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Talk Title: Variations on a theme of Aharonov and Bohm

Abstract: The Aharonov-Bohm effect (AB) concerns the role in quantum physics of the magnetic vector potential of an impenetrable line of magnetic flux. Its partial anticipation by Ehrenberg and Siday, in terms of interference, was an approximation whose wavefunction was not singlevalued, and whose connection with the singlevalued AB wave involves topology: 'whirling waves' winding round the flux. AB is a fine illustration of idealization in physics. There are four AB effects, depending on whether the waves and the flux are classical or quantum. In the classical-classical case, many details of the AB wavefunction have been explored experimentally in ripples scattered by a water vortex, where the flow velocity of the water corresponds to the vector potential. The AB wave possesses a phase singularity, and there is a similar phenomenon in general interferometers. Gauge-invariant AB streamlines exhibit extraordinary sub-wavelength structure. Connections between the AB wave and the Cornu spiral describing edge diffraction lead to extremely accurate approximations.