



東北大学 宇宙創成物理学国際共同大学院プログラム

GP-PU (Graduate Program on Physics for the Universe) Seminar セミナー

"A Nuclear Physics Explanation of Biomolecular Homochirality: Theory and Experiment"

by Michael Famiano

(Western Michigan University and NAOJ)

Time and Date : 15:00 - 17:00, Tue June 4th 2019

Venue : Room 745, Science Complex B (H-03)

Abstract:

The discovery of bio-molecules in meteorites with an excess of one chiral state has created one of the biggest questions in science today. That is, what is the origin of bio-molecular homochirality? Studies of this question are highly interdisciplinary, and while several phenomenological models exist, we examine the relationship between fundamental symmetries at the particle level and the macroscopic formation of bio-molecules. A model has been developed which couples fundamental interactions with the formation of molecular chirality. In this magneto-chiral model atomic nuclei bound in amino acids interact via the weak interaction in stellar environments. Nuclei are coupled to the molecular geometry (chirality) via the shielding tensor - the same interaction responsible for NMR identification. Associated with this is the fact the isotopic abundances vary from solar system values. Interactions with leptons can then selectively destroy one chiral state over the other while changing isotopic values. Possible sites are proposed in which this model may exist.

It may be possible to test the formation of chiral bio-molecules in space in an electron beam experiment at a facility much like the one at nearby facilities. Such an experiment will be discussed along with several problems and questions associated with it.

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