Theses on the Geometric Theory of Fields

from

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Galileo's Golden Rule

Take nature as is, not as you'd like that it had to be !

Newton's Grand Idea

Newton defined a property of each body, independent on location and time, from force-actions to the body. He called this property *mass*.

FARADAY's Grand Idea

FARADAY saw that electromagnetism does not act across a finite distance. It acts always from one point to the next, as well in time as spatially. The interval respectively distance from one point to the next is *very* small. The change from one point to the next is very small too. We call that *near action*.

Gauss' Grand Idea

Gauss has determined the properties of a bent surface, independent on the location. As well, he saw that the surface is completely described by exactly one quantity at each point of the surface. It is the Gaussian curvature, and results from the *product* of minimal and maximal vertical curvature.

RIEMANN's Grand Idea

Bernhard RIEMANN defined a general geometry with any number of dimensions. In which, he saw that the properties of the entire n-manifold (with n dimensions) are fixed from $n\,(n-1)\,/\,2$ mutually orthogonal surfaces in this manifold. With it, the entire manifold can be bent. By the way, RIEMANN saw the physical meaning of this step !

MINKOWSKI's Grand Idea

Hermann MINKOWSKI saw from the law of the light propagation (with the unchanging light-speed), that time is a geometric category like length. One can define a fourth coördinate $x_4 = \mathrm{j}\ c\ t$ with $\mathrm{j}^2 = -1$, and treat it like a spatial coördinate.
People call j the imaginary unit, but this name is definitively false. This number is *very* real !

EINSTEIN's Grand Idea

Albert EINSTEIN saw the dependence of the scales and clocks on the observer.

That means first the relative velocity (special relativity).

With the try to define a general relativity (under acceleration), he found the dependence of the scales and clocks on the gravitation via the *equivalence principle*. It says: Acceleration and gravitation act same way to a body with its mass.

What is Force ?

It is surely a kind of action. One can say:

$$\text{Force} \quad = \quad \text{Property times Action}$$

What properties and actions are that ? There are two of each $\Longrightarrow$

Remember MINKOWSKI's Grand idea. It unifies space and time to the four-dimensional space-time. With RIEMANN, the entire space-time is bent, not the space alone.

So, each body describes a time-like curve in the space-time, a so-called world-line. This world-line can be bent within the space-time.

Accelerated motion as well as gravitation act to the body with its mass.

$$\mathcal{F} = m \cdot \left(\frac{\partial^2 \mathcal{X}}{\partial t^2} + \mathcal{G}\right)$$

That is nothing else than the first approximation of the *curvature vector* of the body's world-line, multiplied with the constant rest mass ! The curvature vector is the curvature parameter of any curve ! It "accompanies" the curve.

$$\mathcal{F} = Q \cdot (\mathcal{E} + \mathbf{v} \times \mathcal{B})$$

Yet a force ! The charge Q is another property of the body. Thus, the electromagnetic field were another parameter of the world-line ?

Let us see $\Longrightarrow$

Each curve in an n-manifold is accompanied by a set of n mutually orthogonal unit vectors, an orthogonal ennuple or n-Bein. With it, each world-line has its orthogonal quadruple or Vierbein. The first vector is the tangent vector (time-like), and the second the main normal (space-like). The direction of the main normal is that of the curvature vector. The remaining vectors are physically irrelevant.[1]

[1] This statement is supported by the fact that the normals of geodesics are indefinite.

Just the world-lines can be accompanied also by congruences of two dual surfaces ! These are mutually orthogonal, and meet at the current point of the world-line. There is a special pair of surfaces, which performs the electromagnetic field tensor, like the main normal performs the curvature vector. With it, the electromagnetic field tensor is a geometric quantity !

These surfaces reflect unique geometric properties of the four-manifold !

What are Mass and Charge ?

These are integration constants of the source-free Einstein-Maxwell equations. $\Longrightarrow$
Spin and magnetical moment are such integration constants too.
(Also higher moments are.)

$$R_{ik} = \kappa \cdot (\frac{1}{4}\ g_{ik} F_{ab} F^{ab} - F_{ia} F_k{}^a)$$

$$F^{ia}{}_{;a} = 0 \quad \text{(even NOT } \ S^i \text{ !)}$$

$$\text{with} \quad F_{ik} = A_{i,k} - A_{k,i}$$

These tensor equations have been derived from MAXWELL's equations and EINSTEIN's gravitation equations, together with LORENTZ' energy and momentum components. They involve mentioned unique geometry.
RAINICH knew something about it already in 1924.

Are you surprised at the lack of sources, i.e. distributed charges and currents ? The reason is quite simple :

1. The material quantities, i.e. mass, spin, electric charge, magnetic moment, are the first integration constants, as already mentioned.

2. The sources are only a mathematical trick to avoid singularities. But this trick

   (a) is unnecessary, and

   (b) makes huge problems.

There are good reasons for the general validity of the source-free EINSTEIN-MAXWELL *equations :*

1. The math runs seamlessly. (Headword BIANCHI identities)
   Nobody has to invent any additional terms making additional problems.

2. We have 10 independent equations for 14 components of metrics and electromagnetic vector potential. However, in first approximation (MAXWELL's equations respectively four components of gravitation equations alone), that become 8 wave equations for 8 components. This mathematical fact says everything about causality.

3. Plausible interpretation of electrical conductivity and tunnel effects as well as quantum "coupling".

4. Last but not least, particles are discrete solutions of the source-free EINSTEIN-MAXWELL equations. It should be known that integration constants take on discrete values as soon as limits are present. These limits are special geometrical structures of the space-time.

Are you aware that algorithms based on finite differences lead to solutions that *fundamentally* differ from so-called "exact" solutions, even also if the differences become very small ? It has to do with chaos. The set of particle characteristics is comparable with Julia or Mandelbrot sets.
Nature says, that the first way is the right. We find chaos everywhere.
Numerical simulations have already provided twelve particle numbers and additionally masses of nuclei and neutrinos (!) with great confidence. Everybody can repeat it.

In view of overwhelming evidence, are there obstacles ?

Philosophers take the geometry as a mathematical construction. Is it not more, even reality ?

That could be an interesting philosophical subject.

However, physicists say about the fact that the material properties of a body are integration constants:

That must not be !

But it is so. Sorry.

What is so hard to grasp ?