Electrical Manipulation of Magnetization

The field of spintronics aims a new paradigm of electronics to develop the next generation devices. Contrary to the conventional electronics, it utilizes the spin degree of freedom of electrons. Spin is an elementary property of physical particles as well as it can affects our macroscopic world, as exemplified by magnets. One of the core issues of spintronics is how to manipulate magnetization of magnetic materials. Here, I would like to introduce several techniques of electrical control of magnetization, such as spin-transfer torque, spin-orbit torque, and self-generated spin torque. These techniques are based on the conservation of angular momentum, exchange interaction, and spin-orbit coupling. This talk would demonstrate an example that physical understanding of quantum phenomena is directly connected to development in industry.