

10.2 Particle Physics viewed from Category Theory

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Zbigniew Oziewicz was always at the cutting-edge of science. As a young scientist he studied particle physics and carried out important work on the properties of the muon. Latterly he pioneered the application of category theory to a diverse range of subjects of topical interest in science and engineering. It is therefore appropriate in memoriam of the late Professor Zbigniew Oziewicz to consider how the properties of the Standard Model of elementary particles in Physics might be viewed from the perception of Category Theory. In applied methodology Category Theory is more than just for modelling as in pure mathematics. In postmodern science Category Theory is now the formal language to express metaphysics as promoted formally and informally by the mathematician and philosopher Alfred North Whitehead (1862-1947) in his *Process and Reality* (1929). The muon is still of great topical interest in that measurement of its magnet moment has recently in April 2021 shed doubt on validity of the Standard Model of Elementary Particles. The early work by Oziewicz on muon capture by a neutron led him into his lifetime work on Operads and more lately into Category Theory. The Feynman Diagram in particle physics is an early informal premonition of category theory. Some tentative work on Feynman Categories by Kaufman and Ward has shown the difficulties in using the category of sets and confirms the results we have found in many applied fields that the logic of set theory is not the natural logic of nature. Newton's World a three or four Euclidean dimensional block has to be replaced by the process of a Topos. The components of a Topos do not need to be independent as the elements of a set. They are individualised but not separable. They are not subject to what Whitehead calls the fallacy of misplaced concreteness. If the Standard Model is to be revised it needs to recognise the features from Category Theory.