

Citation

For pioneering researches in integrating neuroscience and robotics toward understanding of information processing in the brain

Dr. Mitsuo Kawato

Position and Organization :

Director, ATR Computational Neuroscience Laboratories

Doctorate: Ph.D. in Biophysical Engineering

(Osaka University, 1981)

Date of Birth: November 12, 1953

Brief Biography :

- 1976 B.S., Physics, University of Tokyo
- 1981 Ph.D., Biophysical Engineering, Osaka University
- 1981 Research Associate, School of Engineering Science, Osaka University
- 1987 Lecturer, School of Engineering Science, Osaka University
- 1988 Senior Researcher, ATR Auditory and Visual Perception Research Laboratories
- 1989 Supervisor, ATR Auditory and Visual Perception Research Laboratories
- 1992 Department Head, Department 3, ATR Human Information Processing Research Laboratories
- 2001 Department Head, Department 3, ATR Human Information Science Laboratories
- 2003 Director, ATR Computational Neuroscience Laboratories

Main Awards and Honors :

- 1993 Minister of State for Science and Technology Award for Persons of Scientific and Technological Research Merit
- 1993 Osaka Science Prize
- 1997 Okawa Publications Prize
- 2005 Chunichi Cultural Award
- 2007 Asahi Prize
- 2008 International Neural Network Society Gabor Award
- 2009 Info-Communications Promotion Month Minister of Internal Affairs and Communications Commendation (individual)

Main Achievements :

As one of the world's premier experts in the field of computational neuroscience, Dr. Mitsuo Kawato has made numerous contributions in highly advanced areas, including the proposal and verification of the cerebellar internal models theory and elucidation of brain functions using humanoid robots. Today he continues to be active on the frontiers of the field as director of the ATR Computational Neuroscience Laboratories.

Dr. Kawato has combined theory with experimentation to achieve a wide variety of accomplishments in neuroscience,

including a critical study of the equilibrium-point control hypothesis, and proposing and testing theories such as cerebellar models, the Mosaic model, and a bidirectional theory of visual perception. One of his most outstanding achievements is his proposal of the cerebellar internal models theory. It postulates that in the cerebellum, which plays a vital role in motor control and higher-order cognition, neural networks that mimic the functions of parts of the body, tools, and other people's brains are acquired through learning. He went on to demonstrate this theory in joint research on monkeys and by noninvasive measurements of human brain activity. Through these studies, he clarified principles common to motor control and higher-order cognition in the cerebellum. He applied these principles also to the successful development of a humanoid robot called DB with freedom of leg and arm motion similar to that of humans.

In the course of his original research and development, Dr. Kawato's research group announced an "air hockey robot" as a self-learning robot that alters its behavior through rewards and punishment based on imitating what it sees, thanks to a "brain" that learns by making effective use of errors. His group was also the first in the world to develop a brain-machine interface controlling a robot by thought alone.

His research results have been published in a number of books and more than 100 papers in the world's leading scientific journals including *Nature* and *Science*. Furthermore, he has been invited more than 100 times as a guest lecturer in various parts of the world and has organized many international symposiums with the subsequent publication of the collected papers, as part of his widespread global activities.

His achievements have been recognized in Japan and abroad, and have earned him many different awards including the International Neural Network Society Gabor Award, a Minister of State for Science and Technology award, the Osaka Science Prize, the Okawa Publications Prize, and a Minister of Internal Affairs and Communications award. In May 2001 he was invited by Professor Sten Grillner, the former chairman of the selection committee for the Nobel Prize in Physiology or Medicine, to give a lecture at the Nobel Forum as the only guest speaker; and in June 2003 he gave a lecture at the Nobel Symposium.

For outstanding contributions to pioneering research in integrating neuroscience and robotics toward understanding of information processing in the brain, Dr. Mitsuo Kawato is hereby awarded the Okawa Prize.