Invariance of Electro-magnetic equations L+M p 326

p 329 Lorentz transformation ~~interweaves~~ reveals interdependence of electric & magnetic field intensities. What in one frame of reference is purely electric or purely magnetic, in the other is a compound of both

p 330 ~~Again Lorentz equations of E_y E_z H_y H_z E'_y E'_z H'_y H'_z can be~~

Again transformation could be effected by expressing $E'_x E'_y E'_z H'_x H'_y H'_z$ in terms of $\underline{V}$ and ρ and solving by ordinary Kinematic procedure

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E, H defined by equations p 311 ff

p 315 Electromagnetic field equations – not laws
– but principles, postulates
underlying ~~all~~ electrodynamics

p 315 f. Mentions Planck's derivation from principle of conservation of energy.

p 432. Contrast by E A Milne

1 for some not all observers

2 choice of space for each obs. arbitrary
Relativity ≡ Correlations of space + time for set of observers –

3 no natural measure of time which may be called proper time

observer's choice – congruent clocks – graduated so that apparent uniform relative motion – $\varphi(t) \equiv t$ – Kinematic time

Lorentz formula for correlating descriptions of events

4 essentially homogeneous universe in expansion

finite portion of Euclidean space – same properties at the same epoch – in every point

singularities / creation / density of edge

5 sequence – energy invariant

6 variation in g R for secular time

capable of accounting for spiral nebulae

2

" ... the choice of space arbitrary for any observer. He is fully entitled to choose a private Euclidean space for the description & location of the phenomena he observes. The object of relativity is then achieved by correlating the space & time used by different observers "

p 433

E.A. Milne, Relativity Gravitation & World Structure Oxford 1935

Scope of the Investigations pp 1-21 ff

p.16 "We require another observer, or indeed an array of other observers, whose experiences may be compared with one another. Before there is any sense in speaking of a relativity, before a relativity can possibly exist."

p. 14 f Ultimacy of time as experienced

Axiom 1 To every observable there corresponds an operator

Axiom 2 To every state of a physical system there corresponds a function, called a state function, $\varphi(x)$

Axiom 3 The only values which measurements of an observable can yield are the eigenvalues of its operator

$$P\varphi = p_\lambda \psi_\lambda$$

for each value of observable p_λ there is a unique function ψ_λ

Axiom 4 Let $\psi_q(x)$ be the eigenfunctions belonging to the eigenvalues q of Q.

measurements compute $b(q) = \int_{-\infty}^{+\infty} \varphi(x)\, \psi_q(x)\, dx$

Then $w(q) = b^2(q)$

$w(q)$ is the probability that when the system is in the state $\phi(x)$ the measurement of the observable will be q

i.e. $|\phi(a)|^2$ is the probability that the observable is $=$

Axiom 5 If φ is known at $t=0$ then

$$H\phi = iK \frac{\partial \varphi}{\partial t}$$

where H is the energy operator and $K = h/2\pi$

The operator equation yields as many function ψ_λ

or 1) those are operators

2) those are eigenvalues ϕ_λ

The Schrödinger wave equation yields

state function ψ

Understanding data

1. Immanent | Not sind / intelle / mustern / agent

2° Correlation of measurements

3° Terms implicitly defined by correlations
mass | spatial / temporal | electro-magnetic

4° Generalised conjugates
~~and~~ There are states to which
mathematical expressions represent
States are related to
descriptive elements
States are related to one
another

5° Newtonian mechanics

State $m\,dv/dt$

Relations Action + Reaction

Independence relativity

6° States related to one another | mechanical / thermodynamic / electromagnetic

7° Relativity 1) Special - Electromagnetic, New mechanics
2) General - Gravitation
3) Generalized - EM also unified ...

8° Q Mechanics

ϕ — function of state

only observables — $P\phi = p_\lambda \psi_\lambda$

probability of observable — Φ

succession of states — Schrödinger time equation

9° Explanation for Galileo

Natural Geometry

Objectivity → unification

determinism → abstract limited determinacy of theories

~~degree of abstraction~~

10° Relativity & QM

R — unification and order

QM — on which meaning [illegible]

Degree of abstraction

Let distributions determine tensors

Simultaneity is a symmetrical transitive relation between distinct events on Time

Syn
Trans.
~~Event~~
Distinct

Event what is Known by verifying - it Happens

apparent apart from content of any description || all can be correct incorrect explanation

have different from "simultaneous" equations

at "rain" time

1° No apriori expectation of invariance

2° Meaning of simultaneity not a rule governing transformations

Such rules are rules for mediating different systems of meaning

All simultaneities are within universes of meaning

Generalised Theory

The Heuristic Principle — There are explanatory systems

Relativity — They exclude ~~many~~ objects for extrinsic reasons

The basic physical geometry is selected by the invariance of the equations for the interval

The relations between ~~the same domain~~ of ~~this~~ their verification in spatio-temporal events is mediated by ~~the corr.~~ appropriate tensors

Unified when no systematic divergence in data

Deductions over 10^9 years - ?

Third Intelligibility

Deductive Exposition

$$g_{i[k,l]} = 0 \qquad \Gamma_i = 0 \qquad R_{ik} = 0 \qquad g^{is}_{,s} = 0$$

Other Relativities

2° Occult affirmation of general or absolute

1° Accept negation of sense-like absolute

Milne | 1° | General relativity simultaneity
| | The set of equivalent observers

2° ~~Le~~ Generalised Lorentz invariance

3° Invariance not for all but for some observers

Not methodological relativity — by 3°

MR has no proper Lorentz theory

| Preliminary — velocity laws
| Final — find suitable expression

Steps can be separate : Newton + SR.