Ten Years of Spin Hall Effect

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I survey the theory of the spin Hall effect in doped semiconductors and metals in the light of recent experiments on both kinds of materials. After a brief introduction on the nature of the spin-orbit interaction in these systems, I describe the three conceptually distinct mechanisms that are known to contribute to the spin Hall effect, namely the extrinsic mechanisms known as "skew-scattering" and "side jump", and the intrinsic mechanism associated with the spin-splitting of the band structure. While the first two mechanisms are essentially additive, the last one interferes dramatically with the first two and can lead to their suppression under certain conditions. I also discuss the possibility of observing extrinsic spin Hall drag in bilayer semiconductor systems.