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Lecture I: Optical currents.

For scalar light, the current is the familiar expectation value of the momentum operator. For vector light, the current (Poynting vector) contains an additional term corresponding to the photon spin, recently identified for paraxial light by Bekshaev and Soskin but valid generally after a modification to restore electric-magnetic democracy; this term has physical comsequences. A number of examples demonstrate that there is usually no connection between optical vortices and angular momentum, and between C singularities and angular momentum. The optical wave current is distinct from the rays of geometrical optics in all nontrivial cases.

Lecture II: Vortices threading interferometers.

In interferometers with two branches, the closed circuit formed by them must be threaded by optical vortex lines. For a large class of interferometers, it is shown that the (signed) singularity index jumps by +1 as the phase difference between the branches, that the interferometer is designed to measure, increases by 2pi. The argument is based on the single-valuedness of the wavefunction in and leaking between the branches. In some cases, the jumps occur when the phase difference is an odd multiple of pi. The same result holds for the Aharonov-Bohm wavefunction, where the waves passing above and below a flux line experience different phase shifts.