1107-35-314 **Theodore Dimitrios Drivas*** (`thdrivas@gmail.com`), 1 E. University Parkway, Apt 410, Baltimore, MD 21218, and **Gregory Eyink** (`thdrivas@gmail.com`). *Necessity of Spontaneous Stochasticity for Anomalous Scalar Dissipation.*

The "zeroth-law" of scalar turbulence states that scalar dissipation becomes independent of diffusivity in the infinite Peclet-number limit. This phenomenon has been rigorously proved to occur in the Kraichnan model where the Lagrangian mechanism was revealed to be spontaneous stochasticity of fluid particle trajectories.Here we show that for any advecting velocity field, including a Navier-Stokes solution, spontaneous stochasticity is both necessary and sufficient for anomalous scalar dissipation in domains without boundaries. In wall-bounded domains, spontaneous stochasticity is sufficient for anomalous dissipation. More generally, the time-integrated scalar dissipation must be greater than a volume-average variance of the initial scalar field sampled by backward in-time stochastic fluid trajectories. This provides a lower bound on the Nusselt number in the Rayleigh-Bénard setting. (Received January 18, 2015)