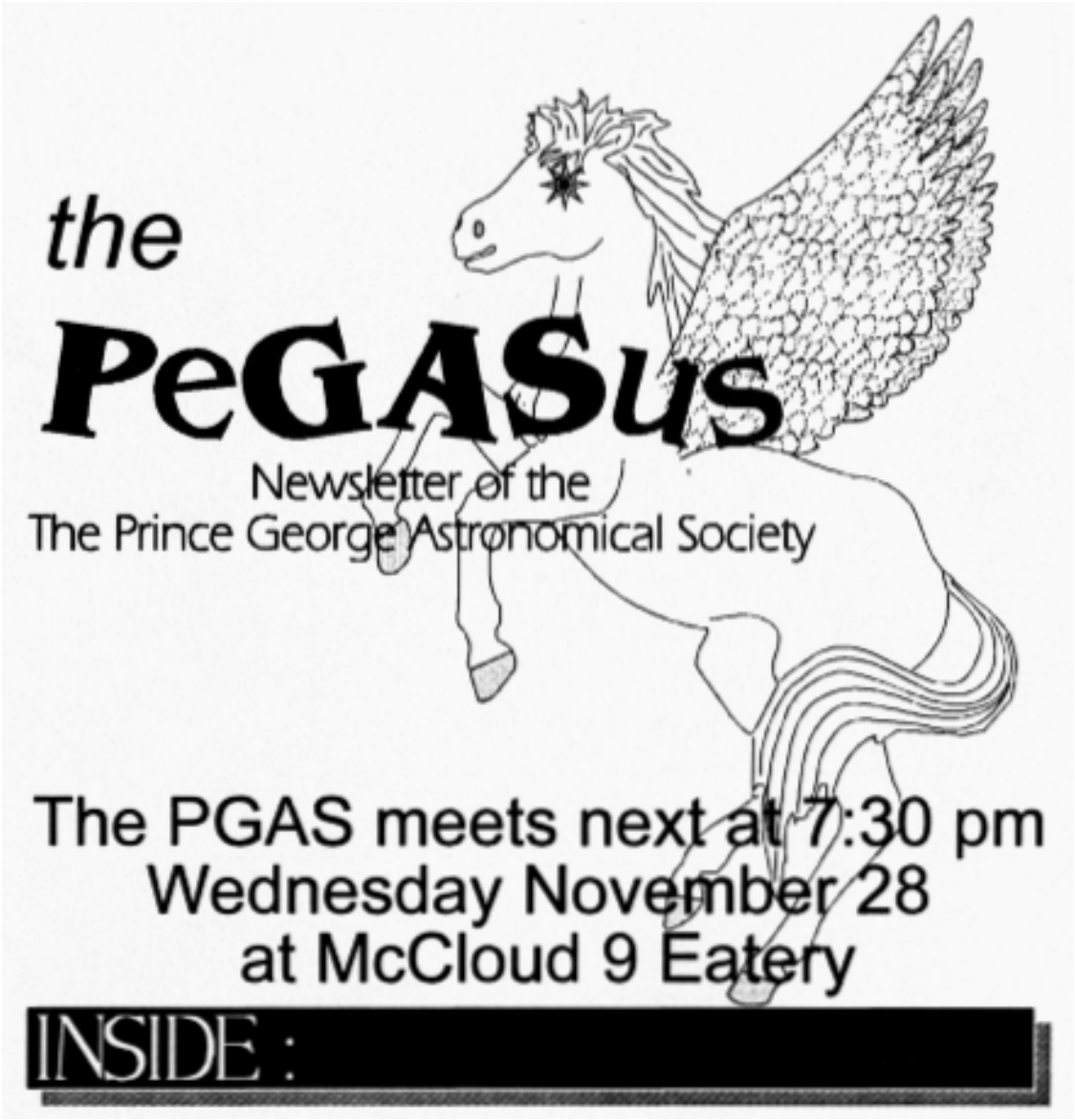
November 2001. ISSUE #116



the PeGASus

Newsletter of the
The Prince George Astronomical Society

The PGAS meets next at 7:30 pm
Wednesday November 28
at McCloud 9 Eatery

INSIDE :

the PeGASus
is published monthly
by the *Prince George Astronomical Society.*

Our pursuits are out of this world. Our activities are astronomical.
Our aim is the sky.

Contributions to the newsletter are welcome.
Deadline for the next issue is
January 18
January 18
Send correspondence to
The PGAS
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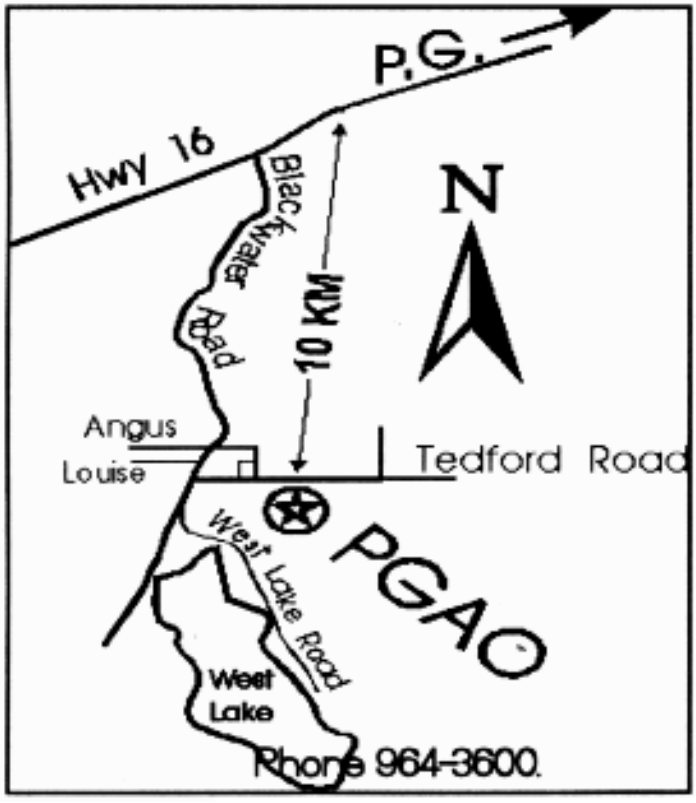

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Editorial

Astronomers & Light Pollution By Daniel W. E. Green THOSE FEW OF US ACTIVELY INVOLVED in fighting light pollution often ask ourselves: “Where are all the astronomers?” At least 200,000 readers comb through popular astronomy magazines such as Sky & Telescope every month, so a great many people have at least heard of light-pollution problems and of the International Dark-Sky Association (IDA). Yet, 10 years after its founding, the association can claim only 2,000 members – barely 1 percent of its potential. It is a sad fact that so few have responded to the IDA’s recruiting efforts. One chapter chairman told me that recently, after speaking to a regional gathering of 75 amateur astronomers on light pollution, he asked how many in the audience were IDA members. Only four raised their hands. After pleading, “If not you, then who?” he managed to leave the meeting with five new members. In other words, more than 85 percent of the audience walked away without showing support for IDA. “Who?” indeed!

One would think that writing about light pollution in a major astronomy magazine would be just “preaching to the choir.” But it appears that most of the astronomical community has missed way too many choir practices. In reality only a tiny fraction of all astronomers, amateur and professional, do anything to help reduce the bane of bad outdoor night lighting. We have everything to lose by being too quiet on these issues. Unless astronomers work en masse to halt and reverse the brightening of the night sky, astronomy could largely cease to exist in the 21st century, save for a handful of very expensive observatories at remote island or mountain outposts.

I can’t print the entire web article, but it said so well what I wanted to say in this editorial, I had a terrible time selecting quotes. But the last paragraph summed it up very well

“So, please, become active today in light-pollution issues. Educate yourself about the problems and the solutions. Push to make your astronomy club or society a useful, informed source on outdoor-lighting issues that affect your com
munity.” (see page 7)

Please read the whole article at

< http://www.skypub.com/resources/Iightpollution/astronomers.html >

Pollution and trespass – nouns that convey a strong emotional content, that clearly apply to this problem. If we don’t get involved, who will? Read, research, talk, convince, argue, write, set yourself a goal (I’m going to find out who is building the new shopping mall) do whatever it takes (as long as it’s legal and moral) – we need to get into this. Talk to Maurice Sluka” <msluka@telus.net> An hour or two from each of use might make the difference. Web sites worth a visit http://cfa-www.harvard.edu/cfa/ps/nelpag.html
http://cfa-www.harvard.edu/cfalps/nelpag/offutt.html
http://www.darksky.org/idalweblinks.html
http://www.skypub.com/resources/lightpollution/Ipnotes.html#lp02 I

Coming Events

If you are involved with any astronomical or otherwise scientific activity on behalf of the PGAS, please list the activity here.

PGAS Meets next November 28 7:30 pm at McCloud 9 Eatery

The Night Sky for December 2001

by Bob Nelson, PhD
Hi Folks,

As I write this, I am huddled over my laptop in our little condo here in Victoria. The good weather has largely gone bye-byes, but it's still mild, and there are lots of flowers all round. (In fact, the city is still putting in bedding plants. Sorry, I just had to slip that in!)

My observing run at the DAO, regrettably, did not go well. The only clear night in my week fell on a Saturday, so the 72" telescope was reserved until 11 PM for the general public. After I got my hands on the telescope, I had trouble with the autoguider, I did not know that I had to refill the vacuum flask every 4 hours with liquid nitrogen (and did not know how to!), and thin clouds started to seep in around *5* AM. Generally, it was a comedy of errors. Altogether, I got three usable spectra of program stars (to go with the 16 I got in August). I shall try, of course, to make the most of the data.. On the plus side, I now know how to do all the reductions using 'IRAF' (the industry standard reduction package) and I certainly kept copious notes!

Also on the good side, I have found the bug in my Windows interface software to the established 'Wilson-Devinney' star modelling program, so now I am able to take the light curve for an eclipsing binary (the stellar magnitudes for a complete cycle), and determine basic parameters like temperature, orbital inclination, mass ratio, etc. I have reached a solution for the data on the contact binary GSC *3551-1708* that the resident astronomer, Russ Robb, got on the UVic 20" telescope. Maybe I'll put on a demonstration when I get back.

So now, for Lois and me, it's finishing up here, boarding a plane on Dec 1 to LAX and then on to the Cook Islands for a week in the sun, followed by the big trip to Aukland, New Zealand for some touring before settling down to work in Christchurch.
I'll be in touch!

PLANETARY ROUNDUP:

MERCUY, is lost in the glare for the first half of the month. However, by month's end, it sets a full hour after sunset. Now since Mercury is near the Sun on the ecliptic (defined as the path of the Sun in the sky) and since the ecliptic near the Sun in December is parallel to the celestial equator, this should be neither a favourable nor unfavourable apparition. However, owing to the inclination of Mercury's orbit, Mercury happens to lie below the ecliptic at this time and will therefore give unfavourable (non-existent?) views for northern observers, lying as it will, very low in the southwest at sunset. however, will be south of the
equator then and will give it a shot - that is, if I can figure out which way is up!]
VENUS is a morning object all month. At mid month, it rises at about 6:42 AM (PST) or about 1/2 hour before the Sun. It is a 9.9" disk of magnitude -3.9. It's on the far side of the Sun and therefore small and dim. Going, going, gone! MARS, in Aquarius from December 4 on, sets at about 10 PM (PSI). It's a 6.8" disk of magnitude *0.5.* It's not very big (maximum size is 18") and it is getting smaller, as the Earth races away from it.
JUPITER, in Gemini all month, is pretty well up all night this month. It's a 46.7" disk of magnitude -2.6. It will reach opposition on New Year's day 2002. Any takers? What will YOU be doing New Year's Eve?
SATURN, in Taurus all year, rises before sunset and is up all night. It reaches opposition on Dec 3. It's a 20" disk of magnitude -0.3 and should be a spectacular sight again.
URANUS, in Capricornus all year, sets at about 11 PM at mid month. Look for it due south at sunset. As usual, it's a 3.6" disk at about magnitude *5.7.* NEPTUNE, in Capricornus all year, sets at mid month a little more than an hour after sunset. A very difficult object this month. As usual, it's a 2.3" disk at about magnitude 8.0.
PLUTO, in Ophiuchus all year, rises at mid month about an hour before sunrise. Notmuch action there.
Winter Solstice (Summer Solstice south of the equator) occurs on December21 at 11:21 AM, PSI. The first day of winter in P.G. (Ahem!)

CONSTELLATIONS to look for in December (at 9:00 PM, PST) are Fornax, Eastern Cetus, Western Eridanus, Aries, Triangulum and Western Perseus. Fornax (For, "The Furnace"), is another southern constellation with a number of faint galaxies.
Eastern Cetus (Cet, "The Sea Monster"). Western Ceti was discussed last month, but in eastern Cetus, we see Omicron Ceti, or Mira ("The Wonderful"). Mira was the first of the long period variables discovered, and was discussed previously. Six or seven degrees northeast of Mira lies M77, a bright and compact spiral galaxy of 10th magnitude. According to Burnham, it's unusual in that it has three spiral arms.

(continued on page 6)

Also, this galaxy (together with the "Sombrero" Galaxy in Virgo) was the first to

reveal a large recessional velocity. In November 1913, V.M. Slipher obtained spectra with exposures over *6.5* hours (!) using the 24" refractor at Lowell Observatory.

Western Eridanus (Er "The River'). is a large constellation out of the Milky Way; the southern part (which we cannot see from Prince George) zigzags its way south to -60 degrees where the bright star Achernar (Alpha En) resides. The triple star system Omicron 2 Eridani consists of a wide (82") AB pair making an orbit in some 7000-9000 years. (The 'A' star is of spectral type K! V with visual magnitude *4.5.)* The inner BC pair is separated by some 9" at the moment; the 'B' star is a white dwarf (magnitude 9.7) and the 'C' star is a faint red dwarf (magnitude 10.8); and the orbital period is some 248 years. This white dwarf was the first to be recognized as such and is certainly the easiest to find with small telescopes. It is about equal to the Earth in size and a little less than half the mass of the Sun. Consequently, its density is some 90,000 the density of water (it's one big atom, folks!).

Aries (An, "The Ram"), is the first entry in the Zodiac and is a northern constellation out of the Milky Way. The brightest star, Alpha Ari is a red giant (sp. K2 Ill) and lies about 75 light years distant. The really good nebula, NGC 6188 lies, alas, at -48 degrees declination and is not visible from Prince George. [I'll look for it from NZ and get back to you.] NGC 6397, a fine globular, is also too far south for PG astronomers.

Triangulum (Tri, "The Triangle"), is a small constellation just south of Andromeda and contains the famous galaxy M33 ("The Pinwheel"), a member of the Local Group of galaxies. It also contains a number of double stars and variable stars, but little else.

Wester Perseus (Per, "The hero tht saved Andromeda"), is a northern constellation (appearing overhead at times), is in the Milky Way and contains many wonderful objects familiar to many of us. One object is Beta Persei or Algol, the ost famous of the eclipsing binaries. [I talked about it a couple of years ago in this column.] Also in this constellation, look for the Double Cluster. It's very prominent to the naked eye, lying as it does about halfway between Alpha Persei and Gamma Cassiopeia (the middle star of the big W in the sky). For what it's worth, the official designation is the "h and X (chi)" Clusters, where the former is NGC 884 and the latter 869. References to the cluster go back as fas as 150 BC – both Hipparchus and Ptolemy (early Greek astronomers) noted the clusters – but the actual nature of the clusters was not known until telescopic observations were possible. Today we know that the clusters lie about 7400 light years distant; each has a diameter of about 70 light years and contains about 5000 soalt masses. They are a striking view in binoculars, in finder scopes or in telescopes of any aperture.

Cheers,
Bob Nelson

Our Light Polluted Planet

Photo by Evan Williams. Please note, that is not a vapor trail, but rather a Leonid meteor slowing down and changing trajectory, the photo also shows the dramatically increased sky-glow over Williams Lake BC

Photo by Evan Williams

Digital Photo By Bob Nelson

Approximately what percentage of people live in a place where light pollution prevents them from seeing the Milky Way?

In order to really see what the night sky has to offer, after you've-waited for your eyes to fully adapt to the dark and there's no moon, you need to have cloudless skies and be away from city lights, including lights from housing developments, highways, rural strip malls, and industrial parks. Who came up with the term "industrial park?" In the early 1800s, the view from a city park or even from a window in a row house was almost as dark as the view from the countryside and certainly darker than any city or suburban location today. However, later in the 19th century, once gaslights and electricity were utilized for lighting purposes, cities and towns began to glow, resembling fireflies in a darkened field.

Today, urban areas are awash in light. Light pollution is a term that was introduced only in the last 40 years. For many urban dwellers, with the exception of a few of the brightest stars and planets, the stars don't really come out at night anymore. Some sky glow is natural, for instance, the faint glow from aurora and other upper atmospheric sources (airglow), the weak glow from starlight that's scattered by the atmosphere and the glow from sunlight scattered off interplanetary dust particles (zodiacal light). But these natural sources of sky glow are rendered invisible by a couple of floodlights in a neighbors yard or even a lamp post or two along your driveway. In the suburbs today, the night sky directly overhead is about *5* to 10 times brighter than the natural sky glow, and overhead in a large city, the sky may be 25 to 50 times brighter than the sky in a remote area unsullied by light pollution! As a result, inhabitants of urban areas are essentially being deprived of the wonders of the night sky.

Light pollution that comes from a horizontal direction is worse than the light that's directed upward. Light aimed straight up generally impacts those people within the immediate vicinity of the source itself, but light that comes from a sideways direction (glare) passes through more of the atmosphere, and thus pollutes more of the night sky.

You've probably seen those nighttime visible satellite images of the US and the world that show the presence of city lights. These images are being used to show where urban sprawl is increasing most rapidly. Actually, these images look more ominous, as sources of light pollution, than they are in reality. The sensors that make these images use a type of photomultiplier tube that's especially sensitive to the brightest lights. So a satellite pixel can be saturated with light when, on the ground, the light pollution may, in fact, be less severe. Nevertheless, by any standard the nighttime skies over certain parts of the US are simply too bright to adequately observe what's there to see. Whereas 30 or 40 years ago, you could drive an hour away from most cities and still find a good dark sky, nowadays, in the northeastern US, a two to three hour drive may be required.

One litmus test for deciding if the night sky suffers from too much

light pollution is whether or not you can clearly see the Milky Way - the milky band traversing the sky consisting of the hundreds of millions of stars that make up our own spiral galaxy. A more detailed test for determining the darkness of the night sky was formulated by amateur astronomer John Bortle.

The Bortle Dark-Sky Scale was developed to rate the night sky conditions for a particular observing site. A 9 level scale is used to judge the truly darkness of the sky. Level 1 represents the best viewing conditions on Earth. It's so dark that nearby objects on the ground, such as a telescope are almost invisible. With the unaided eye, you're able to detect the very faint glow of a handful of galaxies, and the Milky Way can be seen stretching all of the way across the sky. Level *5* represents a typical suburban sky.

The glow of the Milky Way is rather weak overhead and can't be seen at all near the horizon. Light sources are obvious in most all directions, and if clouds are present, they're brighter than the sky itself. Level 9 represents what you can see from the "inner city" of an urban complex. Even overhead the sky is brightly lit, and only the brightest stars (magnitude 2 or brighter) and most obvious constellations (Orion and the Big Dipper, for instance) can be made out. With a telescope, only the moon and a few planets are interesting.

So, how many of us can clearly see the Milky Way on a clear, moonless night? According to astronomers who recently put together the first World Atlas of Artificial Sky Glow, it was estimated that about 1/2 of the people living in Europe and approximately 2/3 of the people in the US cannot see the Milky Way from their home. World-wide, perhaps 1 out *5* people live in a place where the night sky is too bright to identify the Milky Way. Even sadder, the astronomers found that 99% of the US and European population live in areas considered light polluted!

Fortunately, sky glow is not necessarily a permanent problem. Light pollution can be drastically reduced by eliminating the wasted light that's directed upward and using bulbs that reduce glare. It's believed that 30% of all lighting in the US is wasted light, and wasted light is wasted energy. As an example of what can be done to lessen the effects of sky glow, light pollution activists in Connecticut helped convince the state and county governments to replace more than 180,000 streetlights with glare-free light fixtures as the old lights wore out.

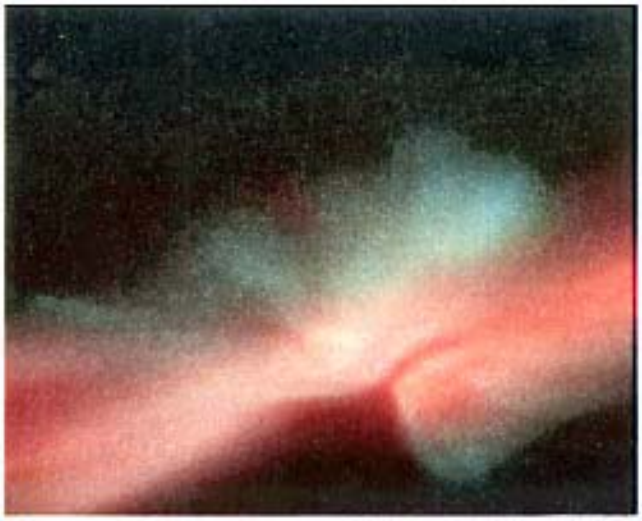
Important Notice

Please be sure to renew your PGAS membership if you have not already done so. We need to update our newsletter mailing list soon. During the Christmas break we will be deleting non-members from our mailing list.

You can renew your membership at

http://www.pgweb.com/~astronomical/

Or with any member of the executive



Here are some pictures from that level 4 aurora storm that occurred on November 5th. Here is what Spaceweather.com had to say about it. I took the pictures from my "backyard" at my house (downtown PG) so there was lots of light pollution. Even visually I could see plenty of colour.

"A solar coronal mass ejection hit Earth's magnetic field at 0150 UT on Nov 6th *(8:50* p.m. EST on Nov. 5th) and triggered widespread auroras. Observers as far south as central California have reported vivid Northern Lights. Sky watchers everywhere, even at middle latitudes where auroras are rarely seen, should be alert for Northern Lights while the geomagnetic storm is underway. Visit SpaceWeather.com for details and updates."

Photos by Brian Battersby

Star light, Star bright....?

Well maybe, depending on the lighting where you are

Light Pollution

The Problem

Light pollution can affect us more than you may be aware of. Some of the affects include the diminished areas for recreational and scientific astronomy, high-energy consumption, security of property, safety of drivers, health and well being of humans as well as flora and fauna.

Light pollution occurs when too much artificial illumination shines directly or reflected into the sky, this light then reflects off water droplets and dust particles causing a condition called skyglow. Light trespassing is also a problem when light shines past the property line on which the light is mounted, to where it not required or desired.

With dark-adapted eyes, we should be able to see at least 2,600 stars in the sky on any clear moonless evening. In many urban areas and now even many suburban and rural areas have less than 100 stars visible in the night sky. With this lost viewing for recreational and scientific astronomy we are loosing our shared heritage of the night sky. This is happening form the misunderstanding that more and brighter light translates to greater security and safety.

The energy consumption from lights now a concern to everyone from private, public and corporate institutions. When a bright and ineffective light shines up, sideways as well as down are it is very wasteful and diminishes safety. No one notices a light that never shuts off, but people notice when a light is switched on.

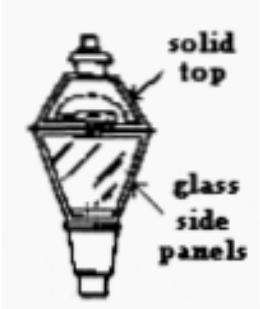
If lights are too bright then the contrast blocks out seeing anything that might be in the shadows. The glare of bright lights can distract, diminish visual acuity, and temporally blind drivers. Glare can also endanger pedestrians when they can disappear behind the vial of a bright light and cannot be seen by an approaching vehicle.

Bright lights during night can disturb natural circadian rhythms and reduce the levels of melatonin. These harmful effects to health are illustrated by more and more medical studies. Animals are also affected by disturbing bird migration routes and can also be temporarily blinded from bright lights. Bright lights can alter growth rates and change the normal day and night cycle of plants.

The Solution

Energy costs for the owner can be reduced by using less powerful lights that focus light where it is needed, and using a more efferent light bulb and reflector. Security and safety can also be gained by using a motion sensor, which switch lights only when needed, rather than burning continuously. To eliminate light trespassing lights can be bought with what is called full cutoff shielding, at very comparable price to the standard light fixture, so that no direct light can shine above the horizontal plane from the lowest part of the fixture. Existing light fixtures can be fitted with shielding, but the energy savings possible by replacing it with a more efficient light may be cheaper.

By Maurice Sluka



GOOD Post-top ornamental fixtures can minimize light pollution via a lamp reflector located above the bulb.

BAD Non-cutoff fixtures like this “acorn” ornamental lamp cause light pollution

GOOD Flat-lens cobra head fixtures provide excellent roadway lighting with greatly reduced glare and no uplight.

BAD The ubiquitous drop-lens cobra head luminaire produces a level of glare and uplight that is both unacceptable and unnecessary.

The Fading Milky Way

Light pollution is a growing environmental problem that threatens to erase the night sky before its time November 1, 2001:
Cosmologists speculate that lOto the 14th years from now (a mind-boggling stretch) the stars in our relentlessly expanding Universe could run out of fuel and fade from view. The night sky, once the TV set of ancient peoples, will become dull and boring: a blank tableau with no stars or nebulae. Sounds like an astronomer's nightmare!
Fortunately, the stars themselves won't go out for a very long time. But researchers say the night sky is already fading. A recent study revealed that perhaps two-thirds of the world's population can no longer look upwards at night and see the Milky Way - a hazy swath of stars that on warm summer nights spans the sky from horizon to horizon.

The Milky Way is dimming, not because the end of the Universe is near, but rather as a result of light pollution: the inadvertent illumination of the atmosphere from street lights, outdoor advertising, homes, schools, airports and other sources. Every night billions of bulbs send their energy skyward where microscopic bits of matter - air molecules, airborne dust, and water vapor droplets -reflect much of the wasted light back to Earth.

City dwellers have already lost most of the constellations, the planet Saturn, and a host of medium magnitude stars. They can forget about observing most meteor showers, too, or faint displays of Northern Lights.

It's a big loss. Young sky watchers grow up to be philosophers, scientists, poets, explorers, and school teachers. But kids aren't likely to watch - or be inspired by - a blank sky.

Exterior home lighting is a primary source of light pollution in some areas, but not all, Street lamps, sports fields, billboards and parking lots - even prison lights - can be the biggest offenders. "The sources of light pollution are as varied as each community or region,".

That variety makes the job of the International Dark-sky Association (IDA) particularly difficult. IDA was formed in 1988 by a group of concerned sky watchers who wanted to combat light pollution. "Our goal," says Eslinger, who is a member of IDA's board of directors, "is to educate the public regarding the indiscriminate use of light and the benefits of choosing the right light to do the job." As awareness grows, they hope, communities and individuals will choose sky-friendly, energy-efficient lighting - and light pollution will subside.

It's a daunting problem: thousands of communities with billions of light bulbs, all aglow. Fortunately, the stars are still out there shining bright - patiently waiting for us to turn down the lights.
(Quoted from a NASA Website) Visit < http://www.darksky.org. >

December Star Hop in Auriga

Auriga, pronounced oh-RYE-gah, is home to one of the brightest stars in the northern sky, Capella. Capella has an apparent visual magnitude of 0.80 and is within the spectral class "G" family which puts it's temperature similar to our Sun. The reason that this relatively 'normal' star shines so brightly in our sky is that it is only 42 light years away. Auriga is positioned along the Milky Way so it contains no easily visible galaxies but there are lots of open clusters, diffuse nebulae and a few planetary nebulae that lie within the active spiral arms of our galaxy.

Hop #1: M37, M36 & M38 — Open Clusters.

These three open clusters are easy to spot in binoculars. The most impressive of the trio, 5.6 magnitude M37, has about 150 members and displays a dark gap in its SW portion. Find it 7° NE of 1 .6M Alnath (Beta TAU).

From M37 pan about 4° to the NW to locate M36 although not as impressive as M37 at 6M it is still easy to locate in binoculars. Moving along again about another 3° to the NNW of M36 you will find M38. M38 is about 6.4M but it is almost as big as M37 from these two facts we can deduce that it has considerably less stars than M37. Congratulations, you can now check off three more items on your Messier hunt list.

Hop #2: IC405 — Diffuse Nebula.

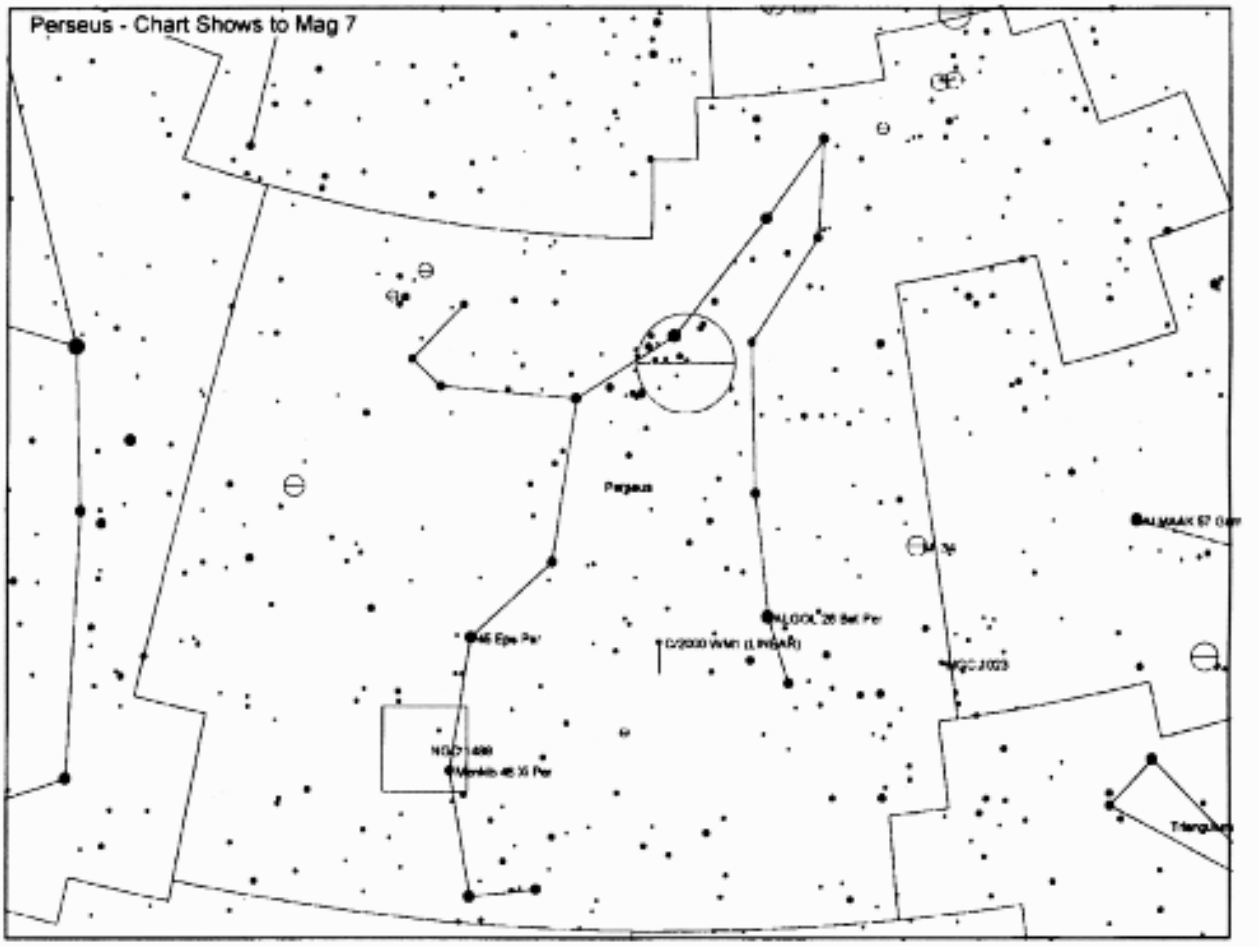
Also known as the Flaming Star Nebula this 10th magnitude collection of gas and dust is being illuminated by the variable star AE Aurigac's ultraviolet light emissions. AE Aurigae is located in the middle of the nebula.

While the nebula is only about 50'x30' (arc minutes) as viewed from Earth it actually spans over 9 light years and lies about 2,200 light years away. To locate it pan a few degrees west of M36 and M38.

Hop #3: IC2 149 — Planetary Nebula.

This very small, l2"x6" (arc seconds) 10th mag, object requires high magnification to view making it an ideal object for our big scope (hint, hint) To locate it without the aid of electronics you will probably need a better chart than the one I provided but you can find it 40' WNW of Pi AUR, the 4.5M star 1° N of 2M Beta AUR (Menkalinan) According to someone who has observed this nebula it looks "NEAT!" Good viewing and good luck!

Brian Battersby



PGAS CONTRIBUTORS

The PGAS would like to thank the following individuals, corporations and government agencies who, since 1991, have donated money, goods or services to the construction and operation of the Prince George Astronomical Observatory.

Ministry of Adv. Ed. Training and Tech.	$25,000
BC Science Council	16,000
BC Lotteries	3,900
Helmar Kotsch (Acme Mas.)	1,932
Northwood Pulp and Timber	1,665
Electrical Services Ltd.	1,583
Royal Bank of Canada	1,500
Xerox Canada	1,300
Regional District of Fraser-Fort George	1,000
Prince George Rotary Club	1,000
The Pas Lumber Co	750
Rustad Broth & Co Ltd	750
Canfor Polar Division	744
Bisque Software	500
Canfor Clear Lake	500

The greatest contributors to the construction and operation of the observatory are from PGAS members who have generously contributed their time to this project. The value of their contribution surpasses all external contributions.

The PGAS is a non-profit organization dedicated to the advancement of astronomy and science in general in Prince George and the neighboring northern communities. Donations of money or *materials* to *the society are greatly appreciated and tax deductible.*