**Eric Bedford** (Indiana University)

**Dynamics of birational mappings of the plane**

**Abstract:** We will discuss some birational mappings of the plane that are defined by rational functions with real coefficients. This allows us to consider them either as maps of the real plane or the complex plane. We will look at some families where the entropies of the real and complex maps are the same. This means that the essential dynamics of the complex map takes place on the real plane, and we can use complex methods to study the real map. We will discuss work with Jeff Diller: `math.DS/0505062`, `math.DS/0609113`, and Kyounghee Kim: `math.DS/0509645`.

**Manfred Einsiedler** (Ohio State University)

**(Effective) Measure rigidity for actions of semisimple groups**

**Abstract:** In this talk I will first outline the proof of a simpler special case of Ratner's theorem on invariant measures: For a semisimple subgroup $H \subset G$ of a Lie group $G$, the $H$-invariant and ergodic measures on a quotient $G/\Gamma$ by a discrete subgroup are all algebraic. The assumption of semisimplicity allows for significant simplifications. Second I will indicate how this proof can be made effective assuming a uniform spectral gap. The latter is joint work with G. Margulis and A. Venkatesh.

**John Franks** (Northwestern University)

**Fixed points of abelian actions**

**Abstract:** We prove that if $F$ is an abelian group of $C^1$ diffeomorphisms isotopic to the identity of a closed surface $S$ of genus at least two then there is a common fixed point for all elements of $F$. If $F$ is an abelian group of $C^1$ diffeomorphisms (not necessarily isotopic to the identity) of a closed surface $S$ of genus at least two then $F$ has a subgroup of finite index all of whose elements share a common fixed point. This is joint work with Michael Handel and Kamlesh Parwani.

**Marlies Gerber** (Indiana University)

**A new construction of a metric on $\mathbf{T}^3$ with ergodic geodesic flow**

**Abstract:** For closed three-manifolds, Riemannian metrics with ergodic geodesic flow were constructed in the 1994 paper of Katok and Burns. In the case of $\mathbf{T}^3$ (and other manifolds with low dimensional factors) another construction was given by Burns and Gerber. The current construction of a metric on $\mathbf{T}^3$ with ergodic geodesic flow starts with a triangulation of $\mathbf{T}^3$. Each tetrahedron in this triangulation is given the metric of a suitably chosen ideal hyperbolic tetrahedron. The metrics on these tetrahedra are "straightened" near the vertices, and tubes are inserted along the edges. Three-dimensional disks similar to those appearing in the (unpublished) work of Burns and Gedeon are inserted as "plugs" to replace the vertices. This work is joint with Keith Burns.

**Francois Ledrappier** (University of Notre Dame)

**Linear drift for actions by isometries on a proper space**

**Abstract:** This is joint work with Anders Karlsson. We consider an ergodic cocycle with values in the isometries of a proper metric space $X$. We prove an ergodic theorem which may appear as an extension of Oseledets multiplicative ergodic theorem. An example of such a space $X$ is the Cayley graph of a finitely generated group $G$. In that case we prove that if there exists a random walk on $G$ with finite moment, Liouville property and positive drift, then $b_1(G)$ is positive. Both result follow from the construction of an invariant measure on the geometric compactification of $X$.

**Araceli Medina-Bonifant** (University of Rhode Island)

**Some examples of cylinder maps**

**Abstract:** We describe the way in which the sign of the Schwarzian derivative for a family of diffeomorphisms of the interval $I$ affects the dynamics of an associated skew product map of the cylinder $(\mathbf{R}/\mathbf{Z}) \times I$.

**Anna Mummert** (Michigan State University)

**A variational principle for discontinuous potentials**

**Abstract:** This talk will focus on the thermodynamic formalism for discontinuous potentials. In particular, conditions will be given under which the topological pressure for discontinuous potentials can be defined. A corresponding variational principle will be established, no additional conditions will be assumed. Several examples will be considered including nonuniformly hyperbolic maps and countable Markov shifts.

**Sheldon Newhouse** (Michigan State University)

**Estimating topological entropy on surfaces**

**Abstract:** We survey various methods for estimating the topological entropy of surface diffeomorphisms. Theorems of Gromov and Yomdin permit weak upper bounds, and theorems of Pieter Collins allow one to obtain lower bounds once one has accurate methods to calculate long pieces of stable and unstable manifolds. Summarizing current joint work with M. Berz, K. Makino, and J. Grote, we consider various ways of computing stable and unstable manifolds, and use these to estimate the entropy of some Henon maps.

**Rodrigo Perez** (Indiana University - Purdue University Indianapolis)

**The spectral problem at the Feigenbaum point**

**Abstract:** We will describe Nekrashevych's algebraic invariant, the "iterated monodromy group" (IMG) of a postcritically finite rational map, and its associated random walk operator. The spectrum of this operator for the map $z^2 - 1$ is, conjecturally, a Cantor set. Extending the notion of IMG to a larger family of maps is not straightforward because there is a choice of generators involved. We will describe a natural choice that defines the IMG of the Feigenbaum map, and discuss its implications on the spectral problem.

**Paul Wright** (Courant Institute of Mathematical Sciences)

**Some rigorous results for a simple model of the adiabatic piston problem**

**Abstract:** A simple model of an adiabatic piston consists of a heavy piston of mass $M$ that separates finitely many ideal, unit mass gas particles moving inside two gas chambers. Averaging techniques, used to study the motion of the slow-moving piston in the limit where $M$ tends to infinity, suggest that the piston should oscillate periodically. For one-dimensional chambers, the effects of the gas particles can be essentially decoupled, and we will show that we recover a strong law of large numbers that is characteristic of classical averaging over just one fast variable: the deviation of the piston from its averaged behavior is no more than $O(M^{-1/2})$ on a time scale $O(M^{1/2})$. We will also show that for a very general gas chamber in higher dimensions, the actual motions of the piston converge in probability to the averaged behavior on that time scale, although a strong law is no longer possible. We learned about this problem from the papers of Neishtadt and Sinai, who derived the averaged equations and pointed out that an averaging theorem due to Anosov could be extended to this case.