World Academy of Science, Engineering and Technology
International Journal of Physical and Mathematical Sciences
Vol:15, No:02, 2021

A Review on the Problems of Constructing a Theory of Quantum Gravity

Authors : Amber Jamal, Imran Siddiqui, Syed Tanveer Iqbal

Abstract : This review is aimed to shed some light on problems constructing a theory of spacetime and geometry in terms of all quantum degrees of freedom called 'Quantum Gravity'. Such a theory, which is effective at all scales of distances and energies, describes the enigma of the beginning of the Universe, its possible end, and reducing to general relativity at large distances but in a semi-classical approximation. Furthermore, the theory of quantum gravity also describes the Universe as a whole and provides a description of most fundamental questions that have puzzled scientists for decades, such as: what is space, what is time, and what is the fundamental structure of the Universe, is the spacetime discrete, if it is, where does the continuum of spacetime come from at low energies and macroscopic scales and where does it emerge from its fundamentally discrete building blocks? Quantum Field Theory (QFT) is a framework which describes the microscopic properties and dynamics of the basic building blocks of any condensed matter system. In QFT, atoms are quanta of continuous fields. At smaller scales or higher energies, the continuum description of spacetime fails. Therefore, a new description is required in terms of microscopic constituents (atoms or molecules). The objective of this scientific endeavor is to discuss the above-mentioned problems rigorously and to discuss possible way-out of the problems.

Keywords : QFT, quantum degrees of freedom, quantum gravity, semi-classical approximation
Conference Title : ICHEPC 2021 : International Conference on High Energy Physics and Cosmology
Conference Location : Rome, Italy
Conference Dates : February 18-19, 2021