



President's Message

Summer for me always means trips to Maine to our family's lakeside camp and a season of binocular astronomy. Because our sky there is limited to a southern view this is a nice break for me to do purely visual astronomy. We have a deck at the water's edge where I'll grab a comfortable chair and my binoculars and scan the rich areas of Ophiuchus, Scorpius, Sagittarius and Aquila for many hours. I have even done mini Messier Marathons with binoculars there, counting about 35 or so M's on one very clear, dark and transparent night. So keep those binoculars handy for a quick peek or a full evening, but get out there and observe!

∞ Gardner Gerry
NHAS President 2007

Highlights for this Month

Voting continues on the proposed amendment to the NHAS By-laws!

Astro 101 continued with a seminar on Polar Alignment.

Exterior cleaning and painting of the Observatory and Warming Hut at YFOS was completed, and the Mosquito Magnet is back in place.

∞ Paul Winalski
NHAS Secretary 2007

No Decision Yet on Amendment to NHAS By-Laws

We've heard from about half of the NHAS membership, but we have yet to reach a decision on the By-laws amendment. If you have voted already, thank you! If not, **we need to hear from you**. Please make your opinion known on this important issue.

At the March NHAS business meeting it was moved and seconded that the following two changes be made to the

NHAS Bylaws (copies available on the NHAS Website or by request from the club Secretary):

(1) From section II.A.3 (duties of the Treasurer), strike paragraph (d), which reads:

d. sign, laminate, and distribute all membership cards;

(2) From section II.A.4. (duties of the Secretary), strike paragraph (c), which reads:

c. be responsible for the production of membership cards, valid for one year and to be provided for each shareholder at the January meeting

The rationale for the motion was that laminated membership cards no longer seem to be necessary, and their production represents an unnecessary burden on the officers involved, as well as an extra expense for the Club.

This motion is now being put forward to a vote.

A **YES** vote means that you are **in favor** of amending the Club By-laws as described above.

A **NO** vote means that you **oppose** amending the Club By-laws as described above.

To pass, a simple majority (greater than 50%) of the entire NHAS membership must vote YES.

There are three ways that you may register your vote:

1) By electronic mail: Send an email message containing your vote (YES or NO) to: prune@Ankh-Morpork.mv.com. Be sure that your real name (NOT just an Internet alias) appears somewhere in the message so that we are sure we know who you are.

2) In person: Give a signed statement indicating your name and your vote (YES or NO) to one of the NHAS officers or Board members, who will forward it to the Secretary for counting.

3) By US Mail: Mail a signed statement indicating your name and your vote (YES or NO) to this address:

**New Hampshire Astronomical Society
P.O. Box 5823
Manchester, NH 03108-5823**

The Secretary will keep all votes in the strictest confidence. If you wish your vote to be kept secret from the Secretary, you must deliver your vote in person or by US Mail. Write your YES or NO vote on a piece of paper and seal it in an unmarked envelope. Enclose that envelope in an envelope on which your name appears, then mail that to the US Mail address given above, or hand-deliver it to a Club Officer or Board Member.

Voting of course is open only to current NHAS members. We need to hear from the majority of the Club to decide this issue. Please let your vote be known!

∞ Paul Winalski

Membership Report and Astro 101

During the last month we welcomed three new members to NHAS. **Mike Dangelo** of Northfield, **Mike Hobbs** of Nashua and **Richard Barbalato** from Chatham NJ (eventually moving to NH) Please welcome them when you see them at club events.

NHAS Membership includes many talented, and knowledgeable people that are expert in the areas they choose to specialize in. Astro 101 and 201 are generously offered by our presenters to share that knowledge with other members.

Astro 101 Courses Scheduled

- July 13, Polar Alignment, YFOS, 7:30PM, Presented by **Chase McNiss**
- August, None

- Sept, Lunar Observation, Sept 21 9:00PM St Anslem and Sept 22 7:30PM, presented by Chase McNiss

Astro 101 courses to be scheduled;

- Sept, Cleaning Optics, TBD, presented by **Paul Winalski**
- October, Solar Observation, TBD, presented by **Rich DeMidio**
- November, Deep Sky Observation, TBD, Presented by Paul Winalski
- Also, Collimation, TBD, presented by **John Bishop**

Astro 201 (for the members ready for more....)

Our first course is scheduled, the topic is Photometry, presented by **John Blackwell** at Exeter Academy on Friday November 2 at 7:00PM. This will involve math, limit 14 people, registration is required by email to acshirey@comcast.net. Course Description: Using computers and images provided, attendees will learn about modern photometry, the measurement of the brightness of things in space. This applies to stars, variable stars, rotating asteroids, comets, and more. The construction of a color magnitude diagram will also be explored, which will then be used to calculate the distance to clusters. Software and hardware will be discussed in some detail.

I'm working on more 201 topics but have not yet arranged schedule or venue.

If you have a specialized topic that you'd be able to present please contact me at acshirey@comcast.net, or at the next club meeting, and we can work out the details.

∞ Alan Shirey

Sidewalk Astronomy at Hampton Beach

After a couple previous misfires, I hosted my first successful Sidewalk Astronomy (SA) event.

Specifics are as follows:

Location: Hampton Beach

Date: Saturday, June 23, 2007

Time: 8 PM to 12AM

Astronomers: **Matt & Will Amar**

Guests: 105 signed my guest book, actual number probably a bit higher

Telescope: 8" Orion SVP

Objects Shown: Moon, Jupiter, Saturn, Albiero, M13

Tonight's SA event was half-planned and half on a whim. I've wanted to try this type of watch for a while now and thought Hampton had some real potential as a site. I decided late in the day to go since there were finally some clear skies on a weekend and with the Moon being in 1st Quarter phase and three planets visible at sundown, I knew I had some crowd pleasing objects regardless of what light pollution problems I might encounter. I decided not to post a chat list notice about my plans since I wasn't sure just how easy it would be to set up and I did not do any real pre-planning. Portability for this location is a must. I was very glad I brought my hand truck as there was a bit of a walk from where I parked but was able to make it in one trip.

Originally I was planning on setting up on the walkway next to the beach but decided once I got there that there would probably be a high likelihood of being bothered by "the man" so I set up on the beach. Without a doubt, the next time I head out to this location it would be great to get another member or two to join in.

Hands down Jupiter and the Moon were the most viewed and appreciated by all. Saturn wowed the few who had the opportunity to view it but it unfortunately was out of view by about 9:30 from my location on the beach, coupled with the fact that when I trained my scope on Saturn a brief fireworks display was set off which distracted most but not all from "the real" show although I must confess I did sacrifice my own night vision to watch a BOOM or two. Albiero and M13 were viewed by the guests who would hang around a little and ask, "what else can you see?" at which I would say, "Have you ever seen a double star? Well just give me a moment..." but that also depended on how many folks were in line to look at one of the show-stoppers.

The spontaneous interest that people have in astronomy never ceases to amaze and "juice" me. SA actually adds to the spontaneity, as people aren't expecting you to be there. Last night, I set up just off the sidewalk on the beach next to an access stair. People strolling

by couldn't help but see me. Those who glanced our way were usually greeted with "Come and see the Moon. Have you ever seen Jupiter in a telescope? Well come here then!" SA is a perfect compliment to our already established outreach programs and I encourage all members to give it a try. I guarantee that if you enjoy the Public Skywatches you'll get hooked with SA too.

NHAS now has two successful SA locations, North Conway and Hampton Beach. Let's see if we can't add to that list. It'll take a little effort by a few folks but I think the returns will be well worth it. If you think a particular location would yield some good results either check it out or maybe suggest it in the NHAS website forum and perhaps someone else would be willing to do a little legwork and set up a scope.

One thing is for certain though; this will not be my last SA event.

∞ Matt Amar

YFOS Report

Thatching: everything went fine. No grass was injured during this thatching. Well, at least not much.

I REALLY NEED everyone who goes to YFOS to check the Mosquito Magnet and tell me promptly if it is working or not working. If the light is green it is working.

∞ Larry Lopez

Astro Photons

There has not been a meeting of the AP committee lately, so if there is demand for one (e-mail **Gardner Gerry** at astrophoto.2007@nhastro.com) we will put one on the schedule. The usual suspects and a few new ones continue to show new work in the forums on the club's website. Please go check out the Pictures forum to see what's happening.

∞ Gardner Gerry

Radio Astronomy

How about detecting a Pulsar?

Something that is intriguing is a radio source that pulses on and off at a miraculously constant rate. They were discovered in the 1960s and were first thought to be evidence of alien intelligence. They have since been

shown to be natural phenomena, a spinning neutron star.

Detecting one ourselves would be one of the harder things to accomplish in radio astronomy as the signals are weak and therefore antennas need to be sizeable. The professionals use large dishes.

Here is a summary of how pulsars work.

The stars magnetic field is generated in a way conceptually similar to Earth's—internal flowing charged plasma material creates the field. It is however a trillion times stronger than Earth's. And like Earth the magnetic pole is not aliened directly with the spin axis. This field arrangement forms a beam of electromagnetic energy that sweeps a circular pattern in space. Whoever resides in this circle sees that beam pass as a flash with every rotation of the star.

A neutron star is small in diameter (~15km) and because of the large energies involved in its formation in a supernova it can be set spinning very rapidly. Most pulsars have periods less than 2 seconds. Generally the fastest spinners are associated with young stars as the energy lost to radiation slows them down with time. The actual emission is very broad in frequency, possibly spanning from radio to gamma rays.

They are very challenging to detect with amateur equipment. But nearly any frequency can be used and signal processing can help pull the signal from the noise. The Crab Pulsar (PSR B0531+21) is a relatively close and young pulsar with a rotation frequency of 30 Hz.

I think it would be neat to hear one of these some day.

.. Bob Sletten

July 3rd Sky Watch @ YFOS



The view from behind Joe Derek's 17" dob at YFOS on July 3.

Joe Derek spoke at a Father/Son Breakfast in Hillsboro on June 16th on the topic of his hobby - astronomy. It was to be followed up that evening with a night of viewing at YFOS but the weather did not cooperate. The evening was rescheduled for July 3rd. A group of 20+ people from the church showed up. Even with short notice, we had a good turnout of club members to share their telescopes with our invited guests. We even had one new member sign up that night! Thanks to all who came out.

.. Joe Derek

Walking an Analemma

To Do is to Know, so I've been told. "What is that odd figure-eight on the globe?" "It's an Analemma." In part, it describes the noon shadow of the Sun made by a gnomon through out the year. "What's a gnomon?" Some things are harder to teach than others...

The NHAS spends a lot of time teaching astronomy and providing the opportunity to see "What's up..." to children and adults in NH. We often describe a deep sky object and then show them what it looks like on a screen or in a book, and then have them look at the real thing. It seems to me that the last step, of actually having the 2 1/2 million year old photons from the Andromeda galaxy hitting somebody's retina makes a difference. Likewise, our local Planetarium show pictures well enough that I sometimes wish I had a Dramamine! Christa would be proud of the way the CMP teaches perspective.

The idea of the Sun's rays burning the Earth almost straight down, or with a wintry glancing blow, is a basic concept needed to understand our environment. To experience it directly either takes a year, or at least a darkened classroom, a globe and a flashlight. I have wanted to develop some ways to teach concepts, like the Analemma, that would be experiential. That's not so easy, but is, I think, important. Thinking of

schools and other places with some open space, I liked the idea of building a pathway that followed the shape of an Analemma. The pathway could be marked with bricks placed at two week intervals of the shadow of a post set to the south. If the post, or *gnomon*, were placed high up on the edge of a northern wall, the Analemma pathway could be pretty big. The post itself need only be a foot or so high; perhaps attached to the parapet, or an existing flag pole could be pressed into service. The resulting path would be like a Möbius strip, extending from near the gnomon's base. Students could then walk the Analemma, much like a simple medieval Prayer or Meditation Labyrinth. At each step the traveler can stop to see how the angle has changed, how the winter is stretched with long shadows, and how the Summer Sun looms near overhead.

The trick is setting it up. One can simply put a marker down once a week at noon and in a year you will be done, baring rain, snow and vacation times. Being impatient, and liking to tinker, I decided to use my LX-90 and ETX-125 (which is easier to use in high places...) as a kind of theodolite to map out the path. First, I used the Autostar Suite Planetarium program to find the Alt/Az position for the Sun on the 6th and 20th of each month at 12 noon. I then loaded the data as Landmarks (which need to be in Alt/Az, not RA/DEC) into the Autostar hand-controller. (Landmarks are terrestrial and as such, the scope's tracking is turned off.) I used the 6th and 20th of each month somewhat arbitrarily. I also used the equinox, and solstice dates, as well as when the path crosses itself. Each site would have to be entered individually, but this did not take very long to do.

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Putting the scope on the edge of the roof, one mounts a green laser on the top of the OTA, pointing away from the objective lens. The scope is oriented and aligned, and then asked to slew to each of the Landmark positions. The laser then shines on the ground where the scope's shadow would fall if the date and time were real. If getting to the top of a wall or flagpole was inconvenient, try doing this at night with the green laser pointing up. Simply shine it on the top of the gnomon, whilst keeping the scope's base oriented north, as it was when first aligned. Then extend the laser line behind the scope to where it hits the ground. Stick in a numbered peg and go off to do another.

Once done, the telescope is replaced with the gnomon, whose shadow (if one has been clever enough) should be cast on the walkway's markers on their appointed dates.

iv, Marc Stowbridge

How They Figured It Out, Part II

In the last article, I explained how patient observation over many cycles could result in knowing the length of an astronomical cycle to great precision even if the observations themselves were not precise. Here let's assume that the cycle lengths are known and see what the ancients could figure out with them without the use of any mathematics or technology they didn't have.

The period from one full Moon to the next (or from one new Moon to the next) is the *synodic* month. That was known to great precision. In what follows, I'll use 29.5306 days, which is correct to two seconds.

The period from one crossing of the ecliptic by the Moon to the next is half a *draconic* month. For the Moon to go from crossing the ecliptic while going downwards (the descending node) to the next time it crosses downwards again is a whole draconic month. That period is harder to measure, but was known to reasonable precision. In what follows, I'll use 27.212 days, which is accurate to about twenty seconds. The half-draconic month is thus 13.0606 days, which probably overstates the

precision of the figure the Greeks and Babylonians had.

The period from one perigee to another is the *anomalistic* month; this is very hard to measure as it's very hard to determine the changes in the apparent size of the moon without instruments.

We do know that the ancients knew there was a size change, though! That period is 27.5545 days, but I doubt they knew it to anywhere near that precision.

Of course, the Greeks and Babylonians didn't use floating point to express these numbers. They used rational numbers. So they might say that since 10000 synodic months took 295036 days, the synodic month was 295306/10000 days long. Similarly, a draconic month was 27212/1000 days long and a half draconic month was 13606/1000 days. Presumably they reduced the fractions. I have not found the actual numbers they used, but we can approximate them as:

- Synodic month: 147653/5000
- Draconic month: 6803/500
- Anomalistic month: 551/20

Consider a total solar eclipse happening today at noon. When will the next total solar eclipse just like it take place? An eclipse can only happen when the Moon is in its new phase, so it will have to be an integral number of synodic months later. It can only happen when the Moon is at one of the two nodes, descending or ascending so it will have to be an integral number of half-draconic months later. How many days will it be before those two cycles align again? (Note that we are not asking when the next eclipse of any sort will take place!)

Obviously, if we wait 295306×136060 days, the two cycles will coincide. That's over a hundred million years.

Other changes to the orbit of the Moon and the Earth will mean that no similar eclipse will happen that far in the future. So let's look for a shorter time and accept that the correspondence may not be exact.

We're looking for a number of days D which is an even number of S synodic months and half-draconic months.

$$D = S * (147653/5000)$$

and

$$D = H * (6803/500)$$

There are a huge number of possible approximations. A particularly good one is 223 synodic months (6585.3 days) and 484 half draconic months (6585.3 days). This is about eighteen years, and is the famous *Saros* cycle (not the same as the nineteen-year "Metonic cycle" which connects the solar and lunar calendars). The Saros cycle has been known since Babylonian times. 6,585 days and 8 hours after a total solar eclipse the Moon and the Sun will be in the same positions relative to the Earth and so there will be another total solar eclipse.

One of the reasons the Saros approximation is so good is that it is also almost an integral multiple of the anomalistic month (the time from perigee to perigee). So not only are the Moon and the Sun in the same line-up, the Moon is also about the same distance away from the earth, which means that the eclipse will be of the same type (total or annular) as the first one.

- 223 synodic months of 29.5306 days = 6585.3 days
- 484 half draconic months of 13.0606 days = 242 draconic months = 6585.3 days
- 239 anomalistic months of 27.5545 days = 6585.5 days

There is that one slight complication: that .3 day. That means if the first eclipse happens at local noon, the next one like it will happen at local 8 pm. Obviously, we won't be in the Moon's shadow and someone else will be. That someone will be 120 degrees to the west of us, where it is local noon. Three cycles later the eclipse will happen near us again but by then the match-up may not be working, and it certainly won't be directly on top of us.

The eclipses which follow each other at these 18-year intervals are in the same "Saros series". Each eclipse series starts with a barely-visible touch, the Moon only covering part of the Sun. As the series progresses each time more and more of the Sun's disc is covered. At the peak, there is either a total or an annular eclipse, depending on how far the Moon is from the Earth. Then the eclipses become less and less full and finally there is a last 'touch' eclipse and the series is over. There are typically about 70 eclipses in a series, of which

about 15 are total or annular. Each series is individual. The individual Saros series are numbered (odd for solar eclipses, even for lunar eclipses). At any one instant in time there are about 40 different series active. Today there are 39 active Saros series of solar eclipses, numbered 117 to 155. This may explain why almost every year there is a total eclipse somewhere!

What did all this mean for the ancient world? It meant that they knew the cycle length and they knew what set of series was active in their time. They could look at the locations of known eclipses over most of the Mediterranean basin and on East into India. With that data the Babylonians, Greeks and all subsequent civilizations could predict the probable location of future eclipses to within a hundred miles or so and the date to the hour. Other peoples in other areas could do the same (such as the Maya and the Chinese).

The social meaning was clear: for educated people, a total solar eclipse was some kind of natural phenomenon; it could not be an omen or a message from the gods. It could, however, be presented as an omen or message in a way which increased the power of the educated. We know Christopher Columbus used a lunar eclipse to make the Caribs give him more food; one wonders how times many high priests used a similar trick to increase their political power – and how many times they had their astronomer killed to prevent the knowledge of the truth getting out!

References:

<http://en.wikipedia.org/wiki/Saros>

<http://sunearth.gsfc.nasa.gov/eclipse/eclipse.html>

☺, John Bishop

NHAS June 2007 Business Meeting

ATM

Baker mirror grinder is with **Larry Lopez**.

YFOS

Larry reports that a work session has been scheduled. We need maskers and painters for the painting session.

Membership

Alan Shirey reported ten new members in the last four weeks. May's Astro 101 class in Astrophotography was led by **John Blackwell**; **Chase McNiss** showed how to do video imaging.

Upcoming classes: Planetary Observing in June (**John Bishop**), Polar Alignment on 13 July (Chase), Lunar Observing in September (Chase).

Web Administration

No report.

Photography

The meeting was the aforementioned Astro 101 course..

Radio Astronomy

Bob Sletten described “Artificial Aperture” at the amateur level. Set up three down-converters at three houses in New Hampshire. Receive a common signal to use as a local oscillator to mix the incoming space signal. Beam the mixed product to a central location. Can we actually make this work?

The meteor listening project is on hold.

Book of the Month

A “Library of the Month” from Mike—a collection of astro books from the 60s and 70s on sale, plus some antiquarian stuff.

Scope of the Month

Vixen ED80SF refractor. \$699 on a Vixen Porta-mount. Excellent grab-and-go scope. Comes with flip mirror.

Miscellaneous Business

Tom Cocchiaro reported that our grant application for PC Connection was passed over this time. We will be applying for a grant from the New Hampshire Charitable Foundation.

Evening Program

Dr. Norbert Schulz gave an excellent talk on High Energy Processes and Early Stellar Evolution. This was mainly on X-ray spectroscopy of protostars and what it tells us.

☺, Paul Winalski

The Bottom Line

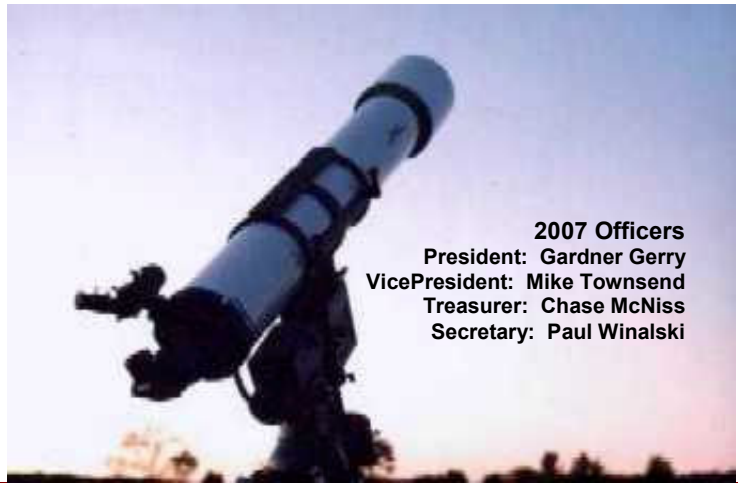
Starting Balance:	\$5804.92
Deposits/Credits:	\$75.00
(Membership)	
Accounts/Paid:	\$1002.96
(Peerless, Titan upgrade, YFOS paint)	
Net Account Balance:	\$4876.96
Petty cash drawer:	\$195.75
Cash Balance:	\$5072.71

2007 Membership: 141

New members:

Eugene Struckhoff, Lebanon, NH
Rocky Cavender, Washington, NH
Daren McAndrew, Tyngsboro, MA
Sharon Comerford, Keene, NH

☺, Chase McNiss



2007 Officers
 President: Gardner Gerry
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DEADLINE August 2007 Issue: 5 PM August 13

E-mail articles to the Editor.

CHANGE OF ADDRESS – Notify the Treasurer of changes to postal or e-mail address.

How to Join N.H.A.S.

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This month's contributors:

Gardner Gerry, Alan Shirey, Matt Amar, Larry Lopez, Bob Sletten, Joe Derek, Marc Stowbridge, John Bishop

New Hampshire Astronomical Society
P.O. Box 5823
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NHAS Upcoming Events

Event	Date	Time	Location
July Business Meeting	July 20	7:30 PM	St. Anselm College
Goffstown Public Sky Watch	July 25	8:30 PM	Cemetery Field, Goffstown, NH
Merrimack YMCA Daytime Sky Watch	August 3	9:00 AM	Camp Sargent, Merrimack, NH
CMP Public Sky Watch	August 3	7:00 PM	Christa McAuliffe Planetarium
Madison Old Home Week Sky Watch	August 8	7:00 PM	Madison, NH
Stellafane	Aug 10-11		Springfield, VT
Coffee House Night	August 10	5:00 PM	YFOS
August Business Meeting	August 17	7:30 PM	Christa McAuliffe Planetarium
CMP Public Sky Watch	September 7	7:00 PM	Christa McAuliffe Planetarium
Coffee House Night	September 14	5:00 PM	YFOS