

# Event Horizon

April 1998

Volume 5 Issue 6

## Precession - The Star Clock of the Ages

- Joachim Brouwer

**C**arbon-14, Potassium Argon and Chlorine-36 are terms which refer to the steady breakdown of radioactive isotopes in organic and inorganic matter and are the principal dating techniques used by archeologists, anthropologists and palaeontologists. These techniques work well in the far distant prehistoric past where decimal accuracy is not so important but are not precise enough in making useful recent dating techniques.

But astronomy has its own dating technique precession, which can be accurate to within a matter of decades in pinpointing ancient civilizations that aren't clear in their own records as well as heretofore unrecognized and unaccredited cultures. As much as archaeologists, particularly those who study ancient Egypt, do not want the accomplishments of their charges to be taken away by extra-terrestrial or "third party" antecedents, they fail to truly realize the breadth of the celestial observations and computations of the cultures they study.

Or could it be as Giorgio Santillana, the author of *Hamlet's Mill* a multi-

cultural study of myths concerning precession, has said that the problem lies with them. "Modern archaeologists have cultivated a pristine ignorance of astronomical thought, some of them actually ignorant of precession itself".

Precession refers to minute changes that can be observed over long periods of time in the position of the stars, opposite to their nightly and seasonal motions in the sky. Precession is caused by the slight wobble of the spin of the earth's axis much like that of a giant top rotating in a circle on a flat surface. This wobble is due to two reasons, the fact the earth is not a perfect sphere and the gravitational pull of the sun and planets.

The act of precession inscribes a giant circle in the sky in the celestial polar regions which takes 25 9000 years to complete. This has caused the star directly above the north pole to shift from Alpha Draconis to Alpha Ursae Minoris (Polaris) in the past few thousand years. In 14 000 AD the pole star will be Vega.

Precession can pinpoint the exact era for the passage of a star over its highest point or zenith in the sky when it goes though the north-south celestial axis. This central axis is called the meridian and the star is

said to culminate when it passes through the meridian. The transit of a certain star or star group though the meridian was considered significant to many ancient cultures since it reached its highest point here before settling downward as the night drew on.

The precession of the equinoxes is only one of the effects of precession and refers to the zodiacal constellation the sun is in at the time of the vernal equinox. This is the specific time of the year where day and night are of equal length everywhere on Earth, the point the sun is at when the celestial equator intersects with the ecliptic. Unlike the sun which moves eastwards through the zodiac over the course of the year, the constellations slowly move backwards in the sky as the Earth's tilt moves.

When astrology was developed by the Babylonians, the sun was actually in the early degrees of Aries at the vernal equinox. This is how astrologers still consider the matter today, since the space, although occupied by another constellation still resonates with Arian energy. In actual fact the sun hits the vernal point in the latter degrees of Pisces today.

Santillana calls the zodiacal constellation at the time of the vernal

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## Editorial

## HAMILTON AMATEUR ASTRONOMERS

The Event Horizon is a publication of the Hamilton Amateur Astronomers (HAA).

The HAA is an amateur astronomy club dedicated to the promotion and enjoyment of astronomy for people of all ages and experience levels

The cost of the subscription is included in the \$15 individual or \$20 family membership fee for the year. Event Horizon is published a minimum of 10 times a year.

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Once again we have a packed issue. Thanks to everyone who sent in articles this month - we have some new contributors as well as our trusty regulars. I would especially like to thank Marg Walton for writing our *Constellation of the Month* column every month. Here's the usual info!

Articles can be e-mailed to

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-Tracy Webb

## Chair's Report

Some of you may be wondering how we can keep our membership dues so low. Your dues actually only cover part of our expenses which are almost completely due to the newsletter printing and mailing. For the first few years of our club we managed to create a surplus through the hard work and generosity of Grant Dixon giving planetarium shows. This year Grant is taking a well deserved break. If any of you have been wondering what you can do to support our club here's the perfect opportunity. We are looking for people with a good knowledge of the sky who are willing to learn how to operate the planetarium at McMaster University.

Back to those surplus funds. The slide projector that we have been using at our meetings was very kindly loaned to us from McMaster University. Your council has de-

cided that since the general meetings are one of the main benefits of belonging to the HAA it would be appropriate for us to purchase our own slide projector. Our new projector has a feature which our speakers find very desirable - a cordless remote control.

I would like to encourage everyone to come out to the *Winchester Arms* after the general meeting. It is less than 10 minutes away from the Spectator building. Food and drinks are good and reasonably priced and it's a great opportunity to get to know your fellow members.

You know you're an amateur astronomer when daylight savings is a bad thing. This weekend, April 4th, we make the switch and unless you are in the habit of staying up until dawn it means one hour less observing.

- Stewart Attlesey  
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# Precession Cont ...

(Continued from page 1)

equinox "the carrier" of the sun. Each of the four cardinal points of the year, the vernal and autumnal equinoxes and the winter and summer solstices were considered celestial pillars that held the sky in place. The myths of many ancient societies spoke of the gods grinding giant celestial mills. Another image was that of an axle, the axle of the earth breaking and upsetting the delicate balance in the sky. The upheavals experienced by humankind at the end of the last Ice Age about 15 000 BC until even as late as 8 000 BC have been linked to changes in the tilt of the Earth's axis.

Many of these myths employ key numbers in the precessional cycle such as 72, the number of years that it takes the sun to move one degree along the ecliptic, and 2160, the number of years it takes the sun to go through 30 degrees or one zodiacal sign.

Hipparchus is supposed to have discovered precession in the second century BC. However, recent studies of the shafts emanating from the Queen and King's Chamber in the Great Pyramid in Egypt by Robert Bauval, as well as the meticulous cross referencing of ancient myths in the work of Santillana, has demonstrated that precession was understood long before the Greeks.

The constellation Orion which Egyptians knew as Sahu rose in the eastern sky a few weeks before the summer solstice in 2 500 BC. However, earlier in history, it rose just before sunrise, at the time of the vernal equinox. When Orion didn't appear in his proper place in the heavens over time because of precession, it became imperative to ensure his "return", even though Orion could still be seen rising helically somewhere between the vernal

equinox and the summer solstice. Thus were initiated complex rituals ensuring the immortality of Osiris, culminating with the dead Pharaoh himself becoming Osiris in the sky while the sun ruled on Earth as Horus, Osiris's son.

The helical rising of Aldebaran in Hyades would later come to mark the vernal equinox but it too would fail to appear over time because of precession. The need for ensuring Osiris/Orion's immortality was augmented since other star groups proved to be unreliable too.

No prominent stars would mark the vernal equinox for many hundreds of years. However, in 2 500 BC the period of Egypt's greatness, the star Sirius's helical rising became the paramount celestial event since it coincided with two other occurrences, the annual flooding of the Nile and the summer solstice. The close concurrence of these three events could not fail to make a deep impression on the Egyptian's collective psyche and came to mark the beginning of their year.

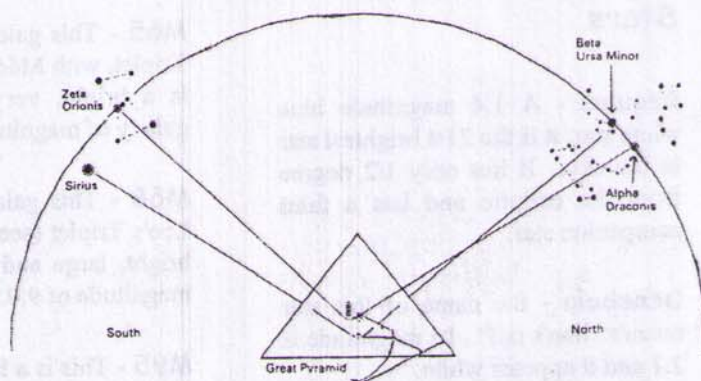
We can imagine Sirius appearing as a flash of light in the sky as the sun slowly rose, right at the time the Nile's waters started to rush over its banks. Sirius is just at the point where the waxing light of the sun causes all the dimmer stars to disappear and allow this already luminous object to shine forth. In a few moments it

would disappear. A few days later Sirius would be too high in the sky and would not be seen because of the sun's waxing light. A few days earlier Sirius would appear in the predawn sky too long, along with many other stars and would not coincide with the rising of the sun. This too was how Orion and Aldebaran must have appeared to and inspired the Egyptians.

Maybe the Egyptians didn't want to lose Sirius to precession too and at this time set out to build or complete the three giant structures on the Giza Plateau. These structures would encode the Egyptians accumulated wisdom and permanently mark and earlier period when their revered gods actually lived on Earth and started them on their remarkable journey.

Bavault states that in 2 450 BC the southern shaft of the King's Chamber pointed to Al Nitak or Zeta Orionis, the lower most of the three stars in Orion's belt, while the northern shaft pointed to Alpha Draconis, the pole star, (see below). The date of 2 450 BC is about the accepted date for Khufu's reign, the pharaoh to whom the Great Pyramid is attributed.

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The stellar alignments of the Great Pyramid's four shafts in the epoch of 2 500 BC.



# Dao Luk Gai (The Chicken Stars)

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Once upon a time, in a kingdom then known as Siam, but which we now call Thailand, there lived a farmer and his wife. The couple owned a plot of land on the edge of the jungle. It was not fertile land, so they had to work very hard merely to survive from year to year.

One day, the old man beheld a Pra Toodong -- a monk who traveled alone in order to meditate. The holy man had made his simple camp by setting up a large umbrella and covering it with a mosquito net. When the farmer came upon him, the monk was seated underneath this umbrella, deep in meditation.

The farmer came home and told his wife about their visitor. Since both of them revered the teachings of the Lord Buddha, they decided to offer some food to the monk so that he would be well-nourished for the next leg of his

arduous journey. Yet what could they offer? They had barely enough to feed themselves.

"What about our old hen?" said the farmer. "She has just hatched six chicks, which will feed us in time. Surely we can do without eggs for awhile."

"But what will the chicks do without their mother?" asked his wife.

They pondered this for a long time. It seemed wrong to make orphans of the chicks, but in the end they decided that feeding the monk was more important.

The hen overheard their conversation. Being a devout creature, she saw it only fitting that she sacrifice her life to nourish the monk who was on the way to an enlightenment which would benefit all living things. The hen was altruistic enough that she was happy to give her life to aid this cause.

So that night, she called on her children and explained to them that when the sun came up, she would no longer be with them. She tried to teach them all she knew and told them to love and protect each other.

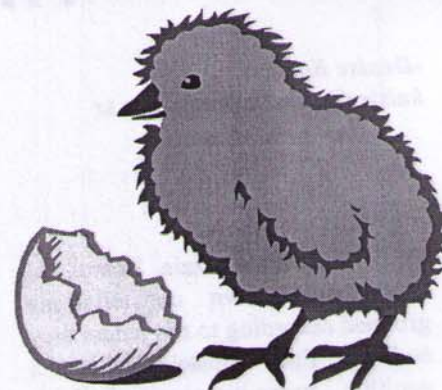
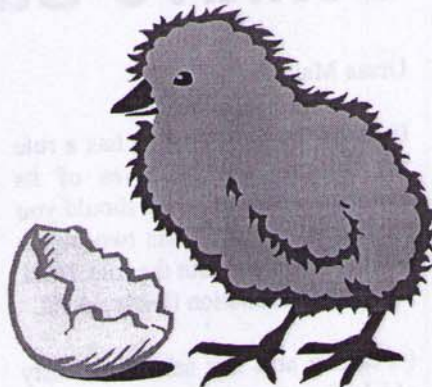
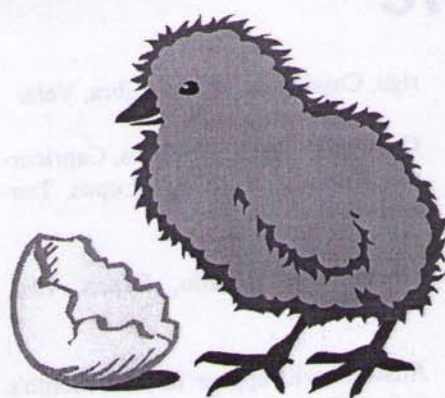
The chicken family cried together all night.

At dawn, as the old man went to the kitchen to get his cleaver and the old woman boiled water, the hen said good-bye to her brood. Then she calmly approached the farmer and let him kill her without a struggle.

At the death of their mother, the six chicks were overcome with grief. In an instant, they decided to end their lives. That way, their spirits could catch up with that of their mother. Perhaps they might be reborn as a family once again. So, all at once, they jumped into the fiery hearth.

The monk who had strong mental powers from all his years of meditation in the jungle, perceived what had happened. During his years of study and righteous living, he had accumulated a great deal of merit. He passed this merit on to the hen and the chicks so that they would get their wish and be reborn together as a family.

And this is why, when we look at the night sky, we can see the star cluster known as *Dao Luk Gai*, or the Pleiades.





# Precession Cont ...

(Continued from page 5)

The 45 degree angle of the southern shaft meant that Orion culminated (transited the meridian) in the southern sky at 45 degrees declination. Zeta Orionis, in fact, is the pivot on which the whole constellation of Orion moves up and down the meridian axis through the ages due to precession. But it also moves anticlockwise like the zodiacal constellations. This anticlockwise motion as we shall see also changes the position of the Milky Way, a crucial point.

Today Zeta Orionis transits the meridian at nearly its highest position of 58 degrees, 6 minutes. In 2 500 AD it will reach 58 degrees, 14 minutes and start going down the meridian pole. Half a precessional cycle earlier, 13 000 years in 10 500 BC, Zeta Orionis was at its lowest point in the sky of 9 degrees, 20 minutes. Orion was now ready to begin its precessional cycle upwards.

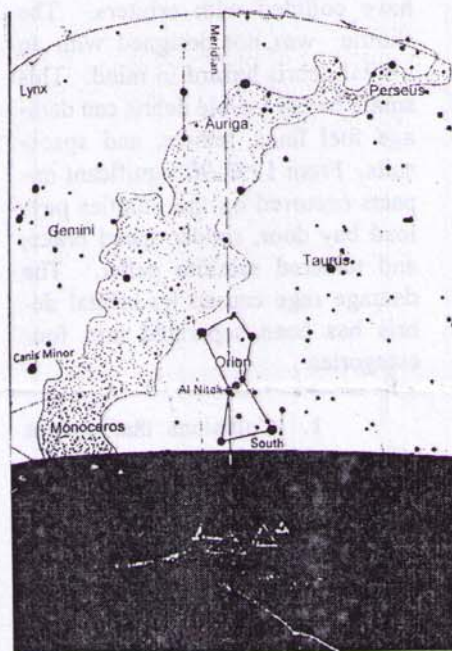
According to Bauval, in 10 500 BC the Milky Way with the three stars of Orion's belt on the west bank corresponded exactly to the position of the Nile River and the pyramids beside it, (see right). Indeed the mirror image of the celestial sky and terrestrial landscape is uncanny.

Further evidence for the greater antiquity of Ancient Egypt lies in the guardian of the Giza Plateau, the man/lion figure of the Sphinx. The convincing evidence of rain water erosion on the body of the Sphinx meant it must have been constructed in an epoch when it was much wetter in northern Africa. The rapid recession of the last ice cap may have been such a time.

More relevant to the topic at hand is

the fact that the constellation of Leo rose on the vernal equinox in 10 500 BC. The Sphinx facing due east would witness his celestial counterpart rising directly opposite him at this time. What would make the helical rising of Leo more dramatic at this time is that it is the only constellation with a -1 magnitude star, Regulus, sitting right on the ecliptic.

If someone watching a sunrise at the vernal equinox in 10 500 BC turned their gaze 90 degrees to the south sky they would see Orion transiting the meridian at its lowest point in the precessional cycle. Whereas there is a 2 160 year window for Leo to appear on the eastern horizon, there is only a 50 or so year period where Orion culminates at 9 degrees 20 minutes.



*The perfect match of sky-ground images is achieved in 10 500 BC when the pattern of the Milky Way and of the three stars of Orion's belt at meridian transit is precisely matched by the course of the Nile and the pattern of the three great Pyramids on the ground.*

Bauval likens this amazing synchronicity to that of a precision tooled machine with two giant sliding scales employing precession as their time/distance counters. When the scales mesh together a specific epoch can be called up.

Even if the world recedes into barbarism and all records and traces of civilization are stricken from history, as appears to have happened, the arcane knowledge cryptically encoded in the monuments of the Giza Plateau (we know that pi, phi and a 1:432 000 representation of the northern hemisphere are encoded in the external and internal dimensions of the Great Pyramid) can be transmitted intact to future generations, if they are receptive to the Egyptian's unique way of thinking.

The date of 10 500 BC, according to Bauval, was the First Time, or Tep Zipi, when the ground plan of the Memphis necropolis where most of the pyramids are located was laid. The actual pyramids were constructed about 2500 BC since the shafts point to objects in the sky at this time as has been said.

This is just some of the material that is coming to the fore concerning Ancient Egypt. Meso-American cultures, particularly the Mayans, were equally familiar with precession but that is another story.

Since professional astronomers who study only a small part of the sky usually probe the depths of deep space, they rely on amateur astronomers to scan the larger heavens for unusual occurrences. This was how the supernova in the Large



# Constellation of the Month: Leo

- Margaret Walton

**L**eo is the 5th constellation in the zodiac. In ancient times, Leo was in the sky during the summer solstice and was worshipped by the Egyptians, as the rising of the Nile coincided with the sun's entrance into Leo (due to precession, it no longer does). In Greek tradition, killing the man-eating lion of Nemea (Leo) was the first of the 12 labours of Hercules. The lion had a pelt that was impervious to stone or metal. Hercules strangled the lion with his bare hands and wore the pelt of the lion as armour.

Leo appears as a backward question mark outlining the head and mane of a westward facing lion. The rest of the lion is formed by a triangle of stars behind the head. Within Leo is the radiant point of the annual Leonid meteor shower, occurring around November 17 each year. This shower is the product of the comet Tempel-Tuttle and has spectacular displays every 33 years, coinciding with the passage of the comet. The next major display is expected in 1999.

## Stars

**Regulus** - A 1.4 magnitude blue white star, it is the 21st brightest star in the sky. It lies only 1/2 degree from the ecliptic and has a faint companion star.

**Denebola** - the name of this star mean's "lion's tail". Its magnitude is 2.1 and it appears white.

**Alrigiba** - This is a binary system consisting of two giant stars. It has a magnitude of 1.9 and appears orange-yellow.

**R. Leonis** - This is one of the brightest of the long period variable stars. Its magnitude varies from about 5 to 10 and has an average period of 312 days. It is a red giant.

## Objects To See In Leo

**M65** - This galaxy is part of Leo's Triplet, with M66 and NGC3628. It is a bright, very large, elongated galaxy of magnitude 9.3.

**M66** - This galaxy is also part of Leo's Triplet (see above). It is also bright, large and elongated, with a magnitude of 9.0.

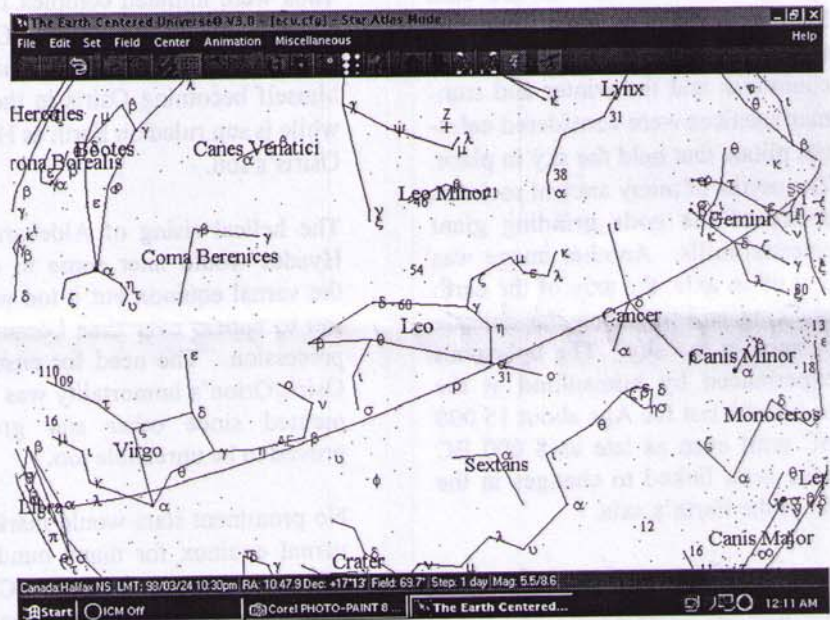
**M95** - This is a large, bright, round galaxy with a magnitude of 9.7

**M96** - Another bright, large elongated galaxy. This one has a mag-

tude of 9.2

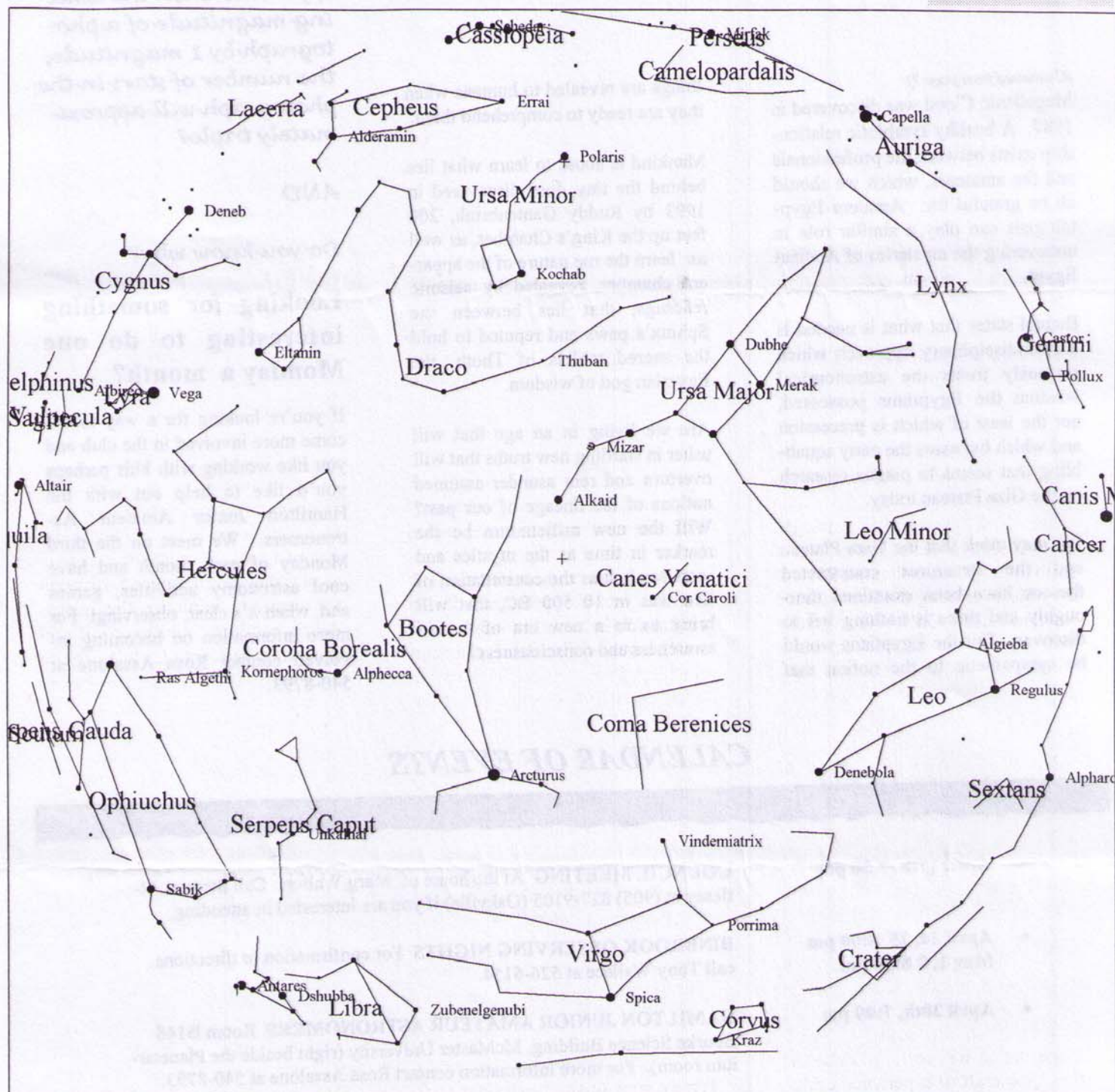
**M105** - This is a bright, large, round galaxy with a magnitude of 9.3. It is paired with galaxy NGC3384, a bright, large round galaxy with magnitude 10.0.

There are at least 74 more NGC galaxies listed in Sky Atlas 2000. This is a very rich constellation to explore.





# May Night Skies



ECU V3.0 (Star Atlas Mode) - May Night Skies

UTC: 1998/05/16 at 03:30  
LMT: 1998/05/15 at 10:30pm

RA=13h45.3m Dec=+43°06'  
Field=180.0° Azim=337°49' Alt=+90°00'



# Floating Misfortune

- Kevin Zwezdaryk

Since the historic launch of Sputnik in 1957 more than 4500 spacecraft have been sent into orbit. Unfortunately not everything that goes into orbit with these spacecraft, comes back. Satellites and various other "debris" could remain in orbit for hundreds to thousands of years. The Space Surveillance Network (SSN) catalogues orbiting objects and warns the Space Shuttle Program of potential dangers to missions. This network has cataloged over 10,000 objects larger than a softball! Yet an estimated 95% of the objects orbiting the Earth are too small to detect. Only objects greater than 10 cm can be tracked, but a particle 1mm in diameter can be potentially dangerous. Considering the speed at which objects orbit the Earth (an average of 22,000 mph), an object the size of a softball can shatter a satellite if the collision occurs at a highly sensitive point on the satellite.

The issue of space debris was brought up during the early years of the space age. Measurements concerning the natural meteoroid environment were made and it was determined that there was no major risk. In July 1982, the Soviet Salyut 7 space station was believed to be the first spacecraft to experience orbital debris. A meteoroid smaller than 1mm is suspected to have caused a 4 mm crater in one of the stations portholes, alarming the crew but not seriously damaging the spacecraft.

As the number of spacecraft increased, so did the orbital debris. Our own spacecraft have contributed to this already potentially dangerous situation. Artificial debris is now the greatest hazard on some missions. Old satellites, spent rocket stages, sensor covers and deployment mechanisms are examples of the various types of debris orbiting the Earth (O.K. some of you pessimists might include the MIR station in this category!) Under the extreme radiation and thermal conditions of space, spacecraft thermal blankets and solar cells come apart over time and paint peels off. Flecks of paint and small, very fine particles such as aluminum oxide caused by the firing of the upper fuel stages have collided with orbiters. The shuttle was not designed with an orbital debris hazard in mind. This small, barely visible debris can damage fuel lines, tethers, and space-suits. From 1995-96 significant impacts occurred on the Shuttles payload bay door, rudder speed brake, and tethered satellite pallet. The damage rage caused by orbital debris has been separated into four categories.

1. Collisions that do not affect a mission but increase mission refurbishment costs, such as the pitting of window surfaces. Such as aluminum oxide and flecks of paint, mentioned above.

2. Collisions that could force a crew to abort missions such as the penetration of a radiator pipe.

3. Collisions that would prevent the orbiter from successfully returning to Earth. A collision resulting in a large hole in the leading edge of a wing.

4. Finally, and a worst case situation, the loss of life or vehicle should the orbiter collide with a large fragment from the break-up of a spacecraft. These possible scenarios resulted in the forming on a Space Shuttle Meteoroid and Debris Damage Team in September 1995.

This team established Guidelines to minimize the probability of orbital debris impact and to minimize the time spent in sensitive altitudes. They deemed the removal of existing debris to be technically and financially infeasible so they then proposed preventive measures. The three main recommendations were to dissipate all leftover fuel or energy sources from a spacecraft to ensure they don't explode, redesign spacecraft to minimize the release debris, and to maneuver all old spacecraft back into Earth's orbit to burn up. These recommendations have begun to be implemented by Canada and the international space community. Yet some experts raise the question of too little too late. Estimates of the debris population suggest that a permanent space station could encounter a dangerous impact once every 200 years. A bus-sized spacecraft called the Long Duration Exposure Facility (LDEF) spent 5.7 years in a low-Earth orbit. When it was retrieved and examined, over 20,000 impacts were documented on LDEF. Is this another instance of mankind placing progress before the environment? Only money, research and of course time, will tell.

For further reading on space debris, the Johnson space center releases a quarterly newsletter. The Internet address is <http://sn-callisto.jsc.nasa.gov>



# Precession Cont ...

(Continued from page 7)

Magellanic Cloud was discovered in 1987. A healthy symbiotic relationship exists between the professionals and the amateurs, which we should all be grateful for. Amateur Egyptologists can play a similar role in uncovering the mysteries of Ancient Egypt.

Bauval states that what is needed is a multidisciplinary approach which seriously treats the astronomical wisdom the Egyptians possessed, not the least of which is precession and which bypasses the petty squabbling that seems to plague research on the Giza Plateau today.

We may think that the Giza Plateau and the structures constructed thereon have been examined thoroughly and there is nothing left to discover. But the Egyptians would be sympathetic to the notion that

things are revealed to humans when they are ready to comprehend them.

Mankind is about to learn what lies behind the tiny door discovered in 1993 by Ruddy Gantenbrink, 200 feet up the King's Chamber, as well as learn the true nature of the apparent chamber, revealed by seismic readings, that lies between the Sphinx's paws and reputed to hold the sacred tablets of Thoth, the Egyptian god of wisdom.

Are we living in an age that will usher in startling new truths that will overturn and rent asunder assumed notions of the lineage of our past? Will the new millennium be the marker in time as the mystics and seers say just as the constellation of Leo was in 10 500 BC, that will bring us to a new era of human awareness and consciousness?

*Did you know that ...*

*If you increase the limiting magnitude of a photograph by 1 magnitude, the number of stars in the photograph will approximately triple?*

AND

*Do you know why?*

**Looking for something interesting to do one Monday a month?**

If you're looking for a way to become more involved in the club and you like working with kids perhaps you'd like to help out with the Hamilton Junior Amateur Astronomers. We meet on the third Monday of each month and have cool astronomy activities, games and, when it's clear, observing! For more information on becoming involved contact Rosa Assalone at 540-8793.

## CALENDAR OF EVENTS

- April 17th, 7:30 pm

**COUNCIL MEETING** At the home of Marg Walton. Call Stewart Attlesley at (905) 827-9105 (Oakville) if you are interested in attending.

- April 24, 25 8:00 pm  
May 1, 2 8:00 pm

**BINBROOK OBSERVING NIGHTS** For confirmation or directions call Tony Wallace at 526-6154.

- April 20th, 7:00 pm

**HAMILTON JUNIOR AMATEUR ASTRONOMERS** Room B148 Bourke Science Building, McMaster University (right beside the Planetarium room). For more information contact Rosa Assalone at 540-8793.

- May 8th, 7:30 pm

**HAA GENERAL MEETING** At the Spectator Building Auditorium. Topic to be announced.