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A Glimpse into Feynman's Contributions to the Debate on the Foundations of Quantum Mechanics

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Although the common lore unofficially (and erroneously) credits Feynman with the famous quote “shut up and calculate!”, he did not avoid foundational questions in quantum mechanics. The first records of his considerations on such issues are in the report of the 1957 Chapel Hill conference on “The Role of Gravitation in Physics”, where foundational quantum issues were widely debated, especially in connection with the problems of quantum gravity and quantum cosmology. In fact, Feynman discussed quantum foundations again in his 1961 letter to V. F. Weisskopf, and in the 1962-63 Lectures on Gravitation. In this contribution, we reconstruct and analyse this aspect of Feynman's work, starting with his many interventions in the debate at Chapel Hill. In particular, we analyse Feynman's arguments in favour of the quantization of the gravitational field, based essentially on a series of gedanken experiments. Then we consider the problem of wave function collapse, for which Feynman hinted at decoherence as a possible solution. Finally, another issue is considered, concerning the role of an internal observer in a closed Universe. In this respect, Feynman's many-worlds characterization of H. Everett's approach is discussed, together with his later reflections on this matter, involving a version of Schrödinger's cat paradox. Philosophical implications of Feynman's ideas in relation to foundational issues are also discussed, as well as some subsequent development.

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