Colloques Internationaux C.N.R.S.
N° 220 – Ondes et radiations gravitationnelles

THE EINSTEIN-CARTAN THEORY OF GRAVITATION

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RESUME

En 1923, E. Cartan a proposé une modification de la théorie de la relativité générale d'Einstein. Dans la théorie modifiée, on admet comme modèle d'Univers une variété différentiable munie d'un tenseur métrique et d'une connexion linéaire euclidienne asymétrique. La torsion de cette connexion est directement liée à la densité du spin. L'article contient quelques résultats récents obtenus par l'auteur dans le cadre de la théorie d'Einstein et de Cartan.

INTRODUCTION

The properties of gravitational waves propagating in empty space are fairly well understood. Their classical behaviour is adequately described by the field equations of Einstein's theory of general relativity. Much less is known about the interaction of gravitational radiation with matter, and very little about the quantum effects of gravity. According to J. Weber, there is more gravitational radiation of cosmic origin than expected on the ground of computations based on Einstein's equations and our present knowledge of the distribution of matter in the Galaxy. The rate of emission of gravitational waves depends on the precise form of the field equations and on the way in which matter acts as the source of the field. There is an interesting modification of Einstein's theory which affects the form of the equations only inside matter. The modification, due to Elie Cartan, gives rise to a new, relativistic theory which we propose to call the Einstein-Cartan theory of gravitation. The purpose of the report is to present a brief account of the theory and its application to cosmology.

A heuristic motivation for considering the modified theory may be found elsewhere [1]-[4] and a good presentation of its history and earlier results is given in a series of papers by Hehl [5], [6], [21], which also contain a comprehensive bibliography. This report is restricted to statements of definitions and results without proofs.