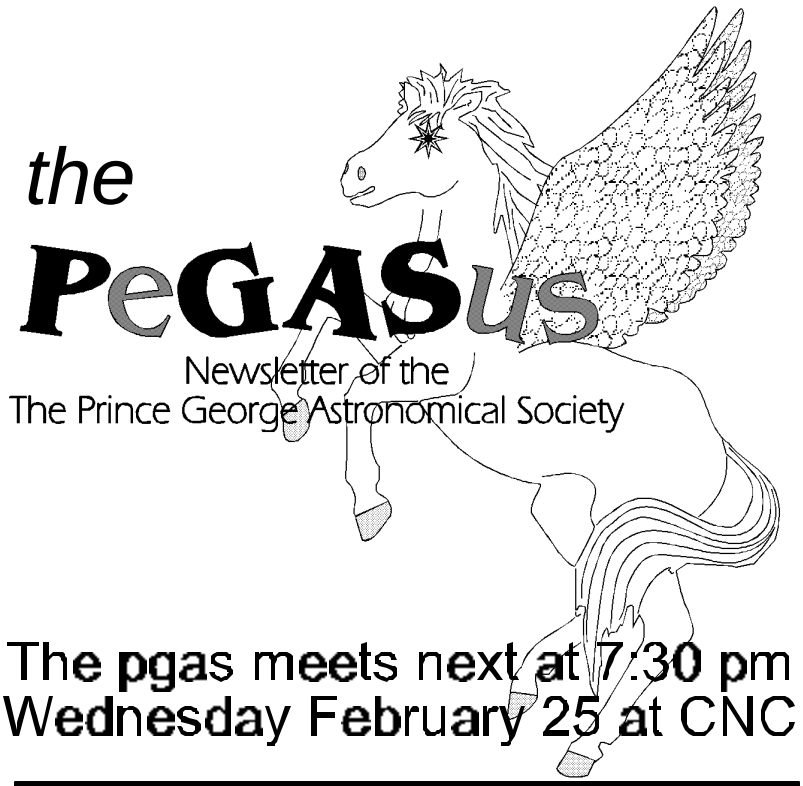
1998 FEBRUARY ISSUE #82



the

PeGASus

Newsletter of the
The Prince George Astronomical Society

The pgas meets next at 7:30 pm Wednesday February 25 at CNC

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

March 14

Send correspondence to
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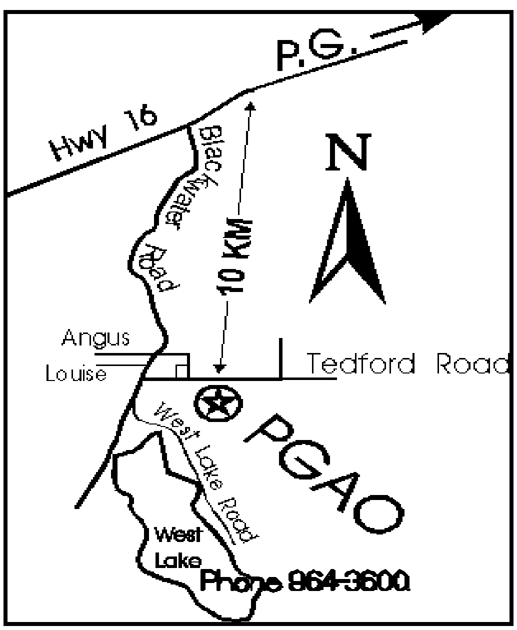

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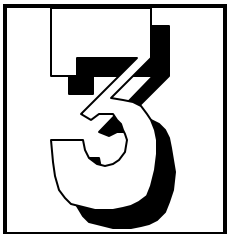
EDITORIAL

by Gil Self



As I assemble this newsletter we are just a few days away from our spring observing season. The three months in the spring when we welcome the public at the observatory is probably the best time of the year for us. This is the opportunity for us to put our best foot forward. Over the years there have been many guests and I don't think I have ever heard of anyone who went away unhappy.

We made some great improvements in the last couple of years and I think this year is going to be the year that many of these projects are going to really turn our facility into something we can be very proud of.

Over the last few years we have managed to get some of the expensive, necessary projects out of the way. (we may even be able to start spending some money on astronomy). The executive has talked about replacing the telescope drives and upgrading the CCD camera.

This should be the season when we can finally start on some serious photography, most of the changes required for high quality photographic work are complete, the telescope drives are out right now being tuned up—last time I saw them they were spread out on the floor at my office (Jon was working on them). They looked rather forlorn, but I am sure Jon and his dad will have them humming right along soon —Thanks guys.

Now, here is the pitch, over the next three months we have thirteen Friday nights to staff for the open house. It is far better if we have two people each evening. So we need as many of you as possible to volunteer an evening or two over the next three months. Even if you have never attended an open house your help would be appreciated, and you may find that you enjoy sharing your interest in astronomy with the public.

These public events and our paid membership are crucial factors when we approach local businesses for their support. We have always enjoyed an excellent reputation in our community and every contact we make could be enhanced by something you did for a guest at an open house. G.S.

Coming Events

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

February 25 —- General meeting at CNC
March 25 —-General meeting at the Observatory

The Night Sky for March '98

by Bob Nelson, PhD

Greetings, fellow observers! As we approach the end of February, our thoughts turn to spring and Spring Equinox which occurs next month. This is not to say that we have had a hard winter -- El Nino seems to have granted us a mild winter (our heating bills should be lower!) and no fewer clear nights (yes, Martha, we do get a few at this time of the year). When spring arrives, we can look forward to occasional clear stretches of weather that can last a week or more. As I write this, the drive mechanism is being repaired and upgraded, and the ST4 autoguider (gasp!) may yet work. The latter should permit us to make stunning long exposures using the 61 cm telescope that will fully justify all the work that we have put into it. Here's hoping!!

Again, here is a prediction of events that should occur next month. I have a new piece of software that will help me -- 'Starry Night' that I have in beta version. It's a rewrite of a popular piece of software (made in Canada) for the Macintosh. So far, it looks quite good with many new features which complement (but do not replace) other features available in Redshift 2 and other programs. (Every piece of astronomical software has its strong and weak points.) Enjoy!

(Unless otherwise noted, all events are for the 15th of the month.)

MERCURY, is a fine evening object in March. On the first, it sets about 34 minutes after sunset; on the 15th, it sets a full hour and 45 minutes after sunset; and on the 31st, it sets an hour and five minutes after sunset. Although the elongation (angular separation from the Sun) is not as great as it is in July's evening apparition, the March appearance is more favourable for observers in the northern hemisphere. The reason is that in March, the Sun is on a part of the ecliptic that is inclined to the north with respect to the celestial equator; this makes the trailing planet (Mercury) as high as possible in the sky at sunset. [See the accompanying diagram, produced by Redshift 2 and Corel PhotoPaint 3.]

The maximum height (elevation) occurs on March 20th (when it is some 17

degrees above the western horizon at sunset = 6:25 P.M.), but it is still good for a week or more on either side of that date. At that time, Mercury is a 6.6" disk at magnitude -0.64 and is 61% illuminated (slightly gibbous). [The corresponding figures for the 1st of the month are 5.1" at mag -1.4 at 97% (full), and on the 31st are 10.4" at mag 3.2 at 5% (extreme crescent).
As you can see, Mercury goes through all its phases in March!]

The big thing to look for on March 20 (or thereabouts) is a beautiful triple conjunction of three planets -- Saturn, Mercury, and Mars -- which should be visible just after sunset. (I discovered it using Starry Night -- it provided a wonderful, realistic preview of the event!) On that date, the planets make a triangle of sides 5°, 6.5° and 8° which should be visible in one field of a pair of 6 x 35 binoculars. [See again the afore-mentioned diagram.] Our observatory, unfortunately, does not have a good western horizon (unless you go onto Tedford Road); therefore if you want to observe or photograph this event (and make the Sky & Telescope Gallery??), it would be good to find a hilltop that's clear to the west. Notice that the Sun is just east of the Vernal Equinox (one of the intersections of the celestial equator and ecliptic, which it passed at 11:54 AM, mentioned below).

VENUS is a morning object in March, rising about two hours before sunrise. It's a 28.3" disk of magnitude -4.5. Good for the early birds.

MARS, in Pisces, is low in the west at sunset. It's a 4.0" disk of magnitude 1.25. See the above discussion on the triple conjunction.

JUPITER, in Aquarius, is lost in the glare of the Sun.

SATURN, in Pisces, is low in the southwest at sunset and sets around 8 P.M. It's a 16.2" disk of magnitude 0.24. See the above discussion on the triple conjunction.

URANUS, in Capricornus, is lost in the glare of the Sun.

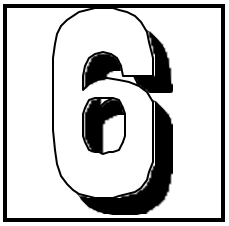
NEPTUNE, in Capricornus, rises at 4:45 AM and sets at about 1 PM. As usual, it's a 2.3" disk at about magnitude 8.0.

PLUTO, in Ophiuchus, rises at about midnight and sets after sunrise. As usual, it's a 0.1" disk at magnitude 13.8.

Spring equinox occurs on March 20 at 11:54 PST.

Constellations to look for are the same as last month -- I got ahead of myself!! Look for Cancer, Hydra, Pyxis and Sextans, visible to the south at 9 P.M. Or, if you stay up later, look for Leo and the many galaxies to the east in Virgo and Coma Berenices. I'll write about the many galaxies one can see next month.

B.N.



VOYAGER 1 NOW MOST DISTANT HUMAN-MADE OBJECT IN SPACE

In a dark, cold, vacant neighborhood near the very edge of our Solar System, the Voyager 1 spacecraft is set to break another record and become the explorer that has traveled farthest from home.

At approximately 5:10 p.m. EST on Feb. 17, 1998, Voyager 1, launched more than two decades ago, will cruise beyond the Pioneer 10 spacecraft and become the most distant human-created object in space, at 6.5 billion miles (10.4 billion kilometers) from Earth. The two are headed in almost opposite directions away from the Sun.

"For 25 years, the Pioneer 10 spacecraft led the way, pressing the frontiers of exploration, and now the baton is being passed from Pioneer 10 to Voyager 1 to continue exploring where no one has gone before," said Dr. Edward C. Stone, Voyager project scientist and Director of NASA's Jet Propulsion Laboratory . "At almost 70 times farther from the Sun than the Earth, Voyager 1 is at the very edge of the Solar System. The Sun there is only 1/5,000th as bright as here on Earth, so it is extremely cold, and there is very little solar energy to keep the spacecraft warm or to provide electrical power. The reason we can continue to operate at such great distances from the Sun is because we have radioisotope thermal electric generators (RTGs) on the spacecraft that create electricity and keep the spacecraft operating,

Voyager 1 was launched from Cape Canaveral on Sept. 5, 1977. The spacecraft encountered Jupiter on March 5, 1979, and Saturn on Nov. 12, 1980.

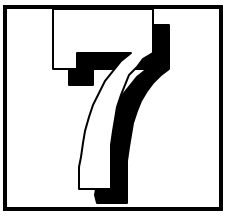
Then, because its trajectory was designed to fly close to Saturn's large moon Titan, Voyager 1's path was bent northward by Saturn's gravity, sending the spacecraft out of the ecliptic plane -- the plane in which all the planets except Pluto orbit the Sun.

Launched on March 2, 1972, the Pioneer 10 mission officially ended on March 31, 1997. However, NASA's Ames Research Center, Moffett Field, CA, intermittently receives science data from Pioneer as part of a training program for flight controllers of the Lunar Prospector spacecraft now orbiting the Moon.

The spacecraft are now so far from home that it takes nine hours and 36 minutes for a radio signal traveling at the speed of light to reach Earth,The signal, produced by a 20 watt radio transmitter, is so faint that the amount of power reaching our antennas is 20 billion times smaller than the power of a digital watch battery."

Having completed their planetary explorations, Voyager 1 and its twin, Voyager 2, are studying the environment of space in the outer Solar System.

Although beyond the orbits of all the planets, the spacecraft still are well within the boundary of the Sun's magnetic field, called the heliosphere. Science instruments on both spacecraft sense signals that scientists believe are coming from the outermost edge of the heliosphere, known as the heliopause.



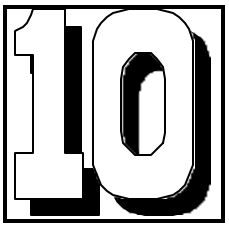
The heliosphere results from the Sun's emitting a steady flow of electrically charged particles called the solar wind. As the solar wind expands supersonically into space in all directions, it creates a magnetized bubble -- the heliosphere -- around the Sun. Eventually, the solar wind encounters the electrically charged particles and magnetic field in the interstellar gas. In this zone the solar wind abruptly slows down from supersonic to subsonic speed, creating a termination shock. Before the spacecraft travel beyond the heliopause into interstellar space, they will pass through this termination shock.

"The data coming back from Voyager now suggest that we may pass through the termination shock in the next three to five years," Stone said. "If that's the case, then one would expect that within 10 years or so we would actually be very close to penetrating the heliopause itself and entering into interstellar space for the first time."

Reaching the termination shock and heliopause will be major milestones for the mission because no spacecraft have been there before and the Voyagers will gather the first direct evidence of their structure. Encountering the termination shock and heliopause has been a long-sought goal for many space physicists, and exactly where these two boundaries are located and what they are like still remains a mystery.

Science data are returned to Earth in real-time to the 34- meter Deep Space Network antennas located in California, Australia and Spain. Both spacecraft have enough electricity and attitude control propellant to continue operating until about 2020, when electrical power produced by the RTGs will no longer support science instrument operation. At that time, Voyager 1 will be almost 150 times farther from the Sun than the Earth -- almost 14 billion miles (more than 20 billion kilometers) away.

On Feb. 17, Voyager 1 will be departing the Solar System at a speed of 39,000 miles per hour (17.4 kilometers per second). At the same time, Voyager 2 will be 5.1 billion miles (8.1 billion kilometers) from Earth and is departing the Solar System at a speed of 35,000 miles per hour (15.9 kilometers per second).



AT THE EYEPIECE by Alan Whitman

Scintillating Wintertime Half-hours

note: Al has been kind enough to arrange to make his RASC artticles available for our newsletter, (continued from last month) Not for redistribution at the author's request

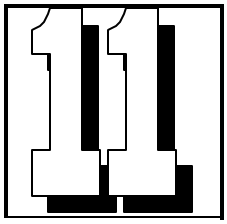
The bright winter stars are famous for their energetic scintillation. The twinkling of bright stars is more noticeable than fainter ones but, aside from that, the stars really do twinkle more on most winter nights. That is because there are almost always one or two frontal zones overhead in winter even on clear nights, and these zones are areas of wind shear which cause atmospheric turbulence. While the resulting poor seeing is yet another excuse not to lug out your big glass, it does provide some memorable sights. Here are four from my logbooks:

Sirius is famous for showing flashes of red, green and blue when at low altitude. One night with poor seeing I followed Sirius at 174x as it set. It became elongated with red towards the horizon, violet at the other end, and the other spectral colours in between, all flashing and pulsating!

Until travelling in southern Europe, I had never seen Canopus, the second brightest star. My wife found us a south-facing fourth floor apartment with a sea horizon in downtown Faro, Portugal at latitude 37 deg 01'. Since Canopus' declination is -52 deg 41' it would culminate 18' above the sea horizon! Spotting a faint object flashing red and green over the Atlantic, I supposed that it was an airplane. But, as this 'airplane' crept excruciatingly slowly along the horizon and a higher star, Tau Puppis, kept pace in binoculars, it dawned on me that the 'airplane' was Canopus, wildly scintillating, mostly green, occasionally pure red, frequently both red and green, and rarely yellow (its true colour). Ten adjacent but higher stars in Puppis allowed a positive identification of Canopus. The magnitude -0.7 star was usually visible without optical aid but not always, disappearing when its scintillation resulted in its photons becoming too greatly dispersed. Most of the time it suffered about 4.5 magnitudes of atmospheric extinction. The star appeared higher above the sea than I had expected-- refraction must have added about a half-degree to its 18' of geometric altitude. From latitude 34 deg in Morocco two weeks later Alpha Carinae was not nearly as dramatic.

When Venus passed through inferior conjunction fully eight degrees north of the sun in March, 1993, this allowed an exceptional view of its hair-thin crescent, only 1.2% illuminated, arcing through 210 deg, and a huge 59" in diameter. Venus set through Mt. Pinataubo's thinning volcanic aerosols one evening, watched with an RFT. The middle of the crescent was closest to the horizon with both cusps pointing upwards. At the lowest point spectrums would appear and ripple up both horns. Five or six of these "rainbows' would be on the crescent simultaneously--a once-in-a-lifetime sight.

Finally, here is an experience of atmospheric refraction effects on the grand scale--the Green Flash from the southernmost tip of The Queen Charlotte Islands, where the sun both rises from and drops into the Pacific. Clear horizons are rare in stormy Haida Gwaii, but all seven flat horizon sunrises or sunsets that I watched there produced a Green Flash in one of its forms. An unforgetable day:



January 22, 1983: "8:36 AM A very fine sunrise Green Segment in 7x50s. There was a very elongated, completely detached green area just above the sea horizon when the rest of the solar disk was still below the horizon. The green area was ragged--it looked like a tiny cloud. This 'cloud' then turned golden in the centre with a green edging. Finally the 'golden cloud' merged with the rest of the solar disk, but was still very flattened. The total duration was perhaps three seconds--unusually long."

"5:13 PM My second Green Flash today! The sun set on a straight-edged and opaque bank of very distant stratocumulus clouds, topped only 1/2 deg above the sea horizon. I didn't really expect a flash but the cloud bank proved adequate and there was a fine bright emerald one. The atmosphere was very transparent, but stratospheric volcanic ash from Mexico's El Chichon became visible after sunset. Then, 37 minutes after sunset, faint red rays appeared, stretching up from the sunset point and lasting about two minutes."

For those long ago January Green Flashes moonboots were not needed. During the great El Nino winter of 1982-83 Cape St.James, B.C. Weather Station's minimum thermometer never fell below freezing at any time in the whole winter. Imagine observing at a place in Canada without ever feeling the nip of frost!

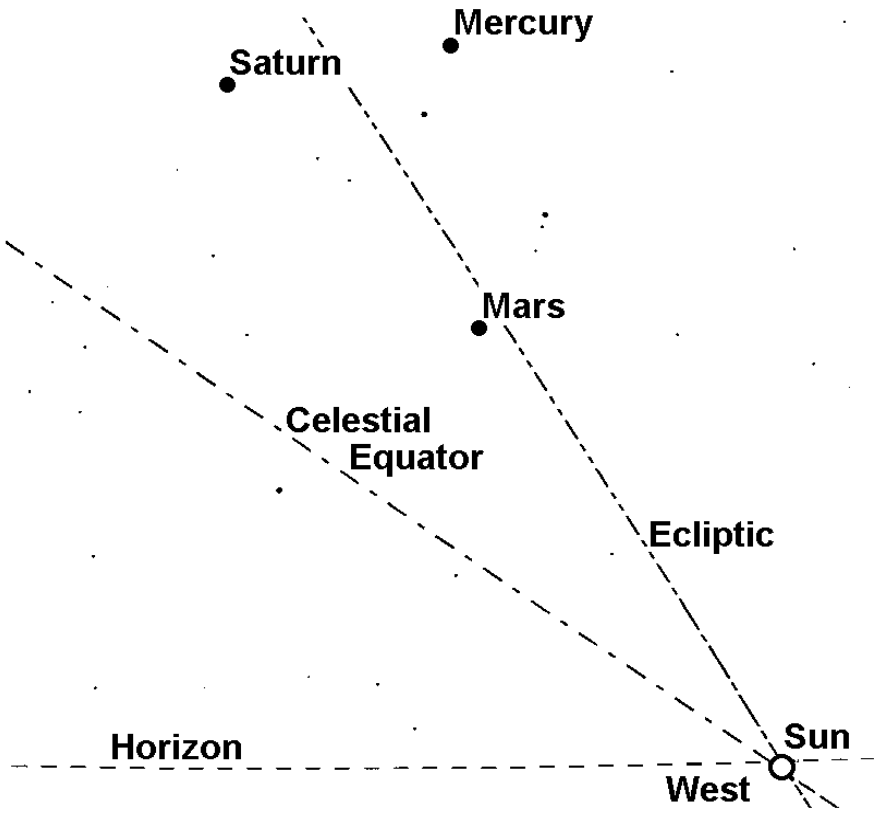
A.W.

An E-Mail I recieved from Orla (G.S.)
Hi all,

Last summer I submitted a proposal to the Very Large Array (the telescope used in the movie 'Contact') to observe a few compact planetary nebulae in an attempt to measure expansion rates (and, hence, distances) . A few weeks ago, I received the referees' report, and I am happy to write that my proposal was one-third successful. I requested 24 hours of observing time and was granted 8 hours. Not bad for some aging guy abandoned in a cold, remote northern oil town. I observe on March 12, so I will be going to Calgary during Keyano's reading week (February 23 to 27) to set up the experiment.

Orla
Congratulations Orla -good hunting-
Clear Skies from all of us.

The Triple Conjunction of 1998 Mar 20
(from Prince George at 18:20 PST)



Graphic courtesy of Dr Bob

Friday March 20 th is also the Vernal or Spring Equinox and is the third open house of our spring season. The observatory will be open and staffed, this might be a memorable sight to bring your family and friends out to witness.

FAST-SPINNING PULSAR DISCOVERY PROVIDES EVOLUTIONARY LINK

Scientists have announced the discovery of a superdense star spinning at more than 60 times per second, and calculate it could have been spinning as fast as 150 times per second or more when it formed some 4,000 years ago. Most astronomers had not previously believed this class of star, called a pulsar, could form with such a rapid spin.

The pulsar is spinning twice as fast as any young pulsar that we have seen before, To put it in perspective, this pulsar is spinning more than 6 million times as rapidly as the Earth.

The newly discovered pulsar establishes a link between fast-spinning pulsars with relatively weak magnetic fields and slow-spinning ones with strong fields, suggesting there may be a natural continuum between the two known types.

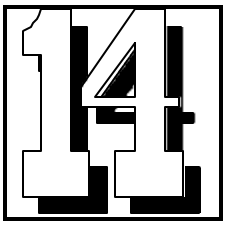
Pulsars get their name because their emissions appear to turn on and off, or pulse, very rapidly. Astronomers believe the stars channel some of their energy into a beam of radiation, and as the star spins the beam sweeps through space like a lighthouse beacon. By counting how rapidly the beam flashes at Earth, scientists can calculate a pulsar's rate of spin. When a star explodes as a supernova it leaves behind a lingering core about 15 miles across but packed with as much matter as in Earth's Sun.
The star is so dense that neutrons are the only form of matter that exist in the star, thus earning the name "neutron star." Those whose rapid spin can be observed are called "pulsars."

The team identified the pulsar as most likely being associated with the remnant of a supernova (catalogued N157B by astronomers) that exploded in the Large Magellanic Cloud, a companion to our Milky Way galaxy, about 4,000 years ago. (The age estimate comes from other X-ray and visible observations of the spreading, tattered gas cloud from the supernova blast and is in agreement with that predicted by theoretical models.) Data from both the Rossi and ASCA satellites were used to calculate the rate at which the pulsar's spin is slowing, which in turn provides an estimate of its age: 5,000 years old, a close match to the age estimate for the supernova remnant.

The other well-known high energy pulsar, in the Crab Nebula, spins just under 30 times per second, and is generally thought to have been spinning at only 60 times a second at its birth in 1054 AD. Since the Crab pulsar's discovery in 1968, astronomers have spotted pulsars spinning as fast as hundreds of times per second. These so-called "millisecond pulsars" (because their spin periods are only a few thousandths of a second) have magnetic fields a thousand times weaker than the Crab pulsar.

Most astronomers believe that the weak-field, millisecond pulsars were born with a slow spin and were "spun up" after sucking in gaseous material from an orbiting stellar companion, but astronomers have not located enough suitable binary star systems to account for the large numbers of millisecond pulsars being discovered.

The pulsar found in N157B, whose magnetic field is only a few times weaker than the Crab pulsar's, suggests an evolutionary link between the strong-field, slower-spinning energetic pulsars and the weak-field millisecond pulsars.



Solar Eclipse-Chasing Nostalgia

from Al Whitman

(continued from last month more excellent recollections starting with another Caribbean encounter.....

July 11, 1991:

What a ridiculous time of year for a first trip to Mexico or Hawaii! I joined the excellently run Calgary RASC Centre/Science Centre expedition to Mazatlan as eclipse weather consultant. Climatological weather prospects on the mainland were much poorer than in Baja California but the hotel prices were reasonable, unlike Baja where they wanted $500 per night for a room. We found a big hole in the clouds north of the centreline (the ONLY big hole on the mainland as satellite photos revealed later) and had a fabulous view. The corona was one of the most beautiful this century. Totality was so long that we were not rushed, there was time to see everything with naked eye, then low power in the RFT, then the incredible luxury of changing eyepieces, refocusing, and viewing prominences at moderate power in the Astroscan (best
rugged, portable eclipse scope made). I had never seen either the chromosphere or Baillys Beads so for the last two minutes concentrated on the third contact limb at 64x. I understood the chromosphere to be a 2 to 3 second thing. BUT the chromosphere appeared as pink Bailly's Beads in deep valleys and it grew and widened for an amazing 18 seconds before the Diamond Ring.

May 10, 1994:

My first and perhaps only annular eclipse. (In a sense it is harder to catch an annular eclipse because you won't travel nearly as far to see one). I was in Oklahoma chasing tornadoes for the US government--talk about fun. Now that was proper scheduling, putting on an eclipse during tornado-chasing season. Talk about making an entrance: you should see what happens when a convoy of 15 US government vehicles bearing masts covered with weather instruments on their roofs and emblazoned with "Official Severe Storms Chaser" on the doors, rolls into a small Oklahoma town and fills up all the gas stations and burger joints. Oklahomans know about tornadoes and our convoy sure made a splash in every town!

But I digress. I had arranged to have several days off to drive over to climatologically-favoured New Mexico for the annular eclipse. But climatology is one thing and the weather of eclipse day is frequently another. It was obvious two days before the eclipse that Oklahoma had better weather prospects than New Mexico so I stayed at home. Just north of Oklahoma City, near the southern limit, the high mountains at the lunar south pole carved out wonderful strings of Baily's Beads on the long horns of the solar crescent just before and after annularity. The last bead appeared a full 4 minutes after third contact.

February 26, 1998:

???? Another adventure awaits!

Alan Whitman

(And Al will probably be there —so I am looking forward to reading about it right here)

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
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Canfor Clear Lake	270
Lutz Klaar	200
Canfor Netherlands	200
Art Beaumont	150

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.

Support Community Science

Join the PGAS

The Prince George Astronomical Society's
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