



REGULUS

SEPTEMBER-OCTOBER 1991

NEWSLETTER OF THE KINGSTON CENTRE
OF THE ROYAL ASTRONOMICAL SOCIETY OF CANADA

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NEWSLETTER.....	Bill Broderick	(000) 000-0000
NATIONAL COUNCIL REP.....	Leo Enright	(000) 000-0000
ALTERNATE N.C. REP.....	Walter MacDonald	(000) 000-0000

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PUBLICITY.....	Bill Broderick	(000) 000-0000
OBSERVING.....	Chris Collin	(000) 000-0000
ASTRONOMY DAY.....	Stan Hanna	(000) 000-0000
	Peggy Torney	(000) 000-0000

UPCOMING MEETINGS AND EVENTS

Regular Meetings of the Kingston Centre, RASC are held in on the second Friday of each month at 8 p.m., in Room D-216, MacIntosh-Corry Hall, Queen's University. Non-members are welcome. Executive meetings are at 7:30 p.m.



TOTALITY

(Photo by Leo Enright)

Sept. 6, 7, 8	<u>"FARMFEST"</u> --near Thomasburg, Ontario. Information and map on page 9.
Fri., Sep. 13	<u>REGULAR MEETING--MEMBERS' NIGHT</u> Please bring your slides, photos, reports of observations, or anything else you would like to present.
Thurs., Sept. 26	<u>SPECIAL MEETING</u> --Come out and meet our National President, Damien Lemay, who will speak on "Scientific Contributions by Amateurs".
Fri., Oct. 11	<u>ANNUAL MEETING AND ELECTIONS FOR 1992</u> Speaker, Bill Broderick, "I.D.A. Slide Presentation on Light Pollution".

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TOTALITY FROM THE CENTRE LINE IN BAJA

Leo Enright

Being able to view the July 11, 1991 solar eclipse, the longest of the decade, was a rare privilege, but to be able to experience it from the centre line of the path of totality at a place that afforded a duration within a few seconds of the maximum possible was an extremely special treat.

Planning for the Royal Astronomical Society of Canada's 1991 Solar Eclipse Expedition had taken place over the last three years. Now at 8:30 a.m. Mountain Standard Time, the 165 members of our group were at our primary observing site, the soccer stadium in the village of Santiago, Baja California Sur in Mexico, two hours before First Contact of moon with sun, carefully preparing our equipment and waiting in anxious expectation for the big event. The blue skies were now almost cloud-free except for miniscule wisps of cirrus that caused little concern. The sun that would be less than 8 degrees from the zenith at eclipse time was climbing higher and higher, and its intense heat was already sending the thermometer over 35°C in the shade.

As the minutes passed until First Contact at 10:25, there was even less concern than there had previously been that the weather might present a problem. During our 6:00 a.m. flight from Puerto Vallarta to Las Cabos Airport at the tip of the Baja Peninsula, views of intermittent cloud banks forming over the Pacific Coast had raised some concerns. On the 40-kilometre bus trip northward from the airport to Santiago, some scattered, fast-moving clouds had been seen coming inland from the Gulf of California and moving quickly southwestward parallel to the mountain range known as the Sierra de San Lazaro.

First Contact was signalled by several shouts as people saw it in their telescopes. The sky remained generally clear for almost all of the partial phase of the eclipse. It was only about 10 minutes before totality, as the darkness of the moon's shadow became visible in the distant hills to the west, that clouds, disappointingly, became thicker and thicker, and started generally to cover the whole area near the zenith. Strangely and with some grotesque irony, those clouds would leave the area of the zenith about 10 minutes after totality.

As the approaching shadow became more noticeable in the five minutes before totality, I saw that it appeared to be heavier or darker on the right (or northern) side than it did on the left (or southwestern) side. This, I thought, was probably because of variations in the density of the clouds which prevented the shadow from being as sharp and noticeable in some places as in others.

The general impression of totality and its attendant phenomena was one of certain events observed but much less distinctly than they would have been seen without the fairly heavy, but occasionally broken cumulus cloud cover. At Second Contact, they allowed us to see only a hint of diamond ring and Bailey's Beads. The cold black "eye-in-the-sky" with the flaming white corona (the essence of any total solar eclipse) was seen intermittently during 5 or 6 intervals, each interval being 5 to 15 seconds long. The corona reached out about half a solar diameter beyond the edge of the disk, certainly only a fraction of the amount of corona that should have been seen under clear skies. During two of the breaks in the cloud cover, two brilliant red prominences were clearly seen protruding from the northern hemisphere of the sun. The "round-the-horizon sunset" glow was most evident to the southeast where clouds interfered the least and where it was an orange-yellow colour. Mountains and hills also prevented a good horizon view to the north. No stars or planets were seen by anyone during totality. At Third Contact the very short diamond ring, characteristic of long eclipses, burst into view more stunningly and more clearly evident than the previous one at Second Contact, its brilliant light a dramatic reminder of how rapid is the passage of 6 minutes and 50 seconds.

The temperature drop at the time of totality had been very noticeable. From an oppressive 41°C it had gone down to 29°C during totality, and now with the disappearance of the clouds 10 minutes after totality, it very soon returned to its original level. The noises of cattle in a nearby field showed their confusion just before and at the beginning of totality, though two dogs at the site seemed unaffected by nature's spectacle. The streetlights came on in the village.

It was an event that brought many emotions. Admittedly there was a feeling of frustration at one thing -- clouds that seriously interfered with viewing totality, though not with most of the partial phases both before and after. However, there was also a feeling of accomplishment for a large group having observed the eclipse from the centre line of a wide path of totality and for having been part of an expedition that "came off like clockwork" thanks to the careful planning and great attention to detail by the members of the organizing committee over the past three years. That committee, made up of Michael Watson, Randy Attwood, and Steve Dodson, deserve the highest praise from all participants for their unstinting efforts. The Royal Astronomical Society of Canada's 1991 Solar Eclipse Expedition was a memorable participation in one of nature's outstanding spectacles of the current century.

QUEST FOR THE POLE

(OR POLAR ALIGNMENT WITHOUT TEARS!)

By Bill Broderick

Instructions for polar alignment, particularly for the novice, are often complicated and confusing. Fixing on the celestial pole can be almost as arduous, in its own way, as were the quests for the poles of the Earth. This discussion will, I hope, enable the veriest tyro to find the Pole quickly and easily.

Right at the outset, I want to say that there are, basically, only **two** kinds of telescope mountings. The first, called "**alt-azimuth**", refers simply to the fact that the telescope can be moved both vertically and horizontally, in altitude and azimuth. The other is called "**equatorial**", and refers to the fact that the base of the mounting is oriented parallel to the plane of the Earth's **equator**.

In other words, an equatorial mounting is simply an alt-azimuth mounting which has been tilted relative to the Earth's surface so that its base has the same orientation in space as the Earth's equator.

Figure 1 shows how this works. At the north (or south) terrestrial pole, an alt-azimuth telescope mount would work just fine. The instrument would only need to

be moved on **one** axis in order to counter the Earth's turning and track an object in the sky. When located at one of the poles, the base of an alt-azimuth telescope mount has the same orientation as the equator of the Earth. The azimuth axis is, in effect, a "**polar axis**".

A telescope located elsewhere on the Earth, somewhere between the poles, must be moved on **two** axes in order to track a celestial object--unless the base of the mounting can be **tilted** so as to achieve the orientation discussed above. An **equatorial mount** accomplishes this objective--providing it is properly "**polar aligned**".

First of all, if you haven't already done so, familiarize yourself with what **controls and adjustments** your telescope mounting is provided with. It will likely have most, if not all, of the following:

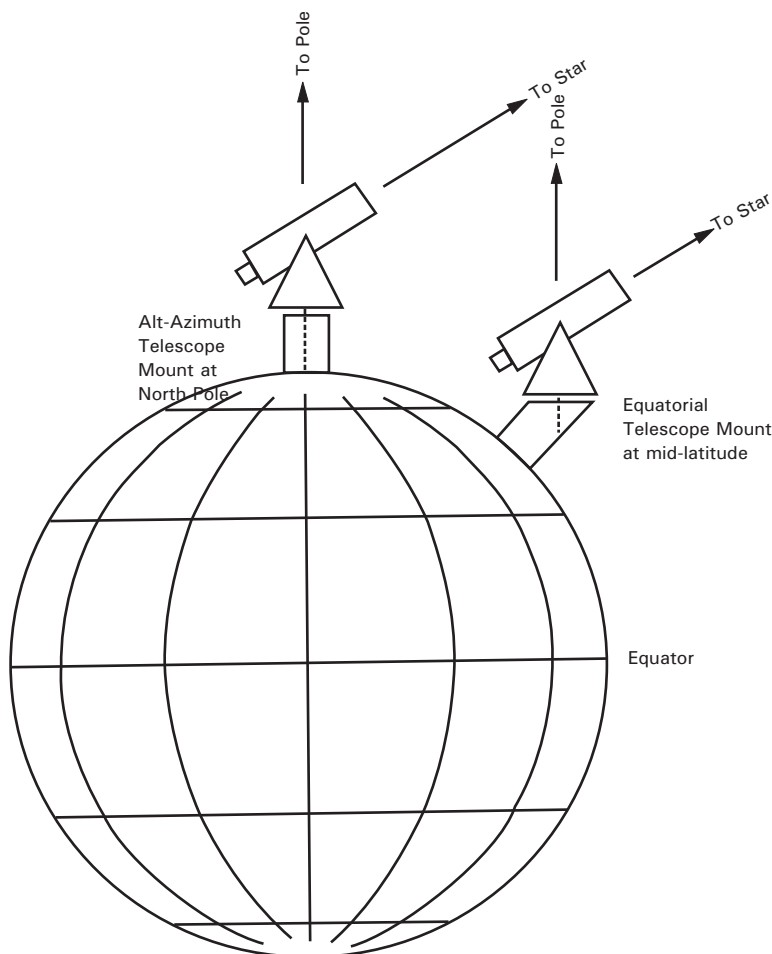


Figure 1

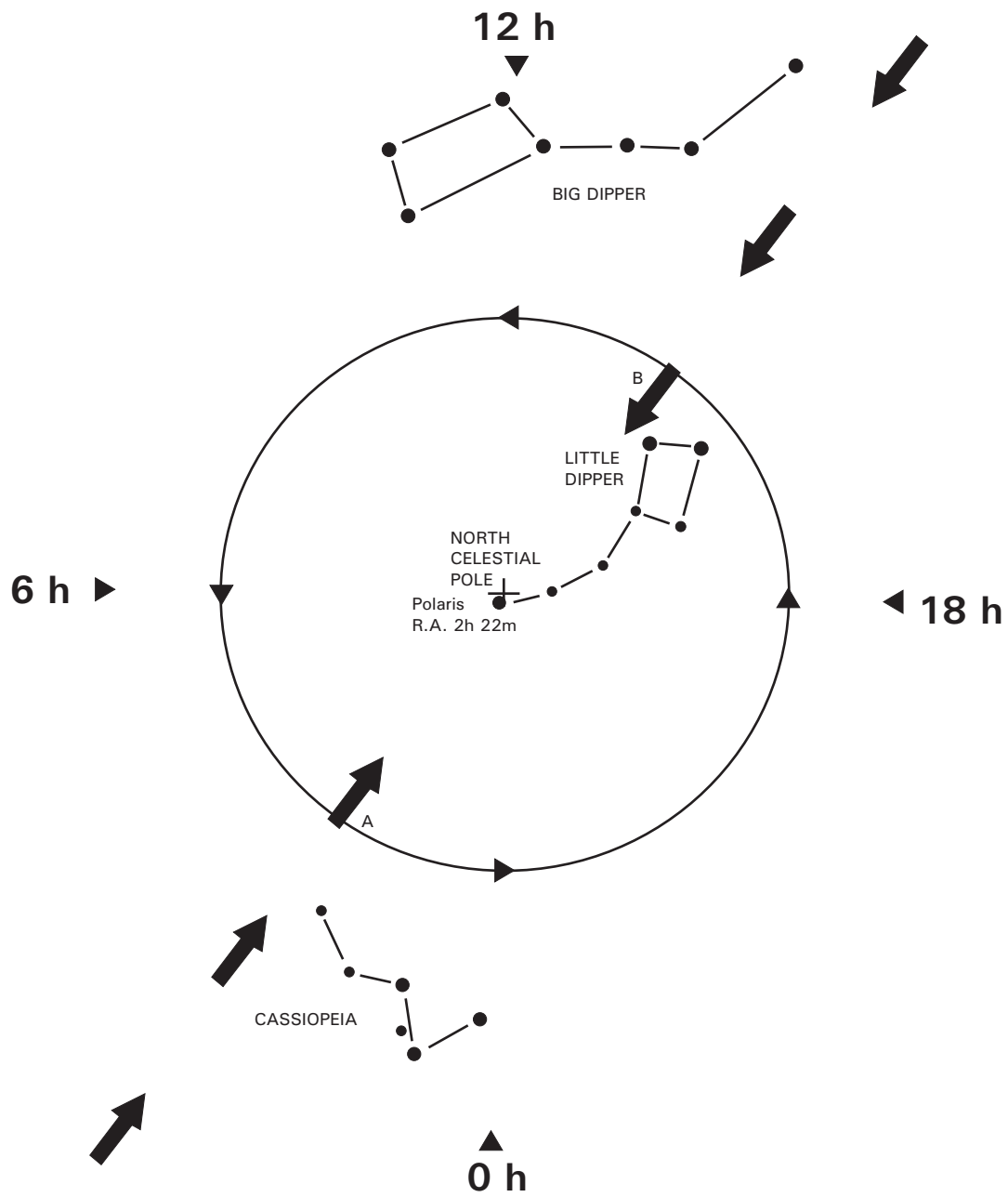


Figure 2

1. Right Ascension and Declination adjustments and slow motion controls;
2. Setting Circles for both Right Ascension and Declination;
3. Polar Axis Tilt Adjustment so that it can be "set" to the proper angle for your latitude;
4. East-West (lateral) adjustment--if this is not provided, the whole tripod-mounting-telescope assembly must be turned as necessary.

And now--onward to the Pole!

1. Align Finder and Main Telescope: Before trying to polar align, ensure that your telescope and its viewfinder are **aligned with each other**. An easy way of doing this is to point the telescope at the "North Star" **Polaris** (see **Figure 2**). At 2nd magnitude, Polaris is reasonably conspicuous and its apparent motion so slight that it hardly appears to move in the eyepiece of a telescope even over the course of many minutes. After centering Polaris in the eyepiece field of view in your main telescope, look at it through your finder scope. If necessary, bring it to the centre of the finder's field of view using the finder's **adjustment screws**.

2. Set Declination Circles: Turn the telescope in **Declination** (north-south) until the **Declination Circle** (or **Circles**) read(s) **90°**. Next adjust the **direction** and **tilt** of the **Polar Axis** of your telescope until Polaris can be **centred** in the eyepiece. Now **rotate** the telescope **180°** around the **Polar Axis** and see if Polaris is **still centred**. If it is not, note carefully **how far off centre** it is as viewed in the eyepiece and/or finder, and by adjusting either the **declination** or the **altitude tilt** of the **Polar Axis**, or by swinging the entire mount **right** or **left**, try to find a position **where Polaris stays in the centre of the finder and eyepiece fields of view** with no (or very little) drift when the telescope is rotated around the **Polar Axis**. When this happy state of affairs is finally achieved, check the **Declination Circle** (or **circles**). It should read exactly **90°**. The **Declination Circle** on **German type equatorial mounts** (the kind with shafts and a counter-weight) is usually pre-set at the factory and may not be adjustable. **Fork-mounted Schmidt-Cassegrains**, on the other hand, have a **Declination Circle** on each **fork arm** which can be adjusted by loosening a nut or knob.

Note that sighting and entering on Polaris is adequate for most purposes, certainly for all casual observing. However, if you want to do celestial photography where the exposure must be guided over many minutes or an hour or more, then more exact polar alignment is required.

3. Set Hour Circle (Right Ascension): After aligning on Polaris as described above, swing the telescope to a fairly bright star well away from the Pole. For fall evenings, **Vega** in **Lyra** is a good choice at **R.A. 18h 37.**, **Dec. 38° 46'**. Having got your target star squarely in the crosshairs of your finder, check that it is centred in the eyepiece of your main telescope, then set your **Hour Circle** to that star's **R.A.** Your telescope can now be used to "tell" **sidereal time**, and you can use your circles to "dial in" any celestial object that you know the coordinates of.

4. Zeroing In On The Pole: The final step is easy. Swing the telescope to **R.A. 2h 22m** and **Dec. 90°**. Polaris

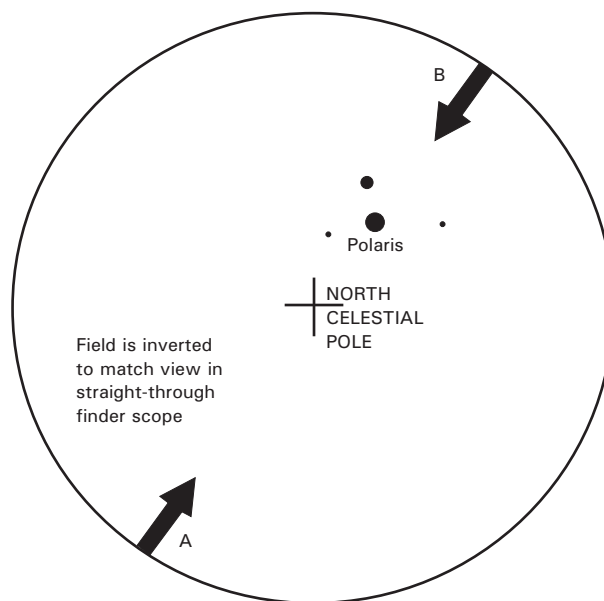


Figure 3

should once again be centred in your telescope finder and eyepiece. Now using your **Declination slow motion control**, bring the telescope to **Declination 89° 13'**, or as close to that value as possible. A good approximation is 89° 15' or 89.25°. Look in your finder; Polaris is now somewhat off-centre, probably about a third of the way to the edge of the field, something like in **Figure 3**. Now using your **Polar Axis Latitude Adjustment (tilt adjustment)** and turning the entire mount right or left as necessary, bring Polaris back to the centre of your finder's crosshairs.

Your telescope is now **Polar Aligned** to within a small fraction of a degree.

Knowing where the **North Celestial Pole** is located relative to Polaris is a help in locating it telescopically. As shown in **Figure 2**, Polaris is approximately mid-way between the **Big Dipper** and **Cassiopeia**--at the end of the **Little Dipper's handle**. Note the two stars in the "bowl" of the **Big Dipper** which "point" the way to Polaris and the Celestial Pole. On any evening when these three familiar star patterns are visible, you can get a good "fix" on the Pole by running a line from the "left" of the Dipper's handle through Polaris to the "left" of the "W" of Cassiopeia.

Figure 3 shows how the field immediately around the Pole looks in a telescope finder scope. This figure can be superimposed on **Figure 2** to make a "**SUPER POLE LOCATOR**". Match the arrows **AB** and **AB** and the field will look as it actually does in the sky. Match the arrows **AA** and **BB** and the field will be inverted as in a **straight-through finder**. (**Note**: to see the field as it would look in a **right-angle finder**, just hold **Figure 3** up to a mirror.)

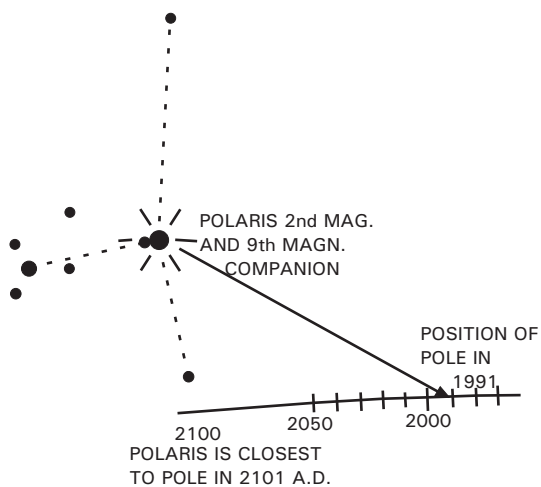


Figure 4

As we all know, few things in our universe are "nailed down". Certainly **not** the Celestial Poles. Because our topsy turvy world wobbles like a top, the North and South Celestial Poles trace huge circles in the sky over the course of some 26,000 years. So the star which we call **Polaris** will in time be supplanted by other stars. For centuries to come, however, Polaris will be the closest star to the North Celestial Pole. Over the next century, in fact, it will be getting closer and closer. Or more correctly, the Pole will be getting closer to it. It will be closest in **2101 A.D.**, as shown in **Figure 4**.

Want to see Polaris in the **daytime**? With good polar alignment you can do that. You might be able to pick up the North Star simply by setting the telescope to **Declination 89° 13'** and turning the telescope around the Polar Axis. But you can find it more easily by setting your telescope to Polaris' **R.A. 2h 22m** as well. Here's how:

1. Determine the **sidereal time** for when you are going to observe;
2. Set your telescope **Hour Circle** to the sidereal time;
3. Turn the telescope to Polaris' **R.A. 2h 22m**.

Polaris should now be somewhere in the eyepiece field of view. In the daytime, however, you may have to look hard to see it, but it can be done!

Besides the benefit of being able to locate celestial objects with known celestial coordinates quickly and easily and tracking them accurately, a well-aligned mount is a source of personal satisfaction. And learning how to Polar Align will enhance your knowledge of the sky and how it moves, and the pleasure you get from observing.

HOW TO DETERMINE SIDEREAL TIME

Sidereal time is simply the **Right Ascension (R.A.)** of the stars overhead. At noon on **March 21st**, the point of the **Vernal (Spring) Equinox** is right overhead and the **sidereal time is Zero (0) hours**. Each month thereafter, sidereal time **advances** by 2 hours. Each day, on average, sidereal time advances by approximately **4 minutes**. We can therefore **determine sidereal time** by the following method:

1. Count the **number of months since the Vernal Equinox (March 21st)** and multiply by 2. Answer is in **hours**.
2. Count the **number of hours since noon (or before noon)** on day in question and **add to (or subtract from)**, the above number. Allow for **Daylight Saving**.
3. Count the **number of days since the previous 21st** and multiply by 4. Answer is in **minutes**.

Example:

What is the **sidereal time** in Kingston at **6 p.m. EDST** on **September 15th**?

Step 1: Number of months since Vernal Equinox (March 21st) is 5. Multiply $5 \times 2 = 10$ hours. Ans. 10 hours

Step 2: Number of hours since noon on September 15th is 6. Subtract 1 hour because of Daylight Saving Time. (Note that DST is from 2 a.m. on last Sunday in April to 2 a.m. on last Sunday in October.) $6 - 1 = 5$ hours. Add to above. $5 + 10 = 15$ hours. Ans. 15 hours

Step 3: Number of days since August 21st is 25 days. Multiply $25 \times 4 = 100$ minutes. Since 60 minutes equals 1 hour, add another hour to the above. Ans. 16 hours
The remaining number of minutes is 40. 40 minutes

The **sidereal time** at 6 p.m. on September 15th is approximately **16h 40m**. ANS.

A small **correction for longitude** could be applied to the above calculation for places **within a Time Zone east or west** of the **Standard Meridian**. Kingston, for example, is 1.5° **west** of the Standard Meridian, which is 75° W longitude, at $76^\circ 30'$, so a correction of **4 minutes per degree** should be made. In this case, the correction is $4 \times 1.5 = 6$ minutes. For stations **west** of the Standard Meridian, the correction is **minus** and is subtracted; for stations **east**, it's plus and is added. So for Kingston, our final result is; $16h 40m - 6m = 16h 34m$.

RELATED READING:

"Setting Circles: Using Them Right", Alan MacRobert. Sky & Telescope (Backyard Astronomy, page 246), September 1990.

"Mastering Polar Alignment", Alan MacRobert. Sky & Telescope (Backyard Astronomy, page 306), April 1984.

Burnham's Celestial Handbook, "Ursa Minor" (page 2009), Robert Burnham, Jr.

NEW MEMBER WELCOME

A word of welcome to **John C. Eustace** who joined our Centre in May. Glad to have you with us, John.

SPACE PHOTOS RECEIVED

The Kingston Centre has received a terrific set of **NASA/JPL** photos of images from various space missions, which are quite literally "out of this world". The photos are a donation from California member **Stephen. J. Edberg**. In a note enclosed with the package of pictures, he writes, "Please share these with Center (Oops! Centre) members and add them to your library," and signs off as "Your adopted Californian".

We've done that, Stephen and all members are invited to enjoy these fascinating images from space. Please contact our Librarian **David Stokes**.

Thanks for this very nice gift.

SPECIAL MEETING THURSDAY, SEPTEMBER 26

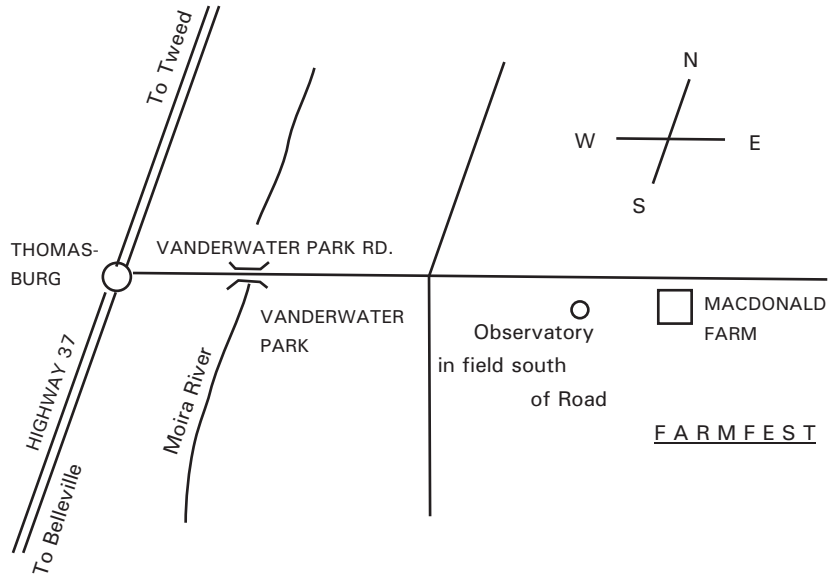
Don't forget the **SPECIAL MEETING** on **Thursday, September 26, 8 p.m.** Our National President **DAMIEN LEMAY** will be speaking on "**Scientific Contributions by Amateurs**". Let's be on hand to give him a big welcome.

FARMFEST SEPTEMBER 6,7, 8

The end of summer is when **Walter MacDonald and friends** get together to enjoy each other's company, the dark skies of Eastern Ontario, and the complex of observatories they have built just east of Thomasburg, Ontario (between Belleville and Tweed) off Highway 37.

This year the get-together, called "**FARM-FEST**", is on Friday, Saturday, and Sunday, September 6, 7, 8.

Anyone who would like to join them is welcome. There's no admission charge and no set program. However, you should bring your own refreshment (there's no refreshment stand either), something to sit on, and maybe a telescope.



THE ROAD TO "FARMFEST"

See map for how to get there.

INTERNATIONAL DARK-SKY ASSOCIATION

3545 N. Stewart, Tucson AZ 85716 USA

Turtles and Outdoor Lighting In Florida

In most cases, there is not much good statistical evidence or data on the effects of nighttime lighting, good or bad, on plants and animals. There is a lot of anecdotal material, but much of that is of no value in assessing any adverse impact of outdoor lighting. This is an excellent area for future quality research.

However, there is at least one case that is well documented: the impact (literally, in this case) on sea turtles. We note in this information sheet some of the latest information. We urge any readers who have more information on this case, or any others concerning the impact of nighttime lighting on plants or animals to contact IDA with details and references.

There is a city law in Delray Beach, Florida, that requires residents and businesses along the beach to shield their lighting. The ordinance is effective between May 1 and October 31 each year. The goal is to prevent the sea turtle from going inland after their stay on the beach, rather than returning to the sea. It appears that the lighting confuses the turtles, and they head off inland, dazed by the streetlights, to be crushed on the highway.

Each year, even with the ordinance, many turtles head for the lights, perhaps confusing them with the reflection of the moon on the ocean. Hatchlings head instead directly for the highway and the lights. Baby turtles are instinctively attracted to the bright lights.

Such deaths anger officials and environmentalists, of course. There is no excuse for this slaughter. As in so many cases, the use of quality lighting would do much to minimize this slaughter. Awareness is needed, followed by implementation. We can do better.

Like air and water pollution, light pollution is decreasing the quality of our lives. Curing light pollution, however, save money and energy, for light is used, not wasted. In addition, energy effective light sources generally offer better lighting at night, and save a great deal of energy. The International Dark-Sky Association (IDA, Inc.) is a relatively new non-profit organization formed with the goal of helping to build awareness of the value of dark skies and of the advantages of quality lighting. To join the cause, or to request information, write to IDA at the address above.

ANNUAL MEETING AND ELECTIONS

OUR ANNUAL MEETING AND ELECTIONS FOR 1992 WILL BE HELD ON FRIDAY OCTOBER 11, 1991, AT 8 P.M. ALL MEMBERS IN GOOD STANDING MAY VOTE AND STAND FOR OFFICE. PLEASE CONSIDER STANDING FOR A POSITION. TERM IS FOR ONE YEAR.