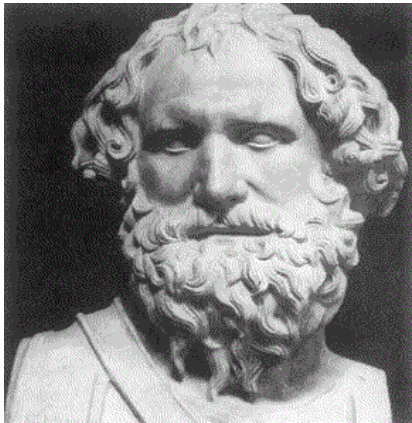# THE ISOPERIMETRIC PROBLEM

Math 17: An introduction to mathematics beyond calculus, Winter 2008, MWF 11
Professor Scott Pauls

What is the shape with area one which has the least perimeter? This is the *isoperimetric problem.* It is easy to state and equally easy to intuitively see the answer: a circle. But to justify this mathematically required hundreds of years of work by generations of mathematicians (including Eudoxos, Archimedes, Euclid, Newton and many more) . Variants of the problem appear in the Aeneid (in the story of Dido founding Carthage), in the fables of early England and in Islamic and Buddhist texts.

In this course, we will examine this problem from its foundations, tracing ancient solutions to the problem and the underlying mathematical challenges:

Archimedes

Dido founds Carthage

- what is the nature of zero and infinity?

- what does it mean to approximate?

- how does the number π arise and why is it special?

- how do we know if a mathematical solution exists?

- what does it mean to prove a mathematical statement?

Students in this course will learn aspects of differential geometry, analysis, and group theory. This course has minimal prerequisites: math 8 or placement into math 11.

For more information, students should contact Professor Scott Pauls via blitz or phone (6-1047).

Milan