Volume 15, Issue 2

February 2008

HAMILTON AMATEUR ASTRONOMERS

Event Horizon

2008 Picture of the Month

The Horsehead and Flame Nebulae

Photo by Kerry-Ann Lecky Hepburn

2008 started off with a bang for the Hamilton Amateur Astronomers. First, it is the 15th anniversary of the club this year and the council would like to find an appropriate venue to celebrate the occasion.

The January meeting of the club was held at our new alternate location at the Knights of Columbus Hall in Burlington. Most people were im-

(Continued on page 2)

From The Editor's Desk

This month we get a treat that, while not exactly rare, is enough out of the ordinary that it is worth paying attention to. Of course, I am referring to the total lunar eclipse that we will have on the 20/21st of this month. This one will be worth a look because you won't see another like it until December of 2010! There will be several partial eclipses before then, but not another total for a couple of years.

This eclipse is a great time for generating interest in astronomy. Nothing screams for attention like something that you can see with your naked eyes!

Unfortunately, this eclipse comes at a time of the year when clear skies are more the exception than the rule. Let's all keep our fingers crossed.

Tim Philp, Editor

Inside this issue:

NOTICE

Members who pre-ordered **2008 HAA calendars** or **RASC 2008 Handbooks** @ $20 can pick them up at the next meeting, Feb 8th at the Spec Auditorium.

There are a couple of calendars left and these will be available for sale at the meeting.

2008 Starts off with a BANG! - By Tim Philp (Continued from Front Page)

pressed with the facilities there and a big thank you should go to Steve Germann who secured the hall for us—thanks Steve!

Our annual telescope clinic was one of the best ever with club members bringing many scopes to display and provide advice to other members and the public.

This event made publicity waves with the appearance of a video crew from the Spectator who filmed the event and interviewed many club members. The video is still online and more information can be had from our chairman's report on page three.

Another event that was a great success, so much so that it might become an annual event, was a public observing night at the Royal Botanical Gardens. About 40 kids and their parents crowded around telescopes to get views of the night sky. Members really came out to support this event and the location seemed to be very convenient for the logistics of setting up many telescopes for the evening.

Anyone taking a look at the galleries on the web site will notice that the HAA is an active club with many die-hard observers. Just looking at pictures of telescopes set up in the snow and the heavy winter clothing worn by observers shows what real dedication there is in our club.

Of course, looking at such scenes also suggests that Mike Jefferson might just have it right with his current exploration into radio astronomy. Sitting comfortably in a warm house the LOFAR receiver keeps taking measurements of the sun's interaction with our atmosphere, rain or shine.

Somehow the idea of observing while doing useful science whilst having your feet up and a glass of wine handy seems a very civilized way to do astronomy.

2008 is the 400th anniversary of the patenting of the telescope and next year will be the 400th anniversary of Galileo's use of that same instrument to usher in the beginnings of modern astronomy. The UN has been petitioned to declare 2009 as The Year of Astronomy.

Somehow, in this club, every year is The Year of Astronomy.

Treasurer's Report— By Don Pullen

(Unaudited)

Opening Balance (1 Jan 2008)	**$2642.52**
Expenses	**$ 278.28**
Revenue	**$ 0.00**
Bank Adjustment	**$ -380.59**
Closing Balance (31 Jan 2008)	**$2522.21**

Notes:

Bank adjustment is a one-time figure to bring our accounts inline with bank statements. Previously we got bank statements nearly a month late. It's now possible to reconcile our accounts to match the bank's month-end figures. Revenues and Expenses always matched, but just not at the same time. The $380.59 amount is to bring the 2 systems inline with each other. So from now on, both our manual accounts and the bank's records should match.

Expenses include: Knights of Columbus hall rental for Jan meeting ($52.50), Jan EH printing ($70.63), Office supplies and meal re-imbursement for guest speaker in November ($155.15)

From the Chair — by Mike Spicer

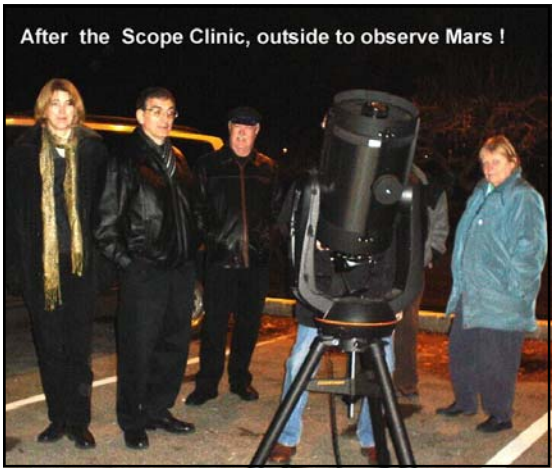
2008 has started off well for Hamilton Amateur Astronomers, despite largely uncooperative observing weather in January. Our annual

Telescope Clinic, held at the Spec Auditorium this year, was very well attended by members and visitors alike. The Spec published a streaming video of the event on their web site: www.hamiltonspectator.com/video2/astronomers.html.

Burlington Knights of Columbus Hall hosted an HAA monthly meeting for the very first time. This alternate site proved to be an excellent forum. I was surprised that attendance was so high in January - the hall was completely filled and people were standing at the back for Greg Emery's *Sky this Month*, and Tim Philp's presentation on *Measuring Astronomical Distances*, Don Pullen's update on *Near Earth Asteroid Passes* and Charlie Ricketts' excellent introduction to his *POD observatory* (he even brought a piece of wall for us to touch)

Mars, just past opposition and very high in the sky, was the object of delight for January. On the few nights when cloud or high winds didn't prevent it, our members were out observing the Red Planet. Unfortunately the nights we set aside to show Mars to the public were clouded out. Saturn is at opposition this month, an excellent alternative of celestial beauty to observe, to image and to show the public (next year at this time the rings will be edge-on and invisible!). Our members are doggedly persevering in the attempt to observe lunar occultations, near-Earth asteroid fly-bys and faint moons of distant planets despite bad weather. The winter constellations are now high in the south in the early evening, the sky filled with bright stars and many deep sky objects. On the evening of February 20th HAA will be observing and imaging the total eclipse of the Moon. This lunar eclipse will be extremely well-placed high in the SE before midnight.

Speaking of deep sky objects, it's time to prepare for the annual March Messier Marathon. This HAA annual fund-raiser provides you with a chance to observe - by yourself or at a group observing event - all 110 Messier objects in a single night (dusk to dawn), a rare achievement for winter observers at our latitude. Sign-up sheets are available at the February, March and April monthly meetings. Don't be afraid to ask your dentist, doctor, accountant and solicitor to sponsor you. The March monthly meeting will feature detailed information on the location and description of Messier objects in case you want to hone your skills.



Last fall the Club visited the David Dunlap Observatory in Toronto to use the big telescope and take in the public observing on DDO grounds. We were treated to a tour and a presentation on the history of Astronomy in Canada by Nicole DeBond. Nicole agreed to prepare a presentation for our club on lunar geology and we are happy to welcome her to the Spec Auditorium this month for that presentation. After the meeting you can talk to Nicole as we will be taking her out to dinner at Kelsey's, our usual eatery.

Large Aperture & Portability

By Kerry-Ann Lecky Hepburn

For years my fascination with the faint deep sky objects has resulted in a desire for more aperture. I wanted to be able to see more objects and resolve more detail.

Aperture fever hits many amateur astronomers and with that, comes the tough decision of what size telescope to buy that will give you the most light gathering ability while at the same time, being manageable, and not putting a large hole in your pockets.

What a tough order to ask for!

Well, that day came when Meade introduced their LightBridge telescope line. These truss-tube dobsonian telescopes ranged from 8in up to 16in and were capable of being broken down easily so that even the 16in version could fit into a small car for easy transport to a dark sky location.

In the past few months the prices have really come down to the point where you could get an aperture as large as 12in for under a thousand dollars, and this is where I couldn't refuse to jump at the opportunity to purchase my first 'big dob'... the 12in LightBridge.

I chose the 12in size because I figured that it would be the largest manageable aperture for my moderately dark skies. The telescope was well packed into two boxes that fit into my sport wagon with the back seats down.

Once it arrived home I couldn't wait to get it put together. The instructions were fairly straightforward. The base unfortunately was missing 2 attachment bolts, but luckily my husband was able to find very similar ones at Canadian Tire.

The collimation process was a little daunting for me but after a little under an hour of reading the manual, figuring out the laser collimator, installing Bob's Knobs and fiddling with lots of

Large Aperture & Portability

By Kerry-Ann Lecky Hepburn

screws, I managed to collimate it well enough. Or at least that is what I hoped. I took some advice about labelling the struts so that I didn't have to re-collimate every time I had to re-assemble it for transport.

My Lightbridge came with a red dot finder that was unfortunately defective. I was not able to adjust or collimate the red dot no matter how many turns I made with the hex screw. I eventually gave up and figured until I get a replacement, I will just have to eyeball where the objects should be in relation to dot.

Sitting in the dining room the 12in looked a lot larger than in the store and for a fleeting moment I was wondering if I got too large of a scope, but all doubts left once I was able to manage taking it apart and bringing it down almost two flights of stairs to the garage.

The month of December was really cloudy, in fact it is statistically the cloudiest month of the year, so I didn't take it personally that my purchase of this new telescope was the cause of my cloudy misfortunes. ***(Editor's Note: We can all blame Kerry and her new telescope for the cloudy skies this month! T.P.)***

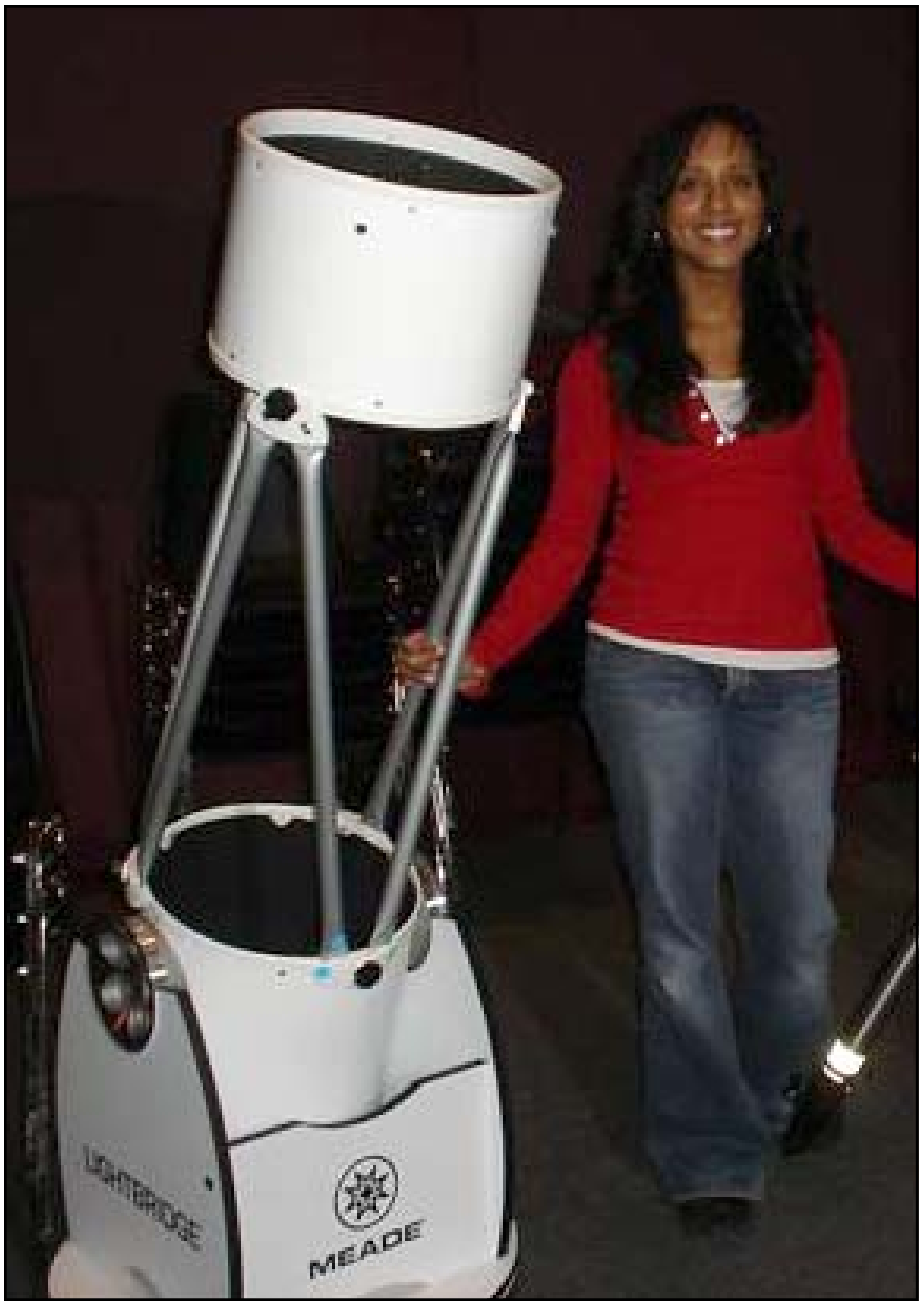
Well it turned out that later that evening the clouds thinned out enough to a veil of cirrus with only the moon, mars and a couple of stars being visible. So I figured now was my

Large Aperture & Portability

By Kerry-Ann Lecky Hepburn

chance to get a 'first light'.

Once the scope was cooled down I was greeted with an absolutely spectacular (but hazy) view of our nearest neighbour, the Moon. No photograph to date has provided me with such sharp and crisp detail. I popped in the 10mm plossl and was stunned! The terminator especially was a sight to see.



Afterwards I scooted over to the only other object that I could see through the clouds, Mars. With just the provided Meade 4000 26mm 2" eyepiece I was able to see a hint of some dark features on the surface. When I magnified the view with my 10mm plossl I was able to confirm it.

A little later the cirrus thinned out a bit more and I was able to scan around for some open clusters. I was very impressed with how sharp the star field looked even through the provided 2" eyepiece. The stars and clusters were lacking some lustre through the clouds but they were still very nice to look at.

After that night, I was able to use the scope a few more times, but under slightly better conditions. I was very impressed with how smoothly this scope moved. Compared to using a computerized scope, I actually found it more enjoyable having the freedom to scan around the entire sky, hunting for many deep sky objects.

Over the past couple of months, the weather conditions have only offered very brief moments of decent visual observing, and the fact that I chose to use the Lightbridge over any of my other smaller scopes during that time period, is a testament to it's relative portability considering the quality and depth of views.

Coming Events!

- **Messier Marathon sign-up sheets will be available at Feb 8 meeting**
- **Total Lunar Eclipse February 20th starting at 10 pm**
- **March 7th meeting at Spectator will highlight the Messier Marathon**
- **Saturn observing 15 March 7 - 9 at Discovery Centre grounds**
- **HAA will sponsor the Jim Winger prize at 2008 Bay Area Science Fair**
  - **Astronomy book "Nightwatch" and $50 cash prize**

  Don Pullen, Judge

Orion 5” MAK for Sale

My Orion 127mm (5 inch) Maksutov-Cassegrain Optical Tube Assembly (f/12.1) is for sale. The OTA is in good condition and includes mounting rings and dovetail rail, a dovetail finder scope mount, a 5 inch Orion Dew Shield and padded carrying case with 3 zippered pockets for accessories. T-threads on the eyepiece adaptor allow attachment of a 35mm camera (with optional T-ring) for astrophotography. A camera can also attach "piggyback" on this scope.

I have purchased a 6 inch Celestron NexStar and so I no longer use this quality OTA. The tube is 15 inches long and weighs 8.6 lbs. It is very portable and easy to handle. This scope gathers 55% more light than a 4 inch scope. A great "step-up" scope for someone with a smaller aperture scope.

This Mak provides excellent views of planets, and is also very good for high power views of star clusters and nebulas, especially globular clusters and planetary nebulas. I remember vividly how wonderful Jupiter looked through this scope: big and lots of fine detail to be seen.

The sale price is $200.00 or I will trade for a Burgess or Williams Binoviewer in good condition and with good quality eyepieces, preferably matched 10mm ones but 20mm would be okay. Interested? Contact: Heather Neproszel at hneproszel@aol.com.

The Sky this Month—by Greg Emory

The winter **Milky Way** offers many delights for viewing on a cold winter night. The numerous **open clusters** which run from **Perseus/Cassiopeia** all the way down to **Monoceros** allow for the viewing of untold numbers of stars against the spackled background of the Milky Way. To prevent boredom we have many assorted dust and gas clouds to gaze upon.

Rising behind **Orion** are the constellations **Canis Major** and **Canis Minor**. **Canis Major** is distinguished as being the home of **Sirius**, the Dog star. One story of **Sirius** goes along the lines that the Ancients considered the heat of the summer months in the Northern Hemisphere (the Dog Days of Summer) to be attributed to **Sirius** being in the sky along with the sun. The combined heat of the two leading to the Summer weather. **Sirius** is a beautiful, bright star – the brightest star, next to our **Sun**, as viewed from **Earth**. On the centerfold star map, **Sirius** and **Canis Major** are just off the below, below **Monoceros**.

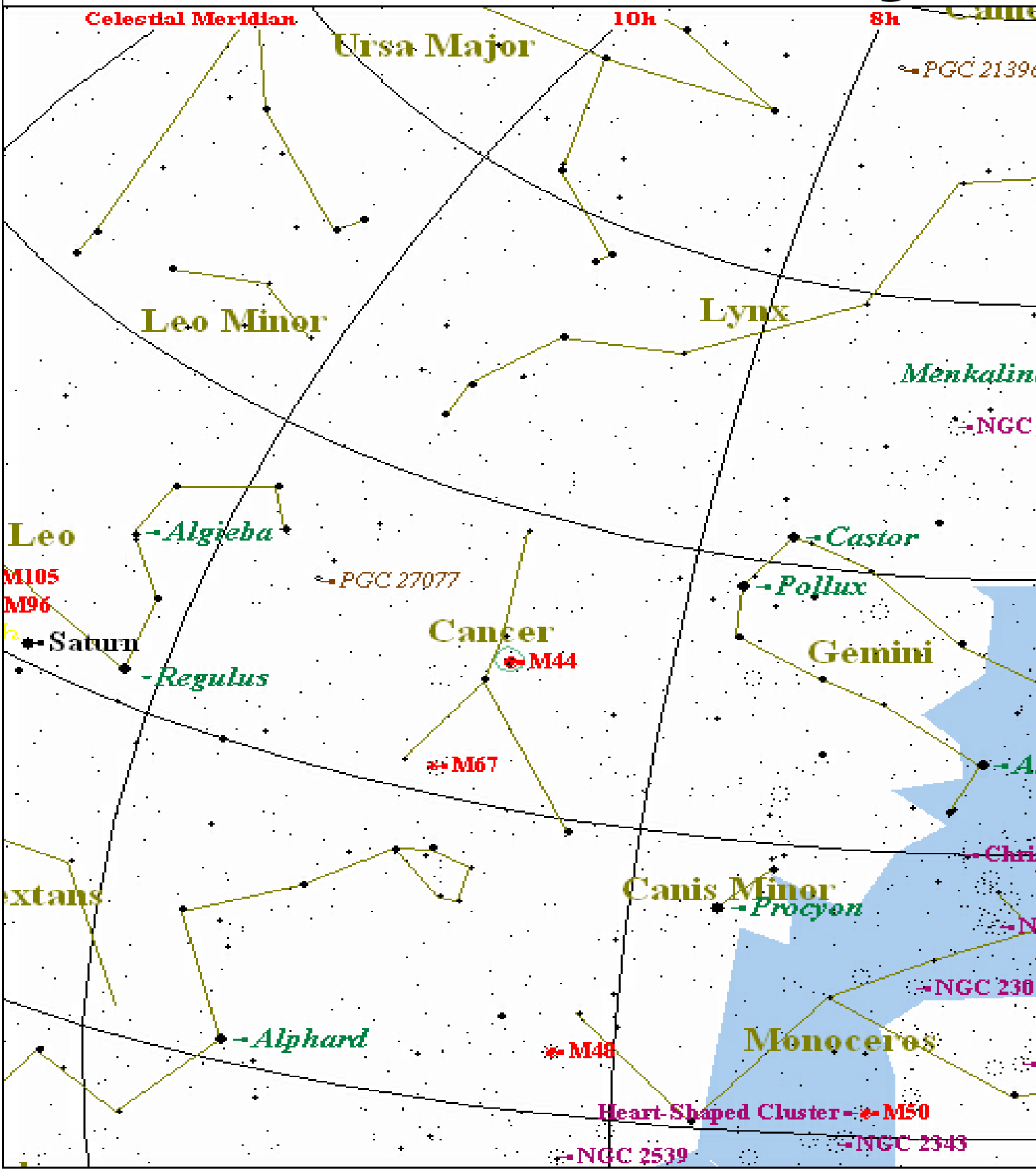
To the east of the Milky Way is **Gemini**, the twins. I have read that the constellation **Gemini** is one of the few that actually looks like the mythical figure it is named after. Unfortunately, I don't see the twins. What I do see is two stars that are relatively close together and are strikingly similar in brightness. **Pollux**, the more southern of the two, is the brightest with a magnitude of 1.15 whereas **Castor** is about magnitude 1.56.

Chasing the twins across the sky is **Cancer** the crab. This relatively non-descript constellation is the home to two **Messier** objects, **M44** and **M67**. The **open cluster M44** is also known as the **Beehive Cluster** or the **Praesepe**. It is a beautiful open cluster visible to the naked eye. To be honest, I find the constellation **Cancer**, as many times as not, by spotting **M44** half way between **Gemini** and **Leo**, this puts me in the middle of **Cancer**. The **Beehive Cluster** is made up of about 200 stars and is the size of roughly 2.5 full **moons**.

If **open clusters** are not your cup of tea, then find comfort in **Leo** and the constellations of spring rising behind **Cancer**. This is galaxy country. **Leo** alone has 8 galaxies brighter than 10^{th} magnitude. Four of the galaxies are clustered in a tight grouping underneath the lion. The four galaxies (**M95**, **M96**, **M105** and **NGC 3384**) are relatively close together in the field of view. The galaxies **M95** and **M96** are a spiral barred spiral (**Sb** and **SB**), respectively. The **elliptical galaxy M105** is classed as an **E1**. For this year **Leo** also has an additional guest, **Saturn**. **Saturn** is located relatively close to **Regulus**, the alpha star of **Leo** which anchors the sickle of **Leo**.

With just a few clear skies, there is something for everyone.

The Sky T


Celestial Meridian
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Leo Minor
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PGC 27077
Pollux
Saturn
Cancer
M44
Gemini
Regulus
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Monoceros
Heart-Shaped Cluster
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NGC 2343
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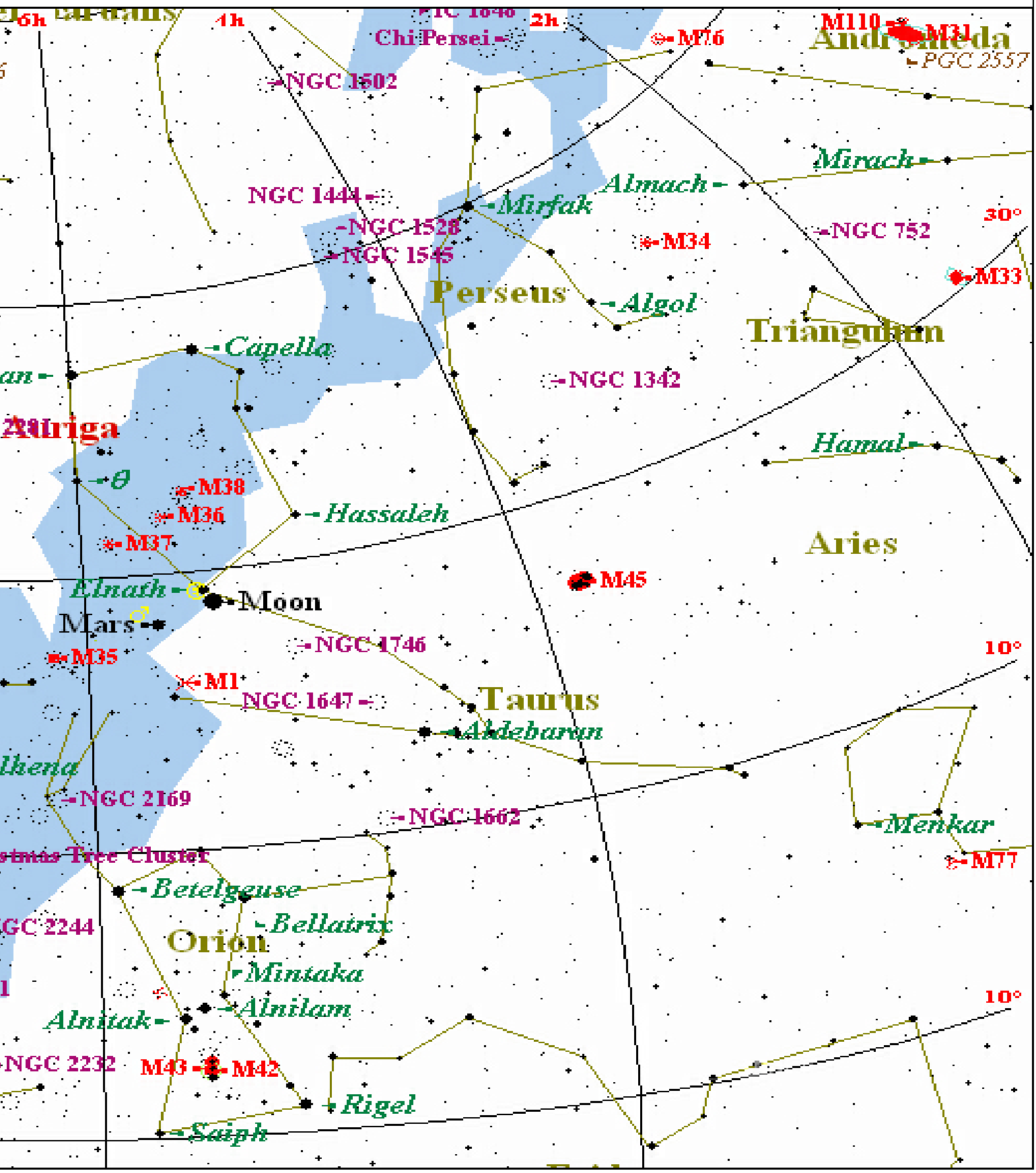
his Month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Andromeda
PGC 2557
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Mirfak
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M34
NGC 752
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Perseus
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Triangulum
Capella
NGC 1342
Auriga
Hamal
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M38
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Hassaleh
M37
Aries
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Elnath
Moon
Mars
NGC 1746
M35
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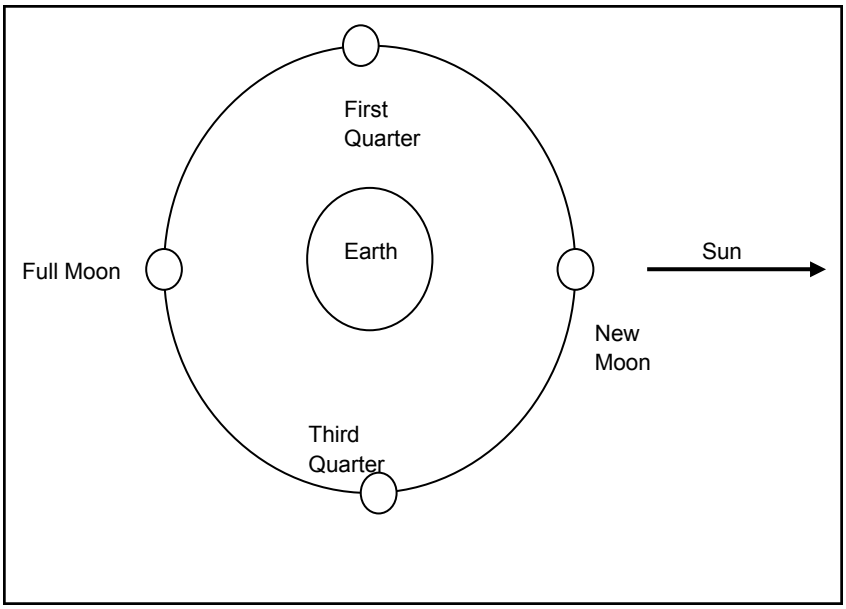
10°
NGC 1647
Taurus
Aldebaran
NGC 2169
NGC 1662
Menkar
M77
Betelgeuse
Bellatrix
Orion
Mintaka
Alnilam
Alnitak
NGC 2232
M43
M42
Rigel
Saiph
10°

Through the Looking Glass—by Greg Emory

Earth's Moon is shrouded in myth, history, legends and lore. The Moon has always been there – at least as long as humanoid life has been around. When we look up at the Moon we are repeating acts that predate history. Man has always looked and wondered, been frightened or intrigued. The Moon is the best place to start learning astronomy. In fact your interest in astronomy may date back to your youth when you looked up at the Moon and simply wondered…

The Moon goes through phases; early phases (from new moon to first quarter or half-moon) put the Moon in the early evening sky. Geometrically, these parts of the phases of the Moon are described by a phase angle of 0 to 90°. From the first quarter moon to the third quarter moon, including the full moon, the geometric angle is between 90 and 270°. These phases are seen from early evening through to mid morning. The geometry of the Sun-Earth-Moon positions is seen in Figure 1.



As the Moon goes through the phases we are able to view different things. Ideally, viewing the Moon is best during low illumination, that is between New and First Quarter or between Third Quarter and New. The Moon reflects light from the Sun, the small amount of light that is reflected can still be overpowering when viewed through binoculars or a telescope. To avoid this you view the Moon when only small fractions of it are illuminated. Objects such as mountains and craters are seen in more detail when they are on or near the terminator, the line between darkness and light.

Many people, in many walks of life, try so hard to speak with a more scientific or learned vocabulary that sometimes we loose the beauty or simplicity. Bubbling becomes ebulating, belly button becomes navel becomes umbilicus and the man in the Moon becomes maria (singular mare). The Moon has many features to look at. The larger scale features such as the Maria or Seas are well viewed with low power – or better still the naked eye. The other features such as Mountains, rilles, ejecta, rays, and craters require some optical aid to be seen or appreciated.

The Moon lacks an atmosphere. This in addition to the lack of water prevents erosion processes which prevail on Earth. The structures and impact craters on the Moon remain as they are until some other event erases them.

The Moon does have hills, highlands and mountains. The mountains rise up to the 17 000 foot range (that is three miles or 5 km) – not something to be ridiculed or trifled with. To me however, the most fascinating things to view on the Moon are the craters.

Craters are large, impressive holes in the ground. A crater is made by a high-speed rock smacking into the Moon. The bigger and faster the rock, the more impressive the hole. Once the rock becomes large enough and fast enough, a simple crater is not formed. These impacts lead to the formation of maria.

When viewing a crater look for some of the following: multiple rims; central peaks or inner craters. Some craters have rims with detailed structure reminiscent of ripples on a pond. If you have ever seen a slow motion video of a drop of water (or milk or paint) hitting a liquid surface, you have also seen how the liquid surface rebounds. Crater formation has the same phenomenon, only with rock. Some craters are two to three miles deep. Due to the lack of erosion, an old crater can be hit by another rock yielding a crater within a crater.

Some of the really big craters had so much material thrown out of them at the time of impact that we can still see the debris (called ejecta) scattered in a splash pattern across the surface of the Moon.

An aid for viewing the Moon is essential, an atlas or book is fine. There are many free or professional software packages with detailed information of the Moon. One good free one is the Virtual Moon Atlas.

HAA Turns 15 Years Old In 2008!

That's right, the HAA turns 15 this year and to celebrate, the council would like your input.

Do you want an outdoor pot luck & BBQ or an indoor sit-down dinner @ about $30.00 per person?

Contact Mike Spicer

debeneesse2001@aol.com

Messenger to Mercury — by Tim Philp

In the more that 30 years that I have been doing astronomy, I have only seen the planet Mercury about 4 times. It certainly was not because I was not looking for it, but because it is so difficult to see. The few times I have seen it, it was so close to the horizon and the setting sun that it was very difficult to spot. Now, it seems, I am about to get the best look at Mercury in more than 30 years as the Messenger spacecraft zooms by the tiny planet snapping pictures as it goes.

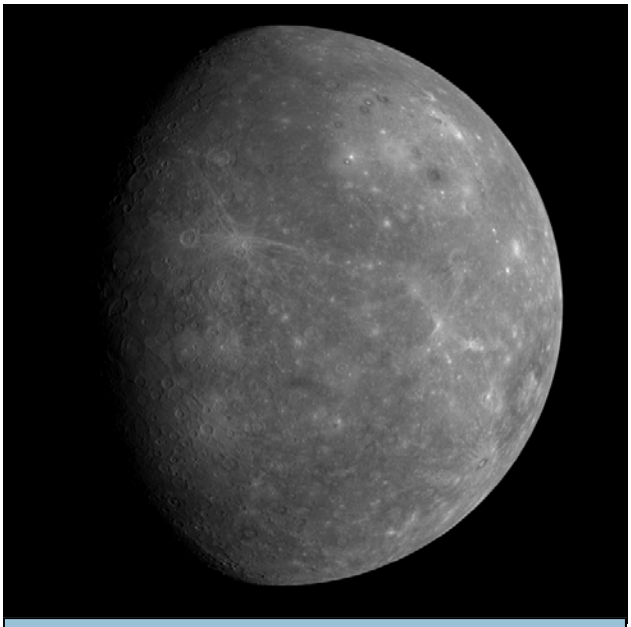
Of all the planets, Mercury is the closest to the sun. It receives about 11 times as much energy from the sun as we do here on the Earth. It is a hot, dry, almost airless rock in space that is only about 1000 kilometres wider than our own moon. In fact, it is only slightly smaller than Ganymede and Titan, moons of Jupiter and Saturn respectively.

When it is visible to earthly eyes, Mercury is almost lost in the glare of the rising or setting sun and quite low on the horizon. When it is viewed through binoculars or a telescope, the Earth's atmosphere distorts the planet and paints it bright rainbow colours that make it a difficult and frustrating target for astronomers.

In this age of fantastic pictures brought to us from the Hubble Space Telescope and the many spacecraft that have orbited distant planets, it is difficult to believe that we do not have images of the entire surface of Mercury. The last time a spacecraft visited Mercury to take pictures was the Mariner 10 spacecraft that mapped only about 45% of the planet. That left more than half of the planet as a blank space to be filled in.

That is about to change as the NASA spacecraft Messenger sped by the innermost planet on its way to an eventual orbital mission at Mercury. As it zipped past the planet it snapped pictures at a great rate and added much to our knowledge.

During the previous Mariner missions, the same side of the planet was turned toward the sun and both spacecraft only saw a fraction of the planet. That changed with Messenger as it captured images of the previously unseen side of the planet to reveal a landscape not unlike parts of our moon with its heavy cratering and bright rays of ejected material.



MESSENGER became the first spacecraft to see the side of Mercury shown in this image.

Messenger is half way through a 7.9 billion kilometre journey to Mercury orbit that includes more than 15 trips around the sun. It has already flown past the Earth once and Venus twice. It has just completed the first of three passes of Mercury before it is inserted into orbit around the planet in March of 2011 to begin its work answering some interesting questions that we have about Mercury.

Such a circuitous route is necessary because of the huge fuel requirements for a direct flight to Mercury. By using the gravitational pull of the Earth, Venus, and Mercury itself, the probe can get to Mercury without having to have much more fuel than can be carried to Earth orbit.

Once there, Messenger will orbit Mercury for one Earth year – 4 Mercury years or 2 Mercury days, during which time it will collect data on the composition and structure of Mercury's crust, its topography and geologic history, the nature of its thin atmosphere and active magnetosphere, and the makeup of its core and polar materials.

Mercury was one of the planets known to the ancients who named it after the speedy messenger God Mercury. It is now, with the demotion of Pluto, the smallest planet in the solar system. It has a highly elliptical orbit that takes the planet to within 46 million kilometres and out to 70 million kilometres. It orbits the sun once every 88 Earth days, but it rotates once every 59 Earth days.

This orbit and slow rotation combine to give Mercury the largest temperature swing in the solar system – from 426 degrees Celsius down to about -184 Celsius. I doubt it will become the vacation spot in the inner solar system! There are, however, areas at the poles that seem to be constantly shrouded in shadow that show up brightly under radar imaging. It is possible that water ice could exist there, but the findings are inconclusive.

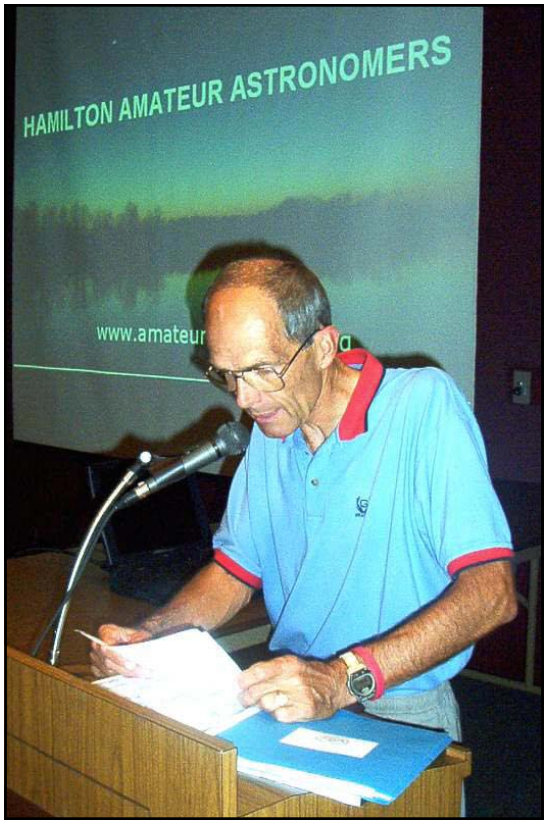
In any case, the next few years, as Messenger settles into Mercury orbit, will be exciting ones for planetary scientists as they await their first close look at the elusive Mercury in 30 years. I can't wait!

Member of the Month— Mike Jefferson
by John Gauvreau

Michael Jefferson takes great pride, and rightly so, in the fact that he is one of the original members of the Hamilton Amateur Astronomers. His contributions to the club come as no surprise to those that know Michael, and his long history of involvement in amateur astronomy has taken him to unique areas of our hobby.

I first met Michael over 20 years ago when we were both members of the Hamilton Centre of the RASC. At that time it was a vibrant and active club and Michael became well known as part of its one-time public education programmes and observing sessions. Michael was also a contributor to the club's assets at its observing site, generously contributing much needed and necessary items to aid in the observing comfort of his fellow members. At the same time he was developing relationships with not just local astronomers but those from far and wide as an early attendee at Starfest, the NYAA's annual star party. Over the years Michael has formed both friendships and a good reputation there, as both a regular visitor and presenter. Michael has also been a member of the International Dark Sky Association and is an associate of the AAVSO, a respected association of variable star observers.

During his tenure with the HAA you know Michael has involved himself with areas of astronomy that few amateurs attempt. He is an amateur spectroscopist, and I have enjoyed the dividends of this endeavour by using his spectra in my college astronomy classes. His contributions to my classes extended beyond this, as he very often helped out on class observing sessions, where he was a welcome aide in guiding these newcomers through the night sky. On one night Michael brought along his green laser, and at this time when green lasers were far from common as they are today, his laser was a bigger hit than anything else that night! More recently he has become involved in radio astronomy. At HAA meetings he has been keeping us up to date with the progress of his latest project: an antenna with which he is monitoring interactions between the Sun and the Earth's upper atmosphere. As he will proudly tell you, this antenna is able to operate on automatic both day and night, and so he is our only observer collecting observations 24 hours a day, 365 days a year!



His homemade radio antenna is only the latest addition to his equipment collection. A few months before joining his first astronomy club in the fall of 1983 he acquired his first telescope. Michael is still the proud owner of this instrument; a Questar that he bought from John and Suzanne Kidner at Perceptor. Michael remained close to John and Suzanne until John passed away recently. Michael owns a second telescope which he obtained in 1996. It is a rare 4" apo refractor made by Zeiss shortly before they stopped making amateur optics. Knowing that he already has a Questar, you also know that Michael appreciates the finest quality. This Zeiss instrument falls in line with that attitude, and gives very lovely images. Michael jokes that this instrument has half the focal length of the Questar but also has a tube length 3 times as long as the small Maksutov! Michael's interest in these instruments extends beyond their performance in the field; he can give you the history of both the Questar company and the Zeiss company in finer detail than many of their own employees could! This past year Mike also obtained a second Questar. A second hand model, it is actually older than his first one. This second one offers advantages over the first, in that the eyepiece holder is a little more versatile and allows the insertion of a standard 1.25" diagonal. Many may be jealous of somebody having two Questars, but Mike is deserving.

Observing with Mike is always an enjoyable experience. Memorable evenings that I have spent with him include the single most remarkable view of Saturn that I have ever had, and other nights with his photography set-up which has included medium format and large format instruments. Michael has recently taken the plunge into digital.

Of course, you would expect anyone with such a remarkable history of involvement in this hobby to have interests beyond astronomy as well. This retired elementary school teacher is a prominent member of the 150 year old Hamilton Association for the Advancement of Literature, Science and Art, and is currently involved in amateur theatre and dance.

Finally, it is worth noting that while with the HAA Michael has collected and saved every single issue of Event Horizon. Mike is a fine and valuable addition to our organization. For the reasons mentioned here and many others that I hope you will discover yourself as you get to know him, I am proud to make Michael Jefferson the HAA's member of the month.

400 Years of Telescopes—by Tim Philp

"***Oh telescope, instrument of much knowledge, more precious than any sceptre! Is not he who hold thee in his hand made king and lord of the works of God? Johannes Kepler (1571 - 1630)***

When we think of astronomy, we automatically think of the telescope. This device has become synonymous with stargazing to the point where many people think that you cannot do astronomy without one. Certainly astronomy has been performed with only the naked eye, but it was the invention of the telescope that transformed it from superstition to science.

The invention of the telescope is somewhat shrouded in mystery, however, there are records that seem to indicate that such a device has been possible for at least 2500 years. In fact, the technology to construct such a device has certainly existed since at least Roman times. It is possible that the technology could be much older than even the Romans.

Hans Lippershey a spectacle-maker from The Hague was the first person to patent the telescope in 1608.

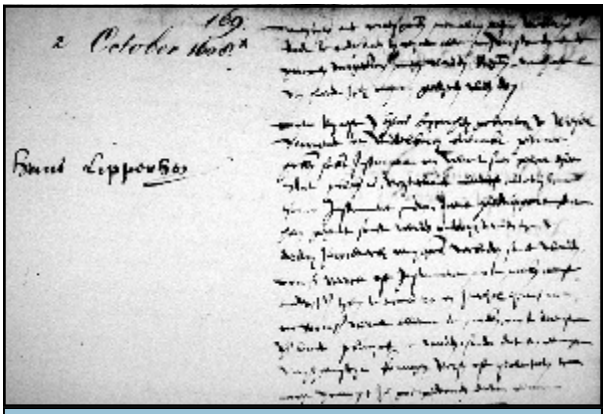
The invention that forms the basis for the telescope is the convex lens. This is a lens that is thicker in the middle than at the edges. Perhaps the best modern example of this kind of lens is the simple magnifying glass.

Crystals of this shape have been discovered in the ruins of the civilizations of Ancient Troy, Carthage, Egypt, and Rome. While these crude lenses are not the optical wonders that we are used to with today's technology, they did indeed serve the purpose of magnifying objects so that they could be seen better than with the naked eye... particularly for older people. The short focal length of these lenses would have rendered them only useful for that purpose, but the basic technology was there to grind crystals into lenses that could have been used to make a telescope.

The first record that we have of a telescope-like device is in an ancient book by a brilliant Arabian astronomer and mathematician, Ibn Alhazen. His book told of concave lenses that were thinner in the middle than at the edges. Both types of lenses are required to construct a telescope. By the 13th century, Oxford scholar and Franciscan monk, Roger Bacon wrote a treatise about using lenses to see at a distance. Other writers such as Giovanbaptista Della Porta a 16th century Italian spectacle-maker wrote about using lenses to see things at a distance as did many others.

While these accounts indicate that it is possible that a telescope was made in ancient times, we have no evidence that one was actually constructed. The first telescope that we can say for sure was actually built was constructed in 1608 by Hans Lippershey, another spectacle-maker in The Hague. Lippershey called his new invention a 'looker' and he sold it to the Estates of Holland for the use of the military. He was paid 900 florins for the device, but he was required to double the tube and construct what we know as binoculars today.

In a dispute that has echoed down through the years whenever any



Lippersey's patent application was the first time the telescope had been documented so he gets credit for it.

400 Years of Telescopes—by Tim Philp

invention that is worth a lot of money is created, others soon turned up with telescopes of a similar design. In fact, within three weeks of Lippershey's patent application, two others claimed the discovery for themselves.

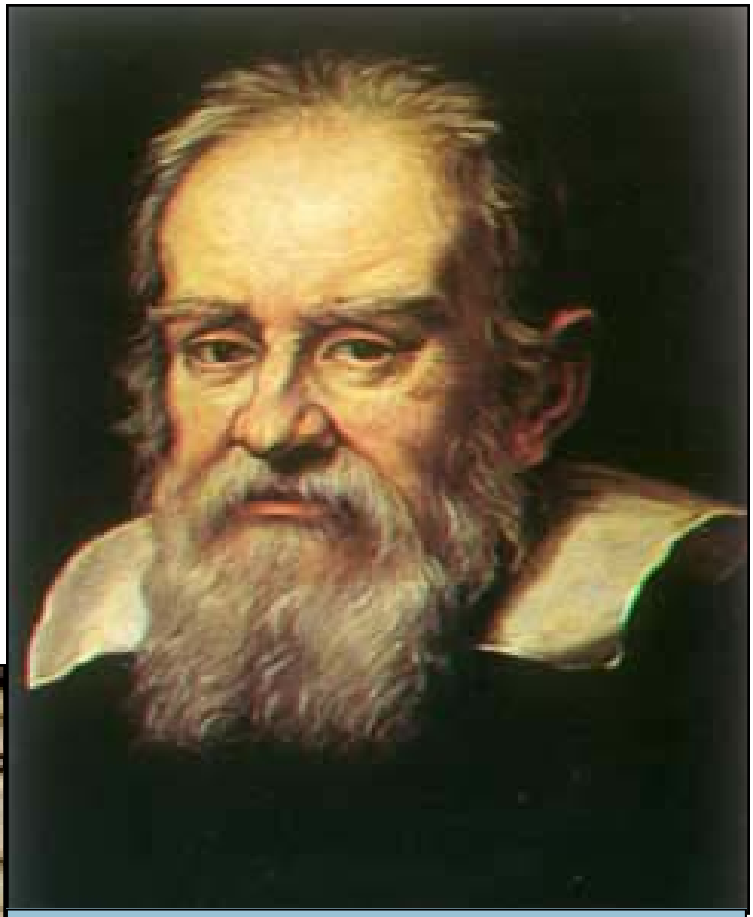
While Lippershey only considered the use of the telescope for earthly pursuits, it remained for a professor of mathematics at the University of Padua in Italy, Galileo Galilei (1564 – 1642) to actually point a telescope skywards.

Working from accounts of Lippershey's telescope, Galileo constructed a small telescope that magnified about three times. This device enabled him to see magnified images of terrestrial objects. He became so skilled at constructing telescopes, that he eventually made one that would magnify 32 times.

The quality of his telescopes was good enough that he was able to see mountains on the moon and, in an observation that was to shake the very foundations of church doctrine, discover moons orbiting the planet Jupiter. This observation was further proof to him that the Earth was not the centre of the universe, as church teachings ordained. His writings on this topic resulted in his imprisonment for many years, until the end of his life.

Of course, the telescope invented by Lippershey had its problems such as colour fringing around the images caused by the properties of the glass used in the telescopes of the day. It was not until modern times with the use of exotic glass technology that this problem was able to be solved.

Because of this, for many years, astronomers abandoned the refracting telescope, one that uses lenses, in favour of a design that used mirrors in place of the problematic lenses. Today, both kinds of telescopes are in common use with many variations on each design. Both Lippershey and Galileo would be astounded if they could move forward in time 400 years and take a quick peek through one of today's inexpensive optical wonders.



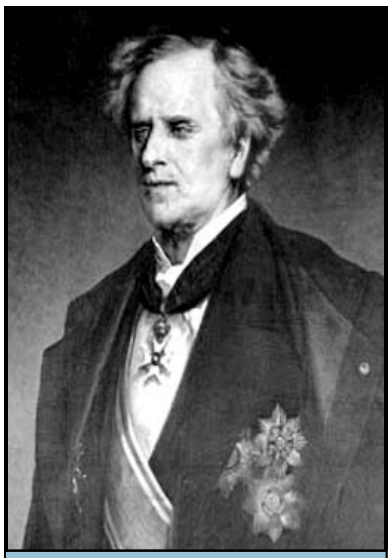
Despite Lippershey's patent, Galileo was the first person we know of who used the newly-invented telescope to view the heavens. This act in 1609 was the start of modern astronomy.

Mounted in an ivory frame, this is the original lens that Galileo used to view the moons of Jupiter. It resulted in condemnation of Galileo for teaching doctrine not approved by the Church.

The Event Horizon Archives— Vulcan, The Intra-Mercurial Planet By Paul Schlyter—September 1998

The French mathematician Urbain Le Verrier, co-predictor with J.C. Adams of the position of Neptune before it was seen, in a lecture at 2 Jan 1860 announced that the problem of observed deviations of the motion of Mercury could be solved by assuming an intra-Mercurial planet, or possibly a second asteroid belt inside Mercury's orbit.

The only possible way to observe this intra-Mercurial planet or asteroids was if/when they transited the Sun, or during total solar eclipses. Prof. Wolf at the Zurich sunspot data center, found a number of suspicious "dots" on the Sun, and another astronomer found some more. A total of two dozen spots seemed to fit the pattern of two intra-Mercurial orbits, one with a period of 26 days and the other of 38 days.



Urbain Le Verrier (1811—1877), best known for the calculations which led to the discovery of Neptune, believed that a small planet he named Vulcan orbited between the Sun and Mercury.

In 1859, Le Verrier received a letter from the amateur astronomer Lescarbault, who reported having seen a round black spot on the Sun on March 26 1859, looking like a planet transiting the Sun. He had seen the spot one hour and a quarter, when it moved a quarter of the solar diameter. Lescarbault estimated the orbital inclination to between 5.3 and 7.3 degrees, its longitude of node about 183 deg, its eccentricity "enormous", and its transit time across the solar disk 4 hours 30 minutes.

Le Verrier investigated this observation, and computed an orbit from it: period 19 days 7 hours, mean distance from Sun 0.1427 a.u., inclination 12# 10', ascending node at 12# 59' The diameter was considerably smaller than Mercury's and its mass was estimated at 1/17 of Mercury's mass. This was too small to account for the deviations of Mercury's orbit, but perhaps this was the largest member of that intra-Mercurial asteroid belt?

Le Verrier fell in love with the planet, and named it Vulcan. In 1860 there was a total eclipse of the Sun. Le Verrier mobilized all French and some other astronomers to find Vulcan - nobody did. Wolf's suspicious 'sunspots' now revived Le Verrier's interest, and just before Le Verrier's death in 1877 some more 'evidence' found its way into print.

On April 4 1875, a German astronomer, H. Weber, saw a round spot on the Sun. Le Verrier's orbit indicated a possible transit at April 3 that year, and Wolf noticed that his 38-day orbit also could have performed a transit at about that time. That 'round dot' was also photographed at Greenwich and in Madrid.

There was one more flurry after the total solar eclipse at July 29 1878, where two observers claimed to have seen in the vicinity of the Sun small illuminated disks which could only be small planets inside Mercury's orbit: J.C Watson (professor of astronomy at the Univ. of Michigan) believed he'd found TWO intra-Mercurial planets! Lewis Swift (co-discoverer of Comet Swift-Tuttle, which returned 1992), also saw a 'star' he believed to be Vulcan -- but at a different position than either of Watson's two 'intra- Mercurials'. In addition, neither Watson's nor Swift's Vulcans could be reconciled with Le Verrier's or Lescarbault's Vulcan.

After this, nobody ever saw Vulcan again, in spite of several searches at different total solar eclipses. And in 1916, Albert Einstein published his General Theory of Relativity, which explained the deviations in the motions of Mercury without the need to invoke an unknown intra-Mercurial planet.

In May 1929 Erwin Freundlich, Potsdam, photographed the total solar eclipse in Sumatra, and later carefully examined the plates which showed a profusion of star images. Comparison plates were taken six months later. No unknown object brighter than 9th magnitude was found near the Sun.

But what did these people really see? Lescarbault had no reason to tell a fairy-tale, and even Le Verrier believed him. It is possible that Lescarbault happened to see a small asteroid passing very close to the Earth, just inside Earth's orbit. Such asteroids were unknown at that time, so Lescarbault's only idea was that he saw an intra-Mercurial planet. Swift and Watson could, during the hurry to obtain observations during totality, have misidentified some stars, believing they had seen Vulcan.

"Vulcan" was briefly revived around 1970-1971, when a few researchers thought they had detected several faint objects close to the Sun during a total solar eclipse. These objects might have been faint comets, and later comets have been observed that later did pass close enough to the Sun to collide with it.

The Space Place—No Mars Rock Unturned

by Patrick L. Barry

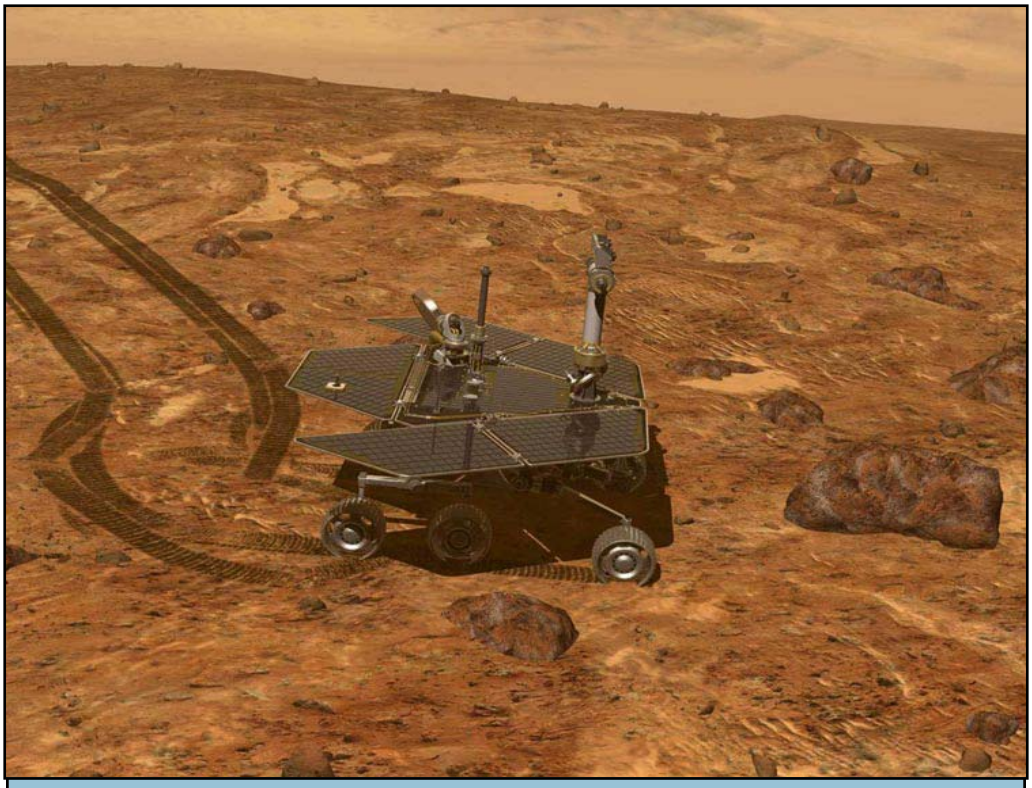
Imagine someday taking a driving tour of the surface of Mars. You trail-blaze across a dusty valley floor, looking in amazement at the rocky, orange-brown hillsides and mountains all around. With each passing meter, you spy bizarre-looking rocks that no human has ever seen, and may never see again. Are they meteorites or bits of Martian crust? They beg to be photographed.

But on this tour, you can't whip out your camera and take on-the-spot close-ups of an especially interesting-looking rock. You have to wait for orders from headquarters back on Earth, and those orders won't arrive until tomorrow. By then, you probably will have passed the rock by. How frustrating!

That's essentially the predicament of the Spirit and Opportunity rovers, which are currently in their fourth year of exploring Mars. Mission scientists must wait overnight for the day's data to download from the rovers, and the rovers can't take high-res pictures of interesting rocks without explicit instructions to do so.

However, artificial intelligence software developed at JPL could soon turn the rovers into more-autonomous shutterbugs.

This software, called Autonomous Exploration for Gathering Increased Science (AEGIS), would search for interesting or unusual rocks using the rovers' low-resolution, black-and-white navigational cameras. Then, without waiting for instructions from Earth, AEGIS could direct the rovers' high-resolution cameras, spectrometers, and thermal imagers to gather data about the rocks of interest.



Are these rocks of any scientific interest? With the new AEGIS software, the Mars Rovers, Spirit and Opportunity, will be able to judge for themselves whether a scene is worth a high-resolution image. (Artist's rendering.)

"Using AEGIS, the rovers could get science data that they would otherwise miss," says Rebecca Castaño, leader of the AEGIS project at JPL. The software builds on artificial intelligence technologies pioneered by NASA's Earth Observing-1 satellite (EO-1), one of a series of technology-testbed satellites developed by NASA's New Millennium Program.

AEGIS identifies a rock as being interesting in one of two ways. Mission scientists can program AEGIS to look for rocks with certain traits, such as smoothness or roughness, bright or dark surfaces, or shapes that are rounded or flat.

In addition, AEGIS can single out rocks simply because they look unusual, which often means the rocks could tell scientists something new about Mars's present and past.

The software has been thoroughly tested, Castaño says, and now it must be integrated and tested with other flight software, then uploaded to the rovers on Mars. Once installed, she hopes, Spirit and Opportunity will leave no good Mars rock unturned.

Check out other ways that the Mars Rovers have been upgraded with artificial intelligence software at http://nmp.nasa.gov/TECHNOLOGY/infusion.html#sciencecraft.

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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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Next Regular Meeting

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7:30 PM @ The 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.