Abstract Submitted
for the FWS19 Meeting of
The American Physical Society

A New Paradigm to Explain Amino Acid Chirality and Isotopic Anomalies in Meteorites RICHARD BOYD, Ohio State Univ., MICHAEL FAMIANO[1], Western Michigan Univ., TAKASHI ONAKA[2], Meisei Univ., TOSHITAKA KAJINO[3], Beihang Univ., SATOSHI CHIBA, Tokyo Inst. of Tech., YIRONG MO, Western Michigan Univ., TOSHIO SUZUKI, Nihon Univ. — The Supernova Neutrino Amino Acid Processing (SNAAP) model selects left-handed amino acids (AAs) via electron anti-neutrinos interacting with ^{14}N (spin 1) nuclei oriented by a magnetic field. Within the AAs, the shielding tensor alters the local magnetic field in a way that is sensitive to molecular chirality. A binary system of a Wolf-Rayet star and a neutron star, when the WR star explodes, or a two-neutron star merger, might supply the required magnetic field and anti-neutrinos. An accretion disk around a neutron star could enable meteoroid and AA formation. Quantum molecular calculations that included perturbation effects on the shielding tensor for N from the reorientation of the molecular electric dipole showed the AAs moving in an external magnetic field to be chirally distinct. An enantiomeric excess of a fraction of a percent was found for isovaline and alanine. Isotopic anomalies have also been observed in meteoritic AAs; they agree qualitatively with model predictions. These results suggest the Galaxy might have been seeded with AAs by one such system. Measurements of ^{60}Fe ($T_{1/2}$=1.6 My) in ancient meteorites suggest that required events have occurred close to Earth.

[1]Beihang Univ.
[2]Univ. of Tokyo
[3]Univ. of Tokyo, Nat. Astron. Instit.

Richard Boyd
Ohio State Univ.

Date submitted: 24 Sep 2019 Electronic form version 1.4