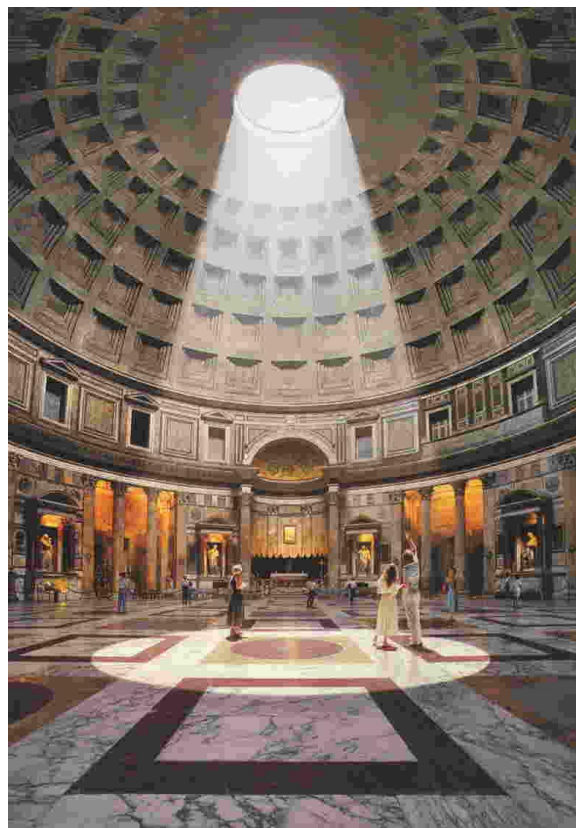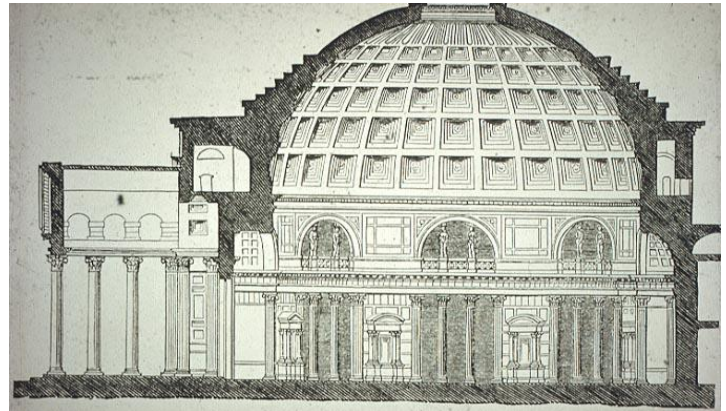# The Pantheon - A Theory
Will Karp

Introduction

According to several sources, the Pantheon has an internal height of between **141feet, 8 inches** and **142 feet** and an equal diameter making a **perfect sphere**.   Many architectural masterpieces prior to and since the building of the Pantheon were based on geometry and mathematics. And I believe there is more to the eye than has been revealed so far.   Why would the designers of the Pantheon pick **that** number for the Pantheon's height and diameter? What significance did this have? Would they just have picked a random number out of the air, without it having a reason for picking it?

Summary

I'm going to state my conclusion and theory here, and then go on to demonstrate my rationale:

My contention is that the designers of the Pantheon had a specific and deliberate reason to make the height and diameter of the building have some significance. There are differing estimates of the height and diameter – partially due to resurfacing and modifications to the interior of the Pantheon through the years. The range of current estimates of scholars puts the diameter and height of the Pantheon somewhere between **141 feet, 8 inches and 142 feet.** Converting these various contemporary <u>rounded off</u> estimates of the diameter and height from feet to units of Roman feet (**pes**), my conclusion is that the exact height and diameter when originally completed is actually **141 feet, 10.2 inches.** This measurement would translate to a volume of exactly **600,000 cubic pes** - or **600 cubic pertica (decempeda)** for the perfect cube encompassed within a perfect sphere. The significance of the **600** may be related to the size of the senate being limited to **600** . Also, the **pertica**, being the standard measurement for the length of stakes in vineyards may have also been used as a reference to wine and the god Bacchus.

The Analysis

Gardener and other sources state the diameter and height to be **142 feet.**

Upon further research, I found other references to **141 feet 8 inches (141.667 feet)**

In meters I found the numbers to be quoted as **43.2 meters** and **43.3 meters**

Because of these differences I conclude these are all rounded off low to high estimates.

The dilemma is that there is NO source I could find that gave the inside dimensions EXACTLY to the fraction of an inch or centimeter. And because of these discrepancies, the REAL number must lie somewhere in between.

Taking these high & low estimates, the first step I took was to convert feet and meters to "Roman Feet" to see what I got. The commonly and widely accepted conversion is **0.971 feet to pes** (Roman foot) and **0.296 meters to the pes**

So the possible range of heights and diameters using these numbers is:

- 141.667/.971=**145.898** *pes* (Lowest value of all)
- 142/.971=**146.241** *pes*
- 43.2/.296=**145.946** *pes*
- 43.3/.296=**146.284** *pes* (highest value of all)

So the diameter range is between **145.898** and **146.284** *pes*.

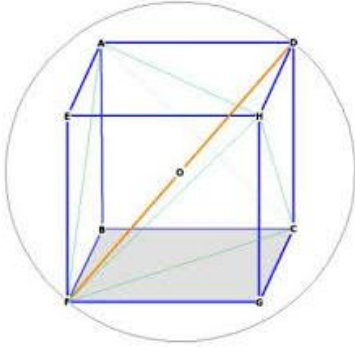And the radius range is between **72.949** and **73.142** *pes*

My first reaction was that rounded off at **146** was very unique since when written in Roman numerals is **CXLVI** where each letter is used only once. Also, the radius is **73** *pes* which is a prime number. Prime numbers were a known commodity at that time. But I was not entirely satisfied with those possible explanations – AND, that would have meant rounding

So the next thing I looked at was the <u>volume of the sphere</u> and the <u>surface area of the sphere</u>, within that range, but there just was nothing that rang a bell. Using the minimum and maximum estimates of the diameter and radius of the Pantheon we get:

Volume of Sphere = $4/3 \pi r^3$ = 1,625,273 to 1,638,833 cubic *pes (amphora)*
Surface Area of Sphere = πr^2 = 16,716 to 16,804 square *pes*

Then I decided to look at the **perfect cube within the sphere**.

To calculate the length L of the side (edge) of the Cube:

L=Diagonal/√3   (Diagonal divided by "cube root of 3") with the "cube root of 3" = 1.732
Therefore L=Diagonal/1.732   (In the graphic above, the Diagonal is shown as the green line, the Edges as blue.)

Since the diagonal of the Cube <u>is the same</u> as the diameter of the Sphere, taking the minimum and maximum estimates of the diameter of the Pantheon, we get:

At Diagonal=145.898, L= 84.237 and then Volume = L^3 = **597,734** cubic *pes*
At Diagonal 146.284, L= 84.460 and then Volume = L^3=**602,494** cubic *pes*

Note that **600,000 cubic *pes* _(amphora)_** lies between these limits. And I contend that is the accurate volume of that cube.

Working backwards:

Since the true accurate dimension of the Pantheon must lie between those 2 dimensions, to achieve a volume of **600,000** cubic *pes* on the nose, and using the formula for the cube, the accurate down to the hairline dimension of the cube length needs to be **84.3434** *pes* which would produce a diagonal (same dimension as the diameter of the sphere) of **146.082** *pes*.   Furthermore, this would then convert to **141.846** feet (**141 feet 10.2 inches)** or **43.24** meters.

The significance of **600,000** cubic *pes* – becomes more interesting and appealing if we use the measurement of *pertica* which is the length of a "rod" being 10 times the length of a *pes*. **The *pertica* was also the <u>standard length of stakes in vineyards</u>.** Using that unit of measure, the volume of the cube is now **exactly 600 cubic *pertica*.** What possible connection? The number of senators was **600**. And, the use of the *pertica*, is yet again another reference to wine and god Dionysus/Bacchus.

Incidentally, the volume of the perfect cylinder within the sphere (which would also contain the perfect cube) would be **900 *pertica*** (the formula for the cube within a cylinder is 2/3 the volume of the cylinder.)

<u>Conclusion</u>

My contention is that the designers of the Pantheon did not just pick a random number out of the air, but had a specific and deliberate reason to make the height and diameter of the building have some significance.

I contend the height and diameter are **141 feet, 10.2 inches** which would translate to encompassing a perfect cube within a perfect sphere to have a volume of exactly **600 cubic *pertica***. The significance of the 600 may be related to the size of the senate of 600 members.