Summary of the paper, *An instability in the Standard Model Creates the Anomalous Acceleration without Dark Energy*, by Joel Smoller, Blake Temple and Zeke Vogler.

In this paper we identify an instability in the Standard Model of Cosmology (SM) based on a new (closed) asymptotic ansatz for local perturbations of the critical ($k = 0$) uniform Friedmann space-time when $p = 0$. The instability naturally creates a region of accelerated *uniform* expansion on the scale of the supernova data, (it's one order of magnitude larger in extent than expected), within Einstein's original theory, without Dark Energy (DE). The region of accelerated uniform expansion introduces *precisely* the same range of quadratic corrections to red-shift vs luminosity, as does the cosmological constant in the theory of DE. We prove that this instability is triggered by perturbations from a canonical 1-parameter family of exact self-similar solutions of the Einstein equations for pure radiation when $p = \frac{c^2}{3}\rho$, (which we refer to as a-waves, normalized so $a = 1$ is the SM). The authors previously made the case that a-waves are the most natural candidates for local time-asymptotic perturbations of SM on the scale of the supernova data, by the end of the radiation epoch, (PNAS 2009). These results lead naturally to a testable alternative to DE as an explanation for the Anomalous Acceleration (AA) of the Universe, wholly within Einstein's original equations without the cosmological constant. Namely, that the AA is due to a local under-dense perturbation of the SM on the scale of the supernova data, arising from time-asymptotic perturbations of SM from the Radiation Epoch that trigger an instability in the SM when the pressure drops to zero. Surprisingly, perturbations of the SM by a-waves do not evolve trivially to the later observation, as we originally conjectured, but rather, it is the non-trivial phase portrait of the *instability* they *trigger* when the pressure drops to zero, that explains the subsequent anomalous accelerations.

From this mathematics, we derive a verifiable prediction that can be tested against the theory of Dark Energy. Namely, after the radiation epoch the pressure falls rapidly to zero on a constant temperature surface. We use the SS a-waves at the end of the radiation epoch as initial data for solutions in the $p = 0$ epoch. We calculate a unique value of the acceleration parameter $a = \underline{a} \approx 1$ that gives rise to the present value of the Hubble constant and the same quadratic correction to redshift vs luminosity as DE. A calculation then shows the cubic correction is of the same order, but of a different sign, than the cubic correction in DE theory, providing a testable prediction which distinguishes this theory from Dark Energy.

Most Importantly: This is a self-contained *mathematical theory* of a new instability, independent of any assumptions regarding the space-time far from the center of the perturbations.