Correspondence

Induction: Hayden vs. Smith

I believe Professor Hayden[1] is right and Peter Smith[2] is wrong. A magnetic field cannot be used in general to explain induction. The Faraday-Maxwell flux rule cannot work in general, because: 1) A magnetic field summed over the empty space inside a loop does not explain how a local electric force field can arise somewhere else to drive electrons in a wire. 2) The net induced energy per charge taken around an entire closed loop, the EMF, does not say what the electric force might be at any individual point; Francisco Müller[3] has demonstrated experimentally that induction is localized. 3) Induction can be produced in a finite straight piece of wire, as demonstrated experimentally by Kennard;[4] so induction does not require an entire closed loop. 4) Induction can occur in a wire, or a loop, where the magnetic field is zero and does not change with time, as demonstrated by the Hooper-Monstein experiment.[5] 5) A force of induction acts on a charge moving in a space-varying magnetic potential field **A**, as demonstrated by the Aharonov-Bohm experiment.[6]

The force **F** of induction acting on a charge q is correctly given by the magnetic vector potential as

$$\mathbf{F} = -\frac{q}{c}\frac{d\mathbf{A}}{dt}$$

in natural scientific Gaussian units.[7]

References

[1] P. Smith, 'A Comment on 'Generalities'', Galilean Electrodynamics **8**, 34 (1997).

[2] H. Hayden 'On 'Generalities'; (Associate) Editor's Response', Galilean Electrodynamics **8**, 34-35 (1997).

[3] F.J. Müller, "Seat of Unipolar Induction", in **Progress in Space-Time Physics 1987**, pp. 156-169, ed. J.P. Wesley (Benjamin Wesley, 78176 Blumberg, Germany, 1987).

[4] E.H. Kennard, "On Unipolar Induction: Another Experiment and its Significance as Evidence for the Existence of Æther", Phil. Mag. **33**, 179-190 (1917).

[5] J.P. Wesley, **Classical Quantum Theory**, pp. 314-316 (Benjamin Wesley, 78176 Blumberg, Germany, 1996).

[6] Loc. cit. pp. 316-321.

[7] Loc. cit. pp. 312-314.

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The Sagnac Effect: Renshaw vs. Driscoll

If we follow Sagnac and assume that the velocity of light is **c** with respect to a stationary luminiferous ether, then the Sagnac effect can be explained trivially by the difference between optical paths for the beam passing around the apparatus in opposite directions, with and counter to the rotation [1]. If we assume the velocity of light to be **c** relative to a frame of reference fixed to the turntable, and if we further assume the first-order violet Doppler shift is seen by the receiver approaching the beam traveling counter to the rotation, and the first-order Doppler red shift is seen by the receiver receding from the beam traveling in the direction of rotation, then apparently the Sagnac effect can also be explained [2].

Unfortunately, this latter explanation is not valid, because: 1) If the turntable is chosen as the frame of reference, the receiver mounted on the turntable neither approaches toward nor recedes from the source or the light beams, no effect should be observed. 2) The only possible velocity that can be defined for the receiver is its velocity relative to the laboratory or the fixed luminiferous ether; so a Doppler effect could only arise if the velocity of light is assumed to be **c** relative to the laboratory, or fixed luminiferous ether, as originally claimed by Sagnac.

Thus the explanation of the Sagnac effect may be taken as either an optical path length difference or a first-order Doppler effect, provided the velocity of light is assumed to be **c** with respect to the fixed luminiferous ether. It should be noted that the Sagnac effect can be adapted to measure the absolute linear velocity of the laboratory with respect to the fixed stationary luminiferous ether [3].

References

[1] R.B. Driscoll, "Doppler-Sagnac: A Rebuttal", Galilean Electrodynamics **8**, 31 and 33 (1997).

[2] C.F. Renshaw, "Doppler-Sagnac: A Surrebuttal", Galilean Electrodynamics **8**, 33-34 (1997).

[3] J.P. Wesley, "Oneway Sagnac Device to Measure Absolute Velocity", Found. Phys. Letts. **7**, 493-499 (1994).

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Errata:

In the masthead of the journal, no less! Three issues in a row said March/April 1997, (Vol. 8, No. 2) in that location. The Editor apologizes: the latter two of them should have said May/June, No. 3 and July/August No. 4. But evidently nobody was thrown off too badly; anyway, nobody complained!

The oversight just goes to show how very hard it can be to see an anomaly that is plainly under our noses, when we are not expecting that particular kind of anomaly. It is just basic psychology. The same is surely also applicable in scrutinizing results in physics experiments. So keep your eyes open, and even more important, keep your minds open!