983-58-708 **Jeffrey C. Lagarias*** (`jcl@research.att.com`), Room C235, AT&T Labs, 180 Park Avenue, Building 103, Florham Park, NJ 07932-0971, and **Eric Rains**, , Princeton, NJ. *A Family of Piecewise-Linear Plane Maps and Associated Nonlinear Difference Operators of Schrödinger Type.*

This talk considers the behavior under iteration of the maps $T_{ab}(x, y) = (F_{ab}(x) - y, x)$ on R^2, in which $F_{ab}(x) = ax$ if $x \geq 0$ and bx if $x < 0$. Here a and b are real parameters specifying the map. These maps are area-preserving homeomorphisms of the plane that take rays from the origin to rays from the origin. The orbits of the map are solutions to a nonlinear difference operator of Schrödinger type $-x_{n+2} + 2x_{n+1} - x_n + V(x_{n+1})x_{n+1} = Ex_{n+1}$ with energy value $E = 2 - 1/2(a + b)$ and antisymmetric step function potential $V(x)$ determined by $\mu = 1/2(a - b)$. We describe properties of the set of parameter values where all orbits are bounded, a set which has some analogies with the Hofstadter "butterfly". We determine special parameter values where every orbit is contained in an invariant circle with irrational rotation number. There are special cases where such invariant circles can be explicitly given as piecewise unions of conic sections, which have a surprising appearance. (Received September 21, 2002)