Abstract Submitted
for the SES06 Meeting of
The American Physical Society

Chaotic Escape of Specularly Reflecting Rays From a Vase-shaped Cavity[1] JAISON NOVICK, JOHN DELOS, College of William and Mary, KEVIN MITCHELL, University of California Merced — We study the escape of rays from a two dimensional, specularly reflecting open cavity having the shape of a vase. At the narrowest point of the neck of the vase there is an unstable periodic orbit which defines a dividing surface between rays that escape and rays that are turned back into the cavity. We imagine a point source on the cavity wall emitting rays in all directions and we record the time to reach a detector forming the mouth of the vase. We find that the rays arrive at the detector in pulses. The escape time, as a function of the initial conditions, displays a weak self-similarity which is understood upon transformation to a suitable phase space. Here, we find that the self-similarity arises from the intersection of the initial conditions with a homoclinic tangle, which is formed by the intersections of stable and unstable manifolds emanating from the unstable periodic orbit. We present a topological theory that partially predicts the self-similarity. We conclude with an example comparing the predictions to numerical calculations.

[1]Supported by NSF

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Date submitted: 21 Aug 2006 Electronic form version 1.4