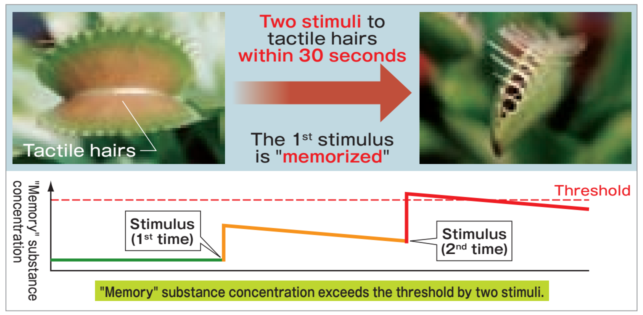
Chemical Approach to the Mystery of Plant Movement

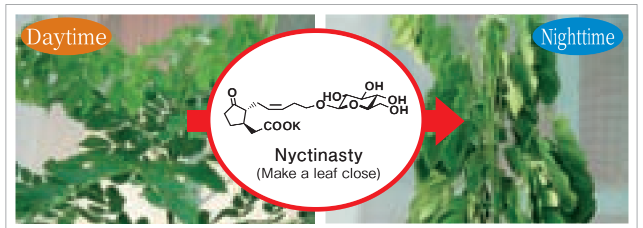
In general, plants are rooted and unable to move from place to place by themselves. However, some plants are known to be able to move in certain ways, such as the thigmonasty of Mimosa (sensitive plant), the trap movement of Dionaea (Venus's flytrap), and the nyctinasty of Albizzia (silk tree), etc.

A research group led by Professor Ueda found that these movements are controlled by endogenous bioactive small molecules. The circadian rhythmic leaf closing movement can be explained by the circadian rhythmic changes in balance between a leaf-opening molecule and leaf-closing molecule within the plant body. Stepwise accumulation of "memory substances" accounts for the "memory" of Dionaea, which is observed in their trap movement. These biologically intriguing phenomena are controlled by a small molecule of subnanometer size. Only chemists can reveal these mysteries which lie between chemistry and biology.

Trap movement of *Dionaea muscipula*



Nyctinastic leaf-movement of *Albizzia saman*



Silk tree (Hawaii, USA)

Graduate School of Science
[Department of Chemistry]

Minoru Ueda
Professor

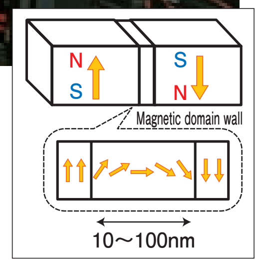
Born in October, 1965. Finished the doctoral course of the Graduate School of Bioagricultural Sciences and the School of Agricultural Sciences, Nagoya University. Became a research associate, assistant professor, and associate professor in the Department of Chemistry, Faculty of Science and Technology, Keio University, and took up his present position.

http://www.org1.sakura.ne.jp/

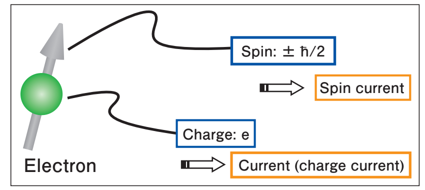
Forefront of Spin Electronics – For a Highly Information-Oriented Society

Electrons have a spin property that is the basis of magnetism. Spin electronics is making an innovative development from conventional electronics by use of the spin. Professor Sadamichi Maekawa has been a world leader in this field. Since the mid-1990's, nanotechnology has been a high-profile research area in the world. It has made it possible to control devices on a scale far smaller than 1 μ m. Professor Maekawa has elucidated the phenomena that occur in a nanoscale world by means of theoretical physics and computational physics, and constructed new ideas of matter based on quantum phenomena caused by electrons in a substance. In recently conducted joint research with Hideo Ohno, professor at the Research Institute of Electrical Communication, Tohoku University, Professor Maekawa illuminated the difference between a current and a magnetic field acting on a magnetic nanostructure called a magnetic domain wall. The research result was published in Science (Vol. 317, September 21, 2007).

Professor Maekawa was honored with The Humboldt Prize (Germany) in 2001 and The Magnetics Society of Japan Award in 2003 for his achievement in building the foundation for spin electronics, and was selected as a Fellow of the Institute of Physics of the United Kingdom, in 1999, a Fellow of the American Physical Society in 2007, and a Distinguished Professor at Tohoku University in 2008.

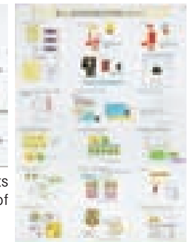


Ferromagnets have structures called magnetic domain walls in each of which N-S directions change on a nanometer scale. A magnetic domain wall can be controlled with a current or a magnetic field.



An electron has a charge and a spin. A current of charges is an electric current, and a current of spins is a spin current.

Reseach discussion with a visiting professor.



Posters describing research results put up in the corridor in front of Professor Maekawa's Laboratory.

Internationally published books written by Professor Maekawa.

Institute for Materials Research
[Theory Division]

Sadamichi Maekawa
Professor

Born in 1946. Specialized in the theory of condensed matter. Graduated from the School of Science, Osaka University. Worked at Tohoku University, the IBM Thomas J. Watson Research Center, and Nagoya University. He has been in this position since 1997.

http://www.maekawa-lab.imr.tohoku.ac.jp/index_e.html