# Hideo Ohno ／ Professor ／ Research Institute of Electrical Communication

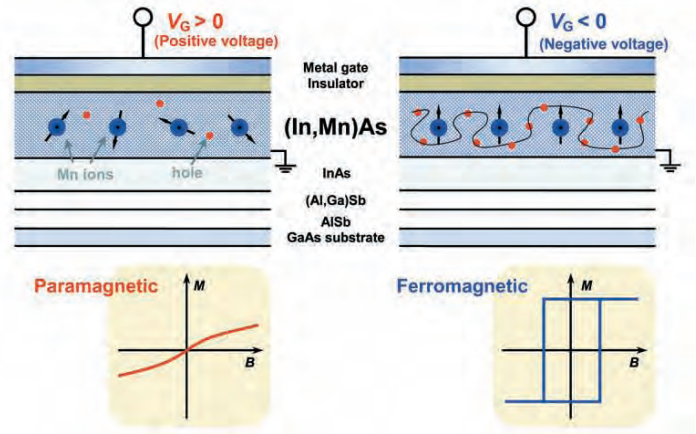
## Profile

Hideo Ohno received his BSc, MSc and PhD degrees from the University of Tokyo in 1977, 1979 and 1982, respectively. He spent one year as a visiting-graduate student at Cornell University, Ithaca, USA from 1979. He joined the Faculty of Engineering of Hokkaido University in 1982. He was a visiting scientist at IBM T. J. Watson Research Center from 1988 to 1990. He moved to Tohoku University as Professor in 1994, where he is currently Director of Laboratory for Nanoelectronics and Spintronics, Research Institute of Electrical Communication. Professor Ohno received the IBM Japan Science Award (1998), the IUPAP Magnetism Prize (2003), Japan Academy Prize (2005), Presidential Prize for Research Excellence, Tohoku University (2005) and the 2005 Agilent Technologies Europhysics Prize. He is a fellow of the Institute of Physics (IOP) since 2004, an honorary professor of Institute of Semiconductors, Chinese Academy of Sciences since 2006 and a fellow of the Japan Society of Applied Physics (JSAP) since 2007.

## Research Activities

Hideo Ohno has been involved in the research of spintronics, where both spin and charge are used to realize functionalities otherwise not possible. He has developed and studied III-V-based ferromagnetic semiconductors and heterostructures, in which rich spin-related phenomena have been discovered, and by doing so introduced a new degree of freedom associated with ferromagnetism in nonmagnetic semiconductor heterostructures. This freedom is utilized to electrically inject spin polarized currents in semiconductor heterostructures and, using an insulating field-effect transistor structure having a magnetic semiconductor channel, to demonstrate electrical control of ferromagnetism. This demonstration is the first of this kind to show that isothermal and reversible control of ferromagnetism is possible, something which has been elusive in the history of magnetism. His series of studies have led to worldwide spintronics research activities in physics as well as in those areas aiming at applications. He is also studying spin-coherence and the quantum mechanical nature of spin-related phenomena in nonmagnetic semiconductors. He is currently leading a project on magnetic tunnel junction / CMOS hybrid integrated circuits for developing novel nonvolatile memories and logic circuits.

Electric-field control of ferromagnetism




By applying electric-fields, carrier (hole) concentration was controlled in ferromagnetic semiconductor (In,Mn)As, which allowed demonstration of turning on and off the ferromagnetic phase reversibly without changing temperature for the first time.

## Message

First, I would like you to develop your ability to write and speak logically, in your own language and in English. Top researchers can all write fast with a solid and clear logic. In order to be one of them or even better, you have to train yourself; it's simple: try to write logically and fast for five years and I promise you will notice a big difference. Secondly, I suggest you think of two things: optimize whatever you are doing within the given boundary conditions, and at the same time define a new and different set of boundary conditions yourself. By doing so you will find a lot of chances to discover new and different things that others don't see. Thirdly, very few people are given chances to study and work in the kind of environment you are currently enjoying. Think about others and use part of your time for others. Lastly, enjoy your life – literature, sports, music and much more – in addition to your science and / or engineering; after all, life is not that long.