

# Limits and Universal Covers

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102 Bradley Hall, 4:00 pm  
(Tea 3:30 pm Math Lounge)

## Abstract

The speaker will define the Gromov Hausdorff Convergence of Metric Spaces and review Gromov's Precompactness Theorem. She will then present examples demonstrating how the universal covers of converging sequences of metric spaces behave. In particular, if a sequence,  $M_i$ , of Riemannian manifolds converge to a metric space,  $Y$ , the universal covers of these  $M_i$ , denoted,  $\tilde{M}_i$ , need not even converge to a covering of  $Y$ . Furthermore,  $Y$  might not have a universal cover.

Next the speaker will present two recent results with Guofang Wei (UCSB). The first involves defining certain special covering manifolds,  $\tilde{M}_i^\delta$  of the  $M_i$ . These covering spaces are shown to converge to a covering space of the limit space  $Y$  when the  $M_i$  are compact with a uniform upper bound on diameter. The second states that if the  $M_i$  also have a uniform lower bound on Ricci curvature, then the limit space,  $Y$ , has a universal cover,  $\tilde{Y}$ . Furthermore, this universal cover is the limit of the special covering manifolds,  $\tilde{M}_i^\delta$ , of the first result.

This talk will only assume an understanding of metric spaces, covering spaces, universal covers, and Riemannian manifolds as smooth metric spaces. The term Ricci curvature will be mentioned but need not be understood except as a condition placed on a Riemannian manifold that affects the way it can bend.