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Deconstructing a non-Abelian gauge theory

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Abstract: We demonstrate in this talk that any non-Abelian gauge theory (with and without couplings to gauge-nonsinglet matter fields) can be expressed classically as an Abelian gauge theory with global non-Abelian symmetry with specific interactions derived by a recursive Noether coupling scheme. We clarify the role of spacetime transverse projections in this classical formulation, based on a publication co-authored by one of us (PM) in the journal Symmetry in 2019. We analyze how this classical equivalence translates into a possible quantum equivalence, using the functional integral formalism for the deconstructed gauge theory. In particular we explore whether the Abelian gauge theory with non-Abelian global symmetry can reproduce two key properties of any quantum non-Abelian gauge theory : asymptotic freedom (a perturbative consequence)and the existence of a mass gap in its non-perturbative spectrum following Feynman's classic work of 1981. The successes and pitfalls we encounter will be discussed. The programme, if successful, will provide an easier path to quantize fundamental theories of strong, weak and electromagnetic ineractions

Keywords: non-Abelian Gauge Theory; global symmetry

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