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## Electron and Nuclear Spin Current Physics and Applications

*Wednesday, 20 October 2021 09:00 (45 minutes)*

Spin current, a spin counterpart of electric current, refers to a flow of electrons' and nuclear spin angular momentum in condensed matter. Spin current has been ignored in electromagnetism in matter for many years, since it disappears in a very short distance, typically at the sub-micrometer scale. However, recent developments in nanotechnology have enabled us to make minute structures. For example, in integrated circuits composed of nanoscale wires, spin current may become as important a quantity as electric current. Spin current can be detected using the inverse spin Hall effect [1]: conversion of spin current into electricity in condensed matter. As a result, a lot of spin-current-related phenomena have been discovered [2-6].

In my talk, I will guide you around the world of spin current science. I will give an introduction to the basic concept of spin current, followed by a review of various phenomena discovered using spin current as a guiding principle, such as spin-Seebeck effects[2,4] and nuclear spin Seebeck effect [5,6]. The physics and materials science behind these effects will also be discussed.

- [1] E. Saitoh et al., Applied Physics letters 88 (2006) 182509.
- [2] K. Uchida et al., Nature 455 778-781 (2008).
- [3] Y. Kajiwara et al., Nature 464 262-266 (2010).
- [4] G. E. W. Bauer et al., Nature materials 11 391-399 (2012).
- [5] Y. Shiomi et al., Nature Physics 15 22-26 (2019).
- [6] T. Kikkawa et al., Nature Communications 12, 4356 (2021).

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