The ASTERISM

Volume XVII No. 4 **Happy Holidays!!** ***December 2005***

The Rise and Fall of Graduation

by Bonnie B. Witzgall

I always thought the word 'graduation' was a misnomer for such a tumultuous event. Nothing is gradual about graduating and commencing to another step along the road of life. The ceremony of graduating, especially from the AAI qualified observers course is brilliant and special. Yet, it's so opposite from the hostile world for which the class is trained.

AAI's graduation rewards the student's persistence for having completed and survived such an intense astronomy course. It is the time to display openly the smiling faces before the entire audience at the monthly membership meeting. It's also the occasion to honor those who taught the class. Those AAI members who have astro-expertise unselfishly shared their experiences and information each Tuesday with the eager pupils. The legacy of how to be an active amateur astronomer is important, especially after the bright lights of graduation are gone. All those who struggled to this point in time earn a personal place in the graduation ritual. The entire audience gives high praise and warmth toward the student and instructors' accomplishments.

Ah, but the next morning, the class's 'graduation high' slopes down sharply to rival the drop into Vales Marineris. No more public acknowledgement in the warm lights of graduation day! Now comes the cold nights in the ice-encrusted domes where you hide your frostbitten face behind inadequate shielding. Now starts the fight to protect the AAI equipment from overeager boy scouts and undisciplined sightseers. You are in constant conflict with the Earth's weather that pelts the astronomer with too much dew, wind and frost. Even the planet's G-forces relentlessly yank at the observer's equipment, constantly trying to entice your most expensive gadget to a spectacular crashing demise. No observer basks in the bright lights of graduation glory any more. Now it's strictly a red light district, with stopped-down aperture, light pollution filters and the weekly explanation to the public about the wickedness of city lights. Do any veteran AAI observers recall the year when Sperry Observatory was out of service due to lengthy electrical repairs and power failures? How about when a squadron of swarming yellow jackets invaded the observatory? Those insects postponed public visiting times and delayed the first night of the Q.O. class. The Qualified Observer's course does not teach combat against airborne aliens. Yet somehow, we endured and defeated the creatures' attack. We had to! It's AAI's job to overcome the elements and perform scientific research, which is taught in the Q.O. Class.

It's not easy to voluntarily step into a cold dark dome and carry out a weekly production to a curious public. Each year the teachers and students in the Q.O. program set the itinerary and despite downturns and hazards, carries on their heartfelt traditions. It's this annual passing of knowledge to the next generation and the accomplishments of AAI that warms the soul during a chilly observing run. It's this rise of the Human spirit that deserves all the glowing approval and the high gradient of Q.O. Graduation Night.

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Monthly Meeting

Friday, December 16th

at 8:00 PM

in the **Roy Smith Theater**

This month our speaker will be

Dr. Orsola DeMarco

American Museum of Natural History

whose topic will be

"Stellar Duets: How Companions Shape the Life and Evolution of Stars"

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Membership Dues

Regular Membership: $21
Sustaining Membership: $31
Sponsoring Membership: $46
Family Membership: $5

Sky & Telescope subscription: $32.95
Astronomy subscription: $34.00

First Time Application Fee: $3

Dues can be paid to the Club Treasurer or Membership Chairperson at the Observatory.

THEATER IN THE SKY

by Ron Ruemmler

January 2006 gives us a number of weird and wonderful astronomical events. Every nineteen months Venus passes between the earth and the sun in what is called inferior conjunction. The brilliant planet usually disappears from view for a few days at this time, but not this year. Venus has been far to the south of the path of the sun since last summer but now it swings so far to the north that it never totally disappears from observers in the northern hemisphere. In fact, on Friday, the Thirteenth, it may be possible to see Venus in both the morning and the evening!

Also on Friday, the Thirteenth, Jupiter passes less than a degree above Alpha Librae. Known as Zubenelgenubi (zoo-BEN-el-je-NEW-be), this star is a binocular double. Its fifth magnitude companion is a fifteenth of a degree to the upper right of the third magnitude primary star, and easy to spot with any optical aid. At the same time, Jupiter's bright moon, Callisto, is a tenth of a degree to the upper right of Jupiter. This is the first of three conjunctions between Jupiter and Zubenelgenubi this year. The last, and best, is more conveniently placed in the evening sky of September.

Mars is almost directly overhead just after dark, but it is rapidly fading. This month will be the last chance to see Mars and Venus at the same time until August 2007!

Saturn is visible all night and spends the whole month just above Delta Cancri, one of the dim stars in Cancer, the Crab. Its common name, Asellus Australis, means the Southern Donkey. Apparently, the nearby Beehive star cluster can also represent a pile of hay!

Mercury might be glimpsed in the morning as the month begins but it quickly passes behind the Sun. Ω

JANUARY SKY CALENDAR

1	SUN	4:30 PM	Thin crescent Venus directly right of thin crescent Moon before sunset
1	SUN	5:30 PM	Venus to right and slightly below crescent Moon
4	WED	7:31 AM	Latest sunrise of the year
4	WED	11:00 AM	Earth at perihelion; closest to the Sun (91,405,953 miles)
6	FRI	1:56 PM	First Quarter Moon
8	SUN	6:00 PM	Mars upper right of gibbous Moon
9	MON	5:00 PM	Last easy evening Venus directly above setting Sun
13	FRI	6:00 AM	Jupiter upper left of Zubenelgenubi
13	FRI	7:15 AM	Venus 5.5 degrees upper left of rising Sun
13	FRI	4:55 PM	Venus 5.5 degrees upper right of setting Sun
13	FRI	7:00 PM	Venus at inferior conjunction; moving into the morning sky
14	SAT	4:47 AM	Full Moon
14	SAT	6:30 PM	Saturn directly below Full Moon
16	MON	7:00 AM	First easy morning Venus directly above rising Sun
22	SUN	10:14 AM	Last Quarter Moon
23	MON	6:00 AM	Jupiter upper left of fat crescent Moon
25	WED	7:15 AM	Crescent Moon just below Antares: occultation visible from Galapagos
26	THU	6:15 AM	Venus far to left and slightly below crescent Moon
26	THU	7:15 AM	Thin crescent Venus far to left of thin crescent Moon after sunrise
26	THU	4:00 PM	Mercury at superior conjunction; moving into the evening sky
27	FRI	5:00 PM	Saturn at opposition from the sun; visible all night
29	SUN	9:15 AM	New Moon; just 17.6 hours before...
30	MON	3:00 AM	Moon closest to the Earth (perigee); expect extreme tides
30	MON	5:03 PM	Sunset; start of Muslim year 1427 A.H.

Stewart's Skybox

by Stewart Meyers

It was the best of times, it was the worst of times. That's how *A Tale of Two Cities* by Charles Dickens begins. However, this isn't a tale of two cities, but a tale of two ice moons, their differences and their mysterious similarity. Since December is a cold month, this topic would be very appropriate.

The two ice moons in question are Jupiter's Europa and Saturn's Enceladus. Let's begin with the one that was discovered first.

Europa

Europa was discovered, as were the three other large moons of Jupiter by Galileo in 1610. These satellites would be cited by Galileo as evidence in support of the then-new Copernican model of the solar system.

Up until about the late 19th century, Europa and the other Galilean moons of Jupiter appeared only as little dots in telescopes, which prevented anyone from learning the nature of their surfaces. Later, telescopes were far better and the Galilean moons appeared as round dots with only very indistinct shading visible in the best of instruments under excellent seeing.

Eventually, people speculated on what Europa and the other Galilean moons were like. The consensus, even well into the 20th century, was that they were heavily cratered bodies like our Moon with some ice mixed in.

In the late 20th century, it became possible to use spacecraft to study planets and their moons. The first probes to visit Jupiter were Pioneer 10 and Pioneer 11. However, the probes were mainly designed to study Jupiter itself and little was done in terms of the planet's satellites. That job fell to a later probe.

Now Voyager

In March of 1979, Voyager 1 reached Jupiter and was followed by Voyager 2 that July. The Voyagers were far more capable than the Pioneers and made many discoveries, especially concerning the Galilean moons. Each moon was different from the others. Callisto has a heavily cratered surface of dirty ice. Ganymede has patches of dark, cratered material and areas of lighter color. Then there was Io. It was devoid of craters and the reason soon became apparent. Linda Morabito, a scientist at the Jet Propulsion Lab (JPL) at the time noticed something odd in an image of Io. Upon analysis, it was a volcanic eruption. It was soon learned that Io is subject to tides caused by Jupiter. These are so strong that Io is flexed repeatedly. This creates huge amounts of heat and that drives the volcanoes.

When Europa was studied, it was seen to be the smoothest object in the solar system and also covered with a large number of cracks. At first, scientists were at a loss. But, with the lesson of Io, it was realized that Europa would also be subject to tides from Jupiter, though to a lesser degree. These would be sufficient to heat the interior enough that a deep layer of liquid water or very slushy ice would be created which would somehow erupt onto the surface from time to time and smooth things out.

This discovery drew the interest of Sir Arthur C. Clarke, who was at work on his novel *2010*. He realized that if there was a layer of liquid water on Europa, it could have life. So, Clarke had Europa and its underground ocean figure prominently in the story.

Scientists also grasped the implications and Europa was the subject of much scrutiny by the later Galileo probe. Based on the way Jupiter's magnetic field interacted with Europa, the subsurface layer is most likely a briny, acidic solution. Galileo's infrared instruments, while not finding any evidence of hot spots, did show that the coloring of some of the surface ice was due salts or sulfur compounds, evidently left when the erupted solution evaporated.

Enceladus

The second ice moon in our story is Enceladus, which orbits Saturn and was discovered by Sir William Herschel in 1789. Unlike Europa which is 3120 km (1934 miles) in diameter, Enceladus is only 504 km (312 miles) across.

Since it is not large and yet appears reasonably bright, scientists reasoned that ice was a major constituent of the satellite. The general opinion was that Enceladus was a heavily cratered ball of ice.

This view changed when Voyagers 1 and 2 passed through the Saturnian system. While most of the planet's moons were indeed icy and heavily cratered, Enceladus was different. Most of the satellite was moderately cratered, but a significant fraction looked very smooth, almost as if it was melted. Since Enceladus did not seem to have an internal heat source, it was puzzling.

Remembering Europa, it was proposed that Enceladus was subjected to strong tidal forces in the past when its orbit was different from today and that the smooth area is a relic from that time. But that picture was soon to be found wanting.

Cassini: The Probe, Not The Man

In 1997, NASA and the ESA launched the Cassini probe, named after 17th-century Italian-French astronomer Jean Dominique Cassini (the discoverer of a major division in the Saturnian ring system), to Saturn. This probe was an orbiter and its mission was to study Saturn and its moons. While Titan has been the star of the satellite show, Cassini made some amazing discoveries about Enceladus.

When flying past Enceladus, the infrared instruments on Cassini detected a warm spot in the south polar area. Further study revealed that this coincided with linear features known as ''tiger stripes'' discovered in high resolution visible light images. But it gets even stranger.

During a very close flyby, Cassini detected water vapor and some carbon compounds in space near Enceladus. This was strong evidence that the satellite was still active. Then, they found the smoking gun. On November 28th, Cassini took images of Enceladus as it was backlit. Clearly visible in the images are plumes of water vapor erupting from the satellite.

Now the mystery is what process heats the interior of Enceladus. Since it is small, it lacks radioactive elements

like those that heat the Earth's interior. And it is thought that the tidal effects of Saturn are too weak to heat it to the extent required. Also, the activity is confined to the south polar area. Is this area the last gasp of once greater activity or is it the result of an unknown but localized phenomenon? Time will tell. Ω

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The ASTERISM can be reached at editor@asterism.org

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Dome Duty Schedule

Dec. 16	**Team A**
Dec. 23	**Team B**
Dec. 30	**Team C**
Jan. 6	**Team D**
Jan. 13	**Team E**
Jan. 20	**Team A**
Jan. 27	**Team B**

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Sperry Observations

The eighth edition of the AAI Journal, ***Sperry Observations****, is now available at the Observatory! The price for AAI Members is only $10!!!*

Articles include:

** The Evolution of Meteor Science -- Mike Luciuk*

** Going Beyond 19th Magnitude! -- Hank Adams*

** Cadwallader Colden: The Man Who Attempted to Do What Newton Wouldn't - Gordon Bond*

** On The Force of Gravitation -- William G. Poelstra*

** Determining the Position of a Body Orbiting The Sun From Orbital Elements -- Dr. Lewis C. Thomas*

** Hunting For Asteroids -- Hank Adams*

** Antigravity Matters -- George Chaplenko*

** The Chaplenko Problem -- William G. Poelstra*

** The Skies of Discovery, Part II -- Alan P. Witzgall*

** Binoculars in Astronomy -- George Helmke*