The ASTERISM

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Old Astrophotographers Never Die... They Just Redevelop

by Bonnie B. Witzgall

Stop the Presses! Breaking News! ''Deep Sky Astrophotography Revival at Sperry Observatory!'' Thanks to the latest technology and dedication by the AAI Qualified Observer, Technical and Research Committees, photographic astronomy has returned with meticulous results!

To get detailed photos of deep sky objects from Cranford today is an earth-shattering headline. Yet thirty years ago, it was common practice. To visually follow and photograph the planets through the 10'' Refractor or 24'' Reflector was a nightly ritual. Even twenty-five years ago, high-quality black and white photography easily captured fuzzy images of nebulas and star clusters using the instruments at Sperry Observatory. These photos were normally taken during the week after the Union Junior College professor finished his daytime and evening astronomy classes at the observatory. Only Qualified Observers of AAI with years of experience and those having a 'member in good standing' status were allowed to enter the observatory 'after hours.' They were not only trained in operating the club's scopes, but also taught how to process the raw photos in the AAI darkroom.

Then the World changed. Strong-arm AAI politics inhibited those who were allowed to touch the club's equipment. The College placed limitations on handling the caustic and lawsuit creating chemicals in the observatory's dark room. Through the passing decades, Cranford and neighboring local towns developed a booming population growth. Businesses, housing and road construction transformed the little towns into small cities with a great expansion of unshielded light pollution. Club members who longed for a deeper sky moved away from the Union County area. AAI'ers who remained local had to satisfy their astronomical fix by showing the Moon or bright planets to the curious public on Friday evenings. The usual cloudy Friday nights and permanent lights affixed in the college's 'temporary' parking lot dampened many astronomical spirits. Detailed astrophotography done once at Sperry was reduced to folktale status. During the ensuing years, younger members were entertained with legends of fixers and enlargers as narrated by older Life Members, recalling those stop bath and snapshot days of yore.

Lately, though there is a technological tremor in the force. Because most AAI members embrace new tools while retaining their persistence and love for the sky, astrophotography is once again alive and progressing at Sperry Observatory. About a year ago, the obsolete 'chemical laden' darkroom at Sperry Observatory was gutted by Union College and converted into a LAN room. The College also set up Wi-Fi capability in the Observatory and installed thirty modem outlets for voice and data connections at Sperry. The College's astronomy professor Ivan Strom was instrumental in bringing laptops and Wi-Fi into the observatory. He continues working with AAI and Union College to get a large monitor at Sperry for PowerPoint presentations.

On September 27, 2005, Research Committee Chair Ed Carlos produced a detailed B&W image of the Ring Nebula during a rare clear Friday night. Using AAI's new ST-8 CCD camera mounted on the 24'' reflector, he captured this 10 seconds x 120 frames image of M 57. With the Digistacks program on his laptop, Ed did the 'darkroom processing' electronically and then uploaded the image to the AAI website for public presentation. Using a CCD camera and digital processing, veteran photographer Hank Adams imaged 2003 UB313, Sol System's tenth planet. He took this image through the lighted polluted West Orange, NJ but Hank swears the same thing can easily be done at Sperry using the club's reflector and club-owned camera. New Qualified Observers Kim Schoenholtz and Elvira Pratsch took their first small steps into the world of astrophotography. Kim obtained superb images of the Moon at Sperry with his digital Nikon SLR camera held by hand to the 24'' eyepiece while Elvira directed the electronic imagery. Clif Ashcraft, Qualified Observer #6, returned to active duty at Sperry with fabulous digital images of Mars. He is also relieved to see the shadowy AAI politics of long ago has lost its image and disappeared like a faded negative.

Mike Luciuk, Steve Clark and Al Witzgall, all old dark room disciples also upgraded their photographic gear and consequently recharged their pursuits in astrophotography. The interest is so great, Al is conducting an astrophoto seminar at Sperry with members lecturing on CCD cameras, digitalized photos, web cam capture and electronic image processing. For all the traditionalists, Al also spoke about film cameras techniques. It's good to see the 'old' AAI instruments being used again by the old hand and novice photographers. It restores one's faith in the new technology and it's adaptation by tenacious astronomers. It's a positive picture. Ω

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Monthly Meeting

Friday, November 18th at 8:00 PM

in the **Roy Smith Theater**

This month our speaker will be

Christopher Ray

Telescope Restorer and Member,

Antique Telescope Society

whose topic will be

"Antique Telescopes: Restoration and Repair"

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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 (note the change!)***

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

December 2005 finds Venus at its highest and brightest as an evening object. Venus does this every 1.6 years in what is called its synodic period. Since Venus repeats itself almost exactly every eight years, we get to see five synodic periods with five different patterns. This one is the worst for observers in the northern hemisphere.

Venus is recovering from last month's record-breaking southern declination (latitude), so it doesn't get a chance to get very high above the western horizon. Still, the "Evening Star" attains its maximum possible brightness and can actually cast shadows from a totally dark location.

In a telescope, or even good binoculars, Venus is a dramatic crescent shape all month. The planet is 33 percent illuminated as December begins and falls to only 7 percent illuminated on New Year's Eve. The magnificent brightness follows from its increasing diameter as it begins to pass between us and the sun.

Venus can also be glimpsed before sunset if the crescent moon is nearby to help locate it. Try this on the afternoon of the 4th. The planet should be to the upper right of the moon at about five times the distance between the cusps of the crescent. Binoculars help.

Venus is not alone in the evening sky. Although Mars is not as bright as it was around Halloween, it is impressively high in the south just after sunset. By the end of the first week, Mars is no longer brighter than Sirius, but it is still much brighter than any other star all month.

Saturn and Sirius rise together around 8:30 PM. On the evening of the 19th telescope users can see Saturn pass very close to the star SAO 98190. The star is both brighter and closer to the planet than Titan, Saturn's major satellite.

Jupiter is now a prominent morning object rising about three hours before the sun. Mercury is also a morning "star," but an unusually good one. Around the 12th, Mercury is not only at its maximum brightness but also rises about 105 minutes before the sun. This is about the maximum interval possible and is well before the beginning of morning twilight!

New Moon occurs twice this month. An entire lunation (number 1026 to be precise) is contained in a single month! Ω

DECEMBER SKY CALENDAR

1	THU	9:59 AM	New Moon (first time this month)
4	SUN	2:00 PM	Venus upper right of crescent Moon
7	WED	4:39 PM	Earliest sunset of the year
8	THU	4:36 AM	First Quarter Moon
11	SUN	11:00 PM	Mars just below almost-full Moon; occultation visible from Siberia
12	MON	6:00 AM	Mercury at maximum morning elongation from the Sun
12	MON	6:00 PM	Venus brightest possible (-4.7 magnitude)
15	THU	11:14 AM	Full Moon
15	THU	9:00 PM	Pluto passes beyond the Sun into morning sky
20	TUE	6:00 PM	Venus and Mars 98 degrees apart (minimum)
21	WED	1:36 PM	Winter solstice; shortest day
23	FRI	2:37 PM	Last Quarter Moon
25	SUN	6:00 AM	Spica lower left of fat crescent Moon
25	SUN	2:00 PM	Lunar occultation of Spica visible from western Canada
26	MON	6:00 AM	Jupiter left of crescent Moon
27	TUE	6:00 AM	Jupiter upper right of crescent Moon
30	FRI	10:11 PM	New Moon (second time this month)

Stewart's Skybox

by Stewart Meyers

In last month's column, I ranted about how the mainstream media sleeps on the job when it comes to space news. However, they sometimes go to the other extreme and get all worked up over something that turns out to be a non-issue. This column, I will discuss the most recent of such incidents and explain why it wasn't worth all the hype.

Late July, there was a post on the AAI Soapbox discussion group that gave a link to a newspaper article about a possible close approach by an asteroid in 2029 and possibly an even closer approach or impact in 2036. Over the next day or so, other media outlets picked up on this and seemed rather concerned. Even former astronaut Rusty Schweickart (Apollo 9) said that NASA should launch a mission to put a tracking device on the asteroid as well as come up with a deflection strategy in a hurry.

Despite all the hoopla, I wasn't too concerned. And after reading this article, you will understand why.

The Beginning

Let's begin when this whole flap got started in the first place. Back in June of 2004, a team of astronomers at Kitt Peak Observatory discovered an asteroid and observed it over two nights, then lost it. It was recovered in mid-December by Gordon Garradd at Siding Spring Observatory in Australia, who found that it fit the pattern for a Near Earth Object (NEO). It was soon designated 2004 MN4 and a preliminary orbit was worked out. According to this, 2004 MN4 would zip past the Earth in 2029 at a distance of 34,676 kilometers (21,499 miles). This caused some stir initially, but as was the case with other NEOs, it was thought that once the orbit was better refined (by finding the asteroid on older images), this threat would vanish.

Not this time. Even with the older images, the close approach was confirmed. It did appear that the asteroid would make a very close pass.

One side effect of the research was that the orbit was refined well enough that it could be named and it became known as 99924 Apophis. Egyptian mythology buffs recognize Apophis as the Egyptian god of evil, but the public probably recognizes the name as that of the Goa'uld System Lord who succeeded Ra in the *Stargate SG-1* universe and threatened Earth on a few episodes (interestingly enough, there was an episode where the Goa'uld tried to use an asteroid as a weapon against Earth). Actually, this is not as big a coincidence or *Stargate* tribute as it might appear. Apophis is classed as an Aten asteroid (in addition to composition, asteroids can also be classified by their orbital characteristics) and asteroids of this class are named after Egyptian deities. The writers for *Stargate SG-1* also drew on the same source for naming some of the Goa'uld characters.

Popular Orbital Mechanics

The reason some scientists got worked up over Apophis concerns what could happen during the 2029 close approach. The exact distance from Earth of this event is unknown. According to Brian Marsden, if the approach falls within certain, narrowly defined distances from Earth (called gravitational keyholes) at a certain time, Earth's gravity will alter Apophis' orbit and turn the close approach in 2036 into a possible impact. These points are extremely narrow, on the order of 2,000 feet or so, hence the interest in precise tracking. That is why former astronaut Rusty Schweickart proposed landing a radio beacon on Apophis so it can be tracked precisely throughout its orbit. If combined with a mission to study Apophis in general, it would also offer a way to advance asteroid science.

Threat Assessment

While the orbital parameters of Apophis have gotten lots of attention, the real indicator as to how seriously it could threaten the Earth is its size and composition. The size of Apophis is thought to be about 300 to 400 meters (roughly 1,000 to 1,300 feet). But little work has been done in trying to figure out its composition – something that greatly affects its threat and how (or if) it can be countered.

Here is a quick, probably oversimplified, lesson on the makeup of asteroids. Asteroids come in several different types (most of these were determined by studying the asteroid chips that have fallen to Earth which we call meteorites). Here is a listing:

1. Nickel-iron: Composed of metals such as nickel and iron, naturally. In fact, it is easiest to describe them as chunks of steel (the nickel-iron mix is similar to the steel used to make battleship armor). As expected, these are rather dense and quite solid. The Willamette meteorite that is at the Rose Center for Earth and Space is one example.
2. Stony-iron. These are made up of mixtures of rock and metals. These are still fairly dense and solid. Pallasite meteorites are from this class of asteroid.
3. Stony: These, naturally, are mostly rock and just as solid. Meteorites of this type are quite common.
4. Carbonaceous: Thought to be leftover material from the beginning of the solar system and are composed of some rock, carbon compounds, and some hydrated (water bearing) materials. The meteorites from the famous Allende fall in Mexico are prime examples of this type.

Recently, there have been some new aspects to this situation. Based on radar studies as well as work done on the evolution of comets, it appears some asteroids are what are called ''rubble piles''. These are asteroids that consist of a few very small asteroids and debris stuck together by their own feeble gravity. Also, some asteroids may actually be the crusted over nuclei of comets as described in my September column. How does this affect the threat this NEO (or any other) might pose? Read on.

A Good Defense

In the previous paragraphs, it was explained why some scientists are very concerned about asteroid 99924 Apophis and that all we know for certain about it is that it will make an extremely close approach to Earth in 2029 with an unknown chance of an Earth impact in 2036. But how much of a threat does Apophis pose and can we do something about it? If Apophis was the fictional character of the same name from *Stargate SG-1*, Jack O'Neill or Samantha Carter would save the day by coming up with an idea at the last possible moment.

But this Apophis is not a fictional alien, but rather a real asteroid. Fortunately, things are not necessarily as bad as the pundits are claiming. Of the types of asteroids I have mentioned earlier, NEOs (including Apophis) are most likely either rubble piles or crusted over comet nuclei as opposed to the more solid types. This narrows down both the threat and possible defenses.

What kind of defenses would we have against NEOs? Over the years, there have been several ideas put forth:

1. Nuclear weapons. A popular idea amongst politicians, screenwriters, and other ignorant people, but it won't work in reality. As we saw last July, the crust of a comet nucleus can absorb huge explosions and impacts, as it is an excellent shock absorber. Rubble-pile asteroids can also absorb major shocks. So while a nuclear blast can be very

dramatic, it won't have much real effect.

2. Rockets. This involves attaching a rocket and fuel tank to a threatening NEO and pushing it into a safer orbit. While it might work with nickel-iron, stony iron, and stony asteroids, it will not work with rubble-piles and dead comet nuclei. The reason is that those objects are very weakly held together. Firing a rocket attached to one of these to try to move it will likely stress the object and cause it to break into several pieces, most of which will still be in the original orbit.
3. Ion engines. Similar to the rocket proposal, but using an ion engine. The very low thrust (comparable to the weight of a sheet of paper on Earth) would not shatter the NEO. And since an ion engine can run for long periods continuously (as we have seen with the ion-powered Deep Space 1 and Smart-1 missions), that thrust can add up to a real change in velocity. About the only downside is that there has to be lots of advance warning.

Of all the strategies currently proposed, the ion engine is the best bet.

But, it is doubtful that these steps will be needed for Apophis. First of all, it is very unlikely that Apophis will pass through a gravitational keyhole. And even if it does, it will find that Earth has some potent, though imperfect, defenses of its own.

First, there's Earth's gravity. Since the strength of gravity is affected by distance, one side of an object will experience a stronger pull than the opposite side. The ocean responding to this difference in the strength of the Moon's gravity pull over the diameter of the Earth is what causes the tides. Now imagine the effect Earth's gravity would have on a rubble pile asteroid or comet nucleus. Since these objects are only held together by the feeble collective gravity of their constituent parts, the difference in Earth's pull between one side of the object and the other can be sufficient to shatter it. Many of us can remember the fragments of Comet Shoemaker-Levy 9 hitting Jupiter back in 1994. The reason there were so many chunks is that the comet was torn apart by the tidal effects I mentioned earlier.

Some astronomers have questioned whether Earth's gravity is strong enough to rip apart rubble piles and small comet nuclei. The answer is yes, and it was dramatically demonstrated back in 1913.

On the night of February 13th that year, observers in Canada saw a straight line of fireballs travel across the sky, as if in formation. Fortunately, this was seen by a number of astronomers, including Charles A. Chant of the University of Toronto. In honor of his detailed reports, this strange event became known as ''Chant's procession''. Astronomers were baffled and, years later, UFO buffs would cite this as evidence of alien visits. But, after Comet Shoemaker-Levy 9, it can be easily explained. The Earth's gravity ripped a rubble pile asteroid apart and the debris entered the atmosphere.

Then there is the atmosphere. When objects enter the atmosphere from space, they are subject to intense heat and stress. And these forces can be quite powerful as proven by the destruction of the Space Shuttle Columbia. While the atmosphere is not a perfect shield (meteorites and impact craters are proof of that), it is surprisingly effective. In fact, military satellites detect about one explosion a month in the upper atmosphere that is due to pieces of cosmic debris about 10 to 50 meters (30 to 150 feet) exploding at altitudes of about 65 to 80 kilometers (40 to 50 miles) with yields measured in kilotons (the atomic bomb dropped on Hiroshima had a yield of about 14 kilotons).

A more solid asteroid explodes at a much lower altitude. The Tunguska explosion of 1908 was the result of a 100 meter (330 foot) stony asteroid exploding at a height of six kilometers (3 miles) with a force of about 10 megatons. But most NEOs are nowhere near this substantial.

In the Year 2036

The most likely event will be for Apophis to miss the gravitational keyholes in 2029, which means that there will only be a close approach in 2036.

If Apophis does manage to get into an impact trajectory, it is quite likely that Earth's gravity will break it into a number of much smaller fragments which will meet explosive ends in the Earth's upper atmosphere without doing any damage to the ground. Perhaps a few meteorites might even reach the ground, but nothing to worry about.

The Best Defense

In the future, it is quite possible that NEOs will no longer pose a threat. Someday, humanity might have a true permanent presence in space. When that happens, asteroid mining will be needed to provide the resources. And once we start doing that, the NEOs will be the first targets for such exploitation, thereby ending their menace. Ω

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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*

Dome Duty Schedule

Nov. 18	**Team B**
Nov. 25	**Team C**
Dec. 2	**Team D**
Dec. 9	**Team E**
Dec. 16	**Team A**
Dec. 23	**Team B**
Dec. 30	**Team C**

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