1052-37-38 **Michel L. Lapidus** (lapidus@math.ucr.edu), 900 Big Springs Rd, Surge Building, Department of Mathematics, Riverside, CA 92512, and **Robert G. Niemeyer*** (niemeyer@math.ucr.edu), 900 Big Springs Road, Surge Building, Department of Mathematics, Riverside, CA 92521.

Experimental and theoretical results on the Koch Snowflake billiard and its associated flat surface.

In this talk, we attempt to define and understand the orbits of the Koch snowflake fractal billiard KS. This is a priori a very difficult problem because $\partial(KS)$, the snowflake curve boundary of KS, is nowhere differentiable, making it impossible to apply the usual law of reflection at any point of the boundary of the billiard table. Consequently, we view the prefractal billiards KS_n (naturally approximating KS from the inside) as rational polygonal billiards and examine the corresponding flat surfaces of KS_n, denoted by $\mathcal{S}_{KS_n}$. In order to develop a clearer picture of what may possibly be happening on the billiard KS, we simulate billiard trajectories on KS_n. As a result, we formulate conjectures about the existence and the geometric properties of periodic orbits of KS and detail a working plan on how to prove such conjectures using inverse limits, of which includes a Veech Dichotomy for the billiard KS. Moreover, we hypothesize that the billiard flow on KS will be clearly understood once we demonstrate the existence of a well-defined flow on a 'fractal flat surface' of infinite genus, denoted by $\mathcal{S}_{KS}$. (Received August 02, 2009)