Abstract Submitted
for the APR17 Meeting of
The American Physical Society

Field Discontinuities and the Memory Effect ALEXANDER TOLISH, ROBERT WALD, The University of Chicago — The "memory effect," a permanent change in the separation of test particles after the passage of a pulse of gravitational radiation, is a well-defined and fairly well-understood phenomenon in spacetimes with a notion of null infinity. However, many valid questions remain unanswered. For example, how do we define memory in the absence of null infinity? Or, does memory depend on the precise details of the radiation source or just on the source's asymptotic behavior? We believe that such questions are best answered using a simplified, distributional model of memory. If we consider linearized gravity on fixed background spacetimes, we can study the scattering of point particles, which radiate metric perturbations with sharp, step-function wave fronts. These steps correspond to derivative-of-delta-function discontinuities in the curvature, and according to the geodesic deviation equation, it is these discontinuities (and these alone) that contribute to permanent, finite changes in test particle separation–i.e., memory. Using this analysis of field discontinuities (as well as scalar and electromagnetic analogues of gravitational memory) we can isolate the physics of the memory effect from other, background phenomena.

Alexander Tolish
The University of Chicago

Date submitted: 01 Oct 2016

Electronic form version 1.4