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Towards detecting gravitational waves: a contribution by Richard Feynman

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We give an account of Richard Feynman's involvement with gravitational waves, which can be traced back to 1957, when he attended the famous Chapel Hill conference on the Role of Gravitation in Physics [1]. Feynman' s contribution was further developed in a subsequent letter to Victor Weisskopf [2], completed in February 1961, as well as in his Caltech Lectures on Gravitation [3], delivered in 1962-63. The focus is on the celebrated sticky bead argument, which Feynman devised in order to argue that gravitational waves must carry energy, if they exist at all. Further details on the calculation of the power radiated as gravitational radiation in the quadrupole approximation (which is the first non-vanishing term in the presence of a tensor source term) are given in the Weisskopf letter, where both classical and quantum field theoretical tools are used, ending with the relevant quadrupole formula and its application to gravitational radiation by a binary system. While giving a simple argument in favor of the existence of gravitational waves, Feynman's thought experiment paved the way for their detection and stimulated subsequent efforts by J. Weber (who also attended the 1957 Chapel Hill conference) in building a practical detecting device [4].

[1] C. DeWitt-Morette and D. Rickles, The Role of Gravitation in Physics, Report from the 1957 Chapel Hill Conference, Edition Open Access (2011).
[2] R. P. Feynman, Unpublished letter to Victor F. Weisskopf, February 1961; in Box 3, File 8 of the Papers of Richard P. Feynman, the Archives, California Institute of Technology.
[3] R. P. Feynman, F. B. Morinigo, W. G. Wagner and B. Hatfield, Feynman lectures on gravitation, Reading, USA: Addison-Wesley (1995).
[4] J. Weber, Phys. Rev. Lett. 17 (1966) 1228.

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