EDITORIAL INTRODUCTION

Torsion special issue

RECENTLY, *we all have read discussions on several basic concepts of the 20th century fundamental physics, including the torsion concept, and the cosmological constant as well, between S. Weinberg, W. Hehl and R. Becker [1]. I also decided to contribute to the solution of the torsion question, but in a different way. Instead of expressing my own opinion again (following, by the way, S. Weinberg, "any term in the field equations of physics that is allowed by fundamental priciples is likely to be there in equations"; "today we know that the equations governing electrodynamics contain terms with any number of spacetime derivatives"; "I agree with Hans Ohanian about the synchronization of clocks", etc.), I invited well-known experts to publish their thoughts (some kind of "brainstorm") in papers forming a thematic issue of the French Journal "Annales de la Fondation Louis de Broglie", with which I earlier composed several special issues. Let me take freedom to comment a bit. Of course, a reader should study these excellent pieces of work carefully in detail.*

The antisymmetric tensor in lower indices $\Gamma^{\alpha}_{[\mu\nu]}$, *which can be obtained from the connection, is now called as the torsion. The question is the following one, how should one extend general relativity (GR) to include micro-, macro-scopic, propagating torsion, and so on? Professor Hehl called it "a very specific tensor". Weinberg disagrees with the opinion that it has something to do with physics (at least, I understood their statements in [1] in such a way, see also [2, 3]).*

We open our issue with the papers written by Lochak, Daviau, Hehl and Obukhov, Capozziello and Stornaiolo, Fabbri, Aldrovandi and Pereira. All these authors give mathematical foundations of what is called now as torsion.

Lochak's paper is focused on the chiral invariance and the pseudo potential, see also [4, 5]. Daviau uses the Clifford algebra, and his attempt to give a simple explanation of the covering group of the Lorentz group is also useful even for a senior reader. The next paper by Hehl and Obukhov is an excellent review which contains an impressive list of references and critics. Moreover, the authors try to clarify several obscure points to facilitate understanding. Capozziello and Stornaiolo state that "torsion [may] arise from sources without spin as a gradient of a scalar field", while proposing a different scheme, cf. [2, 7]. Next, I would like to draw attention to the Fabbri statement: "torsion has no influence in the motion of macroscopic test bodies, and since torsion is spin, this means that spin does not affect the motion of test bodies in macroscopic situation; this is not surprising, for spin is a quantum effect, and it naturally disappears at macroscopic scales...So, even if torsion is too small a field to be detected in a direct way, its effects on the evolution of the universe might be measured at cosmological scales, as discussed by de Sabbata and Sivaram [6]; also for a general discussion about macro- and micro-gravity, see Hehl...". I hope this would have experimental confirmation. Aldrovandi and Pereira stress again that "three gravitational models involving non-vanishing torsion are examined: teleparallel gravity, Einstein-Cartan and 'new general relativity' ". They also refer to predictions of the latter [8] and the "compelling evidences that [the weak equivalence principle] might not be valid at the quantum level" [9]. Moreover, in their opinion "curvature and torsion are simply alternative ways of describing the gravitational field". Furthermore, it is stated that one should check the applicability of the "general covariance principle" [3] to the theories with torsion. The gauge theories of gravitation are considered in the Minkevich paper (in the Carlevaro et al and several other papers too). "The domain of applicability of general relativity is limited" therein. The same holds for the Mahato paper. The scalar field for the dark matter and the de Sitter group are the questions of his primary concern. Next, we are glad to present an important work of Chandrasekher Mukku. Namely, he states that "the gauge coupling parameter becomes spacetime dependent"; some sort of squeezing 4-potential.

The other papers in this special issue have a rather applied or historical sense, in my opinion. I hope that a reader will find them very useful for a complete understanding. An important paper by W. Rodrigues will be published in a next issue. Finally, I would like to thank the publisher, our authors and our referees. Good luck!

References

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