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Winnicentrics

The Journal of the Winnipeg Centre of the Royal Astronomical Society of Canada

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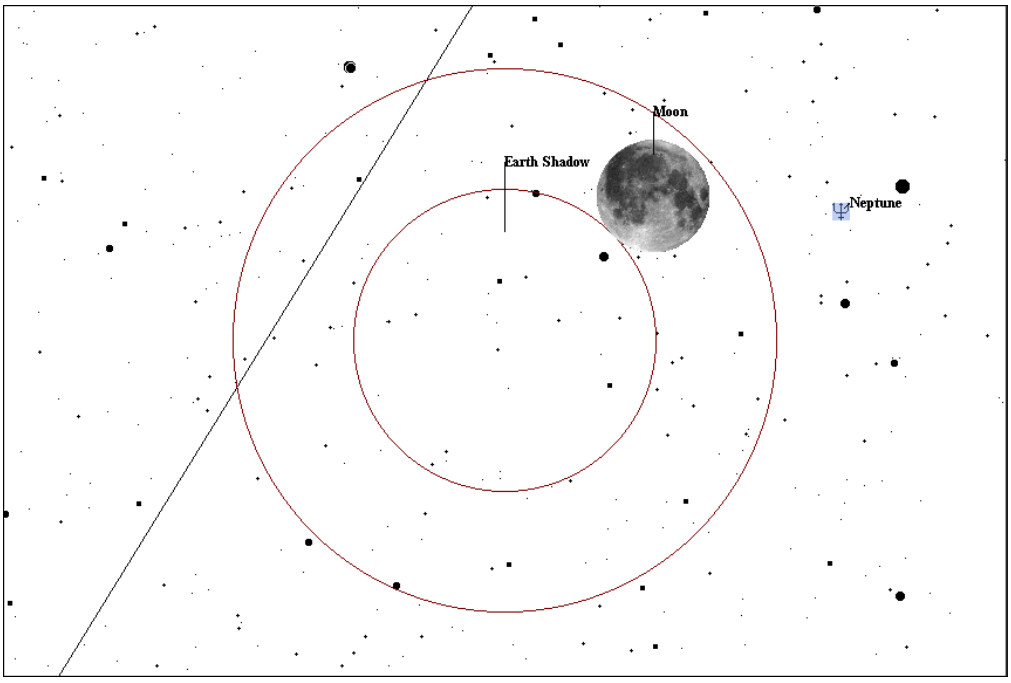
Deadline for the next issue is August 15.

Note the new start time and place for July's meeting—8:30 PM at the Glenlea Observatory.

July 28: Lunar Eclipse



While Europe and the East enjoy a solar eclipse this summer, North America—at least the western part—is treated to a partial lunar eclipse. As lunar eclipses go, partials are usually not very exciting, though they have a charm of their own as the edge of the full Moon turns a coppery colour. You can at least tell that something is going on, and it's probably worth a trip to a dark field and a few photographs.

July 28th's eclipse is a little more of a challenge for those of us in Manitoba, as the Moon will be very close to the horizon. Umbral contact, the point at which the Moon first touches the deepest part of the Earth's shadow, occurs at 5:24 AM, when the Moon is only 4° above the horizon and a little less than 40 minutes before sinking out of sight. The sky will be very bright in the east, but the setting Moon in the southwest should have an extra reddish tone as it lingers above the horizon. The first effects of the Earth's shadow should be detectable on the Moon at about 5 AM.

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Upcoming Meetings and Observing Sessions

July

July
9

The July meeting will be held an hour later than usual, and **at the Glenlea Observatory**. The night will be a combination of observing and talks, and if the weather turns ugly, just talks. The **beginner's part of the meeting will begin at 8:00 PM on Friday July 9, and the regular session at 8:30**, giving the Sun a little extra time to set by the time the meeting adjourns to the night skies. Because we're only a few weeks after the solstice, the skies will be dark only for a couple of hours around midnight. A map to the observatory is printed on the last page of *Winnicentrics*.

Every evening a pageant of Greek mythology parades across the sky. Gail Wise will take us on a tour of the myths behind the constellations. Mars Surveyor will provide us with some new images from the Red Planet, which we might also watch through the 14" telescope. Andora will give a brief report on the 1999 RASC General Assembly which was held in Toronto the week before. And, since it is Gail's birthday, there will be cake on hand, so come enjoy her presentation and help her consume the cake.

August

August
13

Friday the 13th will prove to be very unlucky this August. The usual monthly meeting will be **cancelled** as members travel to the Cypress Hills in southwest Saskatchewan to attend the Cypress Hills Star Party (August 13-15). Since many members of the Winnipeg Centre make this trip, perhaps you should consider travelling along as well (head for Maple Creek and take Highway 21 south to the Cypress Hills Provincial Park). The event is very family and star-oriented, with lots of entertainment and a comfortable campground under some of Canada's best summer skies.

For those staying behind…. The **Perseid meteor shower** peaks on the evenings of **Wednesday the 11th and Thursday the 12th**. This is one of the best showers of the year, and should be enjoyed at our observatory at Glenlea. Bring a lawn chair, flashlight, mosquito repellant, camera on a tripod with a wide angle lens and fast film, and someone you want to share it with. The shower will be best after midnight, and the moon will be

Meeting Summary

July 9:	Glenlea Observatory 8:00 PM: Beginner's Session 8:30 PM: Meeting and Observing
August 11 &12:	Observing session Perseid Meteor Shower Glenlea Observatory After dark until daylight (best after midnight)
August 13:	Meeting Cancelled due to Cypress Hills Star Party
September 10:	St. John's College University of Manitoba Room 118 7:00 PM (Beginners Session) 7:30 PM (regular meeting)

LIFE BEYOND EARTH

EUROPA

It is now clear that organic chemistry has run rampant through the solar system and beyond.
Carl Sagan,
Scientific American, 1997

Jupiter's Beauty

Galileo Galilei published a paper in March of 1610 speaking of four moons revolving around the king of all the planets, Jupiter. Four years later they had names given by Simon Marius: Io, Europa, Ganymede, and Callisto, all named after the lovers of Jupiter (Jove, or Zeus in Greek).

The ancient story tells how Europa, a Phoenician princess famous for her beauty, attracted the attention of Jupiter. Disguised as a white bull, Jupiter took the princess away on his back to Crete. There, Jupiter changed into his human appearance, throwing the bull's shape into the sky. That is the origin of constellation Taurus in ancient charts. Europa bore Jupiter 3 sons. One of them, Minos, was a founder of Minoan civilization, the first civilization in Europe.
One glimpse at Jupiter's moons is enough to understand why they all have names of nymphs and beauties.

Getting a closer view

It has been twenty years since *Voyager* spacecraft missions sent us the most exciting images from that distant world. The variety of the moons and their special personalities left us breathless at that time. In the years since, Europa has continued to intrigue astronomers with her icy, shining, smooth surface, strikingly different from volcano-orange Io or emerald sparkling Callisto.

Four years ago, another discovery! Using the *Hubble Space Telescope*, a team of researchers at the Johns Hopkins University and the Space Telescope Science Institute in Baltimore detected a tenuous atmosphere of molecular oxygen around Europa. In 1997, the *Galileo Orbiter* detected Europa's ionosphere, another sign that it has an atmosphere.

This latter spacecraft performed a close-up flyby of Europa at an altitude of 3560 km, in September last year. *Galileo*'s images from this icy moon, sixth largest in the Solar System and slightly smaller than our own Moon, revealed the complex structure of its surface. The ice is not as smooth as we first had thought; instead it has different features—hills that look like icebergs and gaps between huge ice plates. It looks as if the plates are moving and sliding over some warmer liquid beneath them. There are a lot of colorful signs that Europa is geologically active. The older ice is bluish, but newly erupted material from the interior makes red patches, while scattered ice from Pwyll, a young impact crater, is shining white.

Originally scheduled to end on December 7, 1997, NASA extended *Galileo*'s mission to 1999, with one of the special objectives being a "Europa Campaign": detailed mapping of the surface and a detection of possible magnetic field that would be generated by subsurface ocean. There are a lot of indications that, indeed, beneath the icy surface lays a liquid ocean. The cracks in the ice suggest it, and so does the unusual low density of this frigid moon. Although Europa is 780 million kilometers away from the Sun's heat, and its surface temperature is -145° C, tidal tugs of Jupiter and other moons could warm its ocean and keep it in a liquid state. The same effect is believed to be the trigger for volcanic activity on neighboring Io.

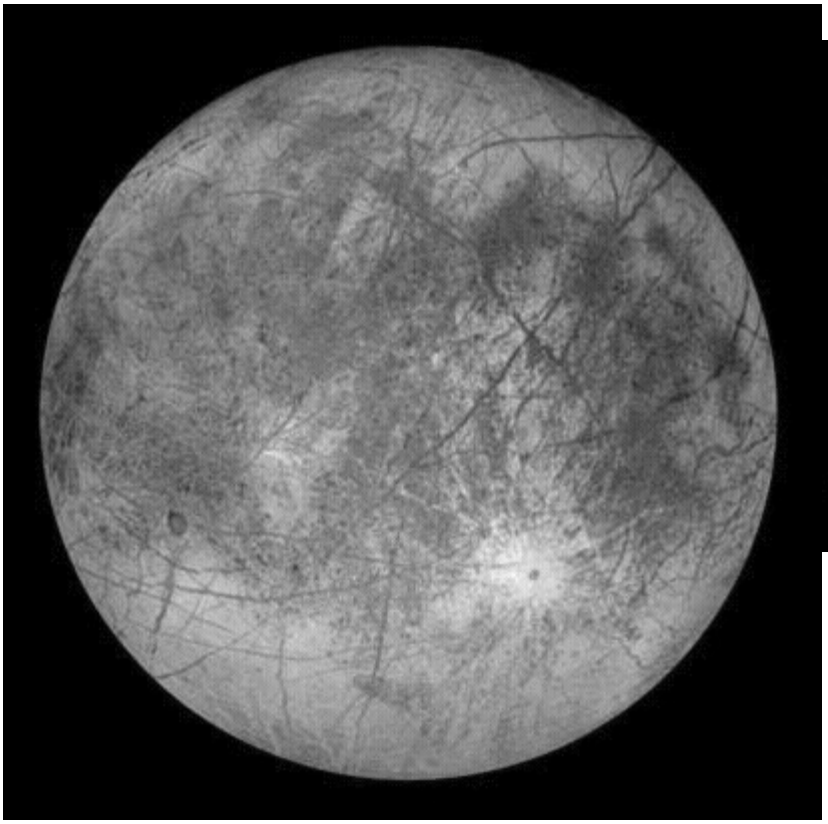
The meaning of all that research is, in fact, search for the possibility of life beyond Earth. And vice versa:

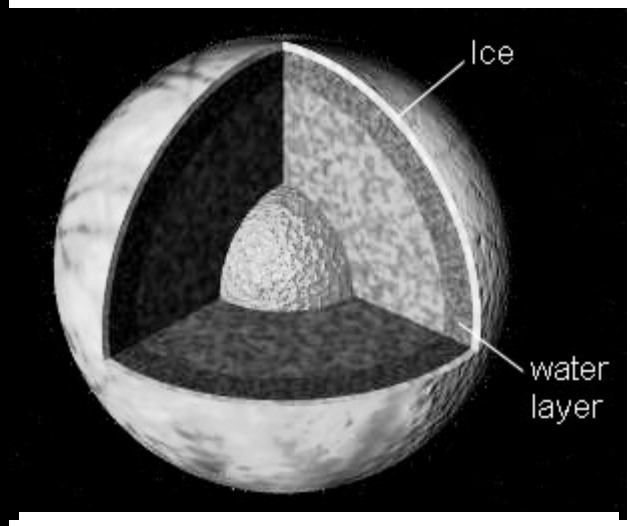
"*The combination of interior heat, liquid water, and infall of organic material from comets and meteorites means that Europa has the key ingredients for life*," says James Head, Brown University professor of geological sciences and a group leader of the *Galileo* re-

search team. "*Europa, like Mars and the Saturn moon Titan, is a laboratory for the study of conditions that might have led to the formation of life in the solar system*."

Laboratories on Earth and Moon

At the same time, exobiologists on Earth performed experiments with most astonishing results. A general goal of these experiments was to test what forms of life could survive without our special environment on Earth. As a part of that mission, one of the first "beyond Earth" experiments was conducted during the *Surveyor 3* mission: ordinary *Streptococcus* bacteria were left on the Moon from 1967 to 1970, in a vacuum, with no food or water. When *Apollo 12* brought them back to Earth they were still alive !





Two views of Europa. At the left is a Galileo image showing the pattern of cracks on the surface of the planet which suggest the presence of a liquid layer below. The white spot with the dark centre in the middle lower right is the impact crater Pwyll. The image above is a diagram of a possible structure for the moon.

From then on, exobiologists have tested other microorganisms in extreme conditions on Earth. Those which pass tests and live or remain viable are called *extremophiles*.

One of the finest natural laboratories on Earth is on Antarctica. Richard Hoover of NASA's Marshall Space Flight Center and Dr. S.S. Abyzov of the Russian Academy of Sciences have been examining deep ice core samples from the *Vostok Station* (about 1,000 km from the South Pole) collected in 1974. Scientists at the St. Petersburg Mining Institute in St. Petersburg developed a technology for drilling ice cores without contaminating the samples. With that method, Abyzov discovered, and in some cases revived, microorganisms in 400 000 years old ice. "*What is clearly going on is that when microorganisms freeze, they shut down and go into this anabiotic state*," explained Richard Hoover. Russian scientists revived from that state (live but inactive), and even culture bacteria, yeast, fungi, and other microbes found in the ice cores.

Three years ago, seismic tools detected a large lake of liquid water beneath the 3 km-deep glacier at Vostok. Now we have a real terrestrial laboratory for understanding what may be occurring in the oceans on distant Europa.

The samples from the ice above the lake, and others from around the Earth, give exobiologists enough material to study possible life forms beyond Earth. Some other survivors found in natural extreme conditions other than Antarctica are micro-organisms from the Siberian permafrost more than 5 million years old, bacteria from a Kamchatka volcano, those found around volcanic vents in ocean depths, and a radiation-resistant yeast that survives in the core of a nuclear reactor.

What are they, or WHO are they ?

All these microorganisms resemble bacteria on one

side, and plant or animal cells on another, but they are neither. They are the third branch of life on Earth -- *archaeabacteria*, or simply *archaea*, between *prokaryotes* (normal bacteria) and *eukaryotes* (plants and animals). The genetic material of *archaea* float freely throughout the cell like in *prokaryotes,* not within the cell nucleus like in plants and animals. But the DNA of *archaea* more closely resembles that of plants and animals than normal bacteria. They also proved to have the best survival abilities of all.

One day, when we send well-equipped probes to every world in Solar System, and if we discover life on any of them, it may be similar to the *archaeabacteria* from Earth.

Now what ?

NASA research teams plan several projects to explore Europa. The first one, planned for launch in 2003, is the *Europa Orbiter*. It would try to scan the surface with more details, estimate the thickness of the ice, and determine whether liquid water exists below the ice. Missions after *Orbiter* will send a probe for undersea explorations of the oceans if they exist.

If you are interested in the accomplishments of previous missions, and to follow future ones, visit an exciting web site **http://www.jpl.nasa.gov/galileo/evropa** called: **Europa, a continuing story of discovery**.

-Vesna Milosevic-Zdjelar

What to see in July and August

Venus at its brightest	July 14	
A partial lunar eclipse	July 28	5:00 AM
Total solar eclipse in Europe and the Middle East	August 11	
Peak of the Perseid meteor shower	night of August 11, 12	

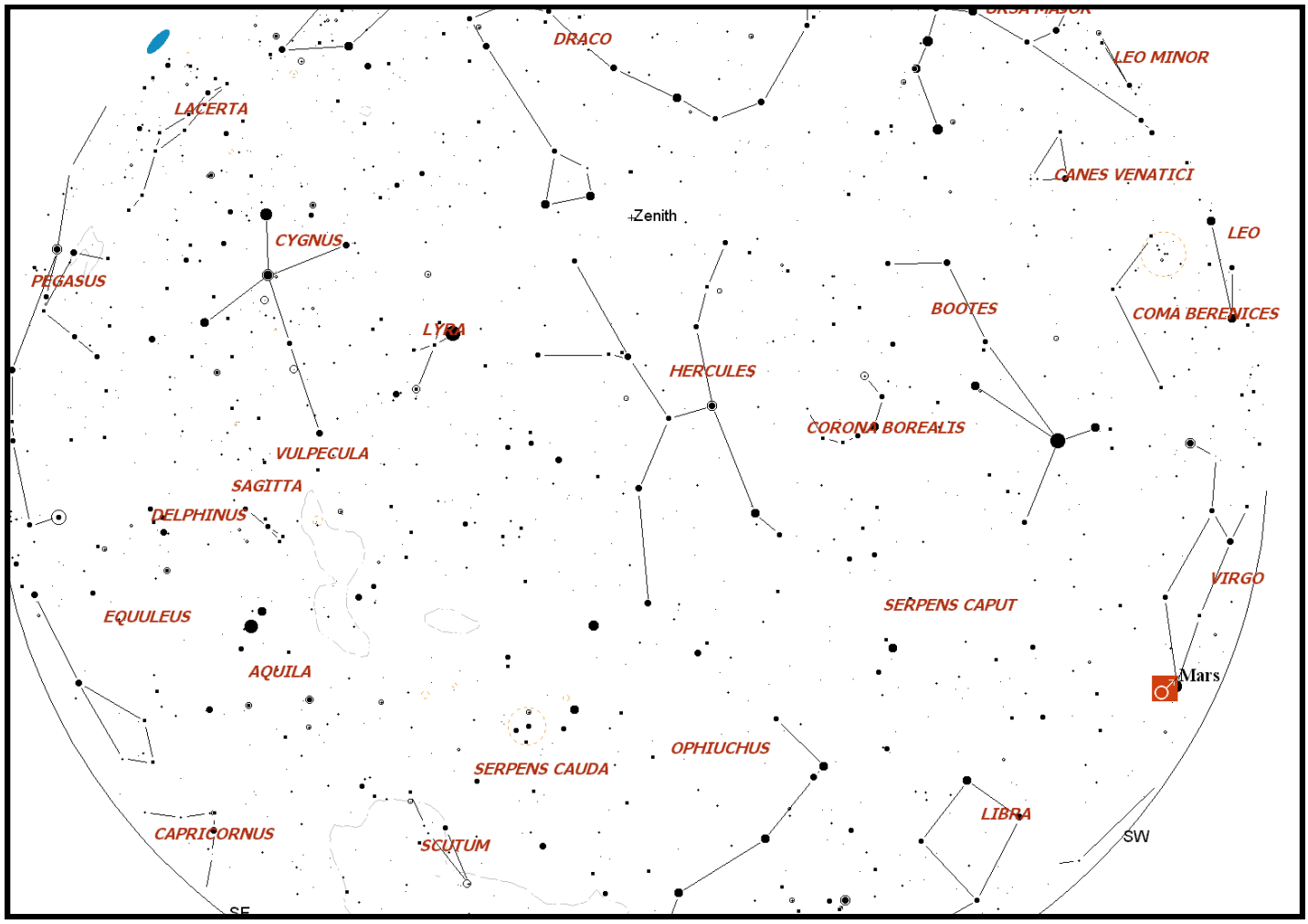
Observing the Perseids

The Perseid meteor shower is often regarded as the best of the year, though that honour is probably more due to its occurrence in the warm summer nights of August than its brilliant meteors. Nevertheless, it's a pretty good show if skies are clear, and this year's shower will be favoured by a new moon, which means the sky will be dark all night long.

To view the shower, little more is needed than a lawn chair, warm clothes, a blanket (as much for mosquitoes as the cool air) , and something warm to drink along the way. The Perseids tend to be very fast moving and long duration meteors, and provide a spectacular show as the flash across the sky, from east to west.

As with nearly all meteor showers, observing conditions will be best after midnight, when the Earth is rotating into the direction of the meteors, making them strike the atmosphere at an even faster speed. As the night progresses, the constellation Perseus will be rising higher in the sky, and meteors can then be seen heading in all directions away from though best observing is likely high overhead through the night.

For ambitious souls, keep a count of the number of meteors visible in every 5 minute interval. In past years we've seen about 30 per hour, but the shower tends to have small peaks which can raise the rate to over 100 per hour. The long term average for dark skies promises a rate of about one per minute.



July Stars for Beginners

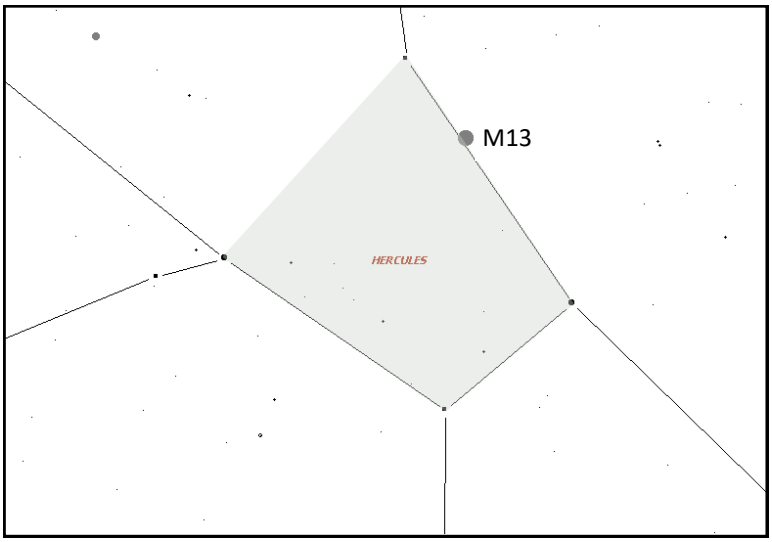
July skies, while not very dark, are beginning to show the spectacular objects which reside in the summer Milky Way. For beginners, navigation to at least some of the brighter nebulae and clusters is easy, relying on the many bright stars to find the way.

Begin by identifying the brightest stars. There are three (ignoring Venus and Mars)—Deneb, Vega, and Altair. Vega is the brightest, shown in the chart above in the constellation Lyra, and partly underlying the name. Above the "C" in Cygnus is the star Deneb. Altair lies above the "A" in Aquila. Together the three form what is known as the "Summer triangle". Arcturus in the constellation Bootes is also bright, but lies well to the west, while the triangle is rising in the east. If you are finding your way about in the heavens for the first time, use the three bright stars to get going.

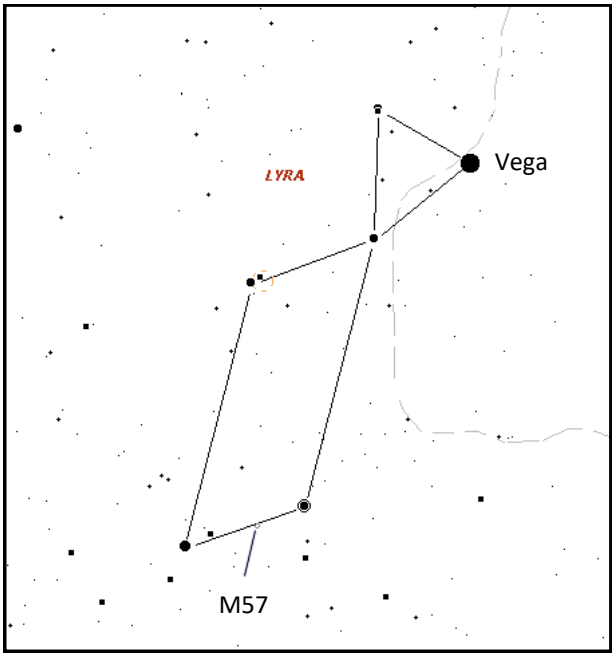
Deneb lies in the constellation Cygnus (the Swan), but it is better known and seen as the "Northern Cross". It's a large constellation with Deneb at the top of the cross, a fairly bright star (gamma) at the intersection of the arms of the cross, and a rather faint star (but a spectacular double called Albireo) at the bottom. The arms are easily seen once Deneb and gamma are identified.

Vega lies above a pushed-over rectangle of stars which are quite distinctive, as Lyra is a small constellation. Altair is prominent as a single star, but the constellation doesn't stand out to any great extent.

Once these patterns have been found, we can begin to look for a few of the goodies in the sky which lurk in this area. The first is the globular cluster M13, located in the constellation Hercules, and easily visible in binoculars. Find Hercules by extending a line from the middle star in the Northern Cross (gamma) to Vega and beyond. While the constellation of Hercules looks pretty big, the only part we want is the four stars which surround the letter "H" in the word "Hercules" in the chart. These four form the asterism (pattern) known as the "keystone", and shape which is fairly easy to see when the constellation is overhead, but more difficult when it lying on its side in the east or west sky. It's not particularly bright, but not difficult once skies get dark. The keystone is shown in more detail in the diagram at the left where the keystone shape is shaded.



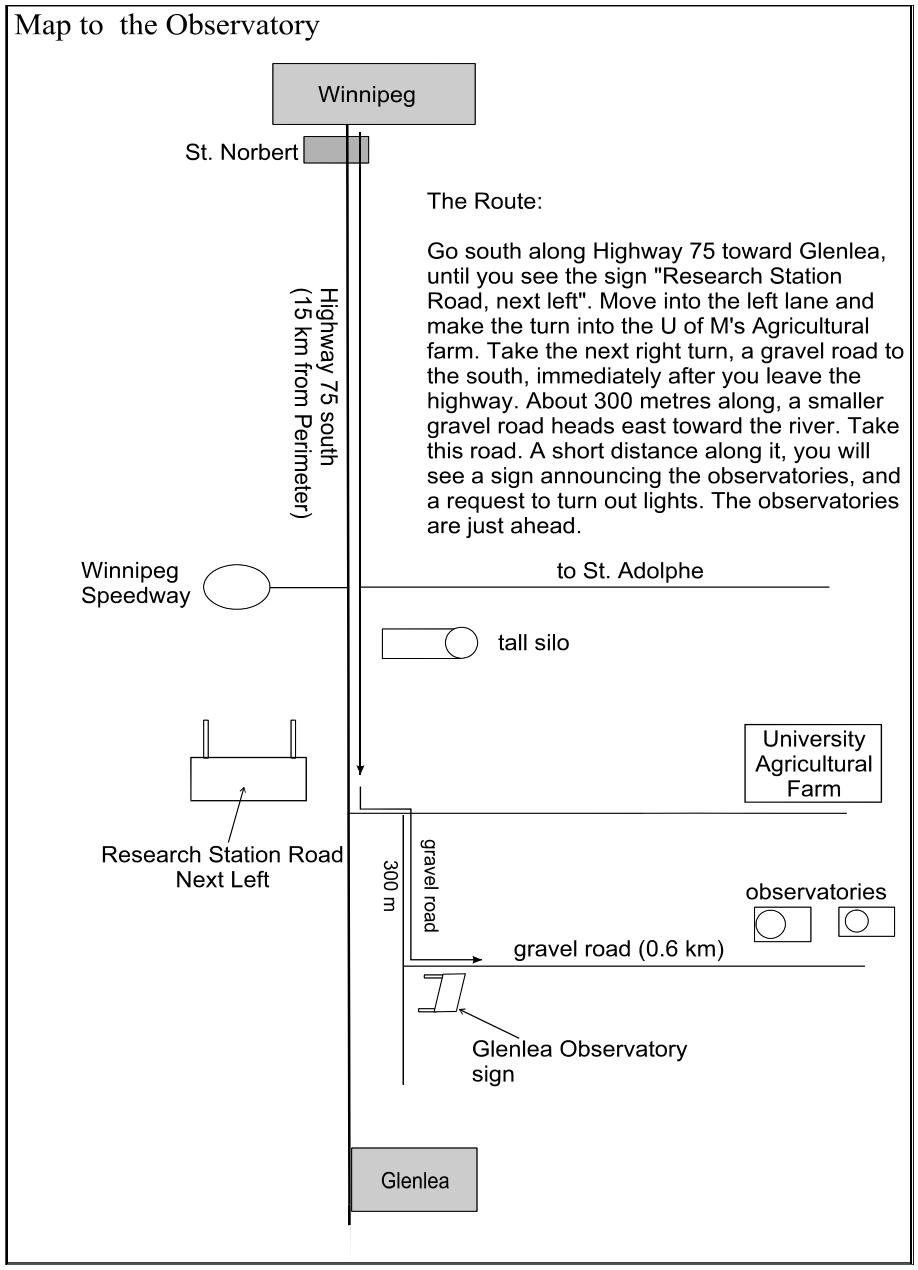
Once the keystone is found, M13, the great globular cluster in Hercules, can be identified by its fuzzy appearance in binoculars, about 2/3rds of the way from the bottom to the top stars on the right side of the keystone. For those using a Dobsonian telescope, the cluster can be found by centering on the top (right) star and then scanning slowly up and down in a searching pattern until the globular is seen. If you search from the top star to the bottom, you then **know** that the cluster must be in the field close by.



The next target is easier to find, but harder to see— the famous Ring Nebula in Lyra. Lyra lies under Vega, the brightest star in the sky, at the bottom of the parallelogram shape that makes up the constellation outline. It too is an easy pattern to find. The Ring Nebula (M57) lies between the bottom two stars in the parallelogram, almost in the middle and almost in line with the flanking stars. In this case a side-to-side motion of the Dobsonian telescope would run over top of it, though it must be looked for carefully as it is quite small. It isn't visible in binoculars.

The stars surrounding the Ring are quite bright, and it isn't always easy to tell which ones are the bright corner stars of the parallelogram when looking through the telescope (and remember, directions left and right are reversed in a telescope!). But the nebula jumps out at you fairly easily, and it is only necessary to use a low power in order to cover a larger area of sky, and then the delicate green of this smoke puff will come out. Put on higher power once you've found it.

M13 and M57 are two of the showcases in the sky, and efforts to find them will be well worthwhile. You'll find that you come back to them again and again over the years, testing new telescopes and eyepieces on them, and showing them off to your friends when they want a look at the skies. And because they're in the midst of the Milky Way, there are dozens or even hundreds of nearby objects which will reward a diligent search with a new perspective on our galaxy.



Finding the Observatory

The Winnipeg Centre maintains a working observatory and warm room at the University of Manitoba's Research Farm near Glenlea. The observatory contains a 14" Celestron telescope on a fork mounting. Members of the Centre may sign out the use of this telescope provided they have first taken a short instruction course on its use.

The Celestron provides outstanding views of the night sky. Its large aperture collects more than 2500 times as much light as the human eye. It is capable of magnifying more than 700 times under very favourable conditions. The telescope also has a solar filter for those wishing to carry out day-time observing.

The warm room provides a convenient place for members to take refuge from winter temperatures and summer mosquitoes, or to wait out a passing cloud. The building also provides desk space, a computer, and lighting for planning a night's observing session. A cement pad in front of the warm room and observatory provides a convenient space to place members' telescopes while conducting personal observing programs. The University of Manitoba also has an observatory at the site.

Etiquette requires that you approach the observing site with your headlights off. On newer cars, stop the engine at the Glenlea Observatory sign, engage the parking break by one notch, and then restart. Your headlights should remain off, but you can still use your parking lights to drive. Proceed slowly, and be careful about parked cars along the road, or people walking. If you cannot turn off your headlights, make a cardboard or garbage bag mask to dim the lights. You might wish to turn around at the end of the road so that you are facing the direction back toward the highway at the end of the evening. During wet weather the road is often muddy and difficult to travel. Be careful when coming in during the dark of the