1047-37-409   **O. Michael Melko*** (`mike.melko@northern.edu`), Department of Mathematics, Northern State University, 1200 South Jay Street, Aberdeen, SD 57401. *Using Mathematica to Visualize Bifurcation and Chaos in the Dynamics of Symplectic Integrators.* Preliminary report.

Symplectic integrators are discrete dynamical systems depending on a time-step parameter h that arise naturally as perturbations of Hamiltonian systems in which the underlying Hamiltonian is separable. By means of the well-known Baker-Campbell-Hausdorff (BCH) series, it can be shown that such integrators are stable approximations to the unperturbed Hamiltonian system for small values of h. However, as h is allowed to grow past the radius of convergence of the BCH series, interesting changes in the dynamics are observed, including bifurcation and chaos. We show how Mathematica may be used to visualize this behavior, focusing on the ideal simple pendulum as a case study. (Received February 02, 2009)