Space: Its Light , Its Shape.
Chapter 4: Orientability

Assignment:

- Read Chapter 4.
- **For Monday, January 24, 2005:** Though everyone is responsible for reading all of the material and for working out all of the exercises, teams have been specific material and exercises for which they are responsible in class presentations. You may want to come to class early to firm up and smooth out the exercises with your teammates.

Team 1: Show the class how to create a model of a Möbuis band out of paper. What are the differences between the paper model and a true Möbius band?

Team 2: Illustrate how traversing a Möbuis band reverses orientation. Which directions get reversed? Up and down? Left and right? All of these?

Team 3: Illustrate a Klein bottle. Show some of the Möbius bands that are contained in the Klein bottle. Show some bands in the Klein bottle that are not Möbius bands.

Team 4: Present an answer for Exercise 4.3 and Exercise 4.8.

Team 1: Describe a Klein bottle assembled in three dimensions. What are the advantages and disadvantages of using three dimensions here? Is such a model a true representation of a Klein bottle?

Team 2: What kind of local geometry does the Klein bottle have? Is it a homogeneous or nonhomogeneous surface?

Team 3: Define an orientable manifold and an nonorientable manifold. Give examples orientable and nonorientable surfaces and three-manifolds.

Team 4: Describe the three-manifold that is analogous to the Klein bottle. Present Exercise 4.9.

Team 1: Define the projective plane. What are some of its peculiarities? Present Exercise 4.11.

Team 2: Present Exercise 4.12.

Team 3: Present Exercise 4.13. In the answer, the author refers to pairs of points that are "90° apart." What do you think he means by that?

Team 4: Present Exercise 4.14.

Team 1: Present Exercise 4.15.

Team 2: If we "flatten" the projective plane to make illustrating easier, which types of properties are preserved? Which types are not preserved?

Team 3: Describe projective three-space. Present Exercise 4.16.

Team 1: Present Exercise 4.17.