Ponder the Portage County Skies with Paul

Sky events for July 2008

02 New Moon 09:19 P.M.
04 Earth at aphelion (farthest from the sun)
04 (1997) Mars Pathfinder landed on Mars
06 (1687) Newton published his Principia
09 Jupiter rises at sunset, sets at sunrise
09 1st Quarter Moon 11:35 P.M.
10 Mars passes 0.7 degrees under Saturn
15 (1975) Apollo 18 launched
18 Full Moon at 2:59 A.M.
20 (1969) First humans walk on the moon
25 Last Quarter Moon 1:42 P.M.

What are the highlights for July? **Mars passing Saturn on the night of the 10th (actually 1 A.M. on the 11th) is the highlight. Mars finds itself within 1 degree of a star actually brighter than itself at the start of this month. The star is Leo's alpha star, Regulus (the heart of the lion). Through binoculars you'll notice an orange Mars at magnitude 1.7 and a bluish-white Regulus at magnitude 1.3, making Regulus 44 ½ % brighter. Jupiter rises in the southeast at the eastern end of Sagittarius, the Archer, to start the month and does a retrograde motion (west) back through Sagittarius during the month. Because Jupiter is so far south the best time to view it would be an hour either side of midnight when it is highest.**

I thought Apollo 17 was the last manned Apollo mission, what is this Apollo 18 launched July 15, 1975? **What the Planetary Society calls Apollo 18 is actually the Apollo-Soyuz Test Project (ASTP) which was the first joint flight of the U.S. and Soviet space programs. For the U.S., it was the last Apollo flight, as well as the last manned space launch until the Space Shuttle. If Sputnik started the Space Race, ASTP was seen as a fitting end to the tension of the Space Race.**

Talking about starting and ending, infinity has no end, right? **True, if you were to sing the song, "100 Bottles of Beer on the Wall" but started instead with An Infinite Bottles of Beer on the wall, … if one of the bottles should happen to fall, an infinite bottles of beer on the wall. Infinity is not a number however, and there exist different size infinities, countable and uncountable! Natural #'s, whole #'s, integers, rational, and algebraic irrational are countable but transcendental irrational and thus real numbers are an uncountable infinity.**

What does a countable infinity mean? **First of all, Georg Gerdinand Ludwig Philipp Cantor (3/3/1845 – 01/06/1918) was the German mathematician who deserves the full credit for insight into the infinite. Let us start with the natural counting numbers 1,2,3, … and use this *countable infinity* to set up a one-to-one correspondence with the other number systems we mentioned above. For instance, for the integers …-3,-2,-1,0,1,2,3,… have the odd numbers 1,3,5, … correspond to the negative numbers and the evens 2,4,6, … correspond to zero and the even integers, making these two infinities the same size.**

What does an uncountable infinity mean? **Cantor said, suppose you listed all the real numbers between 0 & 1 (decimals).**

For instance: .1234543204567…
.13245643667 00…
.8694837626444…
.3745235484663…
… until you listed them all.

Cantor then constructed a real number that was not in your list of all real numbers above by going down the diagonal of your original list and making sure the new number is different by each of the others by one digit in the diagonal. Note the 1,3,9, and 5 are the numbers down the diagonal in our list so far. Cantor made his new number, that is not in the infinite countable list above, by using a random rule like: If a digit in the diagonal is not a 3 make it a 3 and if it is a 3 change it to a 7. Our new number would be .3733… is guaranteed to be different than any number in the original list by at least the one digit in the diagonal, thus a larger infinity.

How then did Cantor jump from this to an infinite amount of infinities? **Cantor invented the Power Set; which is the set of all possible subsets of any given set. He noted that the Power Set always has more members than the original set. For instance, let a set consist of a (p)enny, (n)ickel, (d)ime, and (q)uarter. Its Power Set would be p,n,d,q,pn,pd,pq,pnd,pnq,pndq, and the empty set, making eleven members where the original only had four. Thus the power set of the real numbers would be a larger infinity than the set of real numbers and its power set would be larger yet, etc., etc., etc. GNATS**