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Is Seeing Believing? Direct and Indirect Observation in Physics

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In their recent paper announcing the observation of gravity waves the LIGO collaboration stated, "This is the first *direct* detection of gravitational waves.... ." This was to distinguish their result from those of Taylor, Hulse, and Weisberg and Taylor in which the decrease in the period of a binary pulsar was used to "...establish, with a high degree of confidence the existence of gravitational radiation as predicted by general relativity." The implication by LIGO was that the latter results were not a direct observation. This raises several interesting questions. One might ask how one can distinguish between direct and indirect observation and whether that distinction is exemplified in the practice of science. One might also ask whether a direct observation has more epistemic weight than an indirect observation? In this talk I will briefly discuss several episodes from the history of modern physics in an attempt to answer those questions. These episodes will include the discovery of the neutrino, of the positron, and of the Higgs boson.