THE POTENTIAL GENERATED IN A FALLING METEORITE

John D. Boon

When a material body moves across a magnetic field a potential difference is generated between the opposite sides of the body. The value of this potential difference depends directly upon the velocity, the strength of the magnetic field that is being cut, and upon the dimensions of the body. This potential difference may be expressed by the following equation:

\[ E = HDV \sin A, \]

where \( H \) is the strength of the field, \( D \) is the length of the body taken at right angles to the field, \( V \) is the velocity, and \( A \) is the angle made by the direction of the velocity and the direction of the field. If the potential difference is to be expressed in terms of volts the equation should be written:

\[ E = HDV \sin A \times 10^8 \]

A falling meteorite cuts through the earth’s magnetic field, hence it has a potential difference generated within it. As a meteorite approaches the earth it moves into an ever increasing magnetic field, so that the potential difference steadily increases and perhaps reaches its maximum value somewhere near the surface of the earth. The moment it strikes it is quickly brought to rest, and the charges on its opposite sides flow together as a momentary current. If the meteorite is composed of iron, a good conductor, the current may be of enormous value. On the other hand, if it is composed of stony matter, the current will be small, because of the poor conductivity of the material.

By making certain assumptions in regard to the size and velocity of the meteorite, and also in regard to the strength of the field that it is cutting, the potential difference produced can be calculated, and some notion of the current may be obtained. Suppose that the meteorite is a
giant of cylindrical form, 6000 cm in length, and is moving with a velocity of $3 \times 10^6$ centimeters per second across a field that has a strength of 0.6 oersteds. If the motion is at right angles to its length, the potential difference produced will be about 108 volts. Assuming the diameter of the meteorite to be 3000 cm, the current produced at moment of impact will run into billions of amperes, if it is composed of iron. If, however, it is composed of stony matter, the current will be very small. These figures are, of course, only approximate under the conditions given above. They are given merely to suggest the quantitative values that are involved. It is of interest to note that a portion of the heat developed in an iron meteorite when it strikes the earth is due to an electric current, and that this heat is within the meteorite and not superficial as in the case of air friction heat.