Astrophysical applications of the gravito-electromagnetic approximation within general relativity.[1] AZRIEL WEINREB, JAMES OVERDUIN[2], Towson University — Einstein's field equations of general relativity reduce in the weak-field, low-velocity limit to a set of four differential equations that are almost identical to Maxwell's equations for the electromagnetic field. These equations govern the behavior of gravito-electric and gravito-magnetic fields sourced by mass and mass currents. We explore some of the implications in a general way, focusing on dimensional arguments and order-of-magnitude estimates to assess the extent to which astrophysical phenomena in extreme environments (such as jets and accretion disks) can be understood, at least in part, as gravitational analogs of the familiar laws of Ampere, Biot-Savart, Faraday and Lenz, and even as real-world examples of "gravitational transformers" in action.

azriel weinreb
Towson Univ

Electronic form version 1.4