

Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

On Rolling Loaded Dice¹ GARY WHITE — When an unfair die is tossed, what are the factors that determine the side upon which it lands? Sir Hermann Bondi (see *European Journal of Physics* 14, pp. 136-140) asked a related theoretical question in 1993 with the intention of determining the theoretical probability of a coin landing on its edge. He notes that the center of mass, the coefficients of restitution and friction, and the radius of gyration all play a role, perhaps. A simple model assumes that the probability of landing on a particular side is proportional to the solid angle subtended from the center of mass, but this model predicts too few base landings for tall cylinders, and too many rolling landings for squatty cylinders. Here we propose a thermodynamic modification of this model which qualitatively improves the match between experiment and theory by introducing an effective “temperature” parameter. We apply the model to several different geometrical shapes where the landing odds are not even, including right circular cylinders, rectangular prisms, hemispheres and semi-cylinders. We obtain, perhaps unreasonably, somewhat promising results.

¹The author would like to thank the Society of Physics Students, including dozens of local chapters and hundreds of students, for their participation in and support of this project.

Gary White
American Institute of Physics

Date submitted: 30 Nov 2005

Electronic form version 1.4