PRESS RELEASE

INAMORI FOUNDATION

June 17, 2016

Announcement of the 2016 Kyoto Prize Laureates

The Inamori Foundation (President: Kazuo Inamori) is pleased to announce the laureates of the 2016 Kyoto Prize, an international award presented to individuals who have contributed significantly to the scientific, cultural, and spiritual betterment of humankind. This year's Prize goes to the following three individuals.
The Kyoto Prize Presentation Ceremony will be held in Kyoto, Japan on November 10. Each laureate will receive a diploma, the Kyoto Prize medal (20K gold), and prize money of 50 million yen.

ADVANCED TECHNOLOGY

Prize Field : Information Science

Dr. Takeo Kanade (Japan / October 24, 1945 / Age 70)

Roboticist; *U. A. and Helen Whitaker University Professor, Carnegie Mellon University*

Pioneering Contributions, both Theoretical and Practical, to Computer Vision and Robotics

Dr. Kanade has made fundamental contributions to the basic theory of computer vision and introduced a series of innovative applied technologies in robotics including pioneering achievements in the field of automated driving. He has established the foundation of this academic field and been advancing its frontiers consistently for many years.

BASIC SCIENCES

Prize Field : Life Sciences (Molecular Biology, Cell Biology, Neurobiology)

Dr. Tasuku Honjo (Japan / January 27, 1942 / Age 74)

Medical Scientist; *Professor, Kyoto University*

Discovery of the Mechanism Responsible for the Functional Diversification of Antibodies, Immunoregulatory Molecules and Clinical Applications of PD-1

Dr. Honjo has elucidated the mechanism for the functional diversification of antibodies by clarifying Class Switch Recombination and its responsible enzyme, AID. He also identified several important immunoregulatory molecules, including PD-1, whose function has led to the development of effective cancer immunotherapy. His discoveries and their clinical applications have significantly influenced research in the life sciences and medicine, resulting in eminent contributions to human welfare.

ARTS AND PHILOSOPHY

Prize Field : Thought and Ethics

Dr. Martha Craven Nussbaum (U.S.A. / May 6, 1947 / Age 69)

Philosopher; *Ernst Freund Distinguished Service Professor of Law and Ethics, The University of Chicago*

A Philosopher Who Has Developed a New Theory of Justice Advocating the Capabilities Approach

Dr. Nussbaum introduced the notion of incorporating human capabilities (what each person is able to *do* or *be*) into the criteria for social justice, beyond the conventional theory of equality based on a social contract among rational individuals. She established a new theory of justice that ensures the inclusion of the weak and marginalized, who are deprived of opportunities to develop their capabilities in society, and has proposed ways to apply this theory in the real world.

Dr. Takeo Kanade

Pioneering Contributions, both Theoretical and Practical, to Computer Vision and Robotics

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Computer vision

Just like human beings, computers and robots that interact with their physical surroundings require reliable visual information to function effectively. Accurately recognizing key variables from images captured by cameras or other devices represents one of the central challenges within the field of computer vision, and Dr. Kanade ranks among the field's most accomplished researchers.

The basics—a universal foundation

Dr. Kanade's wide-ranging achievements in computer vision extend from basic theory to real-world applications, and his foresight, practical approaches, and creativity are deeply respected within the field. One of his foundational accomplishments lies in developing a theory for extracting the movement of an object through video images, providing fundamental techniques for motion analysis in MPEG and other video formats (Fig. 1). Further, by compiling a theory for modeling three-dimensional structures from two-dimensional images, he has made theoretical contributions that are expected to guide the future direction of information technology in this area.

Fig.1 Motion extraction using

Applications—the concretization of creativity

His achievements are evident across a broad spectrum of fields. One prime example is his involvement since the 1980s in developing a face-detection algorithm. In 1995, Dr. Kanade made news headlines by traveling across the North American continent in one of the earliest autonomous vehicle prototypes (Fig. 2), and went on to develop a helicopter that navigates autonomously based on image data from live cameras. He surprised the world with his new visual medium named "virtualized reality," which allow objects to be viewed from any angle, and opened exciting new avenues in sports broadcasting (Fig. 3).

Fig.2 "No Hands Across America" project (Provided by Dr. Kanade)

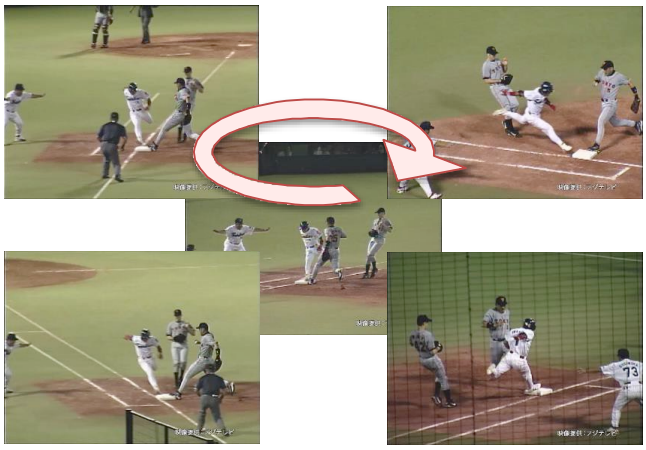


Fig.3 EyeVision, a virtualized reality system (Provided by Fuji Television)

Think like an amateur and execute like an expert

Dr. Kanade's uniqueness as a researcher stems from the fact that he not only advances fundamental theoretical frameworks but also develops spectacular real-world technologies from his own theories. He tells us to "Think like an amateur and execute like an expert," describing how he stimulates his imagination with the enthusiasm of a layperson, and then turns ideas into reality as a professional technologist. The end results of this approach unfailingly astonish and inspire. His inexhaustible creativity continues to command international admiration and respect.

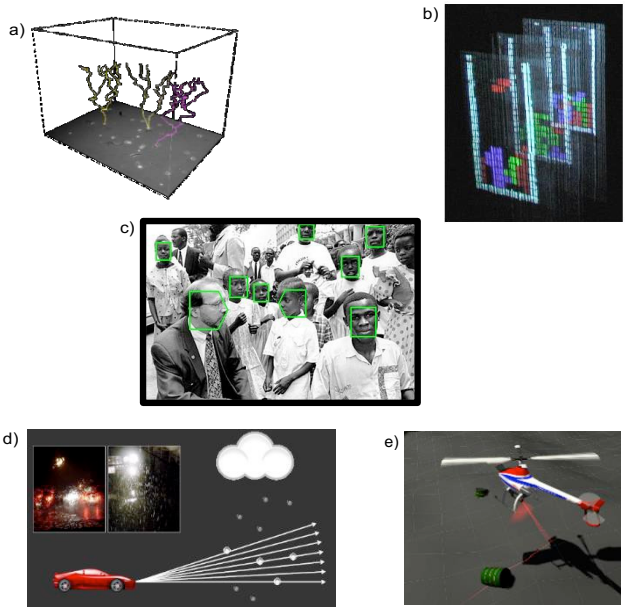


Fig.4 Various research conducted by Dr. Kanade (Provided by Dr. Kanade and partially modified)

a) Cell tracking system, b) Water drop display, c) Face detection,

ACHIEVEMENTS OF THE 2016 KYOTO PRIZE LAUREATE IN ADVANCED TECHNOLOGY

Prize Field : Information Science

Dr. Takeo Kanade

Pioneering Contributions, both Theoretical and Practical, to Computer Vision and Robotics

Dr. Takeo Kanade has devoted much of his life to researching and developing computer vision technologies, from fundamental theories to real-world applications in the field of robotics. Today, cameras and robots with intelligent visual functions are expected to offer solutions to various social problems and Dr. Kanade has made significant contributions to the foundation of these technologies and brought many new concepts into practical reality.

His pioneering research on computer-based image recognition led him to propose face detection technologies using neural networks (1, 2). This method raised the detection rate to an unprecedented level, and subsequent enhancements triggered commercial face-detection applications in many fields.

After joining the faculty of Carnegie Mellon University, Dr. Kanade began researching methods of recognizing three-dimensional structures and motions using video and then went on to propose a robust and fundamental algorithm for optical flow to estimate the direction and speed of a moving object with video images (3). Named after its developers, the Lucas-Kanade method provides the essential technique for much of today's visual processing technologies. He also co-developed Tomasi-Kanade Factorization, a noise-robust, three-dimensional reconstruction method for moving objects in video based on singular value decomposition (4). This work has strongly facilitated a wide range of related research, yielding dramatic progress in image recognition technology. Based on these fundamental contributions, he has realized visual information processing in ways that are highly useful in the real world.

One of his most profound achievements relates to automated driving. In 1985, his autonomous vehicle project formed the early foundation for the recent emergence of autonomous driving technologies (5). He was the first researcher in the world to create an artificial intelligence system capable of sensing freeway lanes, executing accurate lane changes, recognizing and avoiding obstacles, and detecting other vehicles in real time based on data from vehicle-mounted range sensors and cameras. In 1995, his team carried out a superb demonstration called "No Hands Across America," the idea of which was to traverse the North American continent by car without touching the steering wheel. Researchers drove approximately 4,500 kilometers, from Pittsburgh to San Diego, with hardly any use of the steering wheel. This groundbreaking demonstration was extremely significant in showing the future potential for fully automated driving.

Dr. Kanade is also known for his work on real-time, three-dimensional image

reconstruction using multiple cameras, and on practical digital human research designed to improve the quality of life. One project that merits special mention here is his "EyeVision" system, which performs coordinated control of 33 robotic cameras positioned around an athletic stadium in real time to record any player holding the ball (6). The EyeVision system thrilled audiences with an innovative viewing experience during the TV broadcast of the Super Bowl XXXV in 2001, an American football game boasting the highest viewing ratings in the U.S.

As described above, Dr. Kanade's achievements cover a widespread area from scientific basic research to practical research. He has outstandingly contributed in the field of image processing and pattern recognition by putting forth basic and theoretical frameworks, and developing extraordinary practical technologies.

References

(1) Kanade T (1973) Picture processing system by computer complex and recognition of human faces. PhD dissertation (Kyoto University).

(2) Rowley HA, et al. (1998) Neural network-based face detection. IEEE Transactions on Pattern Analysis and Machine Intelligence 20: 23–38.

(3) Lucas BD & Kanade T (1981) An iterative image registration technique with an application to stereo vision. Proceedings of IJCAI '81: 674–679.

(4) Tomasi C & Kanade T (1992) Shape and motion from image streams under orthography: a factorization method. International Journal of Computer Vision 9: 137–154.

(5) Thorpe C, et al. (1988) Vision and navigation for the Carnegie-Mellon Navlab. IEEE Transactions on Pattern Analysis and Machine Intelligence 10: 362–373.

(6) Kanade T, et al. (1997) Virtualized reality: constructing virtual worlds from real scenes. IEEE MultiMedia 4: 34–47.

BIOGRAPHY OF THE 2016 KYOTO PRIZE LAUREATE IN ADVANCED TECHNOLOGY

Prize Field : Information Science

Dr. Takeo Kanade

Roboticist

Affiliation and Title/Position
U. A. and Helen Whitaker University Professor, Carnegie Mellon University

Date of Birth October 24, 1945 Nationality Japan

Brief Biography

1945	Born in Tamba, Hyogo, Japan
1974	Ph.D. in Electrical Engineering, Kyoto University
1974–1976	Assistant Professor, Faculty of Engineering, Kyoto University 1976–
1980	Associate Professor, Faculty of Engineering, Kyoto University 1980–
1982	Senior Research Scientist, The Robotics Institute and Computer Science Department, Carnegie Mellon University (CMU)
1982–1985	Associate Professor, The Robotics Institute and Computer Science Department, CMU
1985–1994	Professor, The Robotics Institute and Computer Science Department, CMU
1992–2001	Director, The Robotics Institute, CMU
1993–1998	U. A. and Helen Whitaker Chaired Professor, CMU
1998–	U. A. and Helen Whitaker University Professor, CMU
2004–2010	Director, Digital Human Research Center, National Institute of Advanced Industrial Science and Technology, Japan
2006–2012	Director, Quality of Life Technology Engineering Research Center, CMU
2014–	Specially Appointed Professor, The Institute of Scientific and Industrial Research, Osaka University
2014–	Visiting Professor, Graduate School of Information Science, Nara Institute of Science and Technology
2015–	Honorary AIST Fellow, National Institute of Advanced Industrial Science and Technology, Japan
2016–	Senior Advisor, Center for Advanced Integrated Intelligence Research, RIKEN

Selected Awards and Honors

1995	Joseph F. Engelberger Award
2000	C&C Prize
2004	Funai Achievement Award
2007	Azriel Rosenfeld Lifetime Achievement Award, IEEE CS
2007	RAS Pioneer Award, IEEE RAS
2007	Okawa Prize
2008	Bower Award and Prize for Achievement in Science
2010	ACM-AAAI Allen Newell Award
2010	Tateishi Prize, Grand Award

Members: American Academy of Arts and Sciences, National Academy of Engineering

Dr. Tasuku Honjo

Discovery of the Mechanism Responsible for the Functional Diversification of Antibodies, Immunoregulatory Molecules and Clinical Applications of PD-1

Dr. Honjo has elucidated the mechanism for the functional diversification of antibodies by clarifying Class Switch Recombination and its responsible enzyme, AID. He also identified several important immunoregulatory molecules, including PD-1, whose function has led to the development of effective cancer immunotherapy. His discoveries and their clinical applications have significantly influenced research in the life sciences and medicine, resulting in eminent contributions to human welfare.

Solving the puzzle of how antibodies acquire diverse functions

Antibodies, essential to the immune system, have a Y-shaped structure consisting of two long heavy chains and two short light chains that each has a variable (V) antigen-binding region and constant (C) region that corresponds to reaction after the binding, respectively (Fig. 1). To produce antibodies that can specifically bind to a near-infinite variety of foreign bodies (antigens) from the outside world, B lymphocytes obtain diversity through gene recombination in the V region. Differences in the C region of the heavy chain determine the antibody's class (IgM, IgG, IgD, IgE, or IgA, in Fig. 2) and function as neutralization of bacteria toxin or virus, immune response to parasites, or allergic reaction, as well as its working site as blood, lymph, or gut. Once exposed to antigens, genes in the V region undergo somatic hypermutation (SHM) to strengthen the antibody's binding potential with respect to that particular antigen. Researchers had faced a longstanding challenge in understanding how the C region in the heavy chain of a particular class was arranged, and how the C region connected to the V region, even though it was known that antibody class plays an important role in determining antibody function.

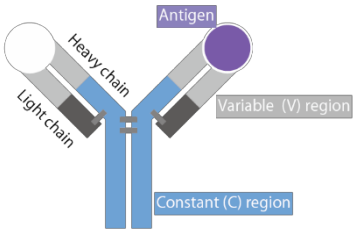


Fig.1 Basic Structure of Antibody

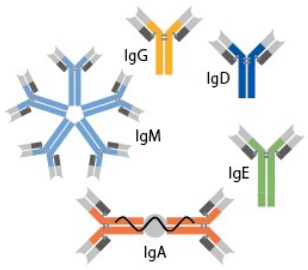
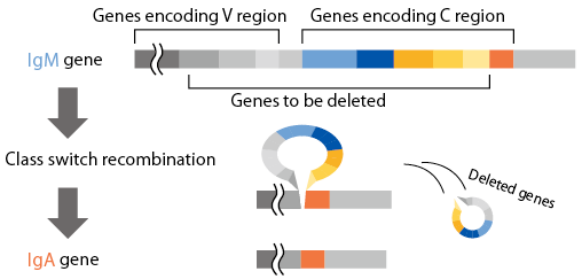


Fig. 2 Various Classes of Antibodies

In 1978, Dr. Honjo analyzed C-region genes in heavy chains of various classes, and discovered that some genes were missing in a characteristic manner. From these results, he proposed that antibodies actually switch their class through class switch recombination (CSR), in which every C-region gene forms a line within the same chromosome and that extra genes between them are deleted when genes in C regions connect with genes in V regions (Fig. 3).



Dr. Honjo's CSR model has since been verified in numerous discoveries elucidating the chromosomal region directly involved in CSR; the DNA sequences encoding each class; and how recombination occurs only in one allele of the gene. He also identified one of the molecules responsible for inducing CSR, interleukin (IL)-4, although the exact mechanism of CSR in B cells remained unexplained.

He made an *in vitro* model that allows CSR by IL-4 stimuli to be observed, and ultimately identified activation-induced cytidine deaminase (AID) as the enzyme which specifically increases CSR. In subsequent studies from 2000 to 2002, he proved that AID is not only responsible for CSR but also essential for SHM in the V region. Dr. Honjo thus identified the molecular mechanism underlying the generation of functionally divergent antibodies.

Application to cancer immunotherapy

In parallel with this study, Dr. Honjo cloned a variety of molecules that play important roles in immune response. He identified the gene of PD-1 in 1992, and in 1999, discovered that PD-1 serves as a "brake" on immune response through his analysis of mice with PD-1 knocked out. Based on this finding, he administered a PD-1 function-blocking antibody to mice exhibiting cancer, and found that the immune response was activated and the cancer reduced. In explaining these findings, Dr. Honjo noted that cytotoxic T lymphocyte is usually activated and able to attack its targets upon recognizing an antigen; however, if programmed death ligand 1 (PD-L1) on the antigen binds to PD-1 on the T-cell, eliciting PD-1 response, then activation becomes impossible (Fig. 4). Cancelling this brake reactivates T-cell to attack the target once again (Fig. 5). Today, PD-1-targeting antibodies have found practical application as an important part of cancer therapy.

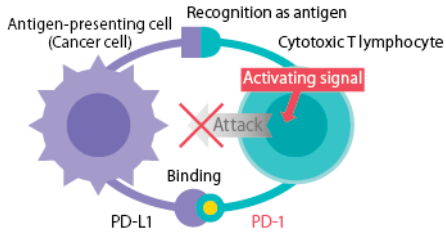
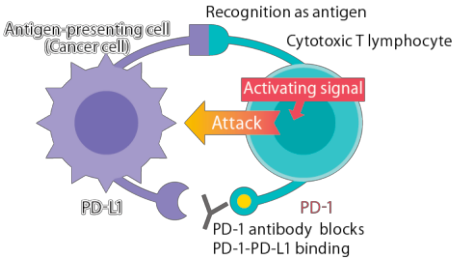


Fig. 4 PD-1/PD-L1 as brake on immune response



ACHIEVEMENTS OF THE 2016 KYOTO PRIZE LAUREATE IN BASIC SCIENCES

Prize Field : Life Sciences (Molecular Biology, Cell Biology, Neurobiology)

Dr. Tasuku Honjo

Discovery of the Mechanism Responsible for the Functional Diversification of Antibodies, Immunoregulatory Molecules and Clinical Applications of PD-1

Using unique molecular biology insights and instincts, Dr. Tasuku Honjo has elucidated one of the basic principles of the immune system and identified key regulatory molecules involved in immune response. His discoveries and their clinical applications have significantly influenced research in the life sciences and medicine, resulting in eminent contributions to human welfare.

Antibodies, which comprise a major component of the immune system, are produced by B cells. The antibody sequence is derived from the rearrangements of immunoglobulin (Ig) genes in variable gene fragments during the development of B cells in bone marrow, where extensive diversity is generated to bind a vast variety of potential antigens. B cells then move to the secondary lymphoid tissues, where, upon activation by exposure to antigens and associated cytokine milieu, they produce antibodies of broad functional diversity. This provides antibodies with the diverse functions required for various immune responses, such as viral neutralization, bacterial phagocytosis, allergic reaction, and mucosal immunity. It also includes somatic hypermutations (SHM) at the Ig variable regions that result in antibodies with higher binding affinity to particular antigens.

In 1978, Dr. Honjo proposed a class switch recombination (CSR) model of antibody diversification, which he corroborated in subsequent works. According to this model, antibody diversification is facilitated when a part of the immunoglobulin heavy chain gene is deleted, and the region coding the class segment is joined by recombination events (1). He then established an in vitro model that recapitulates CSR using cultured B cells activated with interleukin (IL)-4, and cloned activation-induced cytidine deaminase (AID) (2). Subsequent studies by his group proved that AID is not only responsible for CSR but also essential for SHM (3). Dr. Honjo thus identified the molecular mechanism underlying the generation of functionally divergent antibodies, thereby elucidating one of the basic principles of immunology.

In parallel with this study, Dr. Honjo cloned a variety of molecules that play important roles in immune responses. These include IL-4 and IL-5, which activate B cells and induce specific CSR; RBP-J kappa, which was first cloned as the protein binding to immunoglobulin J kappa recombination sequence and was later found as a key mediator of Notch signaling in cell fate determination; and a chemokine SDF-1, which is important in hematopoietic niche formation in the bone marrow.

One of the molecules cloned by Dr. Honjo is PD-1 (4), which negatively regulates the self-tolerance of the immune system, as evidenced by the development of various

autoimmune diseases after deletion of this gene (5) as well as the activation of negative PD-1 signaling by its specific ligand PD-L1 in T cells (6). Based on these findings, Dr. Honjo and his colleagues administered anti-PD-L1 antibodies in mice bearing PD-L1-expressing tumors and found that blocking the PD-1-PD-L1 binding significantly inhibited tumor growth and prolonged survival (7). This milestone discovery by Dr. Honjo stimulated the development of anti-PD-1 and anti-PD-L1 antibodies as anti-cancer immunotherapeutic agents. Subsequent large-scale U.S. clinical trials conducted in 2006, using Nivolmab, the humanized anti-PD-1 antibody, demonstrated marked efficacy against melanoma, non-small-cell lung cancer, prostate cancer, renal carcinoma, colorectal cancer, and Hodgkin's disease in humans. Nivolumab has been approved by the U.S. Food and Drug Administration and is now in clinical use in Japan, the U.S., and Europe.

Dr. Honjo has thus contributed to basic science by clarifying the mechanism responsible for the functional diversification of antibodies, one of the basic principles of immunology, and by identifying several important immunoregulatory molecules. His identification of PD-1/PD-L1 and their function has led to the development of effective cancer immunotherapy contributing significantly to human health and welfare.

References

(1) Honjo T & Kataoka T (1978) Organization of immunoglobulin heavy chain genes and allelic deletion model. Proc Natl Acad Sci USA 75:2140–2144.

(2) Muramatsu M, et al. (1999) Specific expression of activation-induced cytidine deaminase (AID), a novel member of the RNA-editing deaminase family in germinal center B cells. J Biol Chem 274:18470–18476.

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(4) Ishida Y, et al. (1992) Induced expression of PD-1, a novel member of the immunoglobulin gene superfamily, upon programmed cell death. EMBO J 11:3887–3895.

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(6) Freeman GJ, et al. (2000) Engagement of the PD-1 immunoinhibitory receptor by a novel B7 family member leads to negative regulation of lymphocyte activation. J Exp Med 192:1027–1034.

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BIOGRAPHY OF THE 2016 KYOTO PRIZE LAUREATE IN BASIC SCIENCES

Prize Field : Life Sciences (Molecular Biology, Cell Biology, Neurobiology)

Dr. Tasuku Honjo

Medical Scientist

Affiliation and Title/Position Professor, Kyoto University

Date of Birth January 27, 1942 Nationality Japan

Brief Biography

1942	Born in Kyoto City, Japan
1966	M.D. Faculty of Medicine, Kyoto University
1975	Ph.D. in Medical Chemistry, Kyoto University
1971–1973	Fellow, Department of Embryology, Carnegie Institution of Washington
1973–1974	Visiting Fellow and Associate, National Institute of Child Health and Human Development, National Institutes of Health
1974–1979	Assistant Professor, Faculty of Medicine, The University of Tokyo
1979–1984	Professor, Graduate School of Medicine, Osaka University
1984–	Professor, Graduate School of Medicine, Kyoto University
1989–1997	Professor, School of Medicine, Hirosaki University
2005	Professor Emeritus, Kyoto University
2012–	Chairman of the Board, Shizuoka Prefectural University Corporation
2015–	President, Foundation for Biomedical Research and Innovation

Selected Awards and Honors

1981	Noguchi Hideyo-Memorial Award for Medicine
1985	Erwin von Bälz Prize, Boehringer Ingelheim
1988	Takeda Medical Prize
1993	Uehara Prize
1996	The Imperial Prize and the Japan Academy Prize
2012	Robert-Koch-Preis
2013	Order of Culture, Government of Japan
2014	Tang Prize
2014	William B. Coley Award for Distinguished Research in Basic and Tumor Immunology, Cancer Research Institute
2015	Richard V. Smalley, MD Memorial Award, Society for Immunotherapy of Cancer

Members: Leopoldina, National Academy of Sciences, The American Association of Immunologists, The Japan Academy

Dr. Martha Craven Nussbaum

A Philosopher Who Has Developed a New Theory of Justice Advocating the Capabilities Approach

Dr. Nussbaum introduced the notion of incorporating human capabilities (what each person is able to *do* or *be*) into the criteria for social justice, beyond the conventional theory of equality based on a social contract among rational individuals. She established a new theory of justice that ensures the inclusion of the weak and marginalized, who are deprived of opportunities to develop their capabilities in society, and has proposed ways to apply this theory in the real world.

Standing with the weak and the marginalized

Dr. Nussbaum was born into a wealthy family in the U.S., but felt uncomfortable with life in the upper circles of society. The vulnerability of human beings and the reality that many people suffer from discrimination and poverty drove her into humanities research. Having studied the classics and philosophy in graduate school, she wrote her thesis on Aristotle's *De Motu Animalium* (*Movement of Animals*) and received her doctorate from Harvard University in 1975. From 1987 to 1993 she engaged in joint research with noted economist and Nobel Prize laureate Dr. Amartya Sen at the World Institute for Development Economics Research in Helsinki, focusing on factors that contribute to the quality of life. This work led to the development of her version of the capabilities approach.

Dr. Nussbaum in Colombia at the opening of a new housing project and youth center

Capabilities approach—a new theory of justice

According to conventional views, particularly those of John Rawls (*A Theory of Justice*), social justice involves the fair distribution of wealth, freedom and rights based on principles agreed to and accepted by rational individuals who can be "normal and fully cooperating members of society over a complete life." However, this theory of justice does not address the issue of the inequality between people of varying physical or mental abilities. In a society where public spaces and facilities are not made physically accessible to all people, for example, a wheelchair user will not be able to get around as freely as someone who can walk. Even if they both receive the same transportation allowance, additional costs will be imposed on the wheelchair user.

A proper focus for evaluating well-being must include human capabilities, rather than simply wealth and utility. This is the basic idea of the capabilities approach developed by Dr. Sen and Dr. Nussbaum. As a neo-Aristotelian, Dr. Nussbaum criticized the conventional theory of justice from a philosophical perspective. She noted that its assumption of rational individuals as "normal

Dr. Nussbaum as Clytemnestra in Aeschylus' *Oresteia*, at a conference in 2014 on Crime in Law and Literature

excludes large groups, such as the severely physically or mentally challenged, by considering their condition to be exceptional. Dr. Nussbaum therefore advanced a new theory of justice that can be applied equally to socially vulnerable people. No one can be a normal and fully cooperating member of society in all stages of life due to the unique conditions of infancy and advanced age. Based on the notion that all human beings are destined to die, need other humans, and have disabilities of one kind or another, she included in her list of "the central human capabilities" not only the inviolability of good health and bodily integrity, but also imagination, thought, emotions and deep concern for other people and other species.

Toward a life with dignity

Dr. Nussbaum proposed a list of capabilities as central requirements of a life with dignity. Her list, which has found support across diverse cultures, provides not merely a philosophical idea, but social and political goals. By offering this list, she has advanced practical arguments for creating an environment where all people

ACHIEVEMENTS OF THE 2016 KYOTO PRIZE LAUREATE IN ARTS AND PHILOSOPHY

Prize Field : Thought and Ethics

Dr. Martha Craven Nussbaum

A Philosopher Who Has Developed a New Theory of Justice Advocating the Capabilities Approach

Dr. Martha Craven Nussbaum has led global discourse on philosophical topics that influence the human condition in profound ways, including contemporary theories of justice, law, education, feminism and international development assistance.

Starting with studies of ancient Greek tragedy and Aristotelian philosophy, Dr. Nussbaum has taken a critical stance toward the rational individualism in modern Western society while emphasizing the ethical values embodied in emotions. She strives to present ethics that effectively promote human welfare amid an environment of globally changing social conditions that often produce conflict in values and emotions.

Among her best-known achievements is the development of a political philosophy that focuses on human capabilities. Over many years, Dr. Nussbaum worked with Dr. Amartya Sen, an Indian economist who attempted to reintegrate philosophy and economics and advocated a capability approach to human well-being. Dr. Nussbaum's version of the "capabilities approach" was created by developing the results of their collaborative research in a unique way. Reinterpreting the notion of Aristotle's dynamis, she has advocated a new idea: that the normative justice of liberalism should focus on the development of capabilities—what each individual is able to do or be—so people can unlock their potential and flourish. Under the capabilities approach, for example, poverty is reinterpreted as capability deprivation rather than a mere lack of money. Using this theory, Dr. Nussbaum has injected new insights into the discussion of human welfare policy and forms of assistance to developing countries. She has also employed her capabilities-based theory of social justice to such human dignity topics as same-sex marriage, gender discrimination and the issue of sexual "objectification" by pornography.

Dr. Nussbaum has articulated a broad set of human capabilities that includes the inviolability of good health and bodily integrity, the free movement of imagination and critical thinking, and concern for other people and other species. Her list of capabilities is cited around the world as a normative theory for human rights education—and a base of assessment of human development and a foundation for public policy in areas ranging from child welfare to gender equality. She has attracted global attention for advocating liberal education as the foundation of democracy, and multicultural awareness as a path toward harmony among people of diverse cultures while she has engaged in in-depth discussion with people from different cultural backgrounds, particularly in India.

Dr. Nussbaum has devoted particular effort to researching the emotional origins of laws, and her conclusions influence penal policy and related legislation. She has analyzed the

nature of negative emotions, such as anger, disgust and shame, reviewed many cases to examine how human vulnerability is connected to crime and penalties, and presented important views on the fundamental assumptions of a justice system. Amid growing intolerance and discrimination against dissimilar others, her work offers practical significance by identifying the underlying causes of problems and providing new pathways to solutions.

Dr. Nussbaum has led contemporary studies in social philosophy and ethics toward a future of greater human well-being, continuously applying her findings to some of today's most vexing social concerns. Maintaining a strong sense of mission, she continues to seek ways of promoting the harmonious coexistence of different cultures and restructuring the public sphere.

BIOGRAPHY OF THE 2016 KYOTO PRIZE LAUREATE IN ARTS AND PHILOSOPHY

Prize Field : Thought and Ethics

Dr. Martha Craven Nussbaum

Philosopher

Affiliation and Title/Position
Ernst Freund Distinguished Service Professor of Law and Ethics, The University of Chicago

Date of Birth May 6, 1947 Nationality U.S.A.

Brief Biography

1947	Born in New York, U.S.A.
1975	Ph.D. in Classical Philology, Harvard University
1980–1983	Associate Professor of Philosophy and Classics, Harvard University 1984–
1985	Associate Professor of Philosophy and Classics, Brown University 1985–
1989	Professor of Philosophy, Classics and Comparative Literature, Brown University
1987–1993	Research Advisor, World Institute for Development Economics Research, United Nations University
1989–1995	University Professor and Professor of Philosophy, Classics and Comparative Literature, Brown University
1995–1996	Professor of Law and Ethics, The University of Chicago
1996–1998	Ernst Freund Professor of Law and Ethics, The University of Chicago
1999–	Ernst Freund Distinguished Service Professor of Law and Ethics, The University of Chicago

Selected Awards and Honors

2012	Prince of Asturias Award for Social Sciences
2012	Order of the White Rose of Finland, First Class Knight

Member: American Academy of Arts and Sciences

Selected Publications

The Fragility of Goodness: Luck and Ethics in Greek Tragedy and Philosophy, Cambridge University Press, 1986.

Women and Human Development: The Capabilities Approach, Cambridge University Press, 2000.

Upheavals of Thought: The Intelligence of Emotions, Cambridge University Press, 2001.

Hiding from Humanity: Disgust, Shame, and the Law, Princeton University Press, 2004.

Frontiers of Justice: Disability, Nationality, Species Membership, Harvard University Press, 2006.

Political Emotions: Why Love Matters For Justice, Harvard University Press, 2013.

Anger and Forgiveness: Resentment, Generosity, Justice, Oxford University Press, 2016.

EVENT SCHEDULE OF THE 2016 KYOTO PRIZE

1. WELCOME RECEPTION (by invitation only)
   DATE and PLACE: November 9, 2016 (Wed.) / Kyoto Hotel Okura
   The welcome reception and dinner will be hosted by Kyoto Prefectural Government, Kyoto City Government and Inamori Foundation in honor of the laureates.

2. PRIZE PRESENTATION CEREMONY (by invitation only)
   DATE and PLACE: November 10, 2016 (Thu.) / Kyoto International Conference Center

3. JOINT PRESS CONFERENCE (for media only)
   DATE and PLACE: November 10, 2016 (Thu.) / Kyoto International Conference Center
   A joint press conference attended by the laureates will take place right after the Presentation Ceremony.

4. BANQUET (by invitation only)
   DATE and PLACE: November 10, 2016 (Thu.) / Grand Prince Hotel Kyoto

5. COMMEMORATIVE LECTURES (open to the public)
   DATE and PLACE: November 11, 2016 (Fri.) / Kyoto International Conference Center
   The laureates will talk about their views and personal philosophies.

6. WORKSHOPS
   DATE and PLACE: November 12, 2016 (Sat.) / Kyoto International Conference Center or others
   Three workshops in the presence of laureates, scholars and experts will be held in parallel at respective venues.

7. YOUTH DEVELOPMENT PROGRAMS
   DATE and PLACE: to be released in late September
   Laureates will give special classes or forums for children and students. More detail will be announced in late September.

8. KYOTO PRIZE LAUREATES LECTURES IN KAGOSHIMA (open to the public)
   DATE and PLACE: to be released in late September
   This Kagoshima event, started the year before last, is organized by the Kyoto Prize Laureate Lectures Committee consisting of Kagoshima Prefecture, Kagoshima City, Kagoshima University and Kagoshima Chamber of Commerce and Industry, with support of the Inamori Foundation. The laureates will talk about their views and personal philosophies.

9. KYOTO PRIZE SYMPOSIUM IN U. S. A. (open to the public)
   DATE and PLACE: March 14(Tue.)–16 (Thu.), 2017 / San Diego, California, U.S.A.
   Three symposia will be held in honor of the 2016 Kyoto Prize laureates in San Diego, California, U.S.A. hosted by Kyoto Symposium Organization and local universities (San Diego State University, University of California, San Diego, University of San Diego, and Point Loma Nazarene University). This event marks its 16th anniversary in 2017.

10. KYOTO PRIZE AT OXFORD (open to the public)
    DATE and PLACE: May 9(Tue.)–10 (Wed.), 2017 / The University of Oxford, U.K.
    From 2017 the University of Oxford will host the Kyoto Prize laureates for the Kyoto Prize at Oxford, a brand new event which will generate a variety of lectures, interactive seminars and panel discussions. This event will take place at the Blavatnik School of Government, the newest department of the University of Oxford and will provide opportunities for students and faculty across Oxford, and more broadly for people across Europe, to learn about Dr. Inamori's philosophy and the values of the Kyoto Prize.

The 2016 Kyoto Prize Laureates
Pictures for Publication

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Advanced Technology　Dr. Takeo Kanade		
01 	02 	
Basic Sciences　Dr. Tasuku Honjo		
03 	04 	
Arts and Philosophy　Dr. Martha Craven Nussbaum		
05 	06 	07 

* With regard to Dr. Nussbaum's pictures, any cropping, editing or altering the images is not allowed.

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