Theory of Magnetic Fields of Astronomical Bodies KRISHNA KU-MAR, Tennessee Technological University — As part of a Unified Field Theory of the four Fundamental forces, which has recently been developed by the author and applied to Atomic Nuclei, Neutron Stars and Black Holes, a new theory of the magnetic fields of astronomical bodies has been developed. The basic ideas are very simple. (1) Each object contains four types of charges: Electric, Gravitational (related to Mass), Weak (related to isotopic spin), and Strong. (2) Each of these charges produces an electric field due to its location, and a magnetic field due to its motion including spin. Just as in the electromagnetic field theory, interaction between an electric charge and an electric field produces electric (Coulomb) interaction energy, in the Unified Field theory, the other three types of charges also produce interaction energies and contribute to the binding energies, and determine other saturation properties like radii, compressibility, and symmetry energy. These have been tested for some Atomic Nuclei, Neutron Stars, and Black Holes. Now comes the surprising part! Other charges like mass can also produce magnetic fields. The calculated magnetic fields of electrically neutral bodies come out to be too large by one to two orders of magnitude. Total calculated magnetic field varies from 16 G for the Earth to 1.8×10^{14} G for the Neutron Star associated with the Crab Pulsar, as compared to the experimental variation from ~ 1 G to $\sim 10^{12}$ G.

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