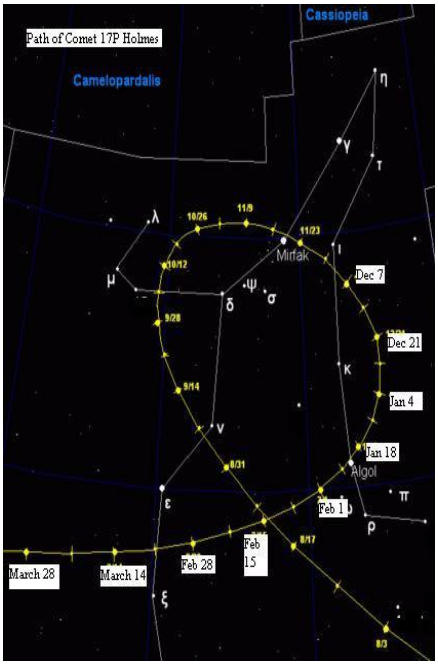
Ponder the Portage County Skies with Paul
Sky events for December 2007
(Article 2 of 13, Volume 1 of 3)

1 Last Q. Moon @ 06:44
9 New Moon @ 11:40
14 Geminid meteors peak (over 110 per hour)
17 1st Q. Moon 04:18
18 Mars closest to Earth (54.8 million miles)
22 Winter Solstice begins 8 min. after midnight
22 Moon at perigee (224,200 miles from Earth)
23 Full Moon @ 19:16
24 Mars rises at sunset, sets at sunrise
31 Last Q. Moon @ 01:51



Last Oct. Comet Holmes became over 473,550 times brighter in 48 hours, then in early Nov. the comets atmosphere *swelled to over the size of our Sun, thus becoming the largest single object in our solar system.* Since we are looking down the tail of the comet, Holmes appears to have no tail. Enjoy following this comet through winter into spring as it moves through the feet of Perseus as shown in the diagram.

Active from Dec. 7 – 17th, the Geminid meteor shower will peak after midnight till dawn on Dec. 14/15. With the moon set the Geminids should feature plenty of bright shooting stars as seen from a dark site. You could see as many as 120 meteors per hour, so don't miss one of the best showers of the year as we close out the year.

Mars is becoming the fourth brightest object in the night sky (only dimmer than the Sun, Moon, and Venus) this month as it reaches its binennial closest point to Earth on Dec. 18/19. Found in the feet of the Castor (one of the Gemini twins), it lies just below the midpoint of Capella and Betelgeuse. Mars disk will not look this large again until 2016.

Since Comet Holmes is completing its big zero in the night sky for us (note diagram) and Mars with most of the other celestial objects appear like zeros in our sky, lets discuss the number zero for a bit. The oldest zero in history was in Babylon. The Babylonian mathematicians and astronomers developed a genuine zero to signify the absence of sexagesimal units (sexagesimal is base 60, like our time and degree base with 60 min. in an hour/degree and 60 seconds in a min.) of a certain order.

The discovery of zero is not confined to arithmetic but zero has played just as fundamental a role in practically *every branch of mathematics*.

To write about the number zero is quite a humbling experience for a mathematician, believe it or not, as I know volumes of books couldn't do the number justice. *In fact, in the history of culture, the discovery of zero will always stand out as one of the greatest single achievements of the human race.*

When one starts teaching a new branch of mathematics, one usually starts out showing how to simplify, add, subtract, multiply and divide with the new branch. The fact the adding or subtracting zero doesn't change your result and multiplying by zero always results in zero has tons of applications in every branch of mathematics. However, the fact that one cannot divide by zero delayed the invention of Calculus (a major part of university education) and until Newton/Leibniz generation (about 1675).

Go ahead, ask anyone you meet what thirteen divided by zero is and I'll bet over 90% of the time they will say zero when the answer is, *division by zero is not possible*. One way to look at this is to consider that 12/4 = 3 because you can break 12 items into 3 piles of 4. So to take 12/0, you are asking how many piles of 0 items would it take to get 12! Another way to look at this is note 12/(1/2) is 24 and 12/(1/4) is 48 and 12/(1/1000) is 12,000 so as you divide 12 by smaller and smaller numbers the quotient gets larger quickly. Thus when dividing, as the denominator approaches zero, the quotient approaches infinity. And now you see why zero took so long to invent, because to invent zero one has to invent infinity at the same instant. GNATS!