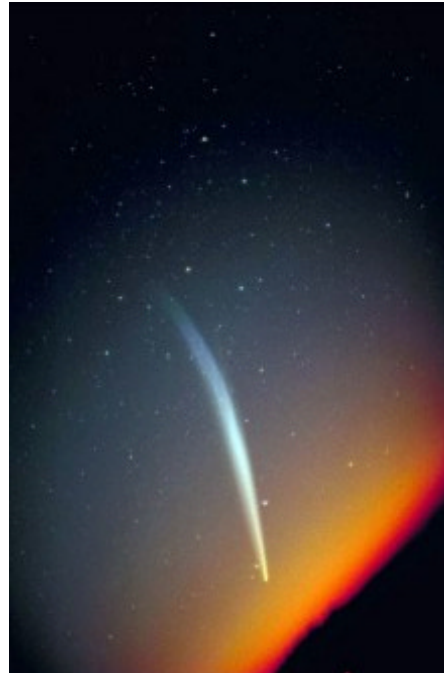


Editorial

Tempus Vernum (Spring) arrives at 2:16 pm on the 20th, and not a moment too soon! Spring is known as “Galaxy Season” primarily because the Virgo cluster is visible at this time. In fact March is an ideal month for observing all types of deep sky objects. This year, the week before the vernal equinox is the optimal time to do a Messier Marathon. The Messiers are a list of a 110 deep sky objects created by Charles Messier in the late 1700s. For a few weeks around this time, it is possible to see all 110 M-objects in a single night. That is why it is called a Marathon. More details on this are inside.

At the Feb 8th meeting, Tony Wallace of the Hamilton Amateur Astronomers, gave us some good tips on how to keep warm while observing. I particularly liked the concoction that Tony developed to keep warm in the inside. In case you missed that meeting, you can catch up on the details in Part II of “Warm Buns at a Cold Eyepiece”, contained within.

This is also the time to start thinking about what we can do as a club to bring astronomy to the masses. This year “Astronomy Day” is on April 20th. Since 1973, astronomy groups have banded together one day each April or May to show the public how much fun astronomy can be. The event's motto is "Bringing Astronomy to the People" and to this end hundreds of clubs and other organizations present special exhibits and stargazing events. We need to think about what we will do for this in the Peterborough Area. According to Dave Duffus, the club used to get tremendous turnouts to observing sessions etc. If you have any ideas or like to be involved, contact either Dave or myself. This is an excellent opportunity to promote our club in the area.



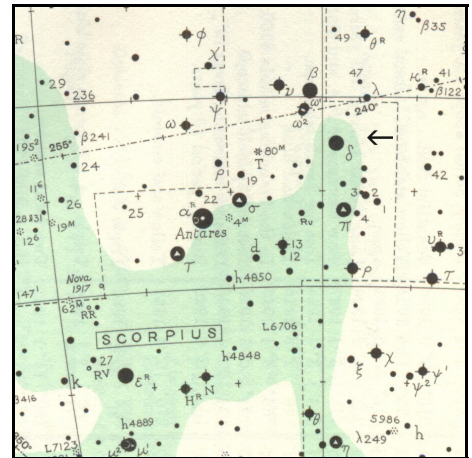
Ikeya-Seki in 1965, one of the finest comets of the last century

There were two big highlights this past month from the astronomical world.

One is the discovery of Comet Ikeya-Zhang, named after the same Ikeya that was responsible for discovering various comets in the 1960s, including the famous naked-eye sun grazer Ikeya-Seki in 1965. Astrometric observations have lead astronomers to conclude that this is the return of the comet of 1661.

This “new” comet is already bright enough to see in binoculars. It should reach perihelion on March 18. During the first week of April, the comet skirts north of the Sun and enters the morning sky where we will likely get our best views in late April.

The other astronomical highlight is the star δ -Scorpii. It has brightened from 2.3 to 1.6 and may brighten even more. Delta is the middle of three stars in the claw of Scorpius. This is a hot giant star of spectral type B0 similar to γ -Cassiopeiae. In 1937, γ -Cas brightened from about magnitude 2.25 to 1.6 and remained near this peak for many months. It then dwindled to magnitude 3.0. It took more than 15 years to



Location of Delta Scorpii

Inside This Issue

- EDITORIAL
- QUICK FIX ON A TRASH SCOPE
- WHY IS THE “FIRST POINT OF ARIES” IN PISCES?
- THE SKY THIS MONTH
- ASTRONOMY SUNNY SIDE UP
- STROLLING THROUGH THE SOLAR SYSTEM: SATURN
- MESSIER MARATHON
- OFF THE BEATEN PATH
- ARCHAIC STAR NAME OF THE MONTH
- ASTRONOMY IN PHILATEY

brighten back to normal.

Be sure to check these out over the next few months.

Clear Skies

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Strolling through the Solar System: Saturn

It don't mean a thing if it ain't got that ring.

Ask any amateur astronomer what's the most stirring view through his or her telescope and Saturn with its magnificent ring will almost surely top the list. Actually Saturn's ring is comprised of three rings that despite their beauty, have been given the uninspiring titles of A-ring, B-ring, and C- ring. The A-ring is the outermost ring.

Galileo was first to notice the rings in 1610. However, the poor optical quality of his telescope only showed Saturn with

"bumps" on each side. It wasn't until 1659 that Dutch Astronomer Christian Huygens recognized the bumps as rings. Telescope optical quality was improving rapidly, and in 1675 Giovanni Domenico Cassini discovered the first feature of the rings, a dark division between the rings. Today it bears his name - the Cassini Division.

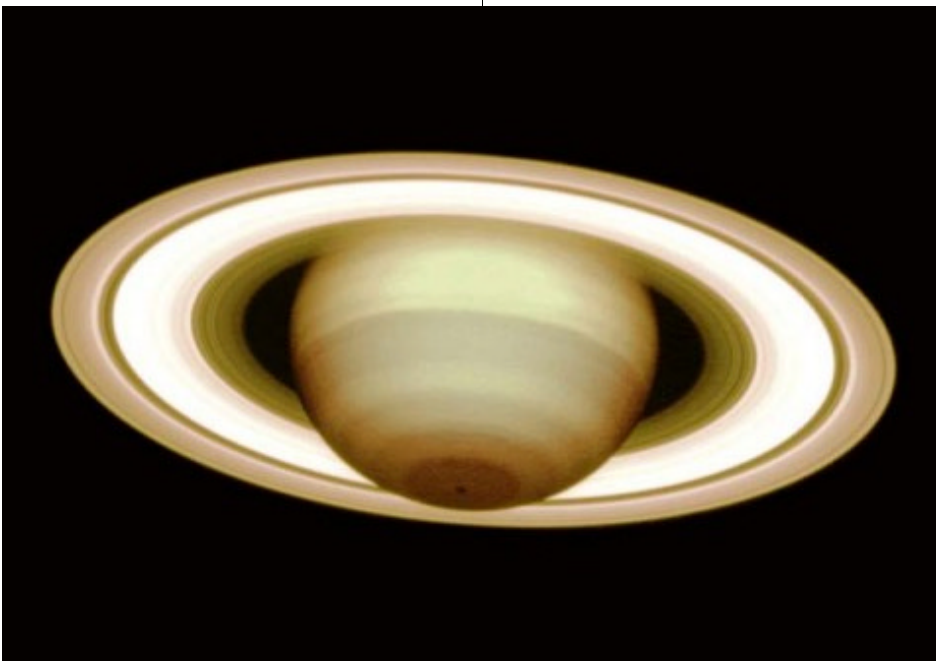
The rings are visible through a telescope at just over 50 power. And at 200 power they appear as a celestial yellow brick road orbiting the planet's sphere. However, you'll have to tread lightly if at all.

Saturn's rings are composed primarily of trillions of separate particles of ice ranging in size from ice fog and large snowballs to huge icebergs. The snowballs will be a few meters apart with greater space separating the larger ice boulders. The rings' great distance from Earth and their highly reflective surface only make them appear to be solid. So instead of imagining yourself racing around the rings in a sports car, you would be better advised to hop into your space suit and grab a rocket pack for propulsion as you hop from iceberg to boulder.

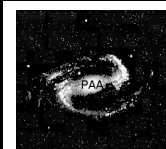
Measured from side to side, the rings span over 260,000 km or about two-thirds of the distance from Earth to the Moon. Yet they are no thicker than the height of a 30-story building. If we made a model of the rings the thickness of this piece of paper, they would have to be as long as a football field to be in proper scale.

How the rings formed remains a question mark. The most popular theory is that they are the result of an ancient collision between two of Saturn's moons or the debris left from the unpleasant meeting of a moon and comet. Perhaps we'll get the answer from the Cassini spacecraft. It is currently sending back some magnificent photos as it passes Jupiter. It goes into orbit around Saturn in 2004. It has recently been discovered that Jupiter, Uranus and Neptune all have rings. But none shine like those of Saturn. Nor are they telescopically visible. Jupiter may win when it comes to size, but Saturn and its elegant rings are the hands down winner of our solar system's beauty contest.

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Saturn—No this isn't a Hubble photograph, but one taken from the ground using the ESO's Very Large Telescope (VLT). It consists of four identical reflectors, each 8.2 meters in diameter, using adaptive-optics.



**Peterborough
Astronomical
Association**

The Reflector is a publication of the Peterborough Astronomical Association (PAA). Founded in 1970, the PAA is your local group for astronomy in Peterborough and the Kawarthas.

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Warm Buns at a Cold Eyepiece - Part 2

In part 1 of this article we introduced the concept of cold weather clothing “layers”, three in all. We covered the particular functions and the various fabrics suited to each layer. This covered our torso and legs, but, what about our head, hands, and feet? These are generally subject to the same 3-layer concept, but, require some special attention. The hands and feet, and to a lesser extent, the head, are indicators that warn us that we need to adjust our clothing. They are the first discomfort we feel when we’re not quite dressed for the part.

Head



There’s a lot of truth in the old adage: *“If your feet are cold, put your hat on”*. I’ve read and heard various reports that the amount of heat lost from a bare head lies between 25% and 40% ! Even conservative estimates indicate this is in the *“Wow, that’s a lot!”* category. It may seem at first that this is a detriment. Quite the contrary. It gives us a range of control over our body heat just through changing headgear. So, get out your earmuffs, headbands, balaclavas, berets, babushkas, turbans, hoods, and what-have-you. They are your arsenal of fine tuning weapons with which you can maintain a balance of warmth and ventilation for the rest of your body (including cold feet!).

We mustn’t forget about ventilation of the ever present perspiration making its journey from skin to the outside air. Be aware that bundling up your head may impede this process and result in

condensation in layer 2 of your headgear. I find it useful to think of the head and its garments as a sort of chimney conducting heat and moisture in an upward direction. My various combinations of headgear then become the “damper” that regulates this chimney action. Too little, and you lose a lot of heat... too much and you retain heat but your head ends up wet. (like when the fireplace damper is closed too far and smoke fills the room!)

I tend to dispense with layer 3 when observing since this allows better moisture flow and winds will be low or absent at these times. Layer 2 is supplied by all manner of non-cotton headgear. I must admit to a personal neglect of layer 1 in cold weather observing because I don’t like snug fitting headwear. Nevertheless, I DO own a polypropylene balaclava which gets use in really cold and windy conditions. The key to headgear is to have a number of options available to you and vary them to suit conditions at the eyepiece.

Hands



Your hands, and in particular, your fingers will be required to change eyepieces and make fine adjustments to your telescope throughout the observing session. As a result, they are quite vulnerable to the icy wiles of Old Man Winter.

The range of available hand wear includes 3 and 5 fingered gloves, slit-fingered gloves, fingerless gloves (a.k. a. *“urchin gloves”*), mitts, combination glovemitts, and the ever useless and

hard to find muff. These are available in a mind boggling array of materials from polypropylene to neoprene; Polartec to what-the-heck!

The easy way out of this maze is to apply our 3-layer principle to hand wear. The basic warmth requirements are met with a polypropylene inner glove, a layer 2 type overglove that insulates, and an outer mitt of Gore-Tex or some other breathable material. The last layer is a mitt since mitts are always warmer than gloves.

There is, however, another important criteria affecting our choice and that is the need to be able to make fine mechanical adjustments. This can be as frustrating as picking fly droppings out of pepper with boxing gloves on unless we make allowances! This is where the particular style of hand-wear comes in. Those *“fingerless”* gloves are a boon in these situations. They really have only the finger tips missing and so allow good tactile sensation as well as keeping most of your hand warm at the same time. These are excellent choices for layer 2 and should be worn over a full fingered layer 1. Layer 3 can be quite a nuisance because it has to come off each time you have to fiddle with things. A good candidate for this outer layer is a Gore-Tex mitt with a Velcro closure applied to a slit across the palm. These are made for the express purpose of freeing your finger tips for work without having to remove the mitt.

My own experiences at the eyepiece have resulted in my choices as follows:

I wear full fingered polypropylene inner gloves. Over these I wear a pair of wool *“urchin”* gloves. This combo has me comfortable in most cases. However, I occasionally resort to my *“cold killer combo”*. I replace the inner gloves with a pair of fisherman’s neoprene slit-fingered gloves. Neoprene is the type of closed cell foam rubber used in wetsuits. The fingertips (and thumb) are slit on the palm side at the first joint allowing me to peel them back exposing my fingertips for fiddling about with filters and such. Bits of Velcro keeps the *“flaps”* out of

my way until I'm ready to cover up again. This provides me with the ultimate in warm handwear and dexterity. "But it's not breathable!" you say. You're right... but read on a bit further.

Feet



Feet are unforgiving! Let's face it, the threat of cold feet are responsible for so many of us refusing to go outside in winter. Feet are the first to complain when they get cold. And they do it soooo well, don't they? Well, we can look at this positively too. This attribute makes them the early warning sensor in detecting heat loss and signaling the need to adjust our garb. Do we need to put on our hat?

The above assumes we're properly attired in the foot department. Starting with layer 1, we would wear a pair of polypropylene, or other wicking socks. Over these, one or more insulating, layer 2, types of socks. Our winter boots would suffice for the windproof layer 3 except that they're often not breathable at all, or are grossly inadequate for the task! This fact alone is the cause of nearly all cold feet at the winter observing site. Extreme countermeasures may be called for here.

Recall the neoprene gloves? They are as impenetrable as rubber gloves, because, well.. that's what they are! What they do is prevent any moisture from leaving the surface of my skin at all! The skin on my hands perspires enough to create its beloved "*rain forest*", and then stops, as long as you're not too active. The insulating layer 2 has absolutely no way of getting damp from the inside, and we're not about to observe in the rain!

This is known as a vapour barrier when used next to the skin. It is a technique used by avid campers in extremely cold conditions. They (I) go so far as to spend the night using a vapour barrier sleeping bag liner to eek out a 10 to 15 degree advantage over life without one. The vapour barrier is a kind of Layer 0. It can be used to advantage when you're not very physically active. Get too active and you'll drown in you own perspiration!

Getting back to our feet, it is this secret weapon we will deploy to guarantee that the familiar cozy feeling prevails. After all, our feet aren't up to much when they're not complaining, are they?

All we need is to don a couple of plastic bags as the first layer and cover them with layer 2 socks. Don't laugh, but, I find bread wrappers are great for this... the kind without holes in the bottom. The extra length makes all the difference. I first discovered this while on a fall camping trip with the local motorcycle club. It was a cold and rainy return from wherever we'd been and I was intrigued to see the more experienced among us snap up all the bread wrappers left over from our food supplies and wear them inside their socks. One has to be a quick study in a bike club. I found it made a big difference on the ride home. Too shy to try? Nobody's going to see anyway! I have not yet needed to resort to this level of footwear while observing. However, people are different in their... let's say... cold tolerance limits. My wife, for example, would pack snowmobile boots for a trip to hell and still complain of cold feet. I suppose that's exactly what she'll give me for writing that... hell *and* cold feet! I include it here for these folks, and for completeness.

My personal solution to cold feet is a bit more conventional. I start with polypro socks, then a layer of wool or synthetic socks. I'll include a second layer of these if I'm to wear my size 12 hunting boots. I take a size 10 shoe, but, the size 12 boot keeps the layer 2 socks thick and fluffy! My preference,

though, is to wear a pair of "*moon boots*" over the polypros and single pair of wool socks. "*Moonboots*" are a wonderful invention fashioned directly after Inuit mukluks. They consist of a mid calf length upper of rip-stop nylon that has been stuffed with Hollofil or some other synthetic insulation. This is attached to a thick sole of Evazote (the yellow spongy closed-cell foam that some sleeping pads are made of) that has been finished by covering with heavy Cordura material for durability. The rip stop nylon seems to form enough of a wind barrier and still allows moisture to escape freely. They're the best when the snow has no chance of melting.

"Fuel"

Now that we've learned how to dress ourselves, there's one more area to cover. While we're out observing we need to consume copious amounts of hot drinks. These go a long way to make a cold night a pleasure for all but the most obstinate curmudgons.



A word about alcohol ... DON'T. There's nothing wrong with a glass of wine or a "wee dram" of the aqua vitae. I sure wouldn't refuse one! However, there is real danger in downing even a few of these. The ability to sense subtle changes in temperature is easily impaired without us even noticing. By the time we're aware that we're cold, the best thing to do is pack up and go home because, in reality, we are probably well down the road to hypothermia, from which some never return. 'nuff said.

The usual hot chocolate, Ovaltine, and herbal teas are fine companions. Be aware that strong tea and coffee result in a net loss in the body's water reserves. Take water along to drink as well. Hot Dr. Pepper is great, as is hot fresh cider, or mulled if you like (skip the rum). Here's one of my favourite cold night

recipes. I usually make 2 litres.

Pour 1 packet. raspberry Jello into a bowl. Add 1 litre hot water. Stir until dissolved. Add fruit punch drink crystals to taste. When it is OK to the taste, add some more! Stir and pour the lot into a thermos. Go to the observing site. Pour the lot into you and your friends.

Don't let it go cold in your mug lest it become sloppy Jello!! Oh yes! Be careful around the 'scopes. I just hate those sticky Naglers, don't you?

Parting thoughts

There you have it! Remember the 3 layer formula and a few tricks with the extremities and you'll be a winter observer in comfort. Exercise an extra bit of common sense before deciding to venture out. That is: don't expect great results in -40 degree temperatures! Your 'scope will likely tell you when it's had enough of that nonsense by creaking loudly or just refusing to move! If you should get cold and aren't sure what to do about it, just go for a walk. It is surprising how little we have to do to get warm. I'll bet it takes less than 100 metres to restore your comfort.

Now then! No more excuses. I expect to see you all ogling the skies at observing sessions from December and right through March. We'll exchange hot drinks and munchies, OK?

Clear skies, warm nights...

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The Sky This Month

MERCURY:

Mercury will be in the sun's glare this month, and thus not visible.

VENUS:

Venus will be low in the west this month

as it returns as the "Evening Star".

MARS:

Mars is visible low in the south in the constellation Aries area after dusk. Look for a 2nd magnitude red "star".

JUPITER:

Jupiter will be in Gemini and appears far brighter than any star, including Sirius in the evening sky.

SATURN:

Saturn is in the constellation Taurus in the eastern evening sky. In a telescope, look for the large moon, Titan, which is near by.

URANUS & NEPTUNE:

Uranus and Neptune are in the sun's glare this month, and thus are not visible.

METEOR SHOWERS:

There are no major showers this month, however there are several minor showers visible from the northern hemisphere. For more information on these, see <http://comets.amsmeteors.org/meteors/calendar.html>.

COMETS:

This month Comet Ikeya-Zhang (C/2002 C1) will be visible in the first half of this month. It is expected to brighten to magnitude 3.4 by March 22, 2002. April will probably be a better time to view this comet as it moves into the morning sky. For those how have seen comets before, magnitude 3.4 is considered "very good". Most comets are barely detectable in binoculars, but this will be well within the naked eye range. It is expected to have a tail about 10 to 15 degrees in length (slightly larger than the Big Dipper's bowl). See www.skyandtelescope.com for details as they arise.

Quick Fixes Turn a Trash Scope into a Useful Beginner's Tool

Maybe it's because I grew up in an era when kids hopped up their cars to make them go faster. Or it could just be that I can't leave well enough alone. At any rate, it wasn't more than a month after I got my first telescope that I started giving it the "hot rod" treatment.

It was a typical camera store fiasco. The name Magnicon 454 was emblazoned across the box that it arrived in on Christmas day about 15 years ago. While it was all bright and shiny, it soon dulled (figuratively at least) when I took it outside.

It didn't take long to discover that the tripod was infected with a terminal case of "the wobblies". A little strategic drilling and replacing skinny bolts with big solid ones held in place by large, finger-friendly wing nuts solved part of that problem.



Once some big bolts "telescope Viagra" had firmed up the tripod, the most important modifications were the installation of a larger finder scope and a hybrid diagonal that fit the 0.96" focusing system, but would accept 1.25" eyepieces and a proper barlow.

Next on the list of fixes came the finder scope. Its 20 mm aperture wasn't big enough to show anything dimmer than the moon or a Jupiter on a good night. A little digging around the used bits section

of the local astronomy store unearthed a 30x6 finder scope with a bracket that even fit the screw holes of the original. \$10.00 later I had a finder scope that could do what its name implied.

A few months later I discovered that I could purchase a quality 0.96" orthoscopic design eyepiece to replace the Huygens design ones that came with the scope. Nothing against Mr. Huygens, it's just that a lot of progress had been made in the last 300 years or so.

Of course it wasn't long after that when I also discovered the wonders of the hybrid star diagonal. This little gem

2.5x TeleVue that I still use today.

Those modifications turned the myopic Magnicon into a genuinely useful telescope that served me for over a year before the move to an 8" SCT. Both the barlow and 20 mm StarTrac Plossl that I purchased years ago are still in my eyepiece case. The Magnicon is still in use today - but in much different form. I shortened the tube, added a hybrid, correct-view, 45-degree diagonal and installed a 60 mm finder scope lens up front. It now sits atop the C-14 and serves as a very effective 9-power finder.



The Magnicon 60 mm (in its "hot-rodded" form) greets the sunrise at the Huronia Star Party in 1991. Note the trendy scope cover from Sac's au Garbage

could handle the more popular, and modern, 1.25" eyepieces. But would still fit into the .96 end of the focusing system. Oh the joy of my first 24 mm Plossl! In all honesty, it seemed like a Nagler wide field compared to the tunnel vision views the Huygens and ortho designs permitted. And it only cost about \$50.00 delivered direct from Orion.

The barlow lens that came with the scope was made of plastic and sagged no matter how tightly I twisted the nasty little screw that held it in place. However, now that I had the hybrid diagonal, I could upgrade that, too. And so I did, with a

It's sad that most 60 mm refractors are automatically relegated to the dumpster of astronomical gear. In most cases they have a descent primary lens. And with a little fixing up, they can serve their owners very well. Once my Magnicon had been "souped up", I was enjoying Saturn's rings, Jupiter's moons, the Andromeda

Galaxy, the brighter star clusters and the Orion Nebula with relative ease.

That's a bundle better than being stuck with nothing more than the Moon and an upside-down view of the girls on the beach across the lake.

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Why is the "First Point of Aries" in Pisces?

The term "First point of Aries" refers to the position of the sun on the first day of spring. Anyone who is familiar with the celestial coordinates will quickly tell you that this point occurs where the ecliptic crosses the celestial equator (an extension of Earth's equator out into the sky) in an increasing manner, or at 0° RA, 0° DEC. A quick glance at any star map will place you well within the constellation Pisces. So why don't we call it the "First point of Pisces"?

The answer lies over 2000 years ago. The ancient Greeks, who were master astronomers, determined the positions of the stars, planets and the sun. From this positional data, they formulated theories to model the universe. Around 130 BC, Hipparchus established the location of one of two places where the Sun crossed the celestial equator. In his time this was located in the constellation Aries, the Ram. After comparing his results with those of Timocharis of Alexandria (about 150 years earlier) and with even earlier observations made in Babylonia, he was quick to realize that this position moved in a predictable way. He determined a value of 46" for the annual precession, which is close to the modern value of 50.26". He termed this phenomenon "Precession of the Equinoxes". The period of precession is about 26,000 years. As a result of precession, the vernal equinox shifts down the ecliptic as time passes. In the 2130 years since, the equinox has shifted:

*"This is the dawning of the Age of Aquarius
The Age of Aquarius"*

- from the Musical "Hair" (1962)

Well actually it's not! We still have about 100 years to go before the vernal equinox shifts into Aquarius.

$$2130 \text{ yrs} \times 50.26 \text{ sec/yr} \times 1/3600 \text{ deg/sec} \\ = 29.7 \text{ degrees}$$

This corresponds to 1/12 of the ecliptic or roughly one zodiacal constellation. In other words, what was in Aries in 130 BC is now in Pisces in 2000 AD.

Since 130 BC all the other seasonal points were also shifted one constellation. In Hipparchus's time, the summer solstice occurred in Cancer, the autumnal equinox occurred in Libra and the winter solstice fell in Capricornus. As a result, the names "Tropic of Cancer" and "Tropic of Capricorn" are still used to describe the places where the sun shines directly overhead on June 21 and Dec 21 respectively. The constellation Libra (the scales) was created by the Romans because the night was balanced with the day when the sun was positioned there, formerly it was part of Scorpius.

Since the direction of precession is coincident with the ecliptic and not the celestial equator, this also causes the celestial poles to shift over time. In 2100 AD, the north celestial pole (NCP) will be less than ½ degree from Polaris. Over 4000 years ago, the Egyptians viewed Thuban in Draco as the North Star. Eventually even Vega will get its turn as the North Star.

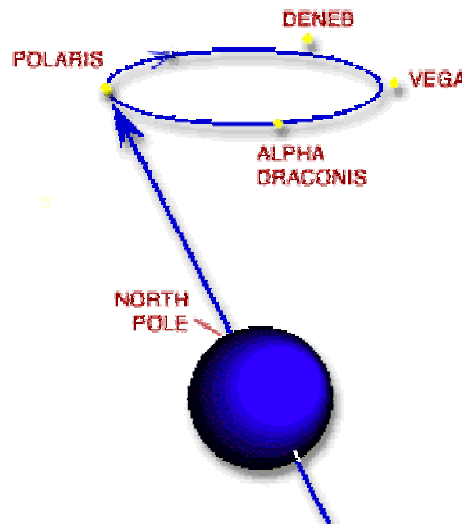
*"But I am constant as the northern star,
Of whose true-fixed and resting quality
There is no fellow in the firmament"*

– from William Shakespeare's
"Julius Caesar"

Clearly Shakespeare was out to lunch on this one. Which star is he talking about? Polaris was about 10 degrees from the NCP in Caesar's time, then again so was β-UMi!

Actually, every star (except those located at the ecliptic poles) will change their celestial position over time as a result of precession. This is why a chart from

epoch 1950 is no longer "good enough" to use today. To see evidence of this, look at the constellation boundaries drawn on any modern star chart. When, the International Astronomical Union (IAU) adopted these in 1930, they made these boundaries parallel or perpendicular to the celestial equator from epoch 1875.0. This date was chosen because the US astronomer Benjamin A. Gould already drew up constellation boundaries for the southern hemisphere using that epoch. A glance at today's star atlases will easily show that they no longer line up very well. You might think that precession is a minor effect, significant only after many centuries, but it can creep up on you. Since 1875, precession has moved Polaris 1.5 moon diameters closer to the north celestial pole.



Forces on the earth cause the pole star to shift over the millennia.

Precession is caused by the gravitational pull of the Sun and the Moon on the Earth. The effect is like that of a spinning top. As the top spins fast upon its axis, the axis itself moves resulting in a "wobbling" motion. Since the sun and moon lie outside the equatorial plane, they exert a torque (twisting force) on the Earth. This combined force results in a spin axis that describes a cone in space (see diagram above) over time. In addition,

the moon imposes an extra wobble on the wobble called nutation. This is a minor "sinusoidal" like motion that has a period of 18.6 years, the same as the lunar nodal cycle. It exists because the moon's orbit is tilted 5.9° from the ecliptic.

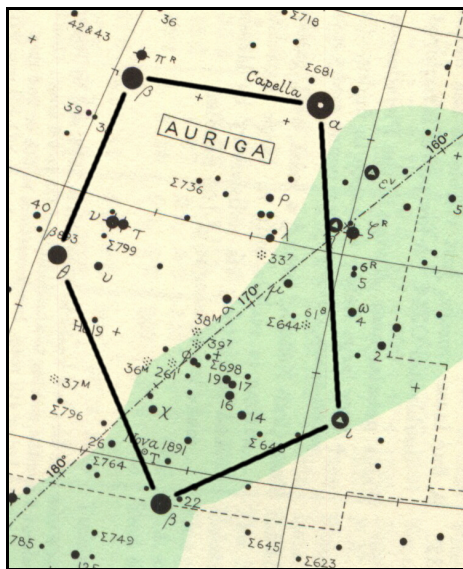
Although precession forces you to update your charts every 50 years or so, it does have an upside. If you wait long enough (~13000 years), you can see most of those southern constellations from this latitude without moving to Australia. Imagine looking at the winter Milky Way that consists of the Sagittarius star cloud almost overhead! Unfortunately, we still would not be able to catch the Large Magellanic Cloud, as it is only a few degrees from the south ecliptic pole.

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Constellation of the Month: Auriga - The Charioteer

The bright star Capella will be first to catch your eye in the winter constellation Auriga. On these early evenings in January, Capella is the brightest star to adorn the patch of sky directly overhead (also known as the zenith). Elegant though the name Capella sounds as it rolls off the tongue, you wouldn't want to give your daughter Capella for a name. After all, it means "she-goat" in Latin.

Auriga is shaped like a like an irregular hexagon and was one of the earliest constellations to be named. Though its precise origin is not known, Auriga is usually identified with either Hephaestus (a.k.a. the Roman god Vulcan) or his son Erechtheus. Both were lame and are credited in Greek legend with inventing the chariot as a means of transportation. Small wonder then that the second brightest star in the constellation, Menkalinan means, "shoulder of the rein-holder."



Auriga—The Charioteer

In classical drawings Auriga is portrayed with a goat over one shoulder which is represented by Capella. This is probably because Capella was identified by the Greeks with Amalthea, the goat that nursed the infant Zeus. According to legend, baby Zeus accidentally broke off one of the goat's horns, which he later imbued with the capability of dispensing great quantities of food and drink. Today we know that horn as the cornucopia.

Auriga is home to three beautiful open star clusters. Designated M38, M36 and M37 the three clusters form a near straight line. A pair of 7x50 binoculars reveals all three can be seen as misty patches in the same field of view.

Each of the clusters has a distinct personality with M37 being the most striking of the three. Ranging in distance from 4,600 light years for M37 to 4,100 light years and 4,100 light years for M36 and M36 respectively, this trio of Messier objects make excellent targets for small scopes. Both M36 and M38 are 6th magnitude while M37 is a bit brighter at magnitude 5.5.

That's a mouthful.

Auriga.....oh-Rye-gah
 Capella.....kah-Pell-ah
 Menkalinan....men-KAL-in-nan

If you're looking for a good test of the night's "seeing" try splitting θ (theta) Aurigae in your telescope. It breaks down into two stars shining at 3rd and 7th magnitudes.

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Off the Beaten Path

Here are a few objects to try out this month.

SEXTANS:

NGC 2974 This is a fairly bright but small elongated galaxy. It is somewhat brighter in the middle with a 10th mag star is in contact with the west side.

NGC 2990 This is another fairly bright galaxy located in this star poor area of the sky. It is large elongated object with a bright center.

NGC 3115 is bright enough that it can be just seen in the 11x80 finder. The center contains a bright envelope with very bright nucleus, all of which at elongated in the same way as the main body of the galaxy.



NGC 3115 in Sextans

LYNX:

NGC 2419 A pretty bright and large open cluster, round and much brighter in the middle.

NGC 2776 Located near the bear's hind foot, this bright large galaxy has a bright center with an almost stellar nucleus. Located near by is a nice yellow and blue double star.



PK 164 +31.1, not to be confused with NGC 2474.

PK 164 +31.1 is a planetary nebula which has been mistaken for NGC 2474 in several references. This planetary is very faint and large which makes it very difficult. To see it requires at least an UHC filter. The nebula is so faint that turning on the very dim red flashlight to make a drawing makes the planetary disappear for a few seconds.

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Book Review:



Messier Marathon Field Guide, by Harvard C. Pennington, 1998, 2nd ed., Pub. Willmann-Bell, Inc., Richmond, VA., 196pp.

You may not realize it, but March is the best time to try and see the

majority of the famous Charles Messier Objects in the shortest period of time. It is in March that the famous “Messier Marathons” are held around the world. The object of a true “marathon” is to see how many of the 110 Messier Objects you can observe (using a telescope) from sunset to sunrise the following day. Annually, people have done it, while others come close. I have never tried, but plan to some day.

If you want a leg up on the competition for an attempt at a Messier Marathon, this is the book to do it for you. It is not only a great primer for observing Messier’s generally, but it is geared for the marathoner because it shows how to find the Messier in the proper order. This is because the numerical order of the Messier’s is not in a logical order as the constellations progress across the evening sky. This book takes the mystery out of finding the proper constellation and the associated Messier’s, as they appear at their optimum point in the sky.

Not only is the issue of the proper order addressed, but also for each Messier, the maps that are used are geared for the “average” observer who star hops across the sky. Between a combination of circles that represent either a Telrad view or that of a 1-degree eyepiece view of the sky, you can glide from one Messier to the next. For those that want or require it, is the Right Ascension (R.A.) and Declination (Dec.) coordinates for each Messier. As an added bonus, each page for a constellation has an accompanying sketch that shows you what you can expect the Messier to look like in both your 8X50 finder scope and your average eyepiece.

There are all sorts of observing tips and hints for not only completing a successful marathon, but in observing Messier’s at anytime of year. This book is geared for those observing in the northern hemisphere around 40 degrees North Latitude. There are even charts to show you for each month, the maximum number of Messier’s you can expect to see. For example, March is the only month that you can possibly see all 110

of them, while December you can only expect to see most about 88 of them. I particularly liked the appendices that include a catalog of the Messier’s and a table for your own personal log of the day, month and year that you first “discover” each Messier. Over the past four years, mostly using my Meade ETX 90, my log shows I have found 73 Messier’s. This book has helped.

For anyone who is into finding the Messier’s, this book is a great reference. If you are into Messier Marathons, this book is a must!

Rick Stankiewicz
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Archaic Star Name of the Month

I am the gem star. My name in Latin was Gemma. Virgil referred to me as Gnosia Stella. To the Arabs, I was known as Al Nair al Fakkah or the “Bright one of the dish”. At one time was given the name Margarita or “Pearl of the Crown”. This was occasionally transformed to Saint Marguerite. What star am I?

Last Month’s Answer:
Sirius (α-CMa)

Astronomy, Sunny Side Up

Perhaps you’ve never thought of the sun as a star. But that’s precisely what it is. The big difference is that we’re much closer to the sun than we are to the stars that twinkle in the night sky. For example, Earth is a mere 140 million kilometres from our sol while the next nearest star, Alpha Centauri is 4.2 light years away. That’s 40.2 trillion kilometres. Small wonder then that the Sun looks so big and bright. By cosmic standards, we’re right on top of it.

The sun was formed at the same time our solar system, about 4.5 billion years ago. And it coalesced from the same gigantic cloud of gas and dust, as did the 9 planets that comprise our solar system.

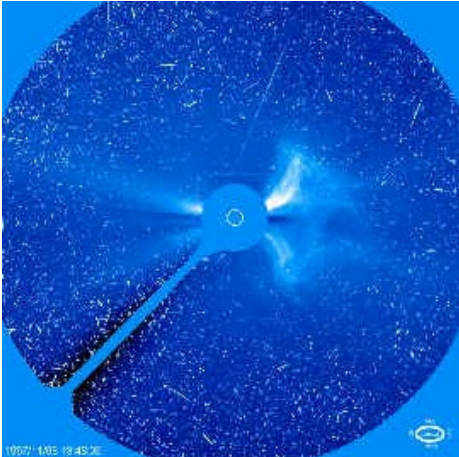
At the present time our star is middle aged, which means it has about another 4 to 6 billion years before it will turn into a red giant, then collapse into a white dwarf at which point it will cool and dim into the blackness of space. As the sun ages, it will expand, gradually bloating out as far as Mars’ orbit. Mercury, Venus and Earth will be consumed. But that’s a few billion years off, so you’re going to have to pay off that Visa bill after all.

The sun accounts for 98% of the mass of our solar system. That means it’s big... very big. Its diameter is about 100 times that of the Earth. The Sun’s volume is 300,000 times that of Earth. It’s also very hot with a temperature of about 5,800 degrees Kelvin (6,073 degrees Celsius) on its surface and 15 million degrees Kelvin at its core.

All that heat means that the Sun puts out an incredible amount of energy. If we were to convert the Sun’s energy output into watts it would be the equivalent of 4 trillion-trillion 100 watt light bulbs. And it blasts that huge amount of wattage out in just a single second. That would be 10¹⁹ dollars (\$10 000 000 000 000 000 000 000) with each tick of your watch. Those numbers are based on 1995 US rates, so we’re also talking US dollars.

The sun produces its energy by nuclear fusion. That’s because the pressure and temperature at the Sun’s core are so incredibly high that hydrogen nuclei are fused together to create helium nuclei. All told, about 400 million tons of hydrogen are converted to helium every second of the Sun’s existence.

Sunspots are areas on the Sun’s surface that are about 1000 degrees K cooler than the surrounding area. That would make them about 5,073 degrees Celsius. Like everything else about the Sun, they too, are huge. In fact, an average sunspot could swallow our home planet with ease.



Coronal Mass Ejections—seen flying out of the sun.

Though the relationship at first seems tenuous, it is the sunspots that are directly responsible for the Northern Lights or aurora we occasionally see on Earth. Their origin can be traced to the point at which a massive magnetic field leaps between a pair of sunspots. This sends huge flares blasting up from the Sun's surface and into space. In that material are charged particles that are carried towards Earth on the solar wind. When those charged particles interact with Earth's magnetosphere and our atmosphere, we see aurora or as most people refer to them, the Northern Lights. And by the way, there are also "Southern Lights" associated with the South Pole. Recent satellite photos show that they happen simultaneously with the Northern Lights.

Our ancient ancestors worshipped the sun as a god. And that certainly was a logical choice of deity. After all, the Sun is our prime source of heat and energy. Without sunlight for photosynthesis, plants cannot grow. And without plants we have no food. If you think of a carrot or an apple as stored solar energy, you could come to the very correct conclusion that we are all "solar powered".

So the next time you make a wish on a star, you needn't wait until Night Fall. Our nearest star has the day shift. And come to think of it, the sun's heat and energy help make a lot of wishes come

true every day.

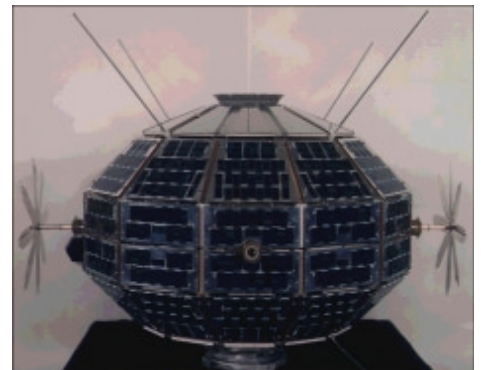
John Crossen
JohnCstargazer@aol.com

Astronomy in Philately

This is the second in a series of articles on astronomical subjects that are reflected on stamps. Similar to the last article (Feb/02), I have chosen a First Day Cover (see attached). This issue shows an envelope bearing a pair of stamps that were cancelled on January 5, 1966, the first day that the Canadian 5 cent stamps showing the research satellite Alouette II, were issued. Since the first Canadian postage stamp was issued in 1851, this stamp is the first Canadian stamp to reflect a "space" topic. It was issued to commemorate Canada's achievement in space research. The stamp design is typical of the period. Only one colour is used in the printing process to depict the satellite orbiting over northeastern Canada. The design of the cachet at the left side on the cover reflects the same design of the stamp itself.

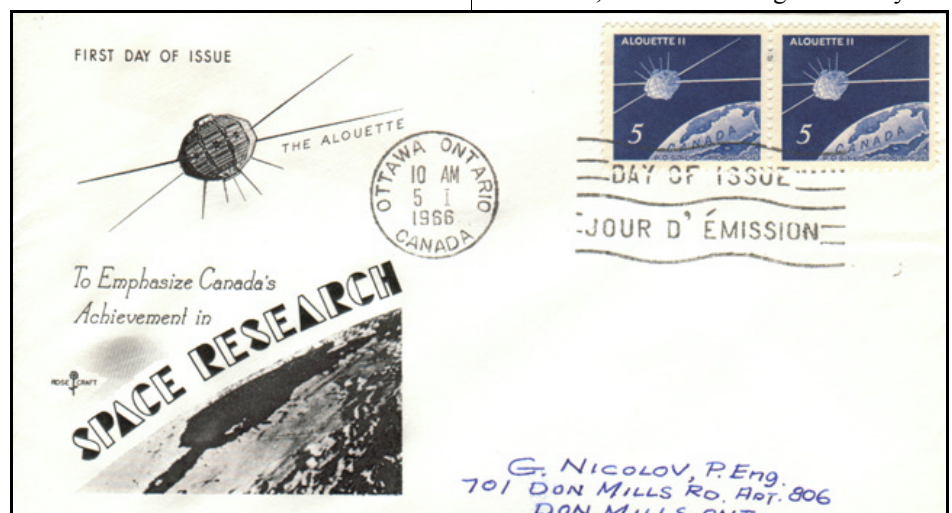
Alouette I, was launched into space (earth orbit) on September 28, 1962, but it was not until after the launch of Alouette II on November 28, 1965, that

a stamp was issued to recognize this momentous occasion. Of the four types of satellites used in space, the Alouettes were used in scientific research, verses the communication, weather or navigational type satellites. The Alouettes were launched in California as part of the Canadian – American program of space research. This may have been a first for Canada, but the American's had put the first research satellite in to space on January 31, 1958 (Explorer I). It was used to discover Van Allen radiation in space.



Alouette I—Canada's first Satellite

Alouette was an atmospheric studies satellite. It's purpose was to study the ionosphere. Canadian scientists had been studying the ionosphere for many years. Before communications satellites, long distance radio signals could only be transmitted over long distances by bouncing them off the ionosphere. However, communicating this way is



Alouette II First day Cover, Issued January 5, 1966

unreliable because the signals are often disrupted when the aurora borealis occur. To learn more about this phenomenon, scientists used Alouette to probe the ionosphere from above.

Until next time,

Your Astronomical Philatelist
Rick Stankiewicz
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Time Travel

It's fair to say we've just taken our first steps into the future of astronomy and space travel. But when you look back, we've actually come a long ways - most of it during the last 50 years.

Here's what happened in March of years gone by:

- ◆ **March 1, 1966** - Venera 3 impacts on Venus.
- ◆ **March 1, 1982** - Venera 13 sends first colour photos from Venus.
- ◆ **March 2, 1972** - Pioneer 10 launched.
- ◆ **March 3, 1969** - Apollo 9 launched.
- ◆ **March 4, 1835** - Giovanni Schiaparelli (Mars' canal theory) born.
- ◆ **March 5, 1979** - Voyager 1 flies by Jupiter
- ◆ **March 7, 1792** - John Herschel was born.
- ◆ **March 8, 1979** - Voyager 1 sends photos of Io's volcanoes.
- ◆ **March 9, 1961** - Sputnik 9 launched.
- ◆ **March 10, 1977** - Rings around Uranus discovered.
- ◆ **March 13, 1781** - William Herschel discovers Uranus
- ◆ **March 14, 1879** - Albert Einstein was born
- ◆ **March 16, 1926** - Robert Goddard launches 1st liquid fuel rocket.
- ◆ **March 18, 1965** - Alexei Leonov makes fist space walk.
- ◆ **March 22, 1997** - Hale Bopp makes closest approach to Earth.
- ◆ **March 23, 1912** - Wernher von

Braun was born

- ◆ **March 25, 1655** - Christian Huygens discovers Titan.
- ◆ **March 29, 1974** - Mariner 10 flies by Mercury.
- ◆ **March 31, 1962** - NASA approves final Gemini spacecraft design.

Messier Marathon

Once a year, for a few weeks around the spring equinox, it is possible to view all 110 of Charles Messier's famous deep sky objects in one night! Seeing all 110 M-objects (as catalogued in the Observer's Handbook) is a challenge that all deep sky observers should try at least once. To be successful, you must be prepared and, of course, have good weather!

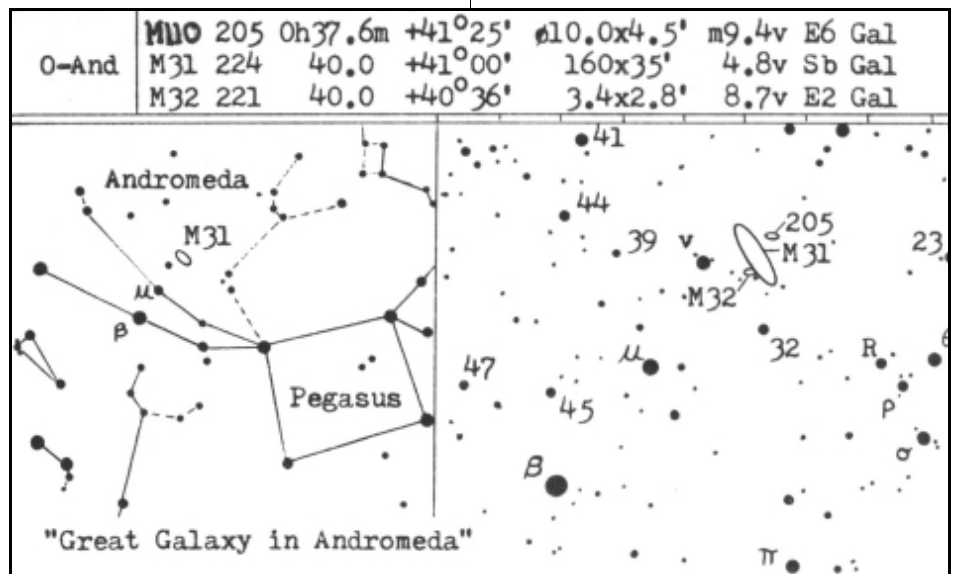
Pick a night around the new moon. A thin crescent is not much of a problem so long as it sets before evening twilight ends, or rises after morning twilight begins. Pick a dark site with no obstructions, particularly in the southeast and northwest. These are critical areas where you will be locating some objects in the twilight hours. At least a 6" telescope is recommended to see them all, however



Binoculars can help to bang off multiple objects at once.

it is possible to see up to 85 objects with 7x35 binoculars. Bring the usual set of eyepieces, red light, pencil, paper and a good atlas such as Sky Atlas 2000.0 or better yet - AstroCards (they are small and compact). Remember that March nights are still cold (as I write this it is -16°C out!), so dress warmly and bring a thermos of hot chocolate and munchies to warm yourself up. A chair and small TV table to place your maps and notes on, is also essential for a successful night. To help you keep your notes in order, bring a clipboard. To protect your notes from the dew/frost place an overhead transparency on top.

Now that we have taken care of some of the logistics, how do we ensure that we will see all of them. The best advice is to **PLAN AHEAD!** Know what you are looking for and when. Bring an ordered



AstroCards are great to have next to the telescope. They are small and easy to use. The above card shows how to find the Andromeda Galaxy.



M77 in Cetus. Get this one early before it sets in the west.

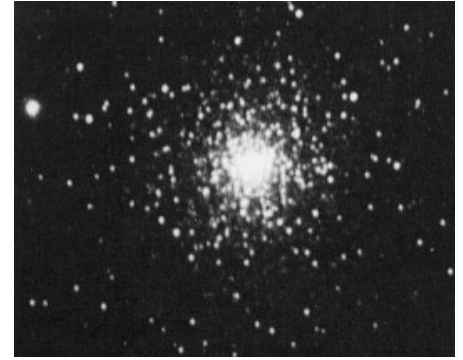
check-list of the 110 M-objects, like the one included at the back of the newsletter. Set-up at the site before dark so you can check your telescope's collimation, finder scope alignment and then relax. Hit some of the brighter objects before twilight ends, such as M42/43 and M45. This will give you more time for those objects like M77 in Cetus, M74 in Pisces, M33 in Triangulum and M31/32/110 in Andromeda, which are all low in the twilight. The toughest objects are M77 and M74.

L u c k i l y , M31/32/110 are again visible in the early morning if you miss them. Try not to spend more than 5 minutes locating each object. If you can't find one object, go on to the next. Use binoculars for the brighter objects, this way you can quickly scan the skies instead of struggling to find it in the telescope's narrower field of view. You may also see several objects

at once, such as in Sagittarius, where there are many clusters in a small area of sky. Work your way in an easterly direction. Remember that more southerly objects do not hang around for long, so hunt them before more northerly ones.

Some of the toughest areas to work are the "Realm of Galaxies" in Virgo, and the Sagittarius star field. It would be advisable to try and go through the Virgo cluster a few days earlier to familiarize yourself with it. The problem with these regions is that there are so many objects, it is hard to tell which ones are which! As general rule, the brighter ones (particularly in Virgo) are more likely to be the M-objects. The only sure way to know is to compare the star fields to a star atlas like Uranometria 2000.0. Fortunately, when you are at this stage in the marathon, the time constraints are more relaxed.

In the Sagittarius region, there are again a large number of objects to find. Here the problem is not so much

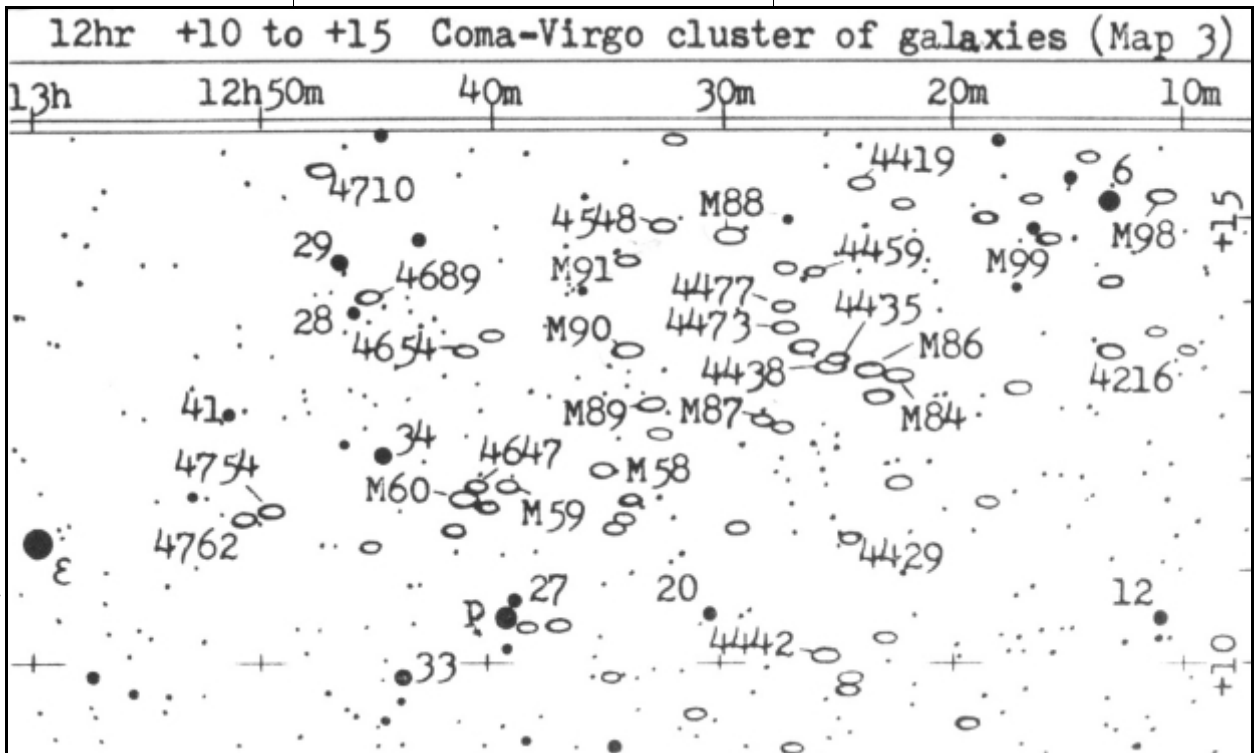


M30 is the last Messier that you can see, and probably the most difficult since it rises just before the sun.

identification, but time. By this stage, twilight is only a short time away.

The last Messier object to rise is M30 in Capricornus. For observers here in Canada, this rises after twilight and is a real challenge..

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The "Realm of Galaxies" in Virgo is the toughest area to navigate because of the large number of other objects which make identification difficult.

MESSIER MARATHON CHECK LIST

CHECK	OBJECT	CONST.	CHECK	OBJECT	CONST.	CHECK	OBJECT	CONST.
<input type="checkbox"/>	M45	Tau	<input type="checkbox"/>	M96	Leo	<input type="checkbox"/>	M107	Oph
<input type="checkbox"/>	M42	Ori	<input type="checkbox"/>	M105	Leo	<input type="checkbox"/>	M80	Sco
<input type="checkbox"/>	M43	Ori	<input type="checkbox"/>	M65	Leo	<input type="checkbox"/>	M4	Sco
<input type="checkbox"/>	M74	Psc	<input type="checkbox"/>	M66	Leo	<input type="checkbox"/>	M19	Oph
<input type="checkbox"/>	M77	Cet	<input type="checkbox"/>	M101	UMa	<input type="checkbox"/>	M62	Oph
<input type="checkbox"/>	M33	Tri	<input type="checkbox"/>	M51	UMa	<input type="checkbox"/>	M6	Sco
<input type="checkbox"/>	M31	And	<input type="checkbox"/>	M94	UMa	<input type="checkbox"/>	M7	Sco
<input type="checkbox"/>	M32	And	<input type="checkbox"/>	M102	Dra	<input type="checkbox"/>	M8	Sag
<input type="checkbox"/>	M110	And	<input type="checkbox"/>	M3	CVn	<input type="checkbox"/>	M20	Sag
<input type="checkbox"/>	M52	Cas	<input type="checkbox"/>	M53	Com	<input type="checkbox"/>	M21	Sag
<input type="checkbox"/>	M103	Cas	<input type="checkbox"/>	M64	Com	<input type="checkbox"/>	M23	Sag
<input type="checkbox"/>	M76	Per	<input type="checkbox"/>	M60	Vir	<input type="checkbox"/>	M9	Oph
<input type="checkbox"/>	M34	Per	<input type="checkbox"/>	M59	Vir	<input type="checkbox"/>	M24	Sag
<input type="checkbox"/>	M79	Lep	<input type="checkbox"/>	M58	Vir	<input type="checkbox"/>	M25	Sag
<input type="checkbox"/>	M78	Ori	<input type="checkbox"/>	M89	Vir	<input type="checkbox"/>	M18	Sag
<input type="checkbox"/>	M1	Tau	<input type="checkbox"/>	M90	Vir	<input type="checkbox"/>	M17	Sag
<input type="checkbox"/>	M35	Gem	<input type="checkbox"/>	M88	Com	<input type="checkbox"/>	M16	Sct
<input type="checkbox"/>	M37	Aur	<input type="checkbox"/>	M91	Com	<input type="checkbox"/>	M11	Sct
<input type="checkbox"/>	M36	Aur	<input type="checkbox"/>	M87	Vir	<input type="checkbox"/>	M26	Sct
<input type="checkbox"/>	M38	Aur	<input type="checkbox"/>	M86	Vir	<input type="checkbox"/>	M22	Sag
<input type="checkbox"/>	M41	CMa	<input type="checkbox"/>	M84	Vir	<input type="checkbox"/>	M28	Sag
<input type="checkbox"/>	M50	Mon	<input type="checkbox"/>	M100	Com	<input type="checkbox"/>	M69	Sag
<input type="checkbox"/>	M47	Pup	<input type="checkbox"/>	M85	Com	<input type="checkbox"/>	M70	Sag
<input type="checkbox"/>	M46	Pup	<input type="checkbox"/>	M98	Com	<input type="checkbox"/>	M57	Lyr
<input type="checkbox"/>	M93	Pup	<input type="checkbox"/>	M99	Com	<input type="checkbox"/>	M56	Lyr
<input type="checkbox"/>	M48	Mon	<input type="checkbox"/>	M49	Vir	<input type="checkbox"/>	M29	Cyg
<input type="checkbox"/>	M44	Cnc	<input type="checkbox"/>	M61	Vir	<input type="checkbox"/>	M39	Cyg
<input type="checkbox"/>	M67	Cnc	<input type="checkbox"/>	M104	Vir	<input type="checkbox"/>	M71	Sge
<input type="checkbox"/>	M81	UMa	<input type="checkbox"/>	M68	Hya	<input type="checkbox"/>	M27	Vul
<input type="checkbox"/>	M82	UMa	<input type="checkbox"/>	M83	Hya	<input type="checkbox"/>	M54	Sag
<input type="checkbox"/>	M108	UMa	<input type="checkbox"/>	M5	Ser	<input type="checkbox"/>	M55	Sag
<input type="checkbox"/>	M97	UMa	<input type="checkbox"/>	M13	Her	<input type="checkbox"/>	M15	Peg
<input type="checkbox"/>	M109	UMa	<input type="checkbox"/>	M92	Her	<input type="checkbox"/>	M75	Sag
<input type="checkbox"/>	M106	CVn	<input type="checkbox"/>	M12	Oph	<input type="checkbox"/>	M72	Aqr
<input type="checkbox"/>	M40	UMa	<input type="checkbox"/>	M10	Oph	<input type="checkbox"/>	M73	Aqr
<input type="checkbox"/>	M95	Leo	<input type="checkbox"/>	M14	Oph	<input type="checkbox"/>	M2	Aqr
<input type="checkbox"/>	M63	CVn				<input type="checkbox"/>	M30	Cap

ARTICLES

Submissions for *The Reflector* must be received by the date listed below. E-mail or “sneaker-net” (i.e., floppy disk) submissions are preferred (Microsoft Word, ASCII and most graphics formats are acceptable). Typed or hand-written submissions are acceptable provided they are legible (and not too long). Copyrighted materials will not be published without written permission from the copyright holder. Submissions may be edited for grammar, brevity, or clarity. Submissions will be published at the editor’s sole discretion. Depending on the volume of submissions, some articles may be published at a later date. Please submit any articles, thoughts, or ideas to this address:

Charles Baetsen
244 Ridgewood Rd.
Peterborough, ON
K9J 8A3

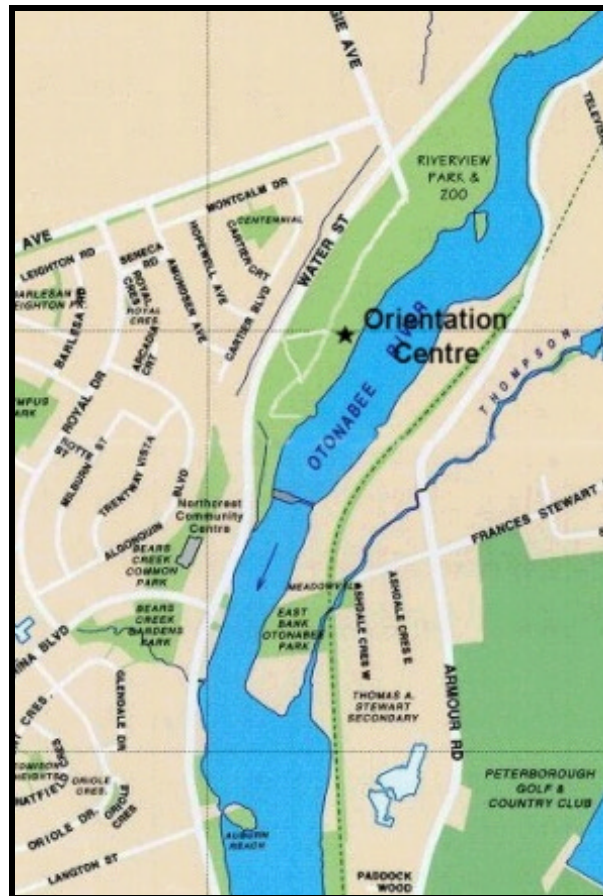
or via e-mail at:
va3ngc@rac.ca

NEXT MONTH’S
DEADLINE IS
April 2nd, 2002



MEETINGS

The Peterborough Astronomical Association meets every second Friday at the Peterborough **Zoo Orientation Centre** (Next to the PUC Water Treatment Plant) at **7:30 pm**.



1 CALENDAR OF EVENTS 1

March 5, 2002	Last Quarter (☾)
March 8, 2002, 7:30 pm	General Meeting — TBA
March 13, 2002	New Moon (●)
March 21, 2002	First Quarter (☽)
March 22, 2002, 7:30 pm	General Meeting — TBA
March 28, 2002	Full Moon (☉)
April 5, 2002, 7:30 pm	General Meeting — TBA

