term to be positive for all possible values of j_α and u_β; this will certainly be the case if (with $\sigma>0$ and ρ a scalar)

$$j^\alpha=\rho u^\alpha-\sigma F^{\alpha\beta}u_\beta, \tag{48}$$

since $F^{\alpha\beta}u_\beta$ is a vector in proper-space. However, Eq. (48) is precisely the well-known invariant form of Ohm's law;[5] in the case of stationary matter it reduces to the classical form:

$$j^\alpha=\rho,\ \sigma E_x,\ \sigma E_y,\ \sigma E_z.$$

Thus ρ is the charge density and σ the electrical conductivity.

The ease with which this law can be incorporated into the equations lends strong support to the theory developed above. It will be noted that Maxwell's equations have not entered this discussion. However, the Eqs. (47) and (48) are too few to determine all the variables, and the Maxwell equations are needed to complete the theory.

[5] See Tolman, *Relativity, Thermodynamics and Cosmology*, p. 114.

Conclusion

It has been shown that the classical considerations of I can readily be extended so that they are consistent with the special theory of relativity. The further extension into the general theory should offer no special difficulties.

One result has appeared clearly: It is necessary to introduce the current-density of matter separately from the energy-momentum tensor. This is also apparent from other treatments of energy and matter, but has rarely been emphasized. From the macroscopic standpoint, therefore, matter cannot be considered a form of energy, even though inertia is a property of energy rather than of matter. Matter has inertia because it has energy, but is not a form of energy. This same conclusion can be reached from a consideration of recent attempts to construct microscopic theories of the ultimate particles.

Correction: The Thermodynamics of Irreversible Processes. II.

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On page 274 of the above paper, the sentence beginning "It is not easy to see . . ." should be replaced by the following:

It can be shown that

$$\textstyle\sum_i\Gamma_i(-\Delta_i/\theta)\geqslant 0$$

for all values of Δ_i. Let

$$x_s'=\textstyle\sum_k\nu_{ks}'\Delta_k/R\theta,$$
$$x_s''=\textstyle\sum_k\nu_{ks}''\Delta_k/R\theta,$$

so that this sum may be written

$$R\textstyle\sum_s a_s[x_s'-x_s''][\exp(x_s')-\exp(x_s'')].$$

Since the exponentials are monotonically increasing positive functions of their arguments, it follows that both brackets in the above expression always have the same sign. Since $a_s\geqslant 0$, the required inequality follows at once.