



THE WEIZMANN INSTITUTE OF SCIENCE  
FACULTY OF MATHEMATICS AND COMPUTER SCIENCE

Geometry and Topology Seminar & Mathematical Analysis and Applications Seminar

Room 261 ,Ziskind Building  
on Monday, Jul 20, 2015  
at 16:00

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Quantitative homotopy theory and the lengths of geodesics on Riemannian  
manifolds

Abstract:

Let  $M$  be a closed Riemannian manifold. There are numerous results that establish the existence of various minimal objects on  $M$ , such as periodic geodesics, minimal surfaces, or geodesic nets. We will present some effective versions of these existence theorems.

For example, we will present diameter upper bounds for the lengths of three shortest simple periodic geodesics on a Riemannian 2-sphere, which can be interpreted as an effective version of the existence theorem of Lusternik and Schnirelmann. (Joint with Y. Liokumovich and A. Nabutovsky).

Finding upper bounds for the size of smallest stationary objects is closely related with construction of "optimal" homotopies. We will show that if  $M$  is a closed surface of diameter  $d$  (with or without boundary), then any simple closed curve on  $M$  that can be contracted to a point over free loops of length less than  $L$ , can be contracted over based loops of length at most  $3L+2d$ . (Joint with G. Chambers).