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A look inside Feynman's route to gravitation

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In this contribution we report about Feynman's route to gravitation [1], which can be traced back to the Chapel Hill Conference of 1957 [2]. As well known, Feynman was concerned about the relation of gravitation with the rest of physics. Probably for this reason, he promoted an unusual, field theoretical approach to general relativity, in which, after the recognition that the graviton must be a massless spin-2 field, Einstein's field equations should follow from the general properties of Lorentz invariant quantum field theory for such a field. Quantization would then be implemented by considering loop diagrams. These ideas were further developed by Feynman in his famous lectures on gravitation, delivered at Caltech in 1962-63 [3], and in a handful of published papers, where he also introduced some field theoretical tools which were soon found to be of general interest, such as ghosts and the tree theorem. The approach was later taken on by people such as Weinberg and Deser [4].
Some original pieces of Feynman's work on gravity are also present in a set of unpublished lectures delivered at Hughes Aircraft Company in 1966-67 and devoted primarily to astrophysics and cosmology [5].
Finally, some comments are made concerning the relation of Feynman's approach to gravity and his ideas on the quantum foundations of the fundamental interactions.

[1] M. Di Mauro, S. Esposito, A. Naddeo, submitted to Eur. Phys. J. H (2021).
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[3] R. P. Feynman, F. B. Morinigo, W. G. Wagner, The Feynman Lectures on Gravitation, Addison-Wesley (1995).
[4] S. Weinberg, Phys. Rev. 138, B988 (1965); S. Deser, D. G. Boulware, Ann. Phys, 89, 193 (1975).
[5] R.P. Feynman. Lectures on Astronomy, Astrophysics, and Cosmology. http://www.thehugheslectures.info/wp-content/uploads/lectures/FeynmanHughesLectures_Vol1.pdf (1966-7).

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