1125-37-119 **Matthew Foreman*** (mforeman@math.uci.edu). *Applications of descriptive set theory to the classification of measure preserving diffeomorphisms of the torus.*

The isomorphism problem in ergodic theory was formulated by von Neumann in 1932 in his pioneering paper *Zur Operatorenmethode in der klassischen Mechanik*. The problem has been solved for some special classes of transformations; Halmos and von Neumann completely characterize ergodic MPTs with pure point spectrum and Bernoulli shifts were classified by Ornstein using the notion of entropy. Many properties of ergodic MPTs were studied over the years in connection with this problem. In 2011, Foreman, Rudolph and Weiss showed that isomorphism between ergodic transformations is not Borel, and hence is inaccessible to countable methods that use countable amounts of information. The technique did not extend to show an anti-classification theorem for C^∞-diffeomorphisms of manifolds. Here we prove:

Theorem: If M the torus $\mathbb{T}^2$ then the measure-isomorphism relation among pairs (S,T) of ergodic Lebesgue measure preserving C^∞-diffeomorphisms of M is not a Borel. Moreover the isomorphism relation is strictly more complex than any equivalence relation induced by an S^∞-action. The proof gives examples of many new isomorphism classes of ergodic diffeomorphisms, such as distal transformations of infinite height.

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