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Keio University

Announcement of The Keio Medical Science Prize 2021

Keio University, Japan's oldest private university located in Tokyo, annually awards The Keio Medical Science Prize to recognize researchers who have made an outstanding contribution to the fields of medicine or the life sciences. It is the only prize of its kind awarded by a Japanese university, and 8 laureates of this prize have later won the Nobel Prize. The 26th Keio Medical Science Prize is awarded to **Katalin Karikó, Ph.D.**, from Perelman School of Medicine, University of Pennsylvania, and **Osamu Nureki, Ph.D.**, from Graduate School of Science, the University of Tokyo.

1. Laureates

Katalin Karikó, Ph.D.



Senior Vice President,
BioNTech SE, Mainz,
Germany

Adjunct Professor,
Perelman School of
Medicine, University
of Pennsylvania,
Philadelphia, USA

**“Discovery of Specific RNA Modification
Leading to mRNA Vaccine Development”**

Osamu Nureki, Ph.D.



Professor,
Graduate School of
Science,
The University of
Tokyo

“Structural Biology of Key Molecules in Life”

2. Award Events

- Release of prize laureates' introduction video
- Keio Medical Science Prize Lecture (Web Live Streaming)

For more information, please visit the Keio Medical Science Prize website:

<https://www.ms-fund.keio.ac.jp/en/prize/>





The Keio Medical Science Prize

1. Background

In the fall of 1994, Dr. Mitsunada Sakaguchi, a 1940 alumnus of the School of Medicine, donated five billion yen to Keio University with the expressed desire that it be used to commend outstanding researchers, to encourage medical research and its creative progress at Keio through grants, and to promote worldwide medical advances. In keeping with Dr. Sakaguchi's commitment, Keio launched The Keio University Medical Science Fund on April 1, 1995. Dr. Sakaguchi made an additional donation of two billion yen in July 1999, bringing the fund to a total of seven billion yen.

2. Initiatives

- The Keio Medical Science Prize
- Grants for International Activities in Medicine and the Life Sciences
- Keio Medical Science Rising Star Award
- Research Grants for Medicine and the Life Sciences
- Sakaguchi Laboratory

3. Objective

The Keio Medical Science Prize gives recognition to the outstanding and creative achievements of researchers in the fields of medicine and the life sciences, in particular those contributing to scientific developments in medicine. It aims to promote worldwide advances in medicine and the life sciences, encourage the expansion of researcher networks throughout the world, and contribute to the well-being of humankind.

4. Prize

Laureates receive a certificate of merit, medal, and a monetary award of 10 million yen. The award events and the Keio Medical Science Lectures are held online this year.

5. Nomination and Selection

The Keio Medical Science Prize is an international award, and each year academics and researchers from around the world are invited to nominate a candidate. Laureates are then selected through a rigorous review process by about ninety Japanese academics from both within and outside of Keio University.

6. 2020 Prize Laureates

Aviv Regev, Ph.D., Executive Vice President, Genentech Research and Early Development

Single Cell Analysis Technology to Understand the Complexity of Life

Atsushi Miyawaki, M.D., Ph.D., Laboratory Head, RIKEN Center for Brain Science, RIKEN Center for Advanced Photonics

Unveiling Life Science through Innovative Molecular Imaging

7. Nobel Prize Winning Laureates

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| 2016 | Tasuku Honjo (The Nobel Prize in Physiology or Medicine 2018)
Identification of PD-1 and Establishment of Cancer Immunotherapy Principle by PD-1 Blockade |
| 2015 | Yoshinori Ohsumi (The Nobel Prize in Physiology or Medicine 2016)
Discoveries of Mechanisms for Autophagy |
| 2010 | Jules A. Hoffmann (The Nobel Prize in Physiology or Medicine 2011)
Discovery of Insect-innate Immune System and Toll Receptors |
| 2006 | Thomas A. Steitz (The Nobel Prize in Chemistry 2009)
Structural Basis of Large Ribosomal Subunit Function and Drug Development |
| 2004 | Roger Y. Tsien (The Nobel Prize in Chemistry 2008)
Visualization and Control of Molecules within Living Cells |
| 2002 | Barry J. Marshall (The Nobel Prize in Physiology or Medicine 2005)
Establishment of Diagnostic Techniques and Treatment for Helicobacter Pylori |
| 1999 | Elizabeth Helen Blackburn (The Nobel Prize in Physiology or Medicine 2009)
Telomeres and Telomerase |
| 1996 | Stanley B. Prusiner (The Nobel Prize in Physiology or Medicine 1997)
Discovery of Prions and Prion Diseases |



The Keio Medical Science Prize 2021 Laureate

“Discovery of Specific RNA Modification Leading to mRNA Vaccine Development”

Katalin Karikó, Ph.D.

Senior Vice President, BioNTech SE, Mainz, Germany

Adjunct Professor, Perelman School of Medicine, University of Pennsylvania, Philadelphia, USA

Messenger RNA (mRNA) molecules convey genetic information from DNA to the ribosome, where they specify the amino acid sequence of the protein products of gene expression. In 1989, Katalin Karikó, Ph.D. started working on mRNA with the conviction that mRNA could be used to instruct cells to make their own medicines. However, as it turned out, human immune cells exposed to synthesized mRNA generated a strong immune response accompanied by secretion of inflammatory molecules. After many years of trial and error, Dr. Karikó found that the incorporation of a modified nucleoside, known as pseudouridine, into the mRNA ablated the immune response. In addition, the modification directed the cellular synthesis of quantities of protein that were several times larger than those produced by the conventional, unmodified mRNA. These findings of Dr. Karikó regarding modified mRNA went on to pave the way to the stunningly successful COVID-19 vaccines that have been developed by pharmaceutical companies. Now that mRNA vaccine technology has been proven, it is expected to transform other vaccines and therapeutic strategies to tackle not only infectious diseases such as HIV, influenza, and malaria, but also cancer and heart failure. Therefore, her achievement is undoubtedly worthy of the Keio Medical Science Prize.

Education

1982 PhD University of Szeged, Szeged, Hungary (Biochemistry)
1978 BS University of Szeged, Szeged, Hungary (Biology)

Positions

2021-present Adjunct Professor, Department of Neurosurgery, University of Pennsylvania
2019-present Senior Vice President, BioNTech SE
2013-2019 Vice President, BioNTech RNA Pharmaceuticals
2009-2021 Adjunct Associate Professor, Department of Neurosurgery, University of Pennsylvania
1995-2009 Senior Research Investigator, Department of Neurosurgery, University of Pennsylvania
1989-1995 Research Assistant Professor, Department of Medicine, University of Pennsylvania
1988-1989 Department of Pathology, USUHS, Bethesda, MD, USA
1985-1988 Department of Biochemistry, Temple University, Philadelphia, PA, US
1982-1985 Biological Research Center, Hungarian Academy of Sciences, Szeged, Hungary

Major Honors/Awards

2021 Rosenstiel Award for Distinguished Work in Medical Science – Brandeis University, USA
2021 Reichstein Medal – Swiss Academy of Pharmaceutical Sciences
2021 Vilcek Prize for Excellence in Biotechnology – The Vilcek Foundation, NYC, USA
2021 Princess Asturias Award – Princess Asturias Foundation, Spain
2021 Semmelweis Award – Hungarian Government
2021 Horwitz Prize – Columbia University, USA

Comment from Katalin Karikó, Ph.D.

I'm humbled and honored to receive the Keio Medical Science Prize in recognition of my contribution to identifying the specific RNA modification that helped develop the mRNA vaccines in the fight against COVID-19. As a result of the modification, mRNA therapies can be safely delivered to patients to make more effective vaccines against other infectious diseases or used for protein replacement therapies and gene editing to treat conditions with unmet medical needs.



The Keio Medical Science Prize 2021 Laureate

“Structural Biology of Key Molecules in Life”

Osamu Nureki, Ph.D.

Professor,

Graduate School of Science, The University of Tokyo

Structural biology is an important area of molecular biology and biochemistry concerned with the molecular structure of macromolecules, especially proteins and nucleotides. Osamu Nureki, Ph.D. as a pioneer in the field of structural biology, has determined the three-dimensional structures of key molecules in life including those of RNA-protein complexes such as tRNA modification enzymes, G protein-coupled receptors and membrane transporters. His achievement has proved that structural biology is not just a method of learning about the structures of molecules, but also a strong means of investigating their biological functions and identifying unknown life phenomena. Recently, he determined the structure of CRISPR-Cas9 for the first time, paving the way to “genome editing-based drug discovery”. Fundamental knowledge originating from his research is now the basis underlying recent advances in biology and medical science. Taking all these above-mentioned facts into consideration, Dr. Nureki deserves to win the Keio Medical Science Prize.

Education

- 1993 Graduated from Department of Biophysics and Biochemistry, Graduate School of Science, The University of Tokyo (Doctor of Science)
- 1988-93 Master and PhD student of Department of Biophysics and Biochemistry, Graduate School of Science, The University of Tokyo
- 1984-88 Undergraduate of Faculty of Science, The University of Tokyo

Positions

- 2014 Professor, Department of Biological Sciences, Graduate School of Science, The University of Tokyo
- 2010 Professor, Department of Biophysics and Biochemistry, Graduate School of Science, The University of Tokyo
- 2008 Professor, Department of Basic Medical Sciences, The Institute of Medical Science, The University of Tokyo
- 2003 Professor, Department of Biological Information, Graduate School of Biosciences and Biotechnology, Tokyo Institute of Technology
- 2002 Associate Professor at Department of Biophysics and Biochemistry, Graduate School of Science, The University of Tokyo
- 1995 Assistant Professor, Department of Biophysics and Biochemistry, Graduate School of Science, The University of Tokyo
- 1994 Special Researcher at Crystallography Laboratory, RIKEN
- 1993 Postdoctoral Fellow, Protein Engineering Research Institute (PERI)

Major Honors/Awards

- 2018 Medal with Purple Ribbon from Japanese Government
- 2014 Takeda Medical Prize of Takeda Science Foundation
- 2014 Uehara Prize of Uehara Memorial Foundation
- 2011 Research Award of The Crystallographic Society of Japan
- 2011 Inoue Prize for Science, Inoue Foundation for Science
- 2008 JSPS Prize, Japan Society for the Promotion of Science

Comment from Osamu Nureki, Ph.D.

I was born at Keio University Hospital. During my childhood, I was interested in becoming a doctor and devoured Hideyo Noguchi biographies and Osamu Tezuka's medical comic Black Jack. In high school, I struggled with finding my purpose and concluded that a life helping others would be a life worth living. I could have studied at the Faculty of Medicine at the University of Tokyo, but I was afraid of diseases and joined the School of Science, believing that I could contribute to medicine through basic research. As a Ph.D. student, I realized that remodeling and controlling proteins as machines made of atoms would allow us to significantly improve medical science. Currently, my laboratory is focused on the structural biology of non-coding RNA and membrane proteins, which are the building blocks of life and higher eukaryotes, and I am creating drugs and medical technologies with two venture companies. This Keio Medical Science Prize is a significant motivator for me to further my research and technological development.

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