

1036-57-178

Gabriel Katz* (katzg@wpunj.edu), 12-78 B Sampson Rd., Fair Lawn, NJ 07410. *"The gradient flows, spaces of multi-tangent trajectories, convexity and complexity on manifolds with boundary"*.

The gradient fields v of nonsingular functions f on compact 3-folds X with boundary are used to generate their spines $K(f, v)$. We study transformations of $K(f, v)$ that are induced by deformations of (f, v) . We link the Matveev complexity $c(X)$ of X with counting the trajectories of the v -flow that are tangent to the boundary dX at a pair of distinct points (so called, double-tangent trajectories). Let $gc(X)$ be the minimum number of such trajectories, minimum being taken over all nonsingular v 's. We call $gc(X)$ the gradient complexity of X . Next, we prove that there are only finitely many irreducible and boundary irreducible X with no essential annuli of bounded $gc(X)$. In particular, there exists only finitely many hyperbolic manifolds X with bounded $gc(X)$. For such X , their normalized hyperbolic volume gives an upper bound of $gc(X)$. All these and many other results of the paper rely on a careful study of the stratified geometry of dX relative to the v -flow. It is characterized by failure of dX to be convex with respect to a generic flow v . It turns out, that convexity or its lack have profound influence on the topology of X . This phenomenon is in the focus of the talk. Then we will discuss some high-dimensional generalizations of these results. (Received January 22, 2008)