# *International Prize for Biology*

## 2018

JSPS


Secretariat of the International Prize for Biology
Japan Society for the Promotion of Science

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Committee on the International Prize for Biology
Japan Society for the Promotion of Science


JSPS

# From Japan to the World
# Working toward the further progress of biological sciences

The International Prize for Biology was established in 1985 to commemorate the sixty-year reign of Emperor Showa and his long devotion to biological research. It also pays tribute to the present Emperor, His Majesty, Emperor Akihito, who has labored for many years to advance the taxonomical study of gobioid fish, while striving continuously to elevate the international stature of the Prize.

Each year, the International Prize for Biology is conferred upon a distinguished researcher in a field selected by the Prize Committee from among all the fields of biology. Based on nominations gathered from around the world, the Prize is awarded to a biologist judged to have a superlative record of achievements in the subject field. Once every decade, "systematic biology and taxonomy" is selected for the Prize as it is the field in which, like Emperor Showa before him, His Majesty the present Emperor has conducted research over many years.

So as to spread global recognition of the International Prize for Biology as a tribute to excellent achievement while accelerating the advancement of biology, the Prize Committee asks for your sustained cooperation and support.

## *Overview of International Prize for Biology*

**Purpose**

While paying tribute to the long-sustained research endeavors of Their Majesties, Emperor Showa and Emperor Akihito, the International Prize for Biology gives prestigious recognition to biologists around the world who have made superlative contributions to advancing their fields of biological science.

**Establishment**

The Prize was established in April 1985 to accede to a fervent desire voiced by biological scientists and others to create an international award to recognize the work of leading scientists in "systematic biology and taxonomy" and other fields of fundamental biology. In establishing the Prize, a dedicated effort was made by a consortium of organizations including the Ministry of Education, Science and Culture, The Japan Academy, Japan Society for the Promotion of Science, Zoological Society of Japan and Botanical Society of Japan. Also helping greatly to realize the desire of biological scientists to create an international prize were many individuals and associations who made generous financial contributions.

**Prize Committee and Secretariat**

The Committee on the International Prize for Biology comprises up to 40 members, who choose the committee chair. Operating under the Prize Committee are two sub-committees: a selection committee and finance committee. The secretariat for the Prize is situated in the Japan Society for the Promotion of Science.

**Recipients**

The Prize is awarded to researchers who have made exceptional contributions to the advancement of fundamental biology.

**Fields**

The branch of biology for which the Prize is awarded is chosen each year by the Prize Committee.

**Selection Process**

The selection committee invites the nomination of candidates from relevant individuals and organizations in Japan and abroad. The selection committee, then, screens the nominated candidates and forwards the top candidates to the Prize Committee along with supporting statements. The Prize Committee makes the final selection of each year's recipient.

**The Prize**

The Prize consists of a certificate, medal and purse of 10-million yen. An imperial gift is also given to the recipient.

**Presentation Ceremony**

The Prize is presented every year in a dedicated ceremony. In conjunction with the ceremony, an international symposium is held in which the Prize recipient is invited to give a special lecture.

**Prize Fund**

A Prize Fund is established for accepting and managing donated money. It is operated by the Japan Society for the Promotion of Science.

## *Achievements of Emperor Showa in Biology*

As a biologist, Emperor Showa devoted himself for many years to research in the systematics of hydroids collected from Sagami Bay along with studies he carried out on other marine animals, seaweeds and myxomycetes. He also conducted studies of plants in Japan's Nasu and Suzaki areas. The Emperor was known as one of the world authorities on hydroids, for which his research was highly acclaimed having described for the first time two genera of thecate Clathrozonidae, *Clathrozoon wilsoni* and *Pseudoclathrozoon cryptolarioides* gen. et sp. nov.. He was able to succeed in describing these genera by keeping colonies of them alive in his biological laboratory at the Imperial Palace.

Emperor Showa in Imperial Biological Laboratory

Over a period of many years, the Emperor also collected numerous specimens of opisthobranchs, sea stars, crustaceans, and other marine creatures from the tide pools and shallows of Sagami Bay. Collaborating researchers in a variety fields have conducted studies and written critiques on these specimens, which are published as literature of the Imperial Biology Laboratory. Also interested in botany, the Emperor coauthored a number of books on studies he made of the flora in Nasu and Suzaki as well as on the grounds of the Imperial Palace.

### *Medal of the International Prize for Biology*


The medal of the International Prize for Biology bears an abstract design based on part of a colony of Clathrozonidae, namely the species *Pseudoclathrozoon cryptolarioides* described by Emperor Showa.

Designer: Sagenji Yoshida
(Professor Emeritus, Tokyo National University of Fine Arts and Music)

*Pseudoclathrozoon cryptolarioides* →



## *Achievements of Emperor Akihito in Biology*

Making time between his official duties, Emperor Akihito has over many years pursued a taxonomical study of fish in the suborder Gobioidei. Between 1963 and the present, he published a total of 28 original papers on this research in journals of the Ichthyological Society of Japan.

For example, of the three known Japanese species of the genus *Cristatogobius* (family Gobiidae)—the Kuro-tosakahaze, Tosakahaze, and Hime-tosakahaze—the latter two were known only by their Japanese common names, as their scientific names had been undetermined. As a result of his studies of these three species of *Cristatogobius*, Emperor Akihito identified the Tosakahaze as *Cristatogobius lophius* Herre and described the Hime-tosakahaze as a new species, *Cristatogobius aurimaculatus*.

He also coauthored a paper that estimated the evolutionary process in gobioid fishes using mitochondrial DNA and that compared those findings with phylogenetic relationships based on morphology. This study appeared in *Gene*, an international journal on genetics published in the Netherlands.

For his work in ichthyological research, Emperor Akihito was invited in 1980 to become a foreign member of the Linnean Society of London, whose membership numbers less than fifty. Then in 1986, he was elected as an honorary member of the Society. He is also an honorary associate of the Australian Museum, an honorary member of the Zoological Society of London, and a permanent honorary member of the Research Institute for Natural Science of Argentina. In 1998, he became the first recipient of the King Charles Second Medal, awarded by the Royal Society of London to heads of state who have made outstanding contributions to the advancement of science.

In 1992 when the American journal *Science* published a special issue on Japan, the editors requested Emperor Akihito to contribute an article titled "Early Cultivators of Science in Japan." In 2007, he presented the keynote lecture, titled "Linné and Taxonomy in Japan," at the Linnean Society of London, marking the 300th anniversary of Carl von Linné's birth. An excerpt of that lecture was published in the British scientific journal *Nature*.

The Emperor conducting research on gobioid fishes

Imperial Gift, a silver vase bearing the imperial crest

## The Prize is awarded each year to a researcher who has made an exceptional contribution to the advancement of biological sciences.

Each year's branch of biology is selected by the Prize Committee. The Prize is awarded to a biologist in recognition of his/her lofty scientific achievements in the subject field. Each year, candidates for the Prize are solicited and screened by the selection committee, with the recipient chosen by the Prize Committee. To date, the following distinguished scientists have been awarded the Prize.

### *The List of Recipients*

| | | | |
|---|---|---|---|
| 1985 (1st) | **Dr. Edred John Henry Corner**<br>*Taxonomy or Systematic Biology* | 2001 (17th) | **Dr. Harry B. Whittington**<br>*Paleontology* |
| 1986 (2nd) | **Dr. Peter Hamilton Raven**<br>*Systematic Biology and Taxonomy* | 2002 (18th) | **Dr. Masatoshi Nei**<br>*Biology of Evolution* |
| 1987 (3rd) | **Dr. John Bertrand Gurdon** → P6<br>*Developmental Biology* | 2003 (19th) | **Dr. Shinya Inoué**<br>*Cell Biology* |
| 1988 (4th) | **Dr. Motoo Kimura**<br>*Population Biology* | 2004 (20th) | **Dr. Thomas Cavalier-Smith** → P7<br>*Systematic Biology and Taxonomy* |
| 1989 (5th) | **Dr. Eric James Denton**<br>*Marine Biology* | 2005 (21st) | **Dr. Nam-Hai Chua**<br>*Structural Biology in Fine Structure, Morphology and Morphogenesis* |
| 1990 (6th) | **Dr. Masakazu Konishi**<br>*Behavioral Biology* | 2006 (22nd) | **Dr. Serge Daan**<br>*Chronobiology* |
| 1991 (7th) | **Dr. Marshall Davidson Hatch**<br>*Functional Biology of Plants* | 2007 (23rd) | **Dr. David Swenson Hogness**<br>*Genetics* |
| 1992 (8th) | **Dr. Knut Schmidt-Nielsen**<br>*Comparative Physiology and Biochemistry* | 2008 (24th) | **Dr. George David Tilman**<br>*Ecology* |
| 1993 (9th) | **Dr. Edward Osborne Wilson** → P6<br>*Ecology* | 2009 (25th) | **Dr. Winslow Russell Briggs**<br>*Biology of Sensing* |
| 1994 (10th) | **Dr. Ernst Mayr**<br>*Systematic Biology and Taxonomy* | 2010 (26th) | **Dr. Nancy Ann Moran** → P7<br>*Biology of Symbiosis* |
| 1995 (11th) | **Dr. Ian Read Gibbons**<br>*Cell Biology* | 2011 (27th) | **Dr. Eric Harris Davidson**<br>*Developmental Biology* |
| 1996 (12th) | **Dr. Ryuzo Yanagimachi**<br>*Biology of Reproduction* | 2012 (28th) | **Dr. Joseph Altman** → P8<br>*Neurobiology* |
| 1997 (13th) | **Dr. Elliot Martin Meyerowitz**<br>*Plant Science* | 2013 (29th) | **Dr. Joseph Felsenstein**<br>*Biology of Evolution* |
| 1998 (14th) | **Dr. Otto Thomas Solbrig**<br>*The Biology of Biodiversity* | 2014 (30th) | **Dr. Peter Crane**<br>*Systematic Biology and Taxonomy* |
| 1999 (15th) | **Dr. Setsuro Ebashi**<br>*Animal Physiology* | 2015 (31st) | **Dr. Yoshinori Ohsumi** → P8<br>*Cell Biology* |
| 2000 (16th) | **Dr. Seymour Benzer**<br>*Developmental Biology* | 2016 (32nd) | **Dr. Stephen Philip Hubbell**<br>*Biology of Biodiversity* |
| | | 2017 (33rd) | **Dr. Rita Rossi Colwell**<br>*Marine Biology* |

### *Developmental Biology*

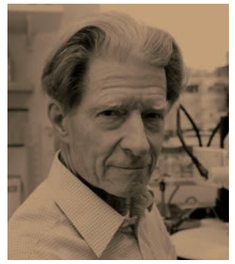
We *Homo sapiens* start life as a single fertilized egg in our mother's womb, and by the time we are born our bodies have a complex structure complete with organs such as the brain, lungs, and digestive tract. Other animals and plants—even fungi, if they are multicellular—also generally start life as a zygote (like the fertilized egg), which becomes an embryo through cell division; as the cells continue to divide, they differentiate and become organized into the structures and morphology of the adult form. The study of the processes and mechanisms involved in the adult's formation is known as developmental biology. In the 19th century, biologists made comparative studies of embryo morphology between different organisms. Research reached the molecular level—genes and proteins—when the techniques of molecular biology were introduced in the 20th century, and this led to discovery of the homeobox genes, which direct development. Dr. John Gurdon, the third recipient of the International Prize for Biology, shared the Nobel Prize in Physiology or Medicine in 2012 with Dr. Shinya Yamanaka of Kyoto University, who produced iPS cells.

**3rd Prize** (1987, Research field: Developmental Biology)

Recipient

**Dr. John Bertrand Gurdon**

John Humphrey Plummer Professor of Cell Biology,
University of Cambridge, UK
Date of Birth: 2 October 1933 Nationality: United Kingdom



Achievements recognized by the Award

By injecting the nucleus of another cell into the cytoplasm of an egg, using amphibians, Dr. Gurdon was the first to show that even the nucleus of a fully differentiated cell can be "initialized" so that it repeats its development, becoming a larva and eventually even a parent. His work exerted a major impact on the advancement of developmental biology, cellular engineering, and the biological sciences as a whole.

### *Ecology*

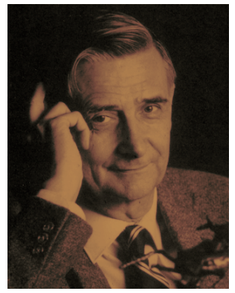
How organisms live in their natural environment is called their ecology; this is also the name of the branch of science that studies the way they live. Ecologists study how organisms live and interact with their environment, being influenced by it and influencing it in their turn. The state of an ecosystem—the complex formed by a community of organisms and their environment—is not easy to grasp because, among other reasons, the environment is not circumscribed like a forest or a lake, and there are complex relationships among predators and prey. Recently, ecology has been gaining in importance as biodiversity is increasingly threatened by global warming and the spread of invasive species.

**9th Prize** (1993, Research field: Ecology)

Recipient

**Dr. Edward Osborne Wilson**

Professor and Curator in Entomology Museum of Comparative Zoology,
Harvard University, USA
Date of Birth: 10 June 1929 Nationality: USA



Achievements recognized by the Award

Dr. Wilson's studies on ants, taking ecological, biogeographical, and behavioral approaches, have yielded a wealth of new knowledge in such areas as community structure, distribution, caste differentiation, and communication. His argument that understanding the social behavior of animals requires a synthesis of ecology, ethology (the study of behavior), and population genetics, and his advocacy of social biology contributed greatly to the advancement of ecology and the biological sciences as a whole.

*Please note that the affiliations of the recipients were current at the time of the award.

## *Systematic Biology and Taxonomy*

The science of taxonomy groups living things so as to make their enormous diversity easier for humans to understand, while systematic biology infers how these organisms evolved and traces their evolutionary history. We used to group organisms and infer their evolutionary pathways according to their morphology (appearance). Since the 1980s, the ability to sequence the DNA of genes and the amino acids of proteins has allowed us to utilize differences in the arrangements of these biomolecules as clues to evolutionary pathways. Thus, biologists can now employ the common benchmark provided by biomolecules to compare different organisms and shed light on the age-old processes of evolution. Emperor Showa pursued evolutionary studies over many years, and His Majesty the present Emperor Akihito continues to do so. Accordingly, once every ten years "systematic biology and taxonomy" is chosen as the field for the International Prize for Biology.

### 20th Prize (2004, Research field: Systematic Biology and Taxonomy)

Recipient

**Dr. Thomas Cavalier-Smith**

Professor of Zoology, University of Oxford, UK
Date of Birth: 21 October 1942 Nationality: United Kingdom and Canada

Achievements recognized by the Award

Dr. Cavalier-Smith has published many works which organize and systematize the classification of the living world, taking a bold yet detailed approach on the basis of his special expertise in cell biology, electron microscopy, and molecular biology, backed by his knowledge of the latest developments in every field of biological science. Focusing on the evolution of cells by endosymbiosis, he has helped create a more natural classification system, primarily by proposing the "six kingdom theory," which added the kingdom Chromista to the five kingdoms (the Monera, Protista, Plantae, Fungi, and Animalia) that had been generally accepted for some time.

## *Biology of Symbiosis*

No biological organism can live without interacting in some way with other living things. The relationships that arise between such partners vary. For example, when only one of the parties benefits, the relationship is known as "commensalism"; when both benefit, it is known as "mutualistic symbiosis." And when one party benefits at the other's expense, it is called "parasitism." The more we learn about the complexity of relationships among living things, however, the more difficult it becomes to distinguish between symbiosis and parasitism. The 1970s saw the birth of endosymbiotic theory, which holds that in the course of evolution certain cells came to live inside other cells. Also, symbionts influence each other's evolution, and this "coevolution" is another area where research is making progress.

### 26th Prize (2010, Research field: Biology of Symbiosis)

Recipient

**Dr. Nancy Ann Moran**

William H. Fleming Professor, Department of Ecology and Evolutionary Biology, Yale University, USA
Date of Birth: 21 December 1954 Nationality: USA

Achievements recognized by the Award

Dr. Moran has contributed greatly to the advancement of the biology of symbiosis in recent years through her studies of intimate coevolutionary relationships between insects and the endosymbiotic bacteria that live within them, studies which have yielded by far the largest number of outstanding research results in this field thanks to Dr. Moran's versatile approach, which draws on molecular biology, genomics, and experimental and theoretical biology.

## *Neurobiology*

In order to survive, living creatures perceive changes in their environment using senses such as sight, hearing, taste, smell, and touch. The information obtained is carried to the brain for processing, as a result of which the organism may take action or changes may occur in its body. The information is conducted there by the nervous system, which developed as multicellular organisms evolved due to the need to transmit information among the cells in order to permit coordinated functioning. Research into the brain, the center of the nervous system, dates back to ancient Egypt, and sketches of microscopic observations of nerve cells were published as early as 1865. The information processing system centered on the brain is highly complex, however, and there is much that we still do not understand.

### 28th Prize (2012, Research field: Neurobiology)

Recipient

**Dr. Joseph Altman**

Professor Emeritus, Purdue University, USA
Date of Birth: 7 October 1925 Nationality: USA

Achievements recognized by the Award

Dr. Altman proved in the 1960s that neurons continue to be generated in certain areas of the adult mammalian brain. His discoveries, which were reaffirmed 30 years later, laid the foundations of a new field of medicine and bioscience which brings together neuroscience, stem cell biology, psychiatry, and neurology, thus contributing greatly to the advancement of the biological sciences as a whole.

## *Cell Biology*

Exactly when the genesis of life occurred remains unclear, but fossils of microorganisms have been found in sedimentary rock from at least 3.5 billion years ago. Life at that time was unicellular, consisting of a single cell. Cells eventually took on a structure with a membrane-surrounded nucleus and organelles such as the mitochondria, and multicellular organisms followed. All life consists of cells, and our knowledge of the cell is the key to our knowledge of life. Cells themselves are equipped with functions such as self-replication and metabolism, while in multicellular organisms cells of the same kind come together to form tissues and perform various functions to maintain life. Cell biology is the study of the structures and functions of cells. Dr. Ohsumi was later awarded the Nobel Prize in Physiology or Medicine in 2016.

### 31st Prize (2015, Research field: Cell Biology)

Recipient

**Dr. Yoshinori Ohsumi**

Honorary Professor, Frontier Research Center, Tokyo Institute of Technology, Japan
Date of Birth: 9 February 1945 Nationality: Japan

Achievements recognized by the Award

Dr. Ohsumi elucidated the key mechanisms of autophagy, which were completely unknown before his studies. He first identified and analyzed multiple autophagy-related genes (ATG genes) in yeast. He established autophagy as an important research field in Cell Biology by elucidating its key molecular mechanisms and by showing that it is an important life phenomenon, widely conserved throughout the living world.

*Please note that the affiliations of the recipients were current at the time of the award.

## *Process for Nominating and Selecting Recipients of the International Prize for Biology*

(In the case of the 33rd Prize)

| | |
|---|---|
| *Around August* | **The Prize Committee selects the branch of biology for next year's Prize.** |
| *From October* | **The selection committee convenes to discuss the criteria for screening candidates.**<br>Committee on the International Prize for Biology<br>↓<br>Selection Committee |
| *From February to mid-April* | **Call issued for candidate nominations**<br>The selection committee invites nominations from universities, research institutions and individual researchers involved in the subject year's branch of biology. Solicitations are made in both in Japan and abroad. |
| *From May* | **Review of candidates**<br>Selection Committee<br>The selection committee members assigned to screen the candidates are experts in the subject field from Japan and abroad.<br>↓<br>Committee on the International Prize for Biology |
| *Around August* | **Decide upon recipient; Issue press release**<br>The Prize recipient is chosen and his/her name is publicly announced. |
| *Around November or December* | **Presentation Ceremony held at the Japan Academy in Tokyo**<br>**Commemorative Symposium for the International Prize for Biology**<br>The presentation ceremony is held in the presence of Their Majesties the Emperor and Empress. A Commemorative Symposium is held in conjunction with the ceremony. |

The Presentation Ceremony for the 2017 Prize
(Recipient: Dr. Rita Rossi Colwell)

Dr. Yoshinori Ohsumi (2015 recipient)
With Their Majesties the Emperor and Empress at the reception



# Donations

A fund for the International Prize for Biology is established
in the Japan Society for the Promotion of Science, which manages the donated money.
To maintain and grow the Prize over the long term, donations are essential.
The Prize Committee invites your greatly appreciated contributions.

If you would like to donate to the Fund,
please download the form from our website at
http://www.jsps.go.jp/english/e-biol/03_donation.html ,
email your donation form to the Secretariat,
and make a bank transfer using the account shown below.

### *Bank Account Information*

Bank Name : Sumitomo Mitsui Banking Corporation
Swift code : SMBCJPJT
Branch : Tokyo Public Institutions Operations Office
Branch Address : 18th floor, Nishi-shimbashi Square 3-1,
Nishishimbashi 1-chome, Minato-ku, Tokyo
105-0003, Japan
Account Type : Ordinary Account
Account Number : 3006718
Account Holder's Name : Japan Society for the Promotion of Science

### *Contact for inquiries*

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