## The Four Color Theorem

How many different colors are sufficient to color the countries on a map in such a way that no two adjacent countries have the same color?

Notice that we define adjacent regions as those that share a common boundary of non-zero length. Regions which meet at a single point are not considered to be "adjacent".

After examining a wide variety of different maps, one discovers the apparent fact that every map, regardless of size or complexity, can be colored with just four distinct colors. This "four-color conjecture" was first noted by August Ferdinand Mobius in 1840. In 1852 a young man named Francis Guthrie wrote about the problem in a letter to his brother Frederick, then a student at University College in London. Neither of the brothers was able to prove the conjecture, so Frederick asked one of his professors, Augustus DeMorgan (1806-1871). DeMorgan too was unable to prove the conjecture, and after recognizing the difficulty of the problem, he wrote to Sir William Rowan Hamilton (1805-1865) to ask for help.

In Greek mythology, the Sirens were sisters whose song lured sailors to their deaths on a treacherous reef. The Four Colour Theorem is to mathematicians what the song of the Sirens was to the sailors of ancient times. Many a mathematician has foundered in attempting its proof .

The four-color map theorem was proved by Appel and Haken at the University of Illinois at Urbana-Champaign in 1976.

Four color mapping has solved complex problems of air traffic control as well as the designing of circuit boards for computers.

**now try to color the following maps with no more than four colors.**

**an example of four coloring the United States is on the next page**