

Undergraduate Mathematics Colloquium

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“Constructing homotopies of low
complexity”

Monday January 14

Talk at 4:00 in Herman Brown 227

Tea at 3:30 in Herman Brown 438

ABSTRACT: Consider two closed curves α and β in the plane. A **homotopy** from α to β is a way of deforming α to β . There are many questions that we can ask, starting with whether such a homotopy exists. This immediately leads to the concept of the fundamental group. If α and β are simple (contain no self-intersections), then we may ask whether there exists a homotopy from α to β through curves which are also simple.

So far, all of these questions are topological in nature; let us add some geometry to the situation. Suppose that α and β are simple closed curves such that a homotopy exists from α to β through curves of length less than L . Does there exist a homotopy from α to β through simple closed curves also of length less than L ? I will resolve this question using a mixture of topological, geometric, and combinatorial techniques. I will also describe relationships between these ideas and well-known conjectures, such as the Poincaré Conjecture.

This talk will be accessible to all undergraduates.

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