R. B. Lindsay & H. Margenau,
Foundations of Physics,
New York, John Wiley & Sons
London, Chapman and Hall
Copyright 1936. 5th Printing 1947

1. Newtonian Relativity, p. 101 f.

Newtonain equations of type $m\ddot{x} = F_x$; $m\ddot{y} = F_y$; $m\ddot{z} = F_z$ are invariant under Galilean transformation.

For $\ddot{x}$ transforms to $\ddot{x}'$, etc., and F_x is function of distance between points and so independent of absolute position.

Cf. Lenzen, 113 f.

2. Concept of Mass, p. 91 ff.

It is possible to associate with each particle a constant that is independent of the particle with which it interacts

Avoids appeal to weight, which defines mass by supposing force. Postulates that ratio of accelerations of interacting particles is scalar constant independent of relative position, relative velocity, place and time. On basis of experiment determines that $M_{cb} = M_{ca}/M_{ba}$ whence

~~M~~ $M_{ba}a_{bc} = - M_{ca}a_{cb}$

where suffixes refer to and three particles.

V. Lenzen begins from statical concept of force; introduces successive definitions; finally, defines mass as the constant ratio between the absolute value of the vector, I, momentum, and the absolute value of the vector, v, velocity. p 96 f, p. 110.

L&M define force as the vector function F(r, ṙ, t), where r is the position vector of particle B with respect to C, ṙ is the relative velocity vector. p. 94.

3. Maxwell's Equations.

$$\text{curl } \underline{E} = -\frac{1}{c}\frac{\partial \underline{H}}{\partial t} \qquad \text{curl } \underline{H} = \frac{1}{c}\left(\partial \underline{E}/\partial t + \rho \underline{v}\right)$$

$$\text{div } \underline{E} = \rho \qquad \text{div } \underline{H} = 0$$

Meaning, L & M, p. 310, recall that E is force of field on unit charge and H is force of field on unit pole. Note that if unit charge or pole introduced, then the field is changed. Consider equations as representing field when in limit as introduced charge and pole approach zero, but note that electron not divisible. Finally propose that E and H are defined by the equations themselves.

p. 315 f. Principles rather than laws. Planck's derivation from conservation of energy.

Lenzen p. 119 builds "the theory of electricity and magnetism upon the definition of force given in dynamics."

Invariant under Lorentz transformation L+M p 326 f

Lindsay & Margenau

4. Deduction of Lorentz transformation. p 335 f.

a Assume linear reciprocal relationship

$$x' = g(x - ut) \qquad x = g(x' + ut')$$

eliminate x' to obtain t'; find dx' in terms of dx and dt; similarly find dt' in terms of dx and dt; hence find dx'/dt' by dividing results; equate dx/dt, dx'/dt', and c, to eliminate x and t and obtain g in terms of u and c.

$$x' = \frac{1}{\sqrt{1-\frac{u^2}{c^2}}}(x - ut) \qquad t' = \frac{1}{\sqrt{1-\frac{u^2}{c^2}}}\left(t - \frac{ux}{c^2}\right) \qquad y = y' \quad z = z'$$

$$x = \frac{1}{\sqrt{1-\frac{u^2}{c^2}}}(x' + ut) \qquad t = \frac{1}{\sqrt{1-\frac{u^2}{c^2}}}\left(t' + \frac{ux'}{c^2}\right)$$