FAKULTÄT für PHYSIK
LUDWIG-MAXIMILIANS-UNIVERSITÄT
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PHYSIK-DEPARTMENT
TECHNISCHE UNIVERSITÄT MÜNCHEN
MÜNCHEN/GARCHING

MLL-KOLLOQUIUM

Donnerstag, 27.06.2013, 16^{15} Uhr

Hörsaal der LMU in Garching, Am Coulombwall 1
Treffen zum gemeinsamen Kaffee 16 Uhr

Prof. Mu-Chun Chen

(University of California, Irvine/USA)

Probing Physics beyond the Standard Model with Neutrino Oscillations

The Standard Model of particle physics has been tested experimentally to a high degree of accuracy. Despite its successes in describing particle interactions at very short distances, it has many glaring deficiencies. Among these are the many free parameters that parametrize fermion masses and mixings. The origin of fermion mass hierarchy and mixing still remains one of the great mysteries in particle physics. Even though the fermion masses are generated by the Higgs mechanism, the Higgs mechanism by itself does not explain the observed mass hierarchy and mixing patterns. The discovery of non-zero neutrino masses leads to yet another puzzle: why the neutrino masses are so small when compared to other fermions, and why two of the three neutrino mixing angles are so large when compared with their quark counterpart. Furthermore, CP violation in the Standard Model is insufficient to explain the observed cosmological baryon number asymmetry. On the other hand, the recent observation of a large value for the reactor mixing angle implies good future experimental prospects for discovering a new source of CP violation in the neutrino sector.
In this talk, I will discuss how these outstanding questions in particle physics can be addressed by symmetries. In particular, I will describe a model based on grand unification in combination with a discrete family symmetry that gives rise to realistic masses and mixing angles of all observed fermions, including the neutrinos, with a significantly reduced number of parameter. In this model, CP violation is entirely geometrical in origin. This leads to interesting experimental predictions as well as implications for the generation of the matter-antimatter asymmetry in the Universe.

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