Volume 15, Issue 1

January 2008

HAMILTON AMATEUR ASTRONOMERS

Event Horizon

Astronomy 2008
A Look Ahead By Tim Philp

Photo Credit: Kerry_Ann Lecky Hepburn

This is the time of year when we all look to the year just past and try to put the events of that year in perspective. Certainly 2007 was a year of interesting things to see in the sky, including a naked-eye comet. However, since 2007 is past, I thought it would be more useful to look at 2008 to see what the year ahead has in store for us.

While Mars rules the sky standing almost overhead late in the evening, there are other events that will take

(Continued on page 2)

From The Editor's Desk

Ok, fess up, who got telescopes for Christmas? It is a well-known axiom of amateur astronomy that the purchase or gift of a new telescope or, indeed, any astronomical toy, generates cloudy skies for at least a month. That, of course, is the reason that the skies are so bad during the month of January… all those telescopes that Santa brings in his magic toy sack. So, if you got a telescope or an eyepiece or anything astronomical, the rest of us know who to blame for the clouds that have been hiding the magnificent winter skies from our instrumentation. You certainly cannot blame me. I got enough coal in my Christmas stocking to heat my house for the winter, but no astronomy toys… but then again, I was not a very good boy!

Tim Philp, Editor

Inside this issue:

Be sure to attend February's meeting when our guest speaker will be Nicole DeBond from the David Dunlop Observatory speaking about Lunar Geology.

Astronomy 2008—A Look Ahead - By Tim Philp with reference to Astronomy Magazine's Skyguide (Continued from Front Page)

centre stage in **January**. Comet 8P/Tuttle reached its closest approach to the Earth on New Years Day at only 23.5 million miles away. While it will not be as bright as the comet that we watched throughout the fall, it will still be visible to anyone with a good pair of binoculars. Discovered 150 years ago, this comet has a 13.6-year orbit and will not be back in our neighbourhood until 2021. It is best to get a glimpse of it before the 14th because then the moon will be too bright to see the comet clearly.

February brings a total eclipse of the moon. Lunar eclipses occur when the full moon passes into the Earth's shadow. Not every full moon brings an eclipse, however, because the moon's orbit is tilted by 5 degrees. Only when the moon's orbit lines up with the sun can an eclipse occur.

This eclipse happens on the night of February 20/21. If you miss this one, there will not be another total eclipse of the moon until December 20/21 of 2010!

In **March**, the planet Saturn starts its slow climb into the sky. The ringed planet will reach opposition, a point directly opposite the sun on February 14th and will dominate the spring night skies for the next few months. Because of the tilt of the ring plane of Saturn, the rings are slowly getting narrower each year. Next year in 2009, the rings, as seen from the Earth will disappear completely.

In **April**, we get a good look at a meteor shower. Meteors that come from showers are the debris left from passing comets. This debris is mostly dust and sand-sized particles that streak into the atmosphere at such a great speed that they burn up leaving a spectacular trail of ionized gases that glow brightly in the night sky. This month's shower, the Lyrids will be a bit difficult to see because of the presence of the full moon near the April 22 peak of the shower. That just goes to show that the moon has a great influence on what you can see in the sky.

In **May** you can get a chance to see the elusive planet Mercury. By April 25th Mercury will be shining brightly in the evening twilight. As a special treat for astro-photographers and binocular watchers, on April 28th, it will pass close to the Pleiades star cluster.

If you have a telescope, **June** will be a dwarf planet bonanza as Ceres and Pluto become visible in the night sky. Ceres is the largest asteroid and Pluto is the former planet, now demoted to dwarf status. To see Pluto, you will need at least an 200mm telescope and a good star chart to locate it.

July brings the largest planet back into prominence as it reaches opposition on the 9th of July. Jupiter will be very low in the South, but should still provide a good view through a pair of binoculars. Also visible orbiting the giant planet are four of its moons. These moons were first seen by Galileo using a very bad telescope.

August brings another meteor shower, the Perseids. This is one of the better meteor showers of the year and well worth spending an evening under the stars to see. No equipment is required. Unfortunately, we will miss a total solar eclipse that will be visible in extreme northern Canada.

September brings a parade of gas giant planets with Uranus and Neptune reaching opposition in that month. While Uranus can be seen with the naked eye, if you know where to look, both require telescopes to get a good view.

October brings the planet Venus to the evening sky. Venus is very bright and has often been mistaken for an airplane. Venus and Saturn will perform a dance as they move in the sky in their perspective orbits.

In **November** you can see a couple of stars that we know have planets orbiting them. The first star known to have planets orbiting it is 51 Pegasi. Laying 50 light-years from the Earth, it shines bright enough to be seen with the naked eye under dark skies. Upsilon Andromedae is another star with planets orbiting it, at least three planets at last count.

December 1st, Venus, Jupiter, and the moon will cluster in the southwest forming a beautiful sight just after sunset. This is the last time that these planets will be this close until 2012, so make sure you get to see this one.

Every night you can see something interesting in the sky. While many things can be predicted, the sudden appearance of a new comet or a supernova can always surprise the interested observer.

I hope everyone has a great New Year and keep watching the sky.

From the Chair — by Mike Spicer

January is a time for looking ahead as we begin the New Year, building on the past. Hamilton Amateur Astronomers begins its fifteenth year in excellent shape. Our membership is growing, and what's more important, the number of members actually involved in the club's activities is increasing.

Attendance at the monthly meetings has been outstanding and the feedback on our speakers has been extremely positive. Our out-of-town speakers have never failed to remark that they enjoyed the large, friendly, interested audience our club provides. It's encouraging to see over half our members turn out for a meeting and to have volunteers from within the club willing to make a presentation.

Last month, for example, Jim Wamsley, John Gauvreau and Glenn Muller demonstrated some of their equipment while presenting on what to buy - and what to avoid - in selecting a telescope. Mike Jefferson updated us on the LOFAR radio telescope and Don Pullen gave a lively talk on occultations, punctuated with some fascinating video. There was so much happening that I didn't have time to speak about Mars as planned!

Our club is an interesting mix of amateurs and professionals, so we work hard to offer a mix to our members - data from professionals and from amateur observations as well as information for beginners and presentations by astro-photographers.

Our meetings cover what's in the sky this month and how to locate some of the objects most interesting to you whether you have a telescope or a pair of binoculars. Members make available a number of observing locations near the city, notably the Binbrook Conservation Area and its alternate site; the Parks Canada Discovery Centre and on occasion even the Spectator parking lot.

The weather does not always cooperate - last month's Mars Observing Night was clouded out, for example - but that doesn't dampen our spirits for long. Join us for a meeting or an observing session!

Our club website at www.amateurastronomy.org is an excellent way to keep up to date on our recent activities The main page presents information on our upcoming activities, the weather and our most recent news items. Other pages give information on the club, maps and photos of the places we meet, and membership information for those who wish to join up ($25 for a year; $30 for the whole family!). Also featured is information on celestial events to watch out for - especially occultations, asteroid movements and planetary activity. We post notes of our recent observing meetings and there are pages for images from our astro-photographers. If you miss a meeting you can catch up by viewing copies of The Sky This Month presentations and our monthly newsletter the Event Horizon is available for download from our website, too.

Got questions or comments? You can always access us though the web site and we try to get back to you as soon as possible.

This year we have started off with our annual Telescope Clinic and the January monthly meeting. Clear nights will no doubt bring out our observing groups, their telescopes and imaging equipment (check for a posting under "observing" on the website and be prepared for cold weather observing!).

February will bring Nicole Debond from DDO to speak on Lunar geology, and speaking of the Moon, keep your fingers crossed for good weather on February 20th for the year's great Total Lunar Eclipse when our club will be out in force.

Hamilton Amateur Astronomers is the region's active astronomy club. We want to make astronomy interesting to you. I'd like to see YOU come out to our meetings, get to know our members, take part in our observing sessions and who knows, even make a short presentation on what you are doing in this fascinating hobby!

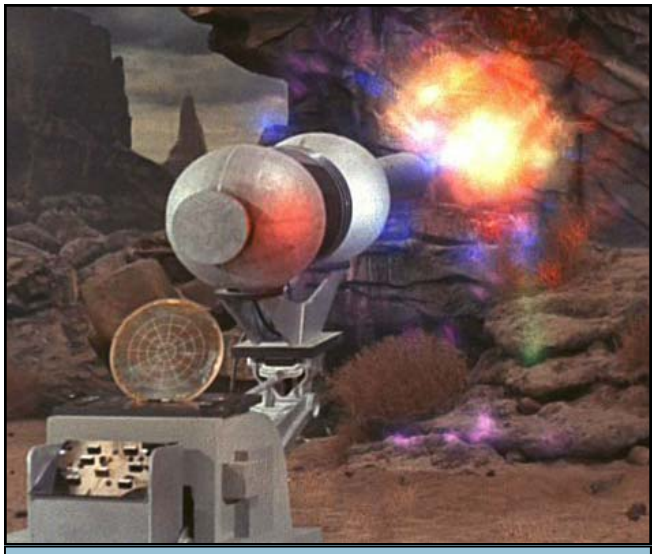
Lasers! By Steve Germann

Many years ago I got a $150 HeNe laser to play with, and managed to project a saucer-sized dot on a fence a few hundred feet away. It had a battery power source with a half-brick sized step-up power supply to run it. It was probably rated at 2 mW but I don't recall the specs. Of course I still have it in a box someplace...

In the past 10 years, there's been a remarkable increase in the quality of semiconductor laser diodes. Early problems of wear-out have been largely solved. The same can be said for white LEDs.

I bought my first red laser pointer from a buddy who just got back from USA, when it was $50 and came with a small assortment of holograms to generate a pointing arrow and a circle, and perhaps a couple more symbols. The light actually comes out in a cone beam, and is collimated by a small lens mounted very close to the laser, adjustable on its own screw thread. I suppose each one is factory adjusted.

It was not long before the price was more like $5 and there was a plethora of available holographic symbols, contained in removable screw-on caps for the keychain ready laser pointers. Unfortunately, the keychain loop was not up to the strain of being on MY keychain, and it soon got trashed. I think subsequently the priced dipped as low as $1 each in quantity. The laser itself stood up well. There's a 2 transistor circuit to regulate the current, and the tip is made of brass in part to dissipate the heat generated; it won't 'lase' if it's too hot.



Lasers have come a long way in only a few years!

Things got nasty when kids started shining them in the eyes of bus and subway drivers... there was a ban on them... but what put the final nail in the coffin was the unavailability of the batteries for them. Originally they ran on 2 small hearing aid batteries.

That was fine, and hearing aids still being in style, the supply was, if not plentiful, at least reliable. However, a hearing aid lasts for a week on such a battery, and it turns out that zinc-air batteries work fine in hearing aids, are lighter, and last longer. However, their low peak power and long recovery time means they won't work for more than a few seconds in a laser pointer. Presto, the problem was solved. Seemingly overnight the only lr44 sized batteries in stores were zinc-air.

Times have changed since then. The battery supply is no better and fads change. Technology continued to advance, and green lasers started being available... first in the multi-hundred dollar price range. I dreamed of owning one, but could not bring myself to pay $300 US cash for one. (They did not take MasterCard, apparently). I eventually bought one a few years later at a hamfest for $135.

The difference with this kind of laser is that it is designed for the serious adult user, as a pointer to be used in presentations, or more appropriately, as a way to point out a distant object. So tiny size and tiny batteries are not a priority.

No longer needing to be small and hidden in the hand of rowdy delinquents... the new lasers are the size of a large pen, accept AAA batteries, and last a long time for a low price.

There's a 1080 nm IR laser diode in there, followed by a frequency doubling crystal. The result is that 2 IR photons become one green photon, and that's what comes out the front. If the laser breaks, it might be that the crystal has come loose...

Never look down the barrel into the source! Especially if you think the laser is broken! It's possibly still putting out a lot of IR and can cause eye damage. My laser pointer still works fine after 3 years.

The old-style red laser would project a small red dot onto its target, a long distance away, but you really could not see the beam unless you were literally right behind the de-

Lasers! By Steve Germann (Continued)

vice. Otherwise the backscatter was far too faint to be seen.

With the green lasers, the increased brightness and the increased sensitivity of the eye added up to easy viewability from any tiny bits of dust or water vapour in the air, and there's a lot of it, even on clear nights. As a result the beam can be seen in the air, even if there's nothing to hit with it.

Their visibility has also drawn ire from other astronomers; since the beam in the sky can be seen by eye, it might also be picked up by an astro-photographer shooting a time exposure.

I remember the first time I pointed my laser skyward in Binbrook and was admonished to keep it out of the light path of an ongoing astro-photo. All of a sudden my magic wand had turned into a death-sabre ready to slash and burn painstakingly aligned astro-photos! Since then I have become much more aware of my surroundings before pushing the button,

It does still serve as an excellent tool in pointing out constellations and other items in the sky. Owning one helps me in 2 ways... it makes it easier for me to point things out, and easy to hand it to an expert and let him or her point out something so I can find it.

Last summer at Starfest, someone pointed his green laser across the sky and drew ire from dozens of astro-photographers in what was probably the most irate outcry I have heard in the last year. The 21.6 magnitudes per square arc-second skies (as determined by my excellent sky quality meter) were split by the green light.

"Hey you! Put down that laser pointer. People are trying to do astro-photography!"

Fortunately he was far enough away to avoid the hail of projectiles hurled in his direction, even if they were mostly dirty looks, and it was dark, making targeting problematic.

The next day an announcement to the effect that green lasers must not be used was made, and signs posted. No sense going to jail for attacking a laser wielder when a sign can do the job.

However, all the world is not starfest, and often astro-photographers are in short supply, or focused on part of the sky which does not cross the zenith, leaving much of the sky available for sharing.

Last may, I put my laser pointer into a tin of pencils and markers to keep it out of reach of children, and forgot about it. A few days later, realizing it was gone, I started the unhappy task of seeking a replacement for it.

In the local astronomy stores, they still run close to $80 each, for the 5 mW versions, and are nonetheless in short supply. Searching eBay turned up numerous sellers of green lasers.

I began the task of surfing up a replacement, and first bought a pair from a dealer in china. Then a single one from a dealer in Hong Kong, thinking it might be better. It wasn't. I also bought one from Richmond Hill in Canada. It was the worst of the bunch... a long warm up time and 'anemic' light output.

When they had all arrived, I then had 3 lasers. To top it off I found the lost one, and I had 4. The new lasers cost only about $30 each with shipping, and although of differing and dimmer brightness they still had the power to educate and inform. It did not take long before I had sold all of the extras to club members, and 3 more besides, so I am back to having just my original and one of the newer ones.

I thought about how best to use these lasers (in non-starfest situations, as described above).

As the owner and aimer of the GWS, it sometimes is a bit difficult to use the red dot finder to aim at the sky, (it can dew up too,) and I am thinking of mounting a green laser on the GWS, which I can energize, reposition the scope, and then turn off again. That will make aiming it more intuitive.

Another use for a green laser is to mount it on binoculars, so it shines

Lasers! By Steve Germann (Continued)

down the center of the field of view. This makes a finder-scope for the binoculars. With a tripod or parallelogram mount, the binoculars can be aimed and will hold their position relative to the sky for a while. Although in practice I have not often needed a finder scope, there have been times when it would be handy.

When a binocular box is used, (a device with a mirror which directs a downward pointing binocular view skywards,) the problem of aiming becomes even more unintuitive. Putting a laser on the binocs and bouncing it off the mirror allows you to look at the sky, and position the beam, if you need to move to a new area. Of course, just looking around and panning slowly can be accomplished without needing to energize the green laser.

Another idea I had for using a laser pointer is to buy a cheap low strength (but low backlash) goto mount, and mount not a scope but a laser onto it. Then I can type in M27, and let the laser slew to the target. (except I think I can find that one, there's plenty more that are hard to find).

I can then point the GWS in the general direction of the laser, or even look through the finderscope for the beam, or energize the matching laser on the GWS and point the beams together. (But don't cross, the beams... I recall that would be bad!).

Since the beam of a green laser only works about 100 meters in clear skies, you still have to be reasonably close to the holder of the laser to determine precisely where they are pointing.

This is a typical LASER pointer used for astronomy. It has a 5mW output at 532nm which gives a brilliant green light. Easily portable in your pocket and uses two common AA batteries. Caution should always be used with these devices as they can easily cause eye damage is carelessly used.

The one I saw at starfest must have been a death-ray by comparison because I could see it shine right across the sky and I was at right angles to it. (You can buy them with up to 100mW output power: those are not legal for use in Canada, and are frankly totally unnecessary.

All in all, the green laser, now readily available under $30, is a tool no star hopper should be without. Even if you don't have the first idea how to hop stars, having it handy allows you to hand it to a knowledgeable expert and simplify your understanding of his advice.

You can also shake it in a fog and get delightful cross sections of the swirling filigrees of fog and non-fog.

The laser pointer has come of age. It's now a valuable tool to be used by serious people but not misused. It's value is obvious but discretion is valuable as well.

In case you want to get a laser for yourself, a search in title *and description* on eBay.ca for ff77hh will lead you in the right direction. "5mw 532nm Astronomy Green Laser Pointer Pen Beam" if you want to be more specific... The price with shipping is $28.99 US for the first one and $27 US for additional units shipped to the same address. (I don't get any commission of course.) These are the best ones I have identified. There are about 4 styles. I have had best success with the almost all black unit, but I suspect it's the same electronics inside each of them, so take your pick. Ask for standard international shipping and you will have it within 2 about weeks. If you have never used eBay, I recommend you get together with someone who has, and get a bit of a discount on the shipping.

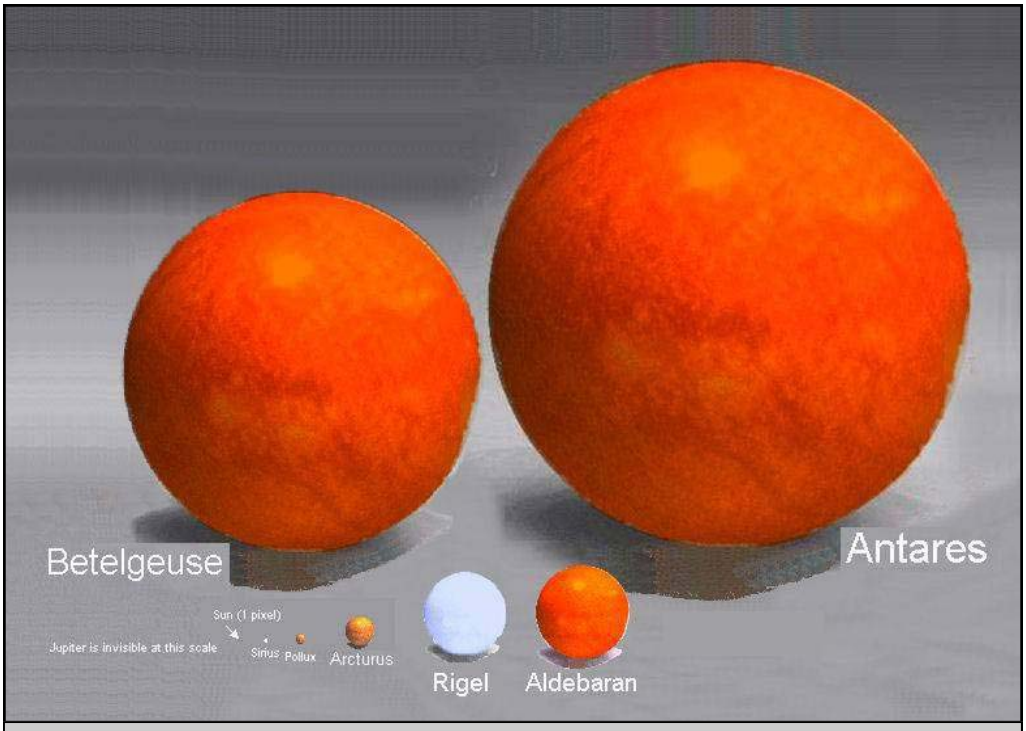
How Large are the Stars?—by Tim Philp

Any view of the night sky will show thousands of stars if you are lucky enough to be in a site with little light pollution. Some stars are brighter and many are different colours, but the all look like points of light. Just how big are they anyway?

The first place to look is at our own sun. The sun is a fairly average star, perhaps a little larger, but still fairly average. We orbit this star at a distance of about 150,000,000 kilometres. It takes light from the sun about eight and a half minutes to travel this distance.

The sun is a 1.39 million kilometre wide ball of hot gas, mostly hydrogen and helium. It is in a state of delicate balance between the radiation pressure from the fusion reaction powering the star trying to blow it up, and the enormous gravity trying to crush it into a smaller form.

This same balancing act takes place in all stars and we are fortunate that our sun is very stable as other stars undergo tremendous changes in size. The size of a star depends upon the amount of stuff or mass that the star contains as well as the violence of the reactions happening in the star.



Stars come in many sizes. Here you can see the relative size of some of the larger stars. Note, our sun is so small in this view that it is represented by only ONE pixel!

Of course, there is a limit to the amount of mass that you can cram into a small space without the star collapsing, so the absolute size of a star can vary greatly.

Recent studies by the Hubble Space Telescope have shown that there is a limit to how much mass a star can contain. Some of the biggest stars have more than 80 times the mass of our sun. The record holder, Eta Carinae has a mass of 100-150 times the mass of our sun. Stars this large have nasty, short lives as they use up their fuel very quickly. Their lives are measured in millions of years, rather than the 10 billion or so that our sun will survive.

Stars have a vast range of sizes. The largest stars, such as Betelgeuse in the constellation of Orion are incredibly large. Betelgeuse is about 1000 times larger than our sun with a diameter of 1.6 billion kilometres and if it replaced our star, it would reach out past to the orbit of Mars!

On the other end of the scale, the smallest stars are about the size of the city of a medium-sized city! These stars are called neutron stars. They have so much mass that the atomic forces that keep the atoms spread out are overcome and the atoms themselves collapse forming a very dense ball of neutrons. These stars are so dense that a thimble full of neutron material would weigh as much as a mountain!

Of course, some stars are formed with so much mass that when they run out of fuel, they collapse far beyond the neutron stage to the point where our knowledge of physics breaks down. Such a state is called a black hole – a space with such a large gravitational field that nothing, not even light, can escape from its grip.

Black holes are not stars, but they can start out as one very massive star. Their diameter cannot be measured as they are shrunk down to the size of a virtually dimensionless point. At this stage, the density of the matter is infinite. We don't know what happens in a black hole. In fact, black hole studies are the cutting edge of physics today.

The next time you look at the night sky, you can realize that there are many different sizes of stars, but they are so far away, that they look just like points to us. It is a good demonstration of the true size of the universe.

Treasurer's Report

(Unaudited)

- **Cash opening Balance (1 Dec 2007) $2857.34**
- **Expenses $1516.32**
- **Revenue $1301.50**
- **Closing Balance (7 Jan 2008) $2642.52**

Notes:

1. ***Major expenses included: balance of payment for 75 calendars ($600), Insurance ($702), Newsletter printing (Oct thru Dec) ($213.52).***
2. ***Major revenue sources include: Calendar sales ($1080), RASC 2008 Observer Handbook ($60), Membership ($25), Donation ($30), 50/50 ($38)***

The Sky This Month—by Greg Emory

The centerfold in this month's EH is for 2100 H on January 15th. The water constellations are diving for the western horizon and the winter Milky Way is coming up overhead. Led by the striking constellation Orion, the skies this month offer something for just about everyone: nebula, SNR, open clusters, globular clusters and galaxies – short of discovering your own comet, the sky this month has just about everything!

Before I get lost in the constellations bordering the Winter Milky Way, I would like to start talking about Cetus and Pisces. Cetus (the Sea Monster) and Pisces (The Water Carrier) are the two large constellations which form the heart of the region of sky known as the water. There are two objects, both galaxies, one located in Pisces (M74) and the other in Cetus (M77). In March or April, these two objects will be viewable just around sunset. In March or April, the HAA will be running a Messier Marathon. These two objects must be completed first, just around sunset. Practice finding these two galaxies over the next month or two in order to make the task a little easier come spring.

Starting near the Cassiopeia/Perseus border we have the double cluster (NGC 869 and NGC 884) two open clusters which are visible in a moderate field of view. Continuing on the "Open Cluster Tour" we pan to the southeast into the constellation Auriga and find three open clusters, M38, M36 and M37, which is the order in which you will trip over them as you sail south down the Milky Way. Of the three clusters, M36 is the least populous with only about 60 or so stars. The journey then takes us to M35 which is in the constellation Gemini. There are about 200 stars in this open cluster.

Anytime that viewing is done in the Milky Way, or near it, you can expect a lot of open clusters, some dust and nebulosity. In the summer months when we view the Milky Way near Scutum and Sagittarius we are looking towards the center of our own Galaxy. In the winter, when viewing the Milky Way we are looking towards the outside or suburbs of the galaxy.

Moving south from M35 in Gemini, we encounter Orion. To me, Orion will always hold something special. I distinctly remember winter nights when I was in high school, and later university, when I would look to the south and see three stars, equally bright, in a near perfect line. There is something so compelling about those three stars. It took another 20 years for my wife to coax me out of the closet and admit that I am an amateur astronomer. Whenever I see Orion, I get lost. My observing plans disintegrate, time seems to speed up. Regardless of how cold it is, I will always take a few moments to stop and look up to see Orion.

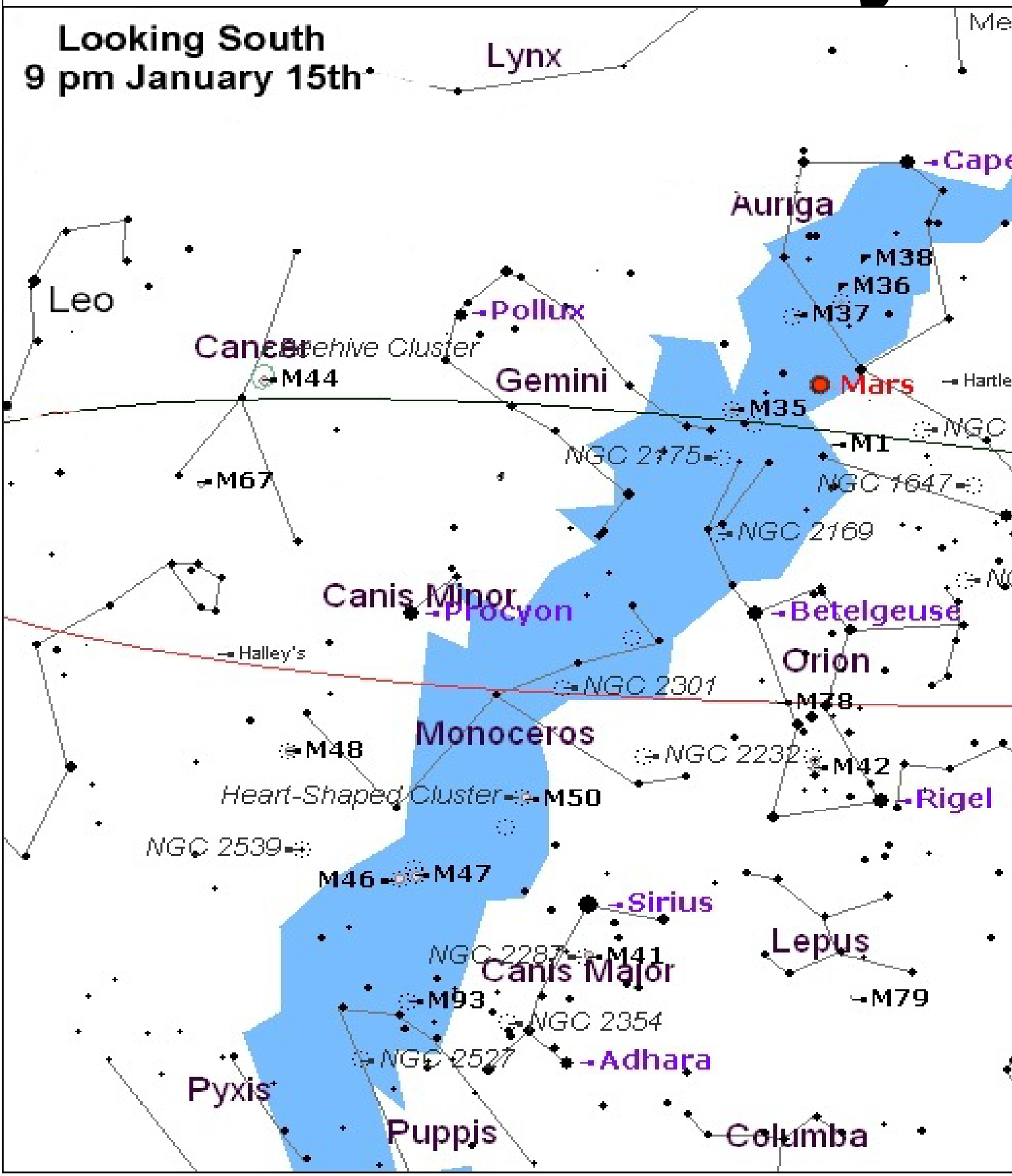
The three stars of Orion are what we call the belt stars. Dropping down from the belt stars are the stars which form the sword of the Hunter. At the southerly tip of the sword are M42 and M43. Within the nebulae are newly formed stars, believed to be some of the youngest in the galaxy. On a truly clear and dark night, the details visible in the nebulae are impressive. Take the time, fight the cold, and look at Orion.

For those of you with a flair for the risqué, some ancient civilizations (might have been the Greeks or Mesopotamians) saw the belt of Orion, but identified the sword as something entirely different. Kind of makes you wonder what the Hunter was after, doesn't it?

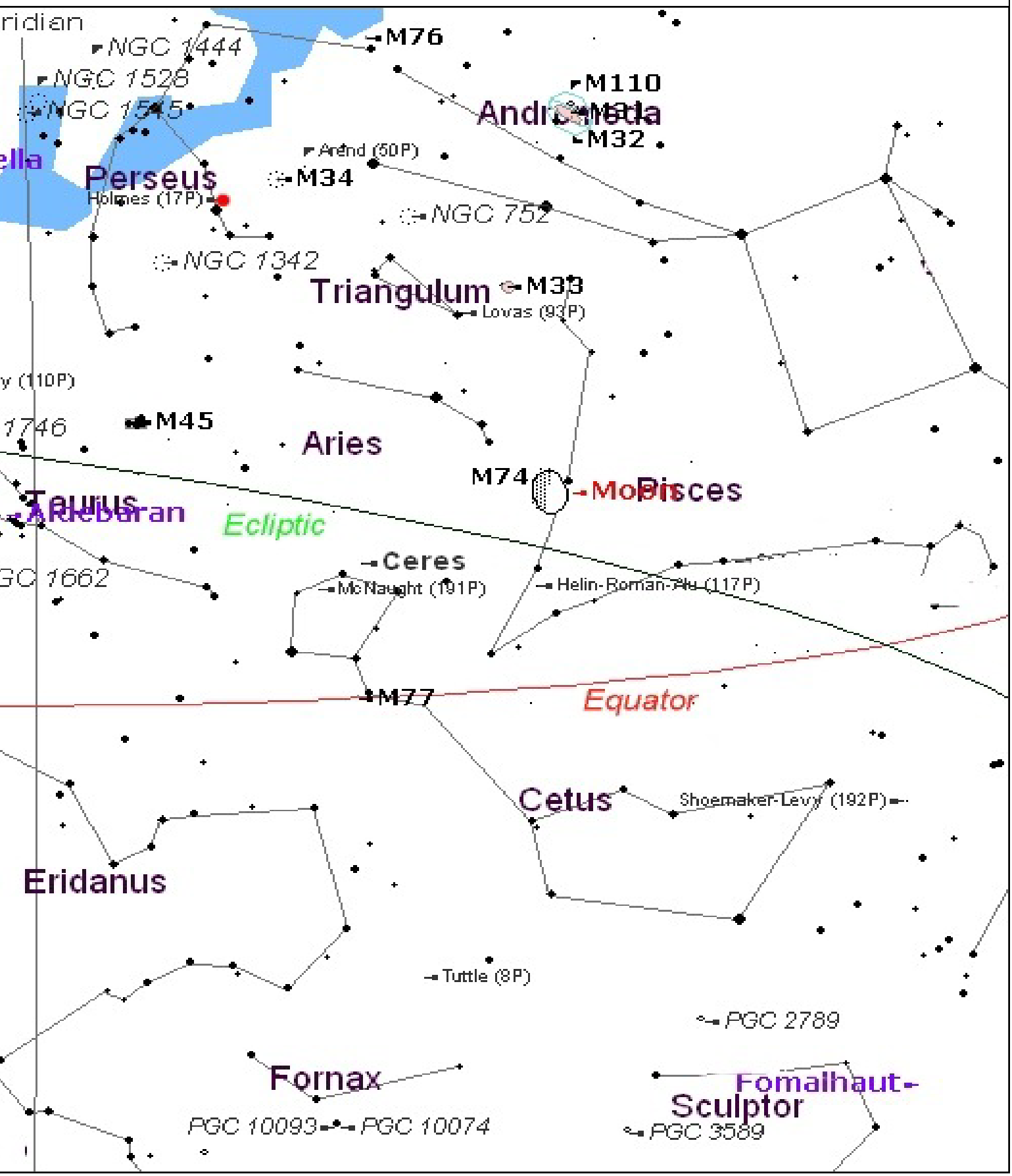
Just to the east of the belt stars, we have yet another nebula, M78. In fact along the eastern side of Orion, technically somewhat in the constellation Monoceros, there are numerous nebula and open clusters – some of them are even in the HAA calendar.

For some unexplainable reason we all remember minute details about certain events from our pass, but still forget to put out the garbage or lock the keys in our car. I can tell you where I was when Paul Henderson scored the goal. Thanksgiving weekend 2002 I saw M42 and M43 for the first time through a telescope, it was around 2 am, I was soaked with dew, wet, and cold and out of coffee standing on top of a hill grinning like the Cheshire Cat.

The Sky T


Looking South
9 pm January 15th
Lynx
Auriga
M38
M36
M37
Leo
Pollux
Cancer
Beehive Cluster
M44
Gemini
Mars
M35
M1
NGC 2175
M67
NGC 1647
NGC 2169
Canis Minor
Procyon
Betelgeuse
Halley's
Orion
NGC 2301
M78
Monoceros
M48
NGC 2232
M42
Heart-Shaped Cluster
M50
Rigel
NGC 2539
M46
M47
Sirius
Lepus
NGC 2287
M41
Canis Major
M93
M79
NGC 2354
NGC 2527
Adhara
Pyxis
Puppis
Columba

his Month


ridian
NGC 1444
NGC 1528
NGC 1545
M76
M110
M31
M32
Arend (50P)
Perseus
Holmes (17P)
M34
NGC 752
NGC 1342
Triangulum
M33
Lovas (93P)
y (110P)
1746
M45
Aries
M74
Pisces
Taurus
Aldebaran
Ecliptic
Ceres
McNaught (191P)
Helin-Roman-Alu (117P)
GC 1662
M77
Equator
Cetus
Shoemaker-Levy (192P)
Eridanus
Tuttle (8P)
PGC 2789
Fornax
Fomalhaut
Sculptor
PGC 10093
PGC 10074
PGC 3589

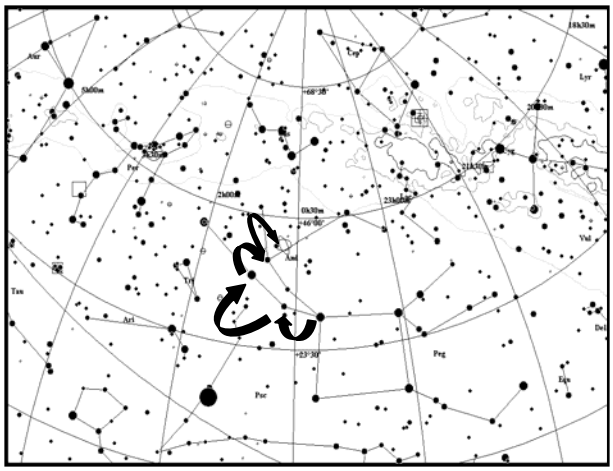
Through the Looking Glass—by Greg Emory

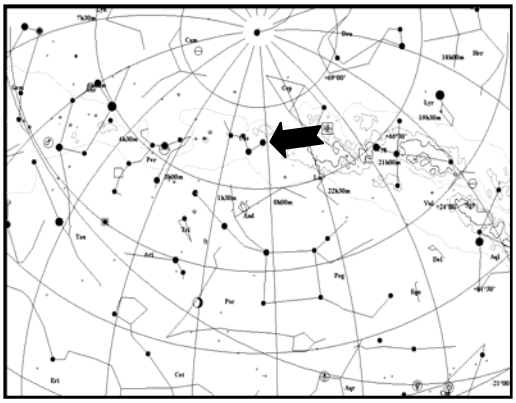
What better way to start a new year than with a new column in the Event Horizon? No? Well, you're correct, I too can think of 10 or 15 better ways to start the New Year but this will have to suffice.

Through the Looking Glass will be a place for me (or others) to provide information to the beginner. I am what I would classify as an intermediate in terms of experience (actually the definition of intermediate is a beginner with delusions of grandeur).

To find a place or location on the earth we look up the longitude and the latitude. The same type of coordinate system is used to locate objects in the celestial sphere. Lines which run from the North Celestial Pole to the South Celestial Pole are referred to as Right Ascension. The Right Ascension (RA) is measured in units of hours. The entire north-south grid has been divided into 24 hours (1 day). Each hour is then subdivided into 60 minutes and each minute into 60 seconds. A full circle is 360°, divided into 24 hours corresponds to 15° per hour of Right Ascension. The horizontal part of the grid is called Declination and works exactly as latitude does on the earth. The celestial equator is defined as 0, the North Celestial Pole is 90 N, the South Celestial Pole is -90 N (or 90 S).

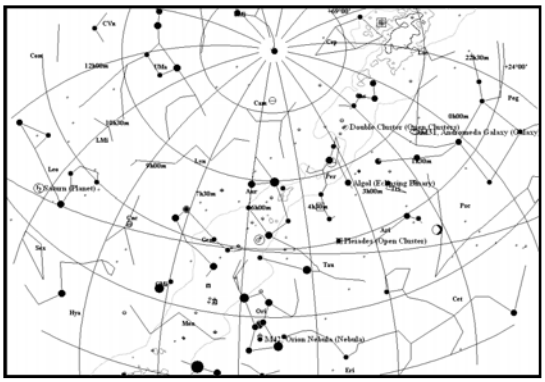
The star Beta Cassiopeia is an important marker for the RA and Dec system. The star has a RA of 00h 09m 36s and a declination of 59°11' 40". If you can find the star BETA CAS, you now have the intersection of the 00 h RA and 60° Dec lines, or close enough. Many people, however only use the RA and Dec to locate the object of interest on a star map. Once on the star map the will determine a "star-hopping" route or find or create some pointers to locate the object. Figure 2 shows the same region as Figure 1, but with a little more detail. To star hop, find a bright, close-by star or object. Now move from that star to another star in the view, continue to do this until you are viewing what you are after. In Figure 2, start at the upper left (northeast) corner of the Great Square of Pegasus. This is actually the star alpha Andromeda, but that doesn't matter. You can now follow the trail of relatively bright stars to find M31 the Andromeda Galaxy.





Now that we have some chance of being able to locate an object we are looking for (and don't worry if it is confusing and frustrating, some of the very first objects I found, all on my own, with my own telescope, took me easily 10 to 20 times longer than it would now. This is an experience thing, you will get better at it – or cough up the money for a goto! Let's consider what is out there to look at. There are stars, stars dead or dying, stars burping and belching, stars being born, stars in tightly packed groups, loosely packed groups. All of this and more – just in our own galaxy. Every Galaxy conceivably has all of this over again. Throw in some dirt, debris and left over trash after the formation of our Sun and we have our solar system. Planets, comets, asteroids, moons, planitessimals (which is what we call former, or yet to be former planets).

Individual stars have different colours and brightness. Some may vary in brightness (Variable Stars). Others have companions and orbit one another (Double or Binary Stars); some are Variable Stars because they are Double Stars (Eclipsing Binaries). Some stars form loosely packed groups or clusters, these are called open clusters. Stars which packed together in tightly grouped spheres are globular clusters. Figure 3 has a few objects highlighted. These objects should be of moderate difficulty to the beginner. They also represent a sampling of most of the object types that are typically viewed by amateurs.



My foray into Binoviewing Part II—by Glenn Muller

Last November, I acquired a William Optics (WO) binoviewing package from Khan Scope. Though fully aware that the unit may not work "as is" in my 6" f8 Newtonian, I was confident that a set of correctors from Siebert Optics could adapt the longer light path of the binoviewer (BV) to my scope's focuser. Happily, this turned out to be the case.

The Internet is a great resource when you need information. Not only can you quickly find a specific product, you can also get honest and unbiased opinions on both the product and the vendor. To know that the person you are dealing with has integrity is comforting, particularly when submitting your credit card number, and Harry Siebert falls into that category.

Harry has either done a nice job of personalizing his automatic e-mail replies, or he prides himself on staying in touch. I had responses to my queries within 24 hours and when my order was ready, about three weeks later, I was provided with a tracking number so I could follow the shipment online. To view Siebert's full range of products, go to www.siebertoptics.com .

The recommended corrector package for my set-up consists of two short, threaded, aluminum tubes, two threaded aluminum cells with lenses, and two rubber "O" rings. Fully assembled, they add 2 ¾" (7cm) to the shaft of the BV and compensate for the focuser not being able to rack down enough to achieve focus.

Although the corrector package would increase my binoviewing cost by $179 there is added value in that it can provide a range of three different magnifications, thereby saving me the cost of two additional sets of matched eyepieces (ep's).

The BV package came with a quality pair of WO Swan 20mm eyepieces with 17mm of eye relief which, if you roll down the eyecups, is enough to let you keep your glasses on.

With the lowest power corrector combination of 1.25x, this gives my scope a field of view of nearly a full degree – perfect for viewing the complete surface of the Moon. Rearrange the pieces and you can increase the power by 2x or 3.5x, all the while enjoying the nice eye relief of the 20mm oculars.

While the image is brought to initial focus with the focuser knob, each eyepiece holder has a diopter adjustment to provide a fine focus for each eye. The holders also employ a compression ring system to keep the eyepieces perfectly centered.

Compared to a single eyepiece in the focuser, the use of BV's means an extra weight consideration of 1 – 1 1/2lbs (500-700g). This can affect the balance of your scope, particularly if it is the free-moving dobsonian variety. This problem I'd had to solve, previously, when I started using Pentax six element ep's. For a counterbalance I attached a couple of 2lb (1000g) flexible ankle weights, to the bottom of the OTA, with Velcro straps. My solution for the binoviewer set-up, therefore, was just to add another ankle weight for a quick and easy fix.

First light came on November 19th. The evening was cool and breezy yet we were sheltered in the "d'observatory" and the first quarter Moon occupied a convenient patch of sky. Within minutes I had everything set up and the desired target in view. A turn of the focuser knob and a beautifully cratered moonscape snapped into sharp relief. A small adjustment of each diopter fine-tuned the image for each eye and there, at last, was the spaceship sensation I'd been hoping for. The unit's Bak-4 prism ensured bright, contrasty images and the comfort of using both eyes was marvelous – well worth the price of admission.

Mentally, I did a little math and added the cost of the BV package ($229 + $32.06 tax) to the shipped cost of the correctors ($154.00 + $25 duty & handling) for a total of $440.06.

Even at that price I consider the bundle an absolute bargain, especially when compared to what Denkmeier offers in that range.

So have I become a fully-indoctrinated binoviewer? Well, yes. And no. It may be a factor of aperture but, where BV's excel with the brighter objects; on dimmer DSO's a pair of garden variety Plossl's, forced to share a limited supply of photons, won't provide the same contrast as a single high-end eyepiece. Another mark against BV's is that they're not really star party friendly. When you have people lined up, any extra adjustment required to give each person the optimum view takes precious time. In those situations, I'd forsake the two-eyed WOW factor for the efficiency and ease of use of a pleasing monocular view.

Tech Tips: Stash Your Gear—by Tim Philp

One of the more annoying things about astronomy, at least nighttime astronomy, is that it is sometimes hard to keep track of all of the accessory equipment that you use at the telescope.

There are flashlights, lenses, barlows, star charts, lens caps, and an assortment of screws and other paraphernalia that would be disastrous should it be dropped or lost at the dark observing site.

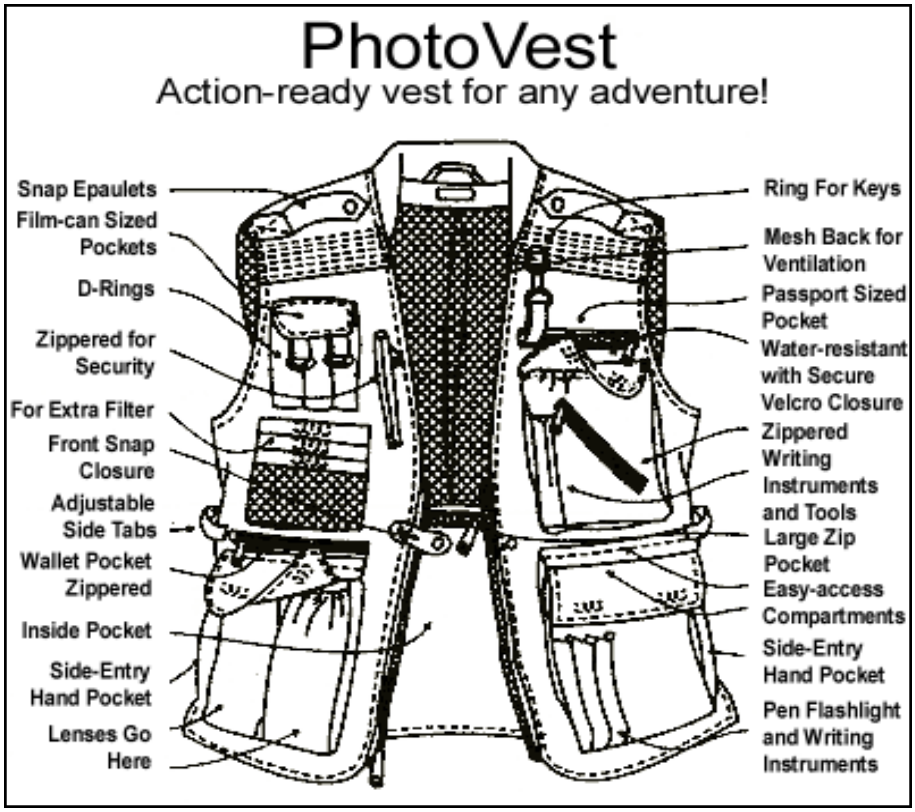
Worse you need to be able to find the right stuff without using any light that would ruin your night vision or that of your observing companions.

One of the best solutions to this problem is to buy a photographer's vest. Less expensive is a 'travel' or fishing vest. These lightweight items have a plethora of pockets and spaces to store small equipment and keep it right at hand when you need it.

When choosing a vest, remember that most observing is done at night when it is cold and you will be wearing winter clothing, even in summer so your vest should be sized to go over heavy coats. As well, you should make sure that you are looking for quality workmanship in your vest as it will be carrying your expensive equipment.

Another drawback of the standard vest is that it is a bit long leaving equipment stashed in the lower pockets bumping against your thighs. You always get nervous thinking about turning quickly and smashing a $500.00 eyepiece against your car or telescope.

For only about $10.00, you can get a tailor to modify the vest to allow it to hang down only as far as your waist.



That will solve the problem of the vest being too long.

When you are loading up your photo vest for a night of observing, you need to pay careful attention to where you put things.

Everyone will have to devise their own system for packing their vest, but you should make sure that everything has its own pocket. Otherwise you will spend a lot of time searching for that 15mm eyepiece through all of the many vest pockets. That is a big timewaster that can be prevented with a little thought as to packing the pockets.

A few things to keep in mind;

- **Buy a vest with good, strong seams that won't rip with heavy eyepieces in the pockets.**
- **Lined, waterproof pockets will protect your equipment from rain and perspiration.**
- **Padded shoulders are nice to have when you have the vest loaded down.**
- **Some vests have mesh backs, which helps ventilation on those hot summer evenings.**
- **A built-in waist belt allows you to tighten the vest, which helps keep your pocketed gear from swaying around too much as you move**

Finally, when you take along snacks, be sure to put them in your own pockets, not the vest. You don't want a bag of salted peanuts or a chocolate candy bar wrapper breaking next to your collection of eyepieces.

Member of the Month— John Gauvreau— by Steve Germann

John Gauvreau went to Nelson High School with me in the late 70's. We were both on the York University Science Olympics team in 1979.

It was quite a pleasant surprise when I met him again after joining the HAA 18 months ago.

John is an excellent advocate for astronomy in Hamilton, and a great treasure to have in our club.

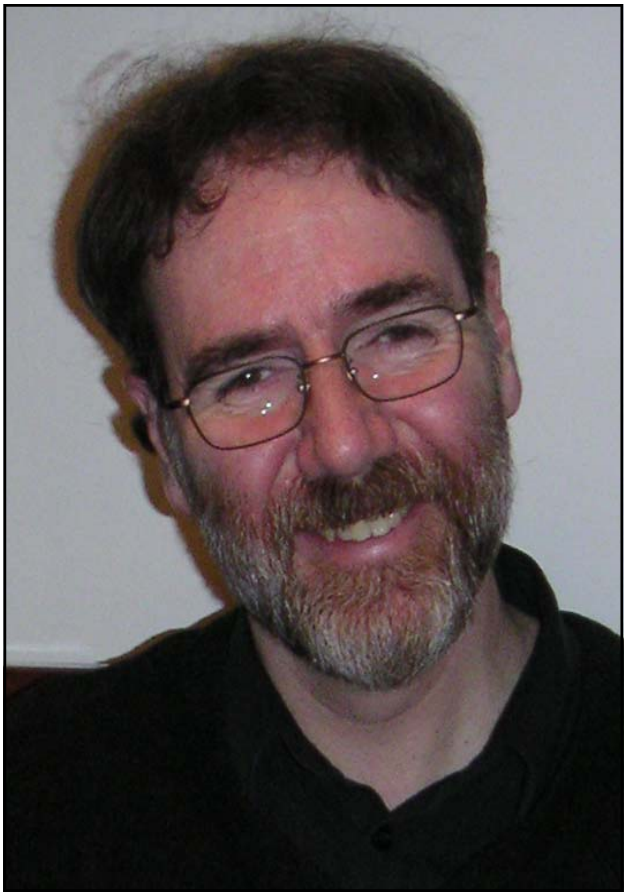
His enthusiasm and sincerity are unmatched, and his breadth of knowledge about the night sky stretches from east to west and back again.

Up until recently he taught a community college course on astronomy. The course included a few excursions to Binbrook when the weather was appropriate.

John does numerous lessons on astronomy and science for primary school students in the area. They're so interesting for the students, he's even been considered cool by his niece! His mastery of the subject is evident whenever he comments on it.

He has a capacity for sly understatement, tapped on occasion. While viewing Venus, Jupiter and Mercury in the night sky, he commented to the entire group at Binbrook that we could see with unaided eye half the planets in the solar system.

Since Pluto was just recently demoted, half the planets still left 4... so I took the bait, got caught in a well crafted trap... and he reminded me I was also standing on a planet!



John comes out to the after-meeting get-togethers and I always enjoy catching up on the latest interesting astronomy related news with him. He once sat a bit too close to the chairman of the club, and got an assignment for a presentation at the next meeting.

He rose to the occasion, and reaching into his deep resources of telescope information, and along with Jim and Don, put together a fine talk about what to buy and what not to buy, in terms of telescopes, at our December meeting. If you missed his talk, you need to attend the meetings. He might talk again someday... I will sum it up...

Aperture is the most important aspect of a telescope. Gathering a lot of light will make things brighter and easier to see; you can always add eyepieces later.

Optics is the most important aspect of a telescope. Alignment, and figuring of mirrors and lenses distinguish a good scope from an also-ran. Apochromatic optics make for much nicer views than uncorrected scopes. He provided coaching on accepting that two parameters can both simultaneously be the most important.

The key point of that talk was don't buy till you try, and our club is the best place to try equipment, because we have a lot of it and are always able and willing to share the view.

John has some fine eyepieces and is keen to let us members try them out on our scopes to get an idea about which ones work best. His telescopes are of very high quality and bring in the tiniest detail possible for a scope of that, ahem, aperture.

He has helped me many times to fish up an interesting deep sky object via star hopping.

In praise of his enthusiasm and contribution to the club, John is my choice for "January Member of the Month".

ASTROLOGY!—by Tim Philp

When people find out that I am an amateur astronomer or that I write an astronomy column in the newspaper, I sometimes get asked 'what sign are you?'. The other variation is that 'the future is in the stars'. In either case, I find myself stifling a bit of irritation and strive to be polite... well, I do TRY to be polite.

Of course, they are confusing the science of ASTRONOMY, with the nonsense of ASTROLOGY. The sad part is that there are many people who actually believe that the position of the planets when you were born can actually have an influence on your character or your future.

It is interesting that astronomy and astrology have common origins. In fact, astronomy has its beginning in astrology. The first people to take an interest in the stars and planets were astrologers. Of course, this was at a time when we were trying to understand how the universe worked and to find some way to have control over the world.

Interestingly, many early astronomers actually dabbled in astrology. Some even made tidy livings casting horoscopes for gullible people who wanted a look at the future. Fortunately, their careers as astrologers was not as memorable as the service that they did to astronomy. It has only been since about the 15th century that astronomy has been able to drag itself out of a pit of superstition to become a the respectable science that it is today.

Of course, knowledge of the movement of the sun, moon, and planets is important if you want to know when to plant your crops, how much longer winter will last, create a calendar, and predict that most frightening of phenomena to primitive cultures, the solar eclipse. This was the domain of the early astrologers as they were the ones who studied the skies.

Because of the success of astrologers in predicting these events,

the idea was born that since the seasons controlled events here on the Earth, and the seasons were controlled by the sun in the sky, perhaps the stars and planets had a similar effect on events here. Of course, that is absolute nonsense.

In fact, the only objects in space that have any effect on the Earth are the sun and the moon. The sun is the source of almost all of the energy that we have here on the Earth and the sun and moon are responsible for tides in the ocean. The stars and the planets have zero influence on people, events, or even the character of anyone or anything on this planet.

Now, serious astrologers, if indeed there can be said to be such an animal, would tell you that of course the horoscopes in the newspaper are garbage. They are for entertainment only and not meant to be taken seriously by anyone.

They would claim that 'real' astrology requires a lot of calculation to prepare an individual horoscope that could be accurate. They argue that they use the same sophisticated programs that astronomers use to determine the position of the planets. Of course high precision is no virtue when your basic assumptions are so totally wrong.

Let's be perfectly clear, there is no scientific basis for astrology. The planets can have no influence on people. In fact, the newsletter that you are reading has more gravitational influence on you than any planet in the solar system!

Newspaper horoscopes are good fun, as long as you keep them in perspective as entertainment. Just make sure that you understand that there is no basis for astrology except superstition and ignorance. Anyone who says otherwise is either trying to fool you, or they have deluded themselves.

Things I Learned While Standing in the Dark—by Everett Cairns

Last year I bought a Pentax K10D, for both wide field astrophotography and everyday use with normal commercial lenses. A very nice SLR camera all around (built in shake reduction good for old farts with shaky hands!), but possibly a little more noisy than the best. A banding artifact shows if exposure pushed too far. I say "possibly" as the noise is a result of the hardware level limits masked by the camera makers choice on how aggressively to hide that noise. Camera to camera comparisons are not that easy through second party reports.

The first thing I learned is that focusing must inevitably be done by trial and error, examining the magnified image at each step. This is a result of the autofocus preference of the majority of camera buyers. As a result viewfinders and lens mechanics are not ideal for astrophotography. Lenses are designed to rack in and out quickly under motor control, not to be focused delicately by hand. Viewfinders lack focusing aids such as split image prisms. Worse still, tolerances on placement of the focusing screen, although good enough for landscapes and portraits, are just too sloppy for critical astro work.

I decided that a good manual focus lens with a solid metal barrel and fine pitch focusing screw would be preferable to an autofocus lens. For this reason I gave myself a Voightlander macro lens for Christmas. To this lens I would have to add a focusing scale so that I could return to the best focus once I found it. I figured that I could find the best focus by taking trial images as I progressively racked the lens in from the infinity stop (time for a quick prayer that the true focus would be inside the infinity stop). When the 125mm f2.5 Voightlander came, I found that as little as 0.1 mm rotation at the 75mm diameter of the focusing ring was significant when near focus. This motion moved the lens in a mere 0.01mm. You can appreciate how critical focusing is. Sign of a good sharp lens.

Although with care I could effect the above small adjustment, I still needed a scale on the lens barrel to read 0.1 mm rotation. In one of those EUREKA moments I realized that a solution was hanging on the bulletin board next to the computer. It was my collection of old printer resolver bands from junked inkjets. These bands of clear plastic have equal spaced lines, typically 0.1mm apart. Now if I cut the band in two and taped one part around the moving lens barrel and the other part around the stationary part of the barrel so that the bands overlapped, than the band would blink for every 0.1 mm rotation as the two moved in and out of alignment. Better still, as I had a second band with 9 rather than 10 lines per mm, I chose to use one of each pitch. This gave me an overlapped band with clearly visible bands of 1 mm spacing which shifted the full 1mm for every 0.1 mm of barrel rotation. Now I could even set to less than 0.1mm rotation, provided I could muster the manual dexterity required !

Armed with my camera and "enhanced" lens I ventured out into the -15 degree Centigrade cold. Although I shot from a driven equatorial mount, I found it better to take short 7 second exposures and stack them. This helped reduce the banding noise on the camera which is random from frame to frame and averages out.

I quickly discovered that the fingers on my right hand, which were from time to time bare to press those fiddly little camera buttons, were about to fall off from frostbite. Nothing I could do seemed to help. The only comfort here was knowing that the camera sensor was also cooling, thereby reducing any thermal noise. After a quick trip indoors to thaw out, I returned with a bottle of hot water in my right coat pocket. This time my hand was in my pocket wrapped around the bottle when not otherwise employed. This worked for me. So finally I got a few shots before the clouds rolled in. Next step--extended focus tests, more photos from a darker site. (The night sky isn't really orange, is it?)

The Event Horizon Archives— Spectroscopy for Amateur Astronomers By Doug Welch—September 2001

A few weeks ago at StarFest I got to say a few words about optical astronomy to a crowd of like-minded sky admirers.

During one of my rants, I got to saying that amateur astronomers are largely missing out on the beauty of looking at spectra on the Sun, stars, nebulae, even streetlamps.

Judging by the number of questions afterwards, I think I may have made a few converts.

In this brief article, I wanted to mention what you need to enjoy visual spectroscopy and what it is good for.

The main piece of equipment you need (that you probably don't already have) is a way to "disperse" light into its different colours. For many, many years, the only affordable way to do this was with a prism—and it is still the first idea which comes to mind. Unfortunately, it is also the most difficult to put to good use.

Prisms, especially equilateral prisms of heavy flint glass, will do the job, but they have a number of very annoying drawbacks. First, the total angle by which the prism deviates the light (from the direction it enters the prism) is large and consequently only a small area gets intercepted.

Second, light is lost by reflection unless the prism is multicoated (which they almost never are). Third, the violet side of the spectrum gets spread out way more than the red end. This is doubly unfortunate because the most interesting stars to examine with a spectroscope are cool, red giants which really only have red light - and that gets all bunched up by a prism!

The alternative to a prism is a "diffraction grating". I won't go into the background theory here, but they are the result of finely scribing numerous parallel, loosely-spaced rulings on a surface. The light that goes through a transmission grating (or reflects off of a reflection grating!) is spread out quite evenly with wavelength. Furthermore, you can buy cheap plastic replica gratings whose performance is really quite good.

I recommend that you first check out the "Learning Technologies" page: ***http:// www.starlab.com/pspl.html***, and think about getting a "PS-09" which is a 35mm slide mounted piece of grating which they sell for US$4.00 for one, or US$35.00 for 10.

You can make quite a decent spectrograph or spectroscope with one of those. Also, Efston science has sold replica gratings of high quality in the past - I haven't checked to see if they still do. I have bought "seconds" of these on several occasions. They have totally inconsequential cosmetic defects and are way cheaper!

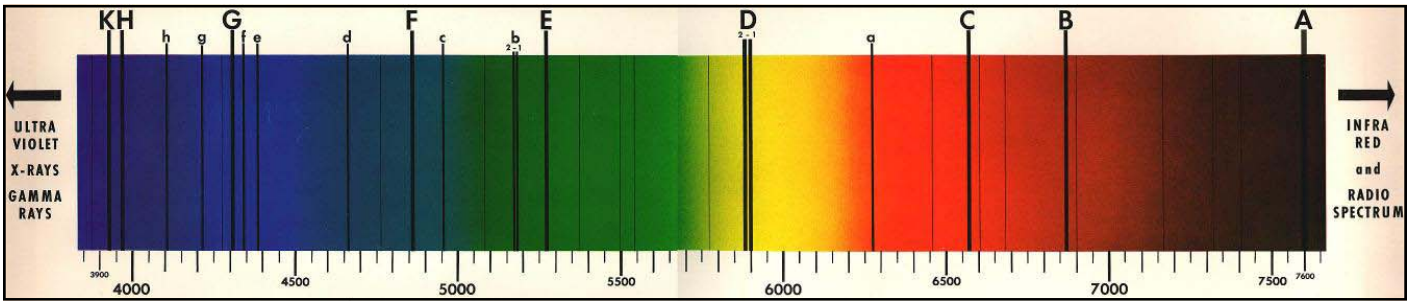
If you want to buy something ready-to-use, I recommend the "Rainbow Optics Star Spectroscope". They have both visual and photographic/ CCD models. The visual one has a high-quality grating which screws onto an eyepiece where the filter would go and then also has a cylindrical lens which goes over the eye end of the eyepiece to give a finite width to the spectrum - making it easier to see the spectral lines. A useful webpage for it is: http://www.astrovid.com/STARSPEC.HTM.

A good starting place for all of this on the Web is the link: ***http:// users.erols.com/njastro/faas/*** which is the "Forum for Amateur Astrospectroscopy".

So, what can you see with a spectroscope? Lots of different things. In a hottish star like Vega, the hydrogen lines are very prominent. Cooler stars like the sun have many lines of iron, chromium, magnesium, vanadium, as well as calcium, sodium, and hydrogen.

Red giants show beautifully coloured bands due to titanium oxide and carbon stars show molecular carbon bands (surprise!). Planetary nebula show one visible line due to twice ionized atomic oxygen for the most part - in fact, their images remain unaltered by dispersing the light, making this an easy way to identify small planetary nebulae which look almost stellar.

And the sun, oh the sun, so much light and so many absorption lines!!! There is NOTHING more beautiful than the purity of colour in the Sun's or a star's spectrum. You must experience it at least once in your life - and hopefully even more frequently!



The Space Place—Ultraviolet Surprise

by Patrick L. Barry and Tony Phillips

How would you like to visit a universe full of exotic stars and weird galaxies the likes of which astronomers on Earth have never seen before?

Now you can. Just point your web browser to galex.stsci.edu and start exploring.

That's the address of the Galaxy Evolution Explorer image archive, a survey of the whole sky at ultraviolet wavelengths that can't be seen from the ground. Earth's atmosphere blocks far-ultraviolet light, so the only way to see the ultraviolet sky is by using a space telescope such as NASA's Galaxy Evolution Explorer.

About 65% of the images from the all-sky survey haven't been closely examined by astronomers yet, so there are plenty of surprises waiting to be uncovered.

"The Galaxy Evolution Explorer produces so much data that, beyond basic quality control, we just don't have time to look at it all," says Mark Seibert, an astronomy postdoc at the Observatories of the Carnegie Institution of Washington in Pasadena, California.

This fresh view of the sky has already revealed striking and unexpected features of familiar celestial objects. Mira is a good example. Occasionally visible to the naked eye, Mira is a pulsating star monitored carefully by astronomers for more than 400 years. Yet until Galaxy Evolution Explorer recently examined Mira, no one would have guessed its secret: Mira possesses a comet-like tail 13 light-years long.

"Mira shows us that even well-observed stars can surprise us if we look at them in a different way and at different frequencies," Seibert says.

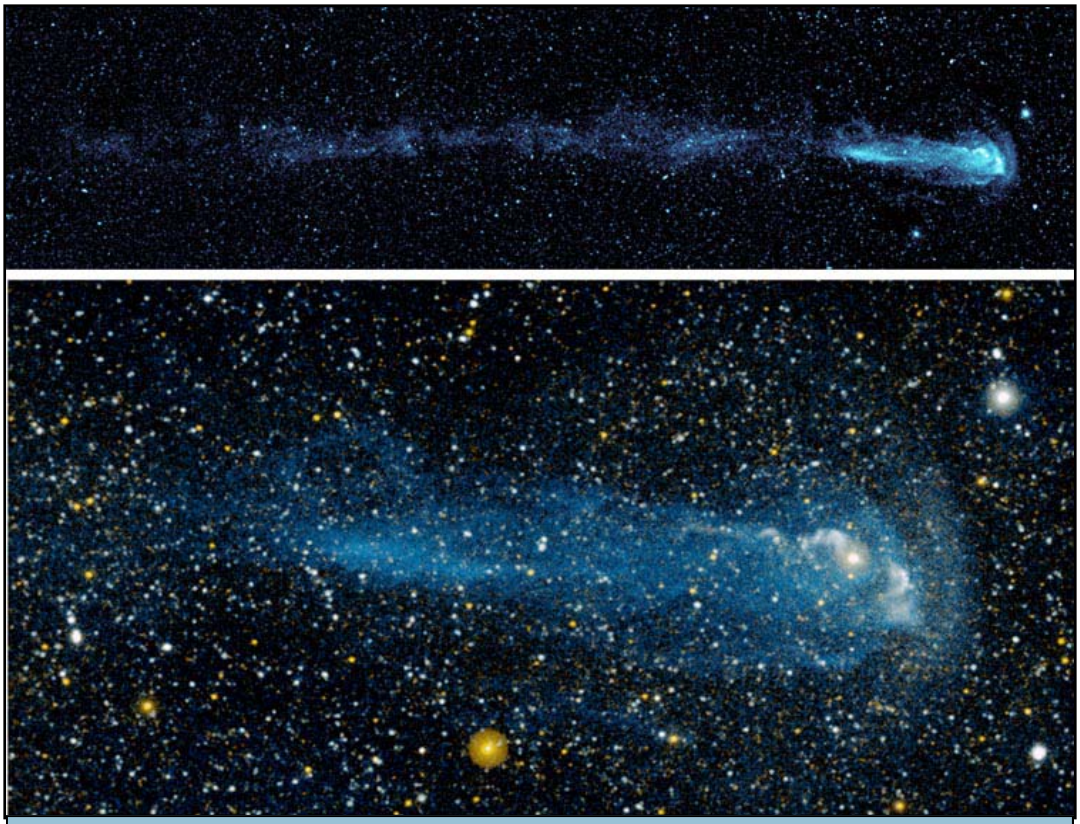
Another example: In April, scientists announced that galaxies such as NGC 1512 have giant ultraviolet spiral arms extending three times farther out into space than the arms that can be seen by visible-light telescopes. It would be like looking at your pet dog through an ultraviolet telescope and discovering his ears are really three times longer than you thought!

The images from the ultraviolet space telescope are ideal for hunting new phenomena. The telescope's small, 20-inch primary mirror (not much bigger than a typical backyard telescope) offers a wide field of view. Each image covers 1.2 degrees of sky—lots of territory for the unexpected.

If someone combing the archives does find something of interest, Seibert advises that she or he should first search astronomy journals to see whether the phenomenon has been observed before. If it hasn't, email a member of the Galaxy Evolution Explorer science team and let them know, Seibert says.

So what are you waiting for? Fire up your web browser and let the discoveries begin!

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.



Astronomers looking at new ultraviolet images from the Galaxy Evolution Explorer spacecraft were surprised to discover a 13-light-year long tail on Mira, a star that has been extensively studied for 400 years.

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Special Notice

Anyone with Internet access can download the latest newsletter (and any previous ones) from the club's website: www.amateurastronomy.org. Having the newsletter available online also allows us to publish it in full colour.

If you do not have Internet access, **you will still be able to pick up a paper copy at each meeting.** Copies of the newsletter will also be available to any newcomers at our meetings. **If you do not have Internet access, and cannot attend the meetings, please call Ann Tekatch at 905-575-5433 and she will place you on the special mailing list.**

The Event Horizon is a publication of the Hamilton Amateur Astronomers (HAA) The HAA is an amateur astronomy club, for people of all ages and experience levels, dedicated to the promotion and enjoyment of astronomy . The cost of the subscription is included in the $25 individual or $30 family membership fee for the year. Event Horizon is published a minimum of 10 times a year.

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7:30 PM @

The Hamilton Spectator

Article Submissions

The HAA welcomes your astronomy related writings for the Event Horizon newsletter. Please send your articles, big or small, to:

editor@amateurastronomy.org

The submission deadline is two weeks before each general meeting.