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# Doubling a Quantum Process: the Intriguing History of a Rare Process

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Just ten years since the introduction of quantum mechanics, and soon after the appearance of the Fermi's theory of beta decay, an elusive and intriguing process was theoretically introduced in the realm of nuclear physics by "doubling"known decays. We here reconstruct the genesis and the early history of such a process, starting from Maria-Goeppert Mayer's Ph.D. work on the theory of processes characterized by the emission or the absorption of two photons. A detailed analysis of her seminal 1935 paper, describing the so-called 2-neutrino double beta decay, is carried out, along with a discussion of several issues related to the later introduction in 1937 of Majorana's neutrino picture. Finally, we deal with the neutrinoless version of double beta decay, whose existence was put forward by W.H. Furry in 1939, and later served to assess the true nature of the (still today) elusive neutrino.

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