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Quantum mechanics, *à la Feynman*, is just fine

In a recent paper entitled "Observing the average trajectories of single photons in a two-slit interferometer" [1] it is claimed that "average trajectories of an ensemble of single photons in the double-slit apparatus" are reconstructed while interference is being observed. However, inspection of the diagram of the experiment [1] reveals that the emission of a single source is divided into two components so that the adjacent, and initially parallel, Gaussian beams are eventually allowed to overlap and hence, interfere. Absent in this experimental set up are the "two slits" mentioned in the title and repeatedly referred to in the text of the article.

The absence of the slits has optical as well as interpretational implications. For instance, in a two-slit interferometer the slits introduce strong and decisive diffraction, an important phenomenon in a two-slit interferometer that is absent in the experiment described in [1]. Indeed, the authors describe their beams as "two Gaussian beams." In a two-slit, or *N*-slit, interferometer it is the strong and decisive diffraction (generated at the slits) that forces the interaction that results in the interference. This crucial phenomenon is missing in the experiment described in [1]. Secondly, in a two-slit interferometer a single beam of light illuminates the two slits which is very different to two Gaussian beams propagating side-by-side until they are allowed to interfere.

Therefore, the experiment described in [1] is not a two-slit experiment. In this regard, their reference [1] to Feynman's statement on double-slit interference and quantum mechanics [2], is unjustified and quite irrelevant. Quantum mechanics, *à la Feynman*, continues to be just fine.

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References

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2. R. P. Feynman, R. B. Leighton, and M. Sands, *The Feynman Lectures on Physics*, Vol. III (Addison Wesley, Reading, 1965).