ON THE MECHANICAL AND ELECTRODYNAMICAL PROPERTIES OF THE ELECTRON: ADDENDUM.

BY MEGH NAD SAHA.

It appears that the relation

$$-\mu = -\frac{m_0 c^2}{e} = \frac{f_{12}}{\Omega_{12}} = \frac{f_{23}}{\Omega_{23}} = \frac{f_{31}}{\Omega_{31}} = \frac{f_{14}}{\Omega_{14}} = \frac{f_{24}}{\Omega_{24}} = \frac{f_{34}}{\Omega_{34}},$$

which was given in my paper¹ "On the Mechanical and Electrodynamical Properties of the Electron" and which was obtained from the determinant

$$\begin{vmatrix} f_{12} + \mu\Omega_{12} & f_{13} + \mu\Omega_{13} & f_{14} + \mu\Omega_{14} \\ f_{21} + \mu\Omega_{21} & f_{23} + \mu\Omega_{23} & f_{24} + \mu\Omega_{24} \\ f_{31} + \mu\Omega_{31} & f_{32} + \mu\Omega_{32} & f_{34} + \mu\Omega_{34} \\ f_{41} + \mu\Omega_{41} & f_{42} + \mu\Omega_{42} & f_{43} + \mu\Omega_{43} \end{vmatrix} = 0$$

or

$$(f_{12} + \mu\Omega_{12})(f_{34} + \mu\Omega_{34}) + (f_{23} + \mu\Omega_{23})(f_{14} + \mu\Omega_{14}) + (f_{31} + \mu\Omega_{31})(f_{24} + \mu\Omega_{24}) = 0,$$

cannot hold. For, from the principle of least action written in Minkowski's form,

$$\delta \int m_0 c^2 ds - \int \delta W \cdot ds = 0,$$

we obtain the relation

$$\int \int [(f_{12} + \mu\Omega_{12})(dx\delta y - \delta x dy)] + 5 \text{ other similar terms} = 0.$$

But it is not possible to equate to zero the coefficients of the six-components ($dx\delta y - \delta x dy$) of the area-six-vector ($dSx\delta s$) as was done in that paper, for though ($\delta x, \delta y, \delta z, \delta l$) represent an arbitrary displacement (dx, dy, dz, dl), is not so, but represent the actual displacements. We have, therefore, to collect the coefficients of ($\delta x, \delta y, \delta z, \delta l$) and put them separately equal to zero. In this way we obtain

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$$\begin{aligned}
 -\frac{m_0 c^2}{e} &= \frac{f_{12}w_2 + f_{13}\omega_3 + f_{14}\omega_4}{\Omega_{12}\omega_2 + \Omega_{13}\omega_3 + \Omega_{14}\omega_4} = \frac{f_{21}\omega_1 + f_{23}\omega_3 + f_{24}\omega_4}{\Omega_{21}\omega_1 + \Omega_{23}\omega_3 + \Omega_{24}\omega_4} \\
 &= \frac{f_{31}\omega_1 + f_{32}\omega_2 + f_{34}\omega_4}{\Omega_{31}\omega_1 + \Omega_{32}\omega_2 + \Omega_{34}\omega_4} = \frac{f_{41}\omega_1 + f_{42}\omega_2 + f_{43}\omega_3}{\Omega_{41}\omega_1 + \Omega_{42}\omega_2 + \Omega_{43}\omega_3}, \quad (A)
 \end{aligned}$$

which are simply another form of the Minkowskian equations

$$m_0 c^2 \frac{d^2 x}{ds^2} = X, \quad m_0 c^2 \frac{d^2 y}{ds^2} = Y, \quad m_0 c^2 \frac{d^2 z}{ds^2} = Z, \quad m_0 c^2 \frac{d^2 l}{ds^2} = L \quad (A')$$

for

$$\frac{d^2 x}{ds^2} = -(\omega_2 \Omega_{12} + \omega_3 \Omega_{13} + \omega_4 \Omega_{14}), \quad \text{etc.}$$

The form (A) as it involves the acceleration six-vector may for certain purposes prove more convenient than the form (A').