Comments on Montgomery's Paper on Electrodynamics

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"Hence the production of an induced current requires a relative motion of the disk and the external circuit, and not as one might expect a relative motion of the disk and the magnet," H. Montgomery wrote recently in the *European Journal of Physics* [1, page 171], adding, on page 180: "According to this argument there seems to be no justification for shifting the 'seat' of the EMF to the external circuit when one considers Faraday's second experiment."

The first sentence above—true but physically "colourless" [2-3]—and the second deserve thorough consideration in light of recent experimental search advanced in *Apeiron* and widely published subsequently.

In fact, since 2001 we have known that a spinning magnet induces a Lorentz-type electric field responsible for a motional Hall effect [4] in the bulk of nearby conductors (Figure 1).

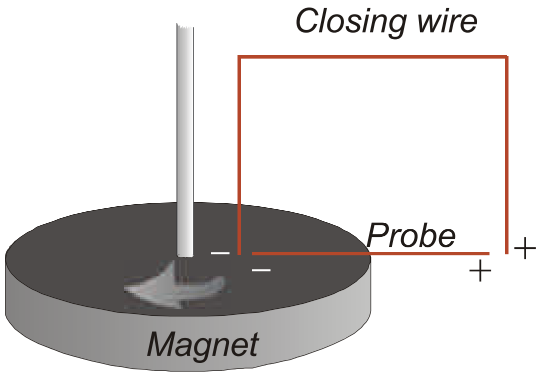

Fig. 1

Homopolar Setup Magnet, Probe and Closing Wire

The figure corresponds to a clockwise north pole rotation beneath two conducting wires: a *probe* and a *closing* (circuit) *wire*. Each wire becomes an electromotive force (emf) source [4-5]. If the ends of the wires are connected, the whole circuit behaves as two identical emf sources connected in opposition, and current cannot flow. If, to enable electrical continuity between the wires, the probe is anchored to the magnet, then direct current flows through the whole circuit. When the probe is at rest relative to the magnet, induction only takes place on the closing wire, which is in motion relative to the magnet. The probe plays a passive role: to provide a current path.

The above experimental discovery emphasizes the crucial role played by the magnet when relational [6,7] rules are applied in order to rationalize inductive phenomena, and lends credibility to (in archaic terms) "rotating field line" advocates [8,9,10,11].

References

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