1082-83-22 **Beverly K Berger*** (beverlyberger@me.com), 2131 Chateau Place, Livermore, CA 94550. *Using Computer Simulations of Cosmological Spacetimes to Explore the Mathematics of General Relativity.* Preliminary report.

Cosmological spacetimes with spatial symmetries provide simplified models to test theoretical, mathematical, and numerical approaches for both classical general relativity and quantum gravity. I will focus on vacuum cosmological spacetimes with 3-torus spatial topology and two Killing fields, namely, the Gowdy and "galileo" models. Roughly speaking, these models consist of gravitational waves that drive the evolution of a background spacetime that originates in a big bang and expands forever. In the collapsing direction, the focus is the nature of the approach to the big bang singularity. Numerical simulations and heuristic methods suggest that the Gowdy models are velocity dominated while the galileo models are mixmaster-like in collapse. In the former case, proofs of this behavior exist. In the latter case, there is numerical evidence that the mixmaster behavior is valid almost everywhere. These singularity studies are relevant for generic gravitational collapse. In the expanding direction, each class of model spacetime has its own interesting features. Generic Gowdy models exhibit unexpected (but now understood) behavior found by Ringström. Numerical studies of the galileo spacetimes reveal an attractor-like behavior that can be made plausible but is not yet understood. (Received May 07, 2012)