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Rotation and Magnetic Fields in Supernovae and Gamma-ray Bursts J. CRAIG WHEELER, University of Texas at Austin — Spectropolarimetry of core collapse supernovae has shown that they are asymmetric and often, but not universally, bi-polar; in some the dominant axes associated with hydrogen, oxygen, and calcium are oriented substantially differently. Jet-induced supernova models give a typical jet/torus structure that is reminiscent of some objects like the Crab nebula, SN 1987A and perhaps Cas A. Jets, in turn, may arise from the intrinsic rotation and magnetic fields that are expected to accompany core collapse. We summarize the potential importance of the magneto-rotational instability for the core collapse problem, stress the non- monotonic response of the final rotation and magnetic field to the initial iron core rotation, and the potential role of non-axisymmetric instabilities in the new-born neutron star. We sketch some of the effects that large magnetic fields, $\sim 10^{15} - 10^{17}$ G, may have on the physics at core bounce and in the subsequent cooling, de-leptonization phase. Production and dissipation of MHD waves in this strongly differentially rotating environment may affect the success of the supernova explosion, the nature of the compact remnant – neutron star or black hole, pulsar or magnetar – and whether the outcome is a normal supernova or a gamma-ray burst. In collaboration with Shizuka Akiyama, University of Texas at Austin.

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