Becoming π

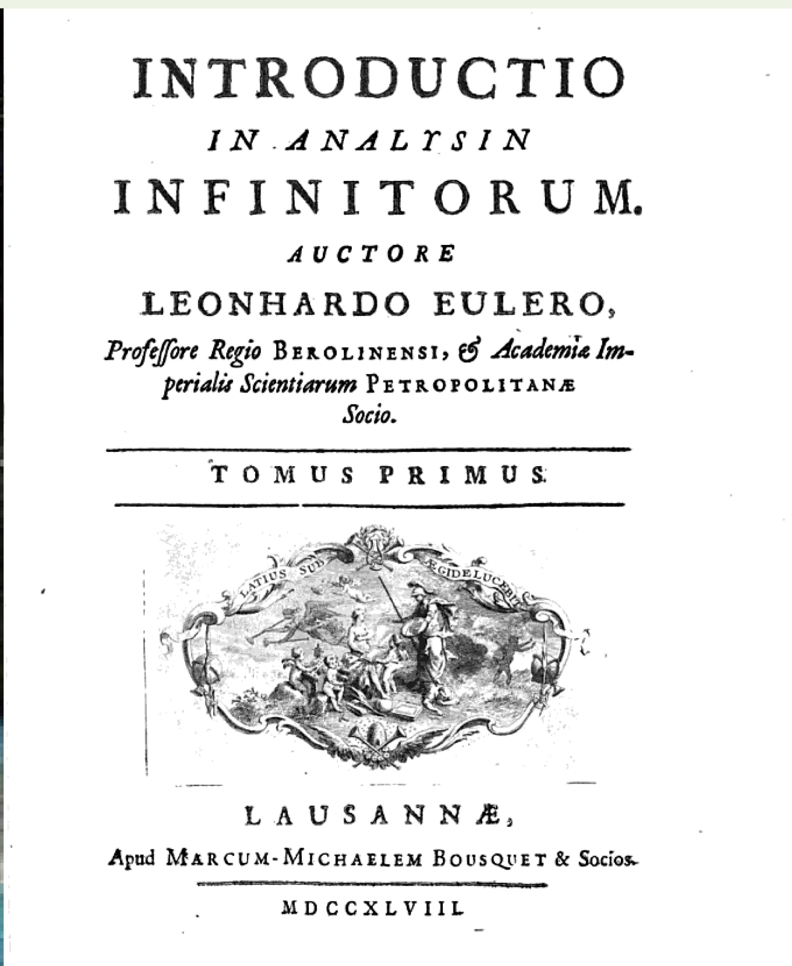
A Name

In 1706 William Jones introduced the Greek letter 'π' to represent the constant ratio of the circumference to the diameter of any circle. Before this the ratio had been awkwardly referred to as 'the quantity which, when the diameter is multiplied by it, yields the circumference'. Jones may have chosen π because it is the first letter of greek word for perimeter, $\pi\epsilon\rho\iota\varphi\acute{\epsilon}\rho\epsilon\iota\alpha$.

π

The Popularity of a Name

Unfortunately, Jones' book *Synopsis Palmariorum Matheseos* where he introduced the new notation for π was not widely read. Accordingly, it is widely and falsely believed that the mathematician Leonhard Euler introduced the symbol π into common use. Indeed, it was Euler's use of the greek letter in 1748 in his book *Introductio in Analysin Infinitorum* that assured its popularity.



INTRODUCTIO
IN ANALYSIN
INFINITORUM.
AUCTORE
LEONHARDO EULERO,
Professore Regio Berolinensi, & Academiæ Imperialis Scientiarum Petropolitanæ Socio.
TOMUS PRIMUS.
LAUSANNÆ,
Apud Marcum-Michaelem Bousquet & Socios.
MDCCXLVIII.

Figure: Leonhard Euler (L) and Intr. in An. Infin. (R)

Discovering Properties of π

An *irrational number* is any real number that cannot be expressed as a ratio of integers. Irrational numbers cannot be represented as terminating or repeating decimals.

In 1761 Johann Heinrich Lambert proved that π is irrational.

Figure: J.H. Lambert (L) and A.M. Legendre (R)

A *transcendental number* is a real number that is not algebraic. That is, it is not a root of a non-zero polynomial equation with rational coefficients.

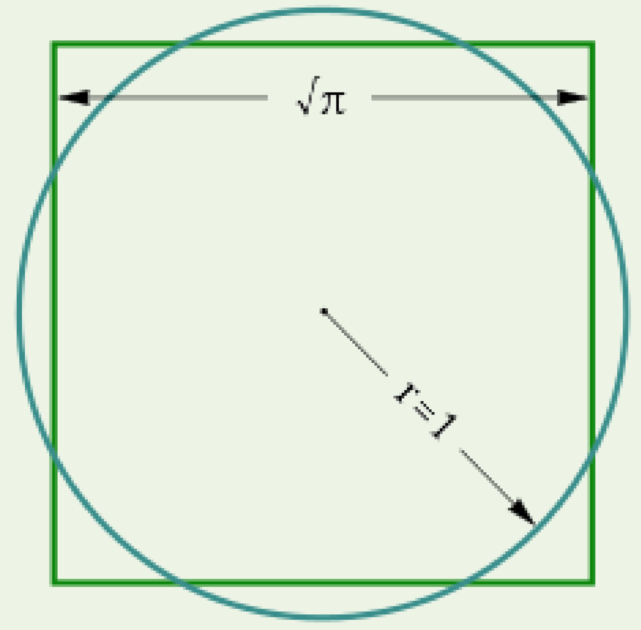
An example of a non-transcendental number is 2 because it is a root of the polynomial

$$x^2 - 4.$$

That is $2^2 - 4 = 0$.

In 1775 Euler pointed out the possibility that π might be transcendental. In 1794 Adrien-Marie Legendre showed that π^2 is irrational and also mentioned that π might be transcendental. In 1882, Ferdinand von Lindemann proved that π is transcendental.

Legislating π



In 1894, Indiana physician and amateur mathematician Edward J. Goodwin believed that he had discovered a correct way of squaring the circle: using only a standard compass and straightedge, constructing a square that has exactly the same area as a given circle.

The fact that π is transcendental makes this task impossible. However, Dr. Goodwin was not to be deterred. He only wanted to redefine π insofar as it would allow him to solve this problem.

He proposed a bill to Indiana Representative Taylor I. Record. The text of the bill includes statements about Goodwin's mathematical prowess:

> *...his solutions of the trisection of the angle, doubling the cube and quadrature of the circle having been already accepted as contributions to science by the American Mathematical Monthly...And be it remembered that these noted problems had been long since given up by scientific bodies as unsolvable mysteries and above man's ability to comprehend.*

And in fact he had published in the American Math Monthly in July of 1894. The editors had merely put the disclaimer "Published by the request of the author". In 1897 The U.S. state of Indiana actually came close to legislating the value of 3.2 for π. The House Bill passed unanimously, but luckily the bill stalled in the state Senate.