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New Developments in the Theory of Incompressible MHD Turbulence with $Pr_m = 1$ J.J. PODESTA, Los Alamos National Laboratory, Los Alamos, NM 87545 USA — For incompressible MHD turbulence, the correlation lengths along directions parallel and perpendicular to the local mean magnetic field may be defined by iso-energy surfaces derived from second order structure functions. The correlation time of the turbulence may be defined in a similar manner by means of a temporal second order structure function. Moreover, there is a natural correspondence between the lengthscales of fluctuations with a given energy and the timescale of fluctuations of the same energy so that each iso-energy surface is associated with a unique pair of parallel and perpendicular correlation lengths *and* a unique correlation time. In the case when the magnetic Prandtl number is unity, $Pr_m \equiv \nu/\eta = 1$, it is shown that the correlation time τ associated with an iso-energy contour of energy E is equal to the energy cascade time of the turbulence in the sense that $E/\tau \sim \varepsilon$, where ε is the energy cascade rate. For balanced MHD turbulence, both the Goldreich and Sridhar theory and the Boldyrev theory are shown to have this same property. I conjecture that the same property also holds for imbalanced MHD turbulence, that is, MHD turbulence with nonvanishing cross-helicity. These and other recent developments in the theory of incompressible MHD turbulence with $Pr_m = 1$ are discussed.

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