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Neutrino Masses from Generalized Symmetry Breaking

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It is now understood that the concept of symmetry in quantum field theory should be vastly generalized from the ones come from a group action on fields. The generalization includes the higher-form symmetry, which acts on extended operators, and non-invertible symmetry, which does not have an inverse operation. In particular, a classical symmetry with an ABJ-anomaly with an abelian gauge group should be regarded as a non-invertible symmetry. A non-invertible symmetry of this type can naturally be broken by a dynamical monopole loop, and such an effect is non-perturbative. In this talk, I discuss the models where this mechanism gives masses to neutrinos. There are two models, one of which gives Majorana masses and the other gives Dirac masses. These models contain a Z' vector boson gauging the lepton number difference $U(1)_{L_\mu - L_\tau}$, which is completed into a non-abelian group in the further UV. These UV models are relatively simple; e.g. the Dirac masses model only contains the standard model fermions and three right handed neutrinos as its fermion content. Since this work mainly focus on the absolute magnitude of neutrino masses, more phenological investigations are desired, e.g. about texture.

Primary author: Prof. OHMORI, Kantaro (University of Tokyo)

Presenter: Prof. OHMORI, Kantaro (University of Tokyo)

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