions include the creation and dissemination of new medical care in fusion with other discipline such as engineering and information science, development and production of new drugs, and development of drug delivery systems.

#### Achievement eligible:

The 2015 Japan Prize in the field of “Medical Science and Medicinal Science” will be awarded to an individual(s) who has made significant contributions to society by achieving scientific and technological breakthroughs in improving people's health through new discoveries and development of innovative technologies for prevention, diagnosis, treatment, and prognostic prediction of diseases.

## 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 under 35 years of age. Every year, the Foundation selects projects in the same fields as the corresponding Japan Prize and gives one million Japanese yen for a project. In 2013, 18 young scientists received the grants, making the total number of grant recipients to 157 since the program's inception in 2006.



#### “Easy-to-understand Science and Technology Seminars”

For junior and senior high school students, the Foundation holds a series of seminars on advanced technologies commonly used in everyday life by inviting Research Grant recipients as lecturers. They explain state-of-the-art technologies in plain terms. The program began in March 1989 and has since executed 239 seminars across Japan by the end of 2013.



#### Stockholm International Youth Science Seminar (SIYSS)

Each year, the Japan Prize Foundation provides an opportunity for young scholars to exchange opinions with their peers on an international level by sending two students to the Stockholm International Youth Science Seminar hosted by the Swedish Federation of Young Scientists with the support of the Nobel Foundation. Young students from Japan and elsewhere in the world attend various events during Nobel Week in Stockholm. Since the program started in 1987, the Japan Prize Foundation has provided this valuable opportunity to 52 undergraduate/ graduate students.



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