Numerical Simulations with Strange Results

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People know two kinds of field which are not tied to a medium but mean special states of space and time: Electromagnetism and gravitation. Here is the great question: What is the origin of these fields ? And people cannot file the observed quantification in any (classical) theory of fields. As well known, quantum theories (with the standard model as most accepted) have their way in physics for long time.

In order to find the origin of the quantification in the fields (as impossible that seems), one must ask two innocent questions:
1) What quantities are conserved ?
2) What quantities have discrete values ?
The answer to both questions is:
Integration constants of partial differential equations meet these conditions.
At this place, the unusual way is gone to search the fitting equations in a continuum theory.

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1. Choice of the field equations

Experimentally well confirmed are the Maxwell equations for electro- magnetism and Einstein's gravitation equations [1] for gravitation. Both use sources, namely distributed charges and masses, to explain the origin of the fields.

The attempt to unify these systems of equations succeeds only in going without sources. That leads to the (source-free) Einstein-Maxwell equations [1,3,4,5]. These are tensor equations, and contain Lorentz' electromagnetic energy and impulse components (known as energy-momentum stress tensor). The first integration constants are just the wanted mass, spin, charge, magnetical momentum, and further are higher momenta of them. Both gravitation and electromagnetism have geometric nature [2,3,5,7].

How can one see particles in the tensor equations ? In order to avoid any speculations, the most suitable step seems to be to calculate these equations.

2. What quantities can one calculate how ?

The favoured Einstein-Maxwell equations are a system of non-linear partial differential equations [1,3,4,6,7]. The entire system of equations involves a special Riemannian geometry [3,5]. These are to solve in the several components of the electromagnetic vector potential and the metric tensor. With the Bianchi identities [2], we get 10 independent equations for 14 to determining components.

What happens if we introduce distributed charges and currents ? The divergences of the energy-stress tensor do not more vanish, so this tensor cannot equal the Einstein tensor, because the Einstein tensor holds the Bianchi identities. Physically does that mean forces and powers which cannot be compensated. - Allegedly do additional terms to the energy-stress tensor help, but the author saw no evidence for the possibility of any compensation of mentioned forces and powers up to now.

In general, it is impossible to solve these equations with conventional methods. The special case of central symmetry allows solutions this way. Known are for example the Schwarzschild vacuum or the Weyl-Reißner-Nordstrøm electrovacuum.

Keep numerical simulations. 22 years ago, the author proposed such simulations [3], and could do them himself 10 years ago. A detailed report is to find in [6], more understandable explanations in the 4^{th} chapter of [7].

Calculated were the courses of the several components. As well, the differential equations become difference equations, because one can computate only in finite steps over finite differences. - Moreover, solely integration constants different from zero lead to non-zero solutions . The first integration constants for stationary solutions are mass, spin, charge and magnetical momentum, further are dipols, quadrupols etc. If we assume a particle on a place, the initial conditions are set in an area outside the particle, where the selected field equations are evident. The computation is done step by step nearer and nearer to the particle. Those partial differential equations have as well an evolution dependent on the integration constants similarly to the chaos.

3. The results

A lot of computations with several values of the integration constants was done. During each computation the steps were counted until the physical components took on an amount of 1 . (That could be a kind of event horizon). As well, the number of steps has periodic behaviour in relation to the integration constants. Maximal numbers of steps appeared when the values of the integration constants were identical with the values of spin, charge, and magnetical momentum from literature [8,9] (of course normalized for the computer). Needs the clue that the latter are empirical values ? - Could not the mentioned evolution be the reason for all quantification ?

4. Consequences

The most important consequence consists in it that we can recognize seen particles in solutions of tensor equations. The author did it with the free electron, proton, deuteron, and Helium nucleus. It should presently be possible to do it with all nuclei, but one needs to test with higher momenta, and with higher precision (more than 80 bit) too. We get concrete evidence about the geometric appearance of particles.

That provides an alternative view of particles, and a valuable addition to the quantum theories.

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Literary index

[1] Einstein, A.: Grundzüge der Relativitätstheorie.
A back-translation from the Four Lectures on Theory of Relativity.
Berlin: Akademie-Verlag, Oxford: Pergamon Press, Braunschweig: Friedrich Vieweg & Sohn, 1969.

[2] Eisenhart, L. P.: Riemannian Geometry.
Princeton: University Press, 1949.

[3] Bruchholz, U.: Zur Berechnung stabiler elektromagnetischer Felder (On Calculation of Stable Electromagnetic Fields).
IET **10** (1980) 481, Leipzig.
Possible archives: Technische Universität Dresden (www.tu-dresden.de), Deutsche Bücherei.

[4] Bruchholz, U.: Berechnung elementarer Felder mit Kontrolle durch die bekannten Teilchengrößen (Calculation of Elementary Fields with Control by Means of the Known Quantities of Particles).
Experimentelle Technik der Physik **32** (1984) 377, Jena.
Possible archives: Friedrich-Schiller-Universität Jena (www.uni-jena.de), Deutsche Bücherei.

[5] Article in sci.physics.research from 2001/7/19.
From: Ulrich Bruchholz,
Subject: Ricci Main Directions in an EM Vacuum,
Message-ID: <9j71vm$lp8mr$1@ID-28113.news.dfncis.de>,

archived at http://www.lns.cornell.edu/spr/ .

[6] Bruchholz, U.: Quantities of Particles as Integration Constants from Tensor Equations.
http://bruchholz.psf.net/feld_ber.tgz (printing only)
http://bruchholz.psf.net/feld_ber.zip
Paper archived at the German patent office, Munich.

[7] Bruchholz, U.: Relativitätstheorie und Geometrische Theorie von Gravitation und Elektromagnetismus, ganz leicht verständlich
(Theory of Relativity and Geometric Theory of Gravitation and Electromagnetism, quite easily understandable).
http://bruchholz.psf.net/lehrbuch.tgz (printing only)

See generally
http://bruchholz.psf.net/index.html .

[8] Gerthsen, Ch.: Physik.
Berlin/Heidelberg/New York: Springer-Verlag, 1966.

[9] http://pdg.lbl.gov/ (actual list of the particle numbers)

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Appendix: The used field equations

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

$${F^{ia}}_{;a} = 0$$

$$F_{ik} = A_{i,k} - A_{k,i}$$

$\mathcal{A}$ electromagnetic vector potential, $\mathcal{F}$ electromagnetic field tensor, g_{ik} metrics, $\mathcal{R}$ Ricci tensor, κ Einstein's gravitation constant, all indices from 1 to 4, or from 0 to 3 . Solved is to g_{ik} , A_i .

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