Abstract Submitted
for the APR14 Meeting of
The American Physical Society

Stokes' theorem, gauge symmetry and the time-dependent Aharonov-Bohm effect JAMES MACDOUGALL, DOUGLAS SINGLETON, California State University, Fresno — Stokes' theorem is investigated in the context of the time-dependent Aharonov-Bohm effect – the two-slit quantum interference experiment with a *time varying* solenoid between the slits. The time varying solenoid produces an electric field which leads to an additional phase shift which is found to exactly cancel the time-dependent part of the usual magnetic Aharonov-Bohm phase shift. This electric field arises from a combination of a non-single valued scalar potential and/or a 3-vector potential. The gauge transformation which leads to the scalar and 3-vector potentials for the electric field is non-single valued. This feature is connected with the non-simply connected topology of the Aharonov-Bohm set-up. The non-single valued nature of the gauge transformation function has interesting consequences for the 4-dimensional Stokes' theorem for the time-dependent Aharonov-Bohm effect. An experimental test of these conclusions is proposed.

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Date submitted: 11 Dec 2013 Electronic form version 1.4