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A look inside Feynman's approach to gravitation

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We discuss part of Feynman's work in classical and quantum gravity, first presented at the Chapel Hill Conference of 1957 [1]. Being concerned with the relation of gravitation with the rest of physics, Feynman embraced a field-theoretical and non-geometrical approach to general relativity in which, after the recognition that the gravitational interaction must be mediated by quanta of a massless spin-2 field, Einstein's non-linear equations follow from the general properties of Lorentz invariant quantum field theory and self-consistency requirements. Quantum effects are then included by considering diagrams with closed graviton loops in the computation of physical processes. These ideas were fully developed in the famous Caltech lectures on gravitation, delivered in 1962-63 [2], where also a more conventional formulation is discussed, and in a handful of published papers, devoted to quantization of gravity, where some field-theoretical tools which were soon found to be of general interest, namely ghosts and the tree theorem, were introduced. Also, an original introduction to general relativity, which complements the one given in the Caltech lectures, appeared in a set of unpublished lectures which Feynman delivered at the Hughes Aircraft Company in 1966-67, devoted primarily to astrophysics and cosmology [3].
In addition, we draw a comparison between Feynman's approach and other previous and subsequent work, and we include some comments on his ideas about the quantum foundations of the fundamental interactions.

Bibliography
[1] C. DeWitt-Morette, D. Rickles, The Role of Gravitation in Physics, Report from the 1957 Chapel Hill Conference. Ed. Open Access (2011).
[2] R. P. Feynman, F. B. Morinigo, W. G. Wagner, The Feynman Lectures on Gravitation, Addison-Wesley (1995).
[3] R.P. Feynman. Lectures on Astronomy, Astrophysics, and Cosmology. Lectures at the Hughes Aircraft Company; notes taken and transcribed by John T. Neer.

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