

# Hydrodynamic Phenomena in Fermi Liquids

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In metals with disorder, the electron transport is of diffusive motion. On the other hand, in those with electron-electron interaction being the dominant source of scattering, the motion of the electrons resembles the flow of classical liquids with high viscosity, namely, the hydrodynamic fluids. The recent progress of nano-technology has made it possible to extend the study on such hydrodynamic electron fluids in nano-devices and low dimensional materials. In such fluids, the angular momentum of the fluid vorticity and electron spins couple due to the angular momentum conservation, i.e., the spin-vorticity coupling. Combining the Navier-Stokes equations and the spin diffusion equation in the presence of the spin-vorticity coupling, we examine a variety of spintronic phenomena.

The hydrodynamics of Fermi liquids opens a door from “Spintronics” to “Spin-Mechatronics” [1].

[1] Spin Current (Second Edition), eds. S. Maekawa et al. (Oxford University Press, 2017).