

# Student Secret Seminar

## *Shadows of a Flat Torus*

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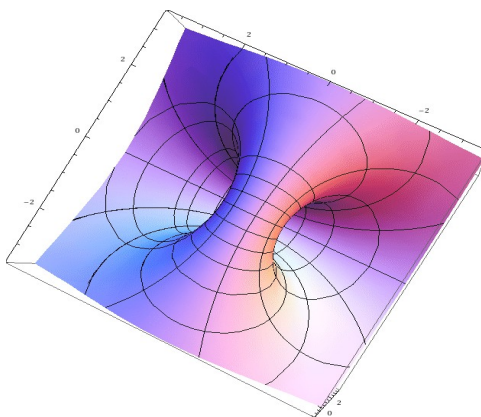
### Experimental Algebra & Geometry Lab

### Abstract

Imposing Euclidean geometry on a surface makes it everywhere flat, and surprisingly it is possible to do this on the surface of a doughnut (called a torus)! It is not possible to have a flat sphere (maps of the Earth are always distorted). The existence of a flat torus means that one can take a sheet of paper and tape its edges together without creating creases or corners (which is impossible in 3D).

We determined the formulaic descriptions for producing such a torus in 4D, and also for realizing its shadow in 3D by shining a light-bulb over it in 4D (a process called stereographic projection). We utilized the program *Mathematica* for these tasks, and also for all visualizations.

This project was inspired by work of Thomas Banchoff at Brown University.



A Shadow of a Flat Torus

Image generated using *Mathematica*, code written by the authors.

Date: Friday, November 12, 2010

Time: 2:00pm-2:45pm

Place: MAGC 1.302

For further information or for special accommodations, please contact Dr. Sean Lawton via email at [lawtonsd@utpa.edu](mailto:lawtonsd@utpa.edu).