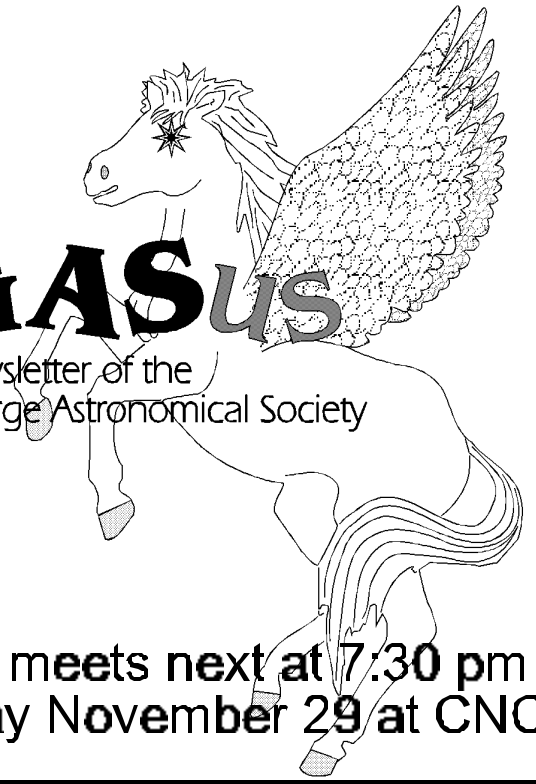
NOVEMBER 2000 ISSUE #107



the PeGASus

Newsletter of the
The Prince George Astronomical Society

The pgas meets next at 7:30 pm Wednesday November 29 at CNC

INSIDE :

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

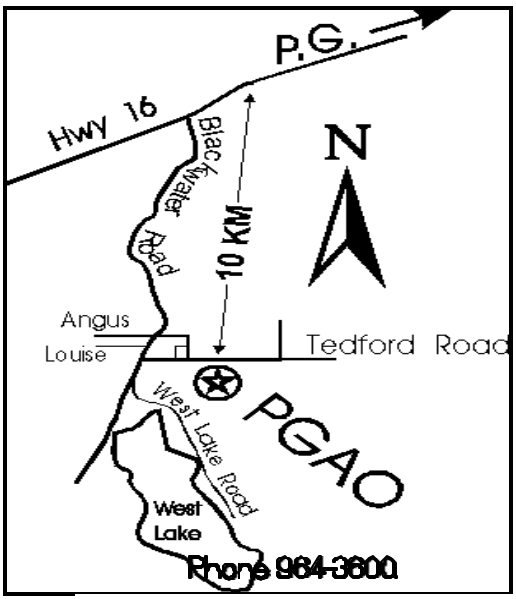
Our pursuits are out of this world.
Our activities are astronomical.
Our aim is the sky.

Contributions to the newsletter are welcome.

Deadline for the next issue is

January 19

Send correspondence to
The PGAS
3330 - 22nd Avenue
Prince George, BC, V2N 1P8
or



Prince George Astronomical Society Executive, 1999/2000

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964-7279

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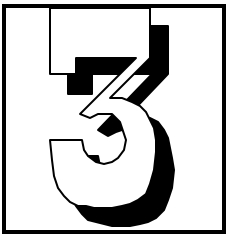


EDITORIAL

By Gil Self

No matter how you count it, this is the last issue of the twentieth century. And as such, I hope you don't think it to puffed -up to wonder if maybe somebody in a hundred years will be looking back at this issue to see what we were up to.

This surely is the golden age of astronomy. I have talked before about some of the marvelous technology that is available to us. It seems almost every week there is an announcement of some new system coming on line. New ways to study the cosmos and spread the information with magazines, television and, of course, the internet.

I won't say it's all over, I realize there are still problems to be solved in the other sciences. But how often do you hear of a new really big discovery in say geology , or meteorology or even medicine? They are tidying up loose ends, finishing up gaps and repairing mistakes. The other sciences will have to come up with cold fusion, or anti-gravity or a longevity pill before they can say they have made the discovery of the century.

It seems to me astronomers come up with ground shaking discoveries several times a year. It would be hard to pick the astronomical discovery of the century. Ancient life on Mars, Planets orbiting other suns, evidence of black holes, --the universe is accelerating !! I have seen solar nurseries and suns dying , galaxies so remote the light has barely had time to reach us since the beginning of time. Distant light bending around galaxies, close-up photos of the surface of forbidding moons.

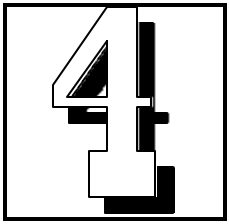
You pick, I can't.

So will the PGAS still be here in one hundred years? First. I think you have to ask yourself what will society be like? Will there still be corporate greed ? Will special interest groups still be strangling the government? Will it still be just as hard to pick the politician to vote for who is the least worst? Will the Americans still be trying to decide who their president is? I think the answer to the above is yes. But the one good thing that I predict is that there will be even more information easily accessible, and more free time to pursue that information. Therefore, since astronomy is likely to still be the most active popular science and people are likely to have free time and easy access to information, I can only leave you with one last question.

Will there still be curious people ?

I hope so.

Gil Self



Coming Events

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

The **PGAS.**
meets next November 29, 7:30pm at CNC

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The Night Sky for December 2000

by Bob Nelson, PhD
Hi Folks,

When you read this, my wife and I should just be returning from sunny (we hope) California. We'll have met some friends, visited an observatory or two, walked on the odd beach etc. And then ... driven back in the snow to good old PG. Oh well, the winter really makes you appreciate the warmer times! But then, there's skiing .....

Anyway, this article is supposed to be about the sky, so here's what is predicted to happen in PG Skies December:

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

PLANET ROUNDUP

MERCURY is a morning object in December; however, the greatest elongation or separation from the Sun occurred last month. You might still be able to see it in the southeast just before the Sun rises early in the month, but by the end of the month it will be lost in the glare of the Sun.

VENUS is an evening object all month but is still somewhat low in the southeast at sunset. [The maximum elongation (angular distance from the Sun) occurs next month on or around January 16th.] On December 15th, it's a gibbous blob of magnitude -4.2 and size 18".

MARS, in Virgo until the end of the month, is a morning object all month. On the 15th, it rises at 2:52 AM and is a tiny 5" disk of magnitude +1.5. Better viewing is ahead!

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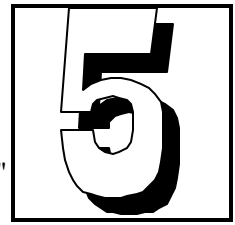


JUPITER, in Taurus all month, is up all night and, on the 15th is a 47" disk of magnitude -2.7. Look for some or all of its 4 brightest moons!

SATURN, in Taurus all month, is up all night; on the 15th it's a 20" disk of magnitude -0.2. How many of its moons can you identify?

URANUS, in Capricornus all year, sets on the 15th at 8:25 PM in the southwest and is a 3" disk of magnitude 5.9. Wait til next year.

NEPTUNE, in Capricornus all year, is not visible this month (it rises near 11:00 AM and sets near 3:00 PM).

PLUTO, in Ophiuchus all year, on the 4th is in conjunction with the Sun (i.e., it's on the far side). On 15th, it rises two hours before the Sun. [This month's quiz -- how can this be?? One month later, most objects rise two hours earlier, yet the time span here is only 11 days. Explain!!] Rising when it does, the object will be a difficult target. It's best to wait til late May 2001 when it will transit (be on the meridian) at around 2:00 AM and still be a reasonable target earlier in the night.

Winter Solstice occurs on December 21 at 5:37 PM PST. Winter has officially begun (but has been in Prince George for several weeks).

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 the northern part visible to us in PG this month. Burnham's Celestial Handbook tells me that Alpha Fornacis (that's the Latin ending for Fornax) is a long-period visual binary first observed by John Herschel in 1835 when the separation was 5.3". During the next century, the separation narrowed to 0.9" but then started to increase. In 1963, the separation had grown to 1.9". I have this planetarium program, PC Sky, that animates visual binaries; it gives the separation and position angle as you time-step watching the simulated orbit. It tells me that in Dec 2000, the separation is 5.1". The latter will increase to a maximum of 6.1" in 2038 and will decrease to a minimum of 0.2" by 2264. The period is around 314 years -- how's that for a long-term phenomenon? Only in astronomy. We must look for the pair; in December, they will be 18 degrees above the southern horizon; Star A is 4.00 mags and Star B is 6.60 mags.

Eastern Cetus (Cet, "The Sea Monster"). Western Ceti was discussed last month, but in eastern Cetus, we see Omicron Ceti, or Mira ("The Wonderful" -- it is!). Mira was the first of the long period variables discovered since 1596 and monitored by the America Association of Variable Star Observers. Much was said a year or so

ago, so I won't repeat myself.

Western Eridanus (Eri, "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 Eri) resides. It also contains the multiple stars system Omicron 2 Eridani. Stars B and C (9.9 and 11.2 mags respectively) undergo a 252-year orbit. At present, their separation is 9.2" (easy) and is near maximum.

Aries (Ari, "The Ram"), is the first entry in the Zodiac and is a northern constellation out of the Milky Way. The brightest star, Alpha Ari (a.k.a. Hamal) is a red giant (sp. K2 III) and lies about 75 light years distant.

Triangulum (Tri, "The Triangle"), is a small constellation just south of Andromeda and contains the famous galaxy M33 ("The Pinwheel"), which is a member of the Local Group of galaxies It was discovered by Messier, in August of 1764. If you've ever observed M33, you'll marvel at how Messier saw it since it's a diffuse, low-surface brightness object which can be a challenge in a small telescope. Try using moderate power in a telescope with clean, well collimated optics on a very dark night with good clarity. (CCD images taken then should turn out well.) Like M31, it has been the subject of intense study by professionals with large telescopes; many variable, novae, planetary nebulae, etc have been discovered.

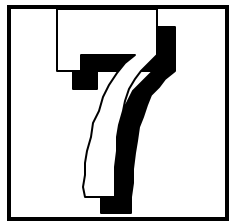
Western Perseus (Per, "The hero that saved Andromeda"), is a northern constellation (appearing overhead at times), is in the Milky Way and contains many wonderful objects familiar to many of us. Look for the Double Cluster, if you haven't seen it before.

NEW BOOKS AT THE PUBLIC LIBRARY.

ONE UNIVERSE: AT HOME IN THE COSMOS.
by Neil de Grasse Tyson, Charles Liu and Robert Irion.// Joseph Henry Press.
This is a beautiful big book, with great illustrations and photographs. To my mind some of the explanations and their illustrations would appeal to young people. There is an illustration of a skyscraper being sucked into a black hole, for example, but most of the book is not so corny. This is not a technical book is any sense, but does explore a lot of theories and ideas about our universe, its origins, time and space, in an entertaining manner.

Yvonne Whebell,
Acquisitions Coordinator
Prince George Public Library

Members Night Report



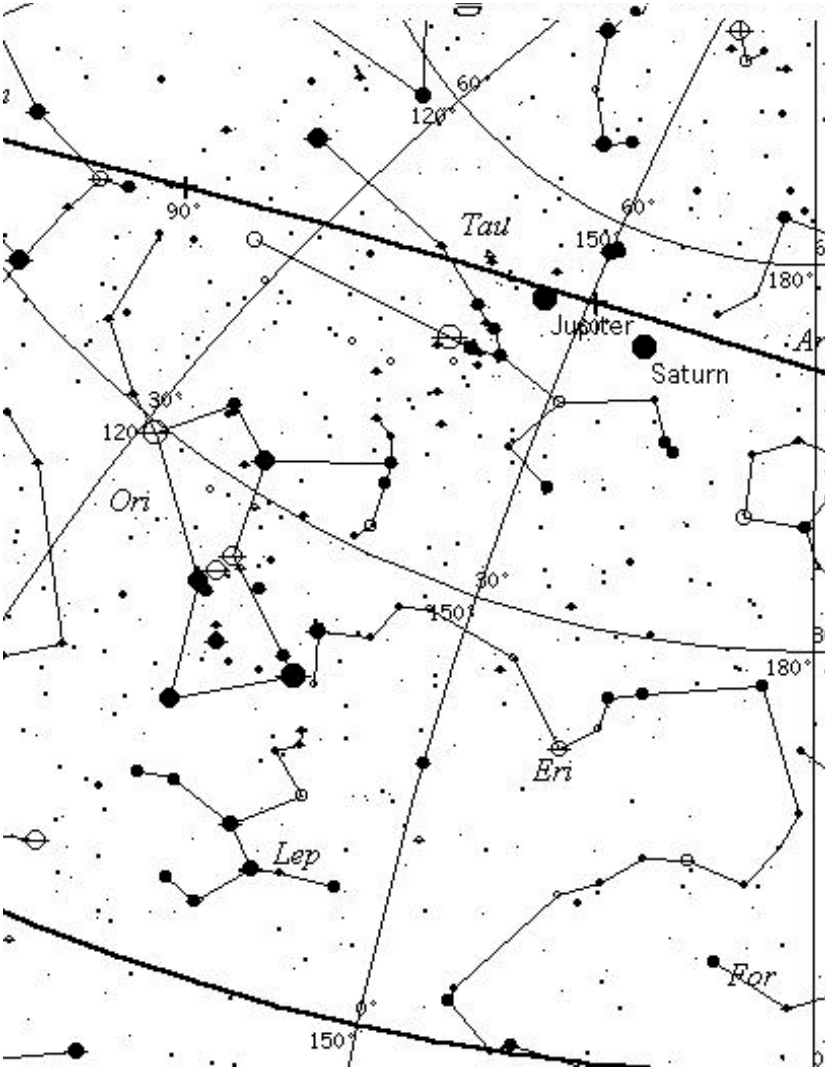
I can't believe another month has come and gone already! Our members night sessions in November left a bit to be desired to due ugly weather however, on Saturday November 4th Bob Klick, Paul Strickland and I finally had a good night for viewing.

The first item we looked for was VX Andromeda. It is a red star, spectral type N7, located in Andromeda (duh!). VX AND is a long-term variable star ranging from mag 8.0 – 9.5 over a period of 376 days. It is located between M31 and Cassiopeia. Long story short… we couldn't find it… my inexperience in making star charts was clearly the problem. (I have it all figured out now) Next up was Gamma Andromeda. This nice double star was no problem to find as it is easily seen visually (not separated visually) It has a 10 arc second separation and is gold/ blue in colour. It is similar in appearance to Albireo in Cygnus. According to my book this is actually a triple star (the smaller of the pair splits) but I couldn't see it. After we finished admiring the pretty colours we moved on to NGC891. We hunted for this galaxy for a long, long time. In fact we gave up after what seemed like an hour but then came back to it and finally found it! (again the star charts were the problem) We snapped the small photo (the one that shows only the central portion) that night. It took awhile to get the tracking sorted out so the stars didn't trail but I think the end result was pretty good. FYI the picture you see is actually a composite of 6 shots that's why getting the tracking right was so important. The full picture of NGC891 was taken about one week later and is a composite of multiple images made of three separate sections of the galaxy and then put together in CCD Soft and Photoshop. We also looked at what we thought was Eta Cassiopeia but when I compared the CCD image to my star chart it clearly was not, I never did manage to figure out what it was.

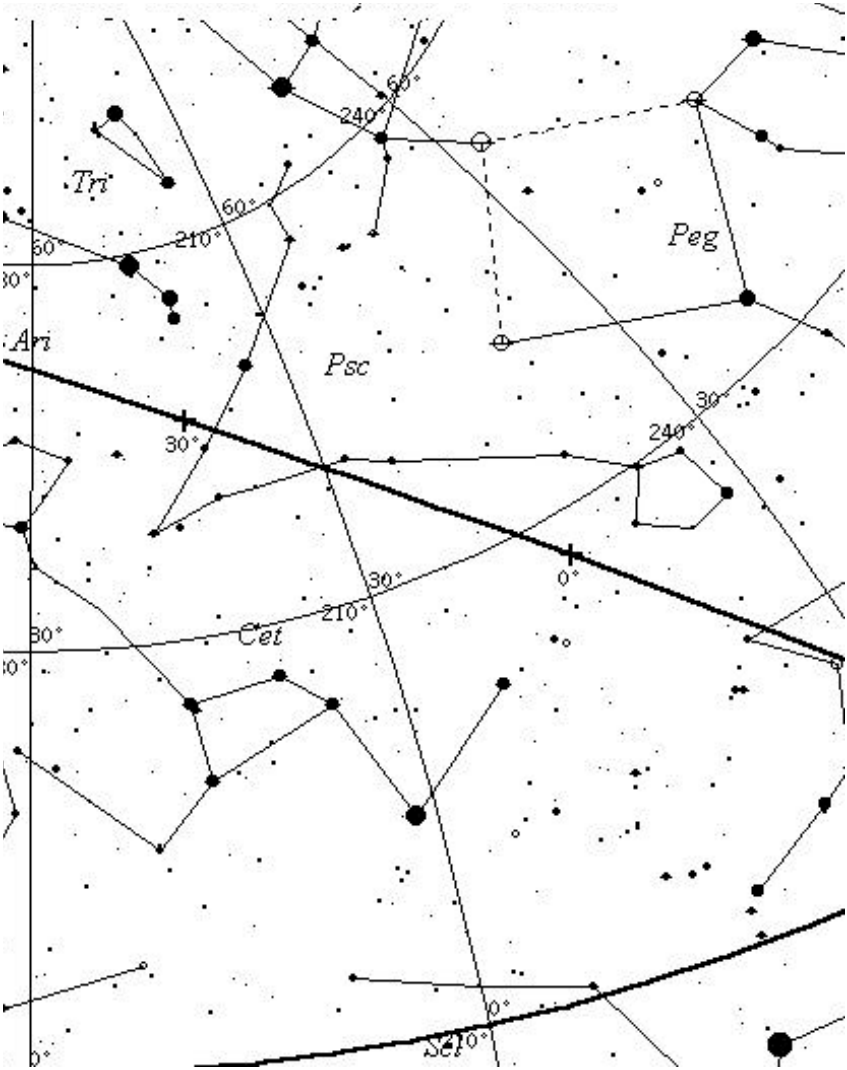
By the time you read this there will only be one official Members Night left (November 25) my thanks to the members who came out and used the scope I certainly enjoyed the company! As I mentioned there will be no more Members Nights until we start the Open House nights up again in the spring. However, I like going out and will continue to do so all winter, time and weather permitting, so if it's a Friday or Saturday night and the sky is clear and you want to go out give me a call if I can I'll be glad to go. (564-4789) Keep looking up!

by Brian Battersby

See Brian's images on page 10,
(probably the best images yet from our observatory)



Night Sky for December, courtesy Dr. Bob Nelson



Night Sky for December, courtesy Dr. Bob Nelson

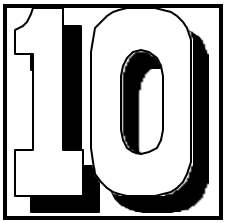
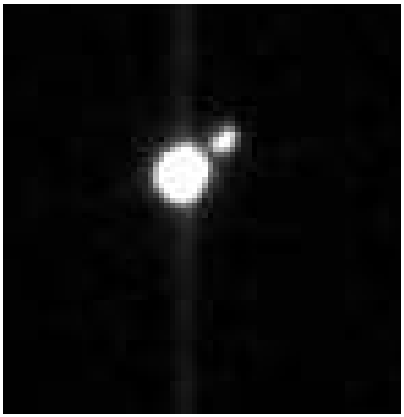


Photo Gallery

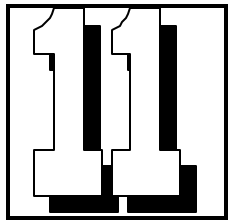
From the net

Brian's photo



Uranus

Gravitational Collapse Part 2



Review- On our last episode I talked about the death of an ordinary star with about the same mass as our Sun. After a star has used up it's nuclear fuel it will collapse due to it's own gravity. Chandraeskar using quantum mechanics and relativity deduced that the collapse would abruptly halt when the star reached about the Earth's diameter. The reason for this was due to electron degeneracy pressure, which can resist gravitational pressure. This new Earth size star is called a White Dwarf. White Dwarfs are extremely bright in the UV and blue portions of the light spectrum (i.e. very hot, much hotter than our sun's surface). But because they are so small they are not obvious objects to the naked eye or binoculars at night. A star goes through many stages before it has spent it's nuclear fuel. Our Sun for instant starts off as a main sequence star converting the Hydrogen nuclei into Helium nuclei. This is called nuclear fusion. The Atomic bomb derives its energy from Fission; the much more powerful Hydrogen Bomb uses Fusion for its energy just like our sun. When the core of our sun converts all the Hydrogen nuclei to Helium, energy ceases to be emitted and the sun starts to collapse. It takes about 10 Billion years for the core to be converted to Helium, our sun is about ½ way through this process....we think? As the core collapses gravitational energy is released which causes the outer core and surface to swell and expand into a red giant which would swallow up Mercury, Venus, Earth, and maybe Mars. Inside the core continues to collapse and heats up until new nuclear synthesis starts to occur making carbon, and Oxygen. The star is now off the main sequence. Chandreskar was famous for the number " **1.4** ". Which meant that any star less than 40 % heavier than our sun will remain a white Dwarf. So what happens to a star with a greater mass? Gravitational collapse can now continue but to what?

First of all nuclear synthesis continues beyond carbon & Oxygen, with the heavier elements neon, and magnesium being created at the core of the Star. If the stars initial mass starts off between 10--12 solar masses then even heavier elements can be synthesized in the star core. This will continue until it reaches the element iron. **Iron** is the death of all stars nuclear synthesis. The fusion process to make Iron does not convert mass into energy i.e. E=MC2 but instead converts energy into mass. This means it robs heat from the central core. Without the thermal nuclear pressure, the star will start to collapse under it's own weight (Gravitational collapse). As it shrinks electrons will be forced into the nucleus of the atom, and actually combine with the Positive charged Protons. This neutralizes there charge and they become Neutrons **So what does all that mean?** This tells us that the White dwarf star can collapse from an Earth size object down to a 20-KM object within a second.

The Stars collapse abruptly halts at about 10km in radius. It is so abrupt that the extremely hardened neutron core actually rebounds (figuratively like a steel coil). This recoil produces a **shock wave** of cosmic proportion. One theory has it that this shock wave moving outwards near the speed of light is actually slowed down or

However a common by product of most nuclear reactions is an elementary particle called a **Neutrino**. In this case electrons merging with protons produce them. Are sun produces them by fusion. Even from our 150 million kilometers from the sun trillions hit a square centimeter of our skin per second ouch. It's not that bad actually, they are possibly massless particles , and travel the speed of light. They hardly interact with normal matter. In fact if you could fill the solar system with lead right out to Pluto you might only stop ½ of them. As the Neutron Star is being created it produces these critters by **Astronomical amounts**. Amounts so large that the very very few that due interacts with the collapsing stars in falling layers of gas is still enough to assist the shock wave, and prevent it from stalling. This shock wave that can now break through these layers of gas is what we call a **SUPER NOVA.** There are 2 types of Super Nova the one I described above is a Type 2, another kind is called a Type 1 Super Nova.

So getting back to our new shrunken star, It's Protons have been converted to Neutrons, the star is now called a **Neutron Star**. The star is more like the nucleus of an atom The nucleus of any atom is extremely small. Most of the space the atom occupies is made up of the electrons, which orbit around the nucleus. If a football stadium were an atom then its nucleus would be much smaller than a pea sitting in center field. So atoms are mostly space. The nucleus however contains more than 99% of the atoms mass. A pretty heavy pea. So the neutron star would weigh greater than 1.4 solar masses and be about 10 KM in Radius. The gravitational field strength of any objects mass is dictated by its total mass and how small its radius is. The Neutron Star scores very high in both accounts. Space near its surface is distorted enough to appreciably bend light. It is also very rapidly spinning due to conservation of angular momentum. It could easily be spinning at 30 times a second. The magnetic fields of a Neutron Star is trillions of times stronger than Radiation (I almost said Tachcyon radiation, that's Star Trek) These Powerful radio beacons are called Pulsars, like the Neutron Star in the Crab Nebula.

So why does the stars collapse halt at 10 km? The same reason white dwarfs halt at 6,000-km radius. It is an overcrowding of particles. White dwarfs halt due to electron degeneracy pressure; Neutron Stars halt due to **Neutron Degeneracy Pressure**. Also known as Paulii's exclusion principle. No two neutrons can have both the same velocity and position. To avoid this the neutrons will vibrate (No thermal energy is released). As the Star continues to shrink the Neutrons are confined to smaller and smaller areas where they must vibrate even faster to maintain the exclusion principle. There's a limit to how fast these suckers can vibrate. That would be the speed of light. So neutron stars will have a mass between 1.4 and maybe 2 solar masses. Somewhere between 2-3 solar masses the neutron degeneracy breaks down as the neutrons refuse to accelerate any further. The star will now continue to collapse as the neutrons merge together. The radius gets smaller and smaller, the density starts to approach infinity. What happens next?……. Well that's another story, sort of like a dark comedy. If you haven't read part 1 I can e-mail it to you. ssenger@telus.net

Steve Senger

Just in case Your interested, Here are the bylaws relating to joining the RASC

Article 4 - Centres

4.01 Establishment and Continuance of Centres

(1) Any group of persons generally residing within an identifiable geographic region or political division in Canada may request recognition as a "Centre" of the Society. The group should have had an active interest in astronomy for at least one year, and there must be a minimum of twenty persons prepared to be members of the Society. Such a group must present a draft set of by-laws specifying the formal organization of the proposed Centre. A special resolution of the National Council is required to form a new Centre.

(2) All Centres of the Society established and existing at the time of the coming into force of this By-law are continued as Centres of the Society.

(3) National Council and the Society may, by special resolutions, withdraw recognition of a Centre if in their opinion the continued recognition of such Centre is not in the best interests of the Society. A Centre whose withdrawal of association is proposed has the right to receive notice of the meetings at which such withdrawal of association shall be proposed and of the intention to propose such withdrawal of association, and to make representations at the meetings at which the votes are held. Where a Centre's association with a Society is withdrawn it shall no longer have the right to use the name specified in Article 4.02 or the name of the Society.

4.02 Names of Centres

Each Centre shall be known as either "The Royal Astronomical Society of Canada, Centre", or "La Société Royale d'Astronomie du Canada, Centre (or Section de) ", or both, which name shall include the applicable geographic region or political division as prescribed by the National Council.

4.03 Incorporated and Unincorporated Centres

(1) A Centre may be an unincorporated association or may become incorporated under applicable legislation.

(2) The proposed letters patent, articles of incorporation or other charter of a Centre that proposes to become incorporated or of a group of persons that proposes to request the establishment of a Centre that will be incorporated shall be approved by ordinary resolution of the National Council prior to the submission of such documents to the applicable governmental authority.

(3) A Centre shall apply for an amendment to its letters patent, articles of incorporation or other incorporating charter only after the adoption of the proposed amendment by ordinary resolution of the National Council.

(4) No letters patent, articles of incorporation or other incorporating charter of a Centre shall conflict with the Constitution of the Society.

4.04 Centre By-Laws

(1) The operations of each Centre shall be governed by by-laws which shall be adopted by special resolution of the Centre and by ordinary resolution of the National Council. Every repeal of, amendment to or enactment of a Centre by-law becomes effective only upon adoption by special resolution of the Centre and by ordinary resolution of the National Council.

(2) No by-law of a Centre shall conflict with the Constitution of the Society, and any Centre by-law that does so conflict is inoperative to the extent of the conflict.

4.05 Powers of Centres

Each Centre may exercise all such rights and has all such powers as are provided under applicable legislation. In particular each incorporated Centre may own property and may incur debts and obligations.

4.06 Relationship of The Society and its Centres

(1) Each Centre is a constituent part of and is associated with the Society.

(2) Where a resolution or action of the Society conflicts with a resolution or action of a Centre, the resolution or action of the Society shall prevail and the resolution or action of the Centre is inoperative to the extent of the conflict.

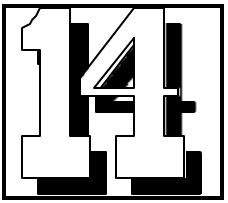
(3) The Society shall be responsible for its own debts, obligations and claims and shall not incur any debt, obligation or claim on behalf of a Centre or be liable for any debt, obligation or claim incurred by a Centre.

(4) Each Centre shall be responsible for its own debts, obligations and claims and shall not incur any debt, obligation or claim on behalf of the Society or be liable for any debt, obligation or claim incurred by the Society.

4.07 Centre Councils and Officers

(1) The business of each Centre shall be administered by a Council which may be designated a Board of Directors or other name, comprised of a President, a Secretary, a Treasurer, and such other officers and councillors as the Centre by-laws may provide.

(2) Every member of the Centre Council shall be elected by the members of the Centre, for such term and in



Complete HNSKY available from Brian B. for the cost of materials, (about $4.00), including 9,537 files he unzipped ,one - at- a -

(RCAS bylaws cont.)

4.08 National Council Representatives

(1) Every Centre is entitled to be represented on the National Council by one member of the Centre for each two hundred voting members of the Centre or portion thereof, which representatives are known as "National Council Representatives." The number of National Council Representatives to which a Centre is entitled during a year shall be determined from the number of members of the Centre as of the end of the previous year (including any members whose memberships expire in December), according to the membership records of the Society. A new Centre shall be entitled to one National Council Representative for the year in which it becomes a Centre. *(amended, July 1999)*

(2) Subject to Article 4.08(4), the National Council Representatives of a Centre shall be elected by the members of the Centre in accordance with the procedure established in Article 4.07(2) for the election of Centre Council members.

(3) The term of office of a National Council Representative is one year. No person may hold the office of National Council Representative for more than three consecutive terms, but such person may be re-elected after a lapse of one year.

(4) If for any reason a National Council Representative of a Centre is unable to attend a meeting of the National Council, then the Council of the Centre may appoint another member of the Centre as an alternate for that National Council Representative. The alternate will be entitled to exercise all the rights of the National Council Representative for whom he or she is the alternate only upon presentation to the National Council of proof in writing from the President or Secretary of the Centre as to the due appointment of the alternate.

(5) Every National Council Representative shall be an ordinary or life member of at least twenty-one years of age. *(amended, July 1993)*

(6) A National Council Representative may be removed from office by special resolution of the Centre that he or she represents. A National Council Representative whom it is proposed to remove from office is entitled to receive notice of the meeting at which such removal shall be proposed and of the intention to propose such removal, and to make representations on his or her behalf at the meeting at which the vote is held. *(amended, May 1991)*

4.09 Duties of Centre Officers

(1) Subject to the by-laws of the Centre, the President of a Centre shall preside at meetings of the Centre and of the Centre Council, and shall have such other duties as are prescribed by the by-laws of the Centre. *(amended, May 1991)*

(2) The Secretary of a Centre shall discharge the duties of Secretary prescribed in the by-laws of the Centre, and shall submit to the Secretary of the Society by 31 January in each year.

(a) a list of the current officers, National Council Representatives, and Centre Council members of the Centre, with addresses for those individuals in the first two categories, and

(b) a brief report on the activities and meetings of the Centre during the past calendar year.

(amended, July 1999)

(3) The Treasurer of a Centre shall discharge the duties of Treasurer as prescribed in Article 4.10(2) and shall submit the financial statement referred to therein to the Treasurer of the Society by 31 January in each year. The Treasurer shall have such other duties as are prescribed by the by-laws of the Centre. *(amended, July 1999)*

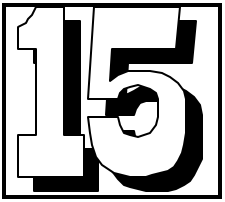
(4) The officers of a Centre shall complete and submit to the National Council such reports and statements as may be prescribed by the National Council from time to time.

4.10 Annual Meetings of Centres

(1) Every Centre shall hold an annual meeting of its members between 1 October and 31 January. *(amended, July 1999)*

(2) At the annual meeting of the Centre, the Secretary of the Centre shall submit for adoption at the meeting a report on the number of members in each class of membership at the end of the previous membership year.

(3) At the annual meeting of the Centre the Treasurer of the Centre shall submit for adoption at the meeting a financial statement for the Centre's previous fiscal year in such form as may be prescribed by the National Council from time to



Membership Dues, are due

In fact they are overdue. We (the PGAS Executive) decided this year to hold off a bit on collecting membership dues. You might say " Due to the uncertainty of our possible dues hike, due to the uncertainty of our status with the RASC, we decided that dues would not be due but rather we would wait until they were overdue. Dues are now due, even thought they are overdue, they are still due". Due to the fact that we need the money to pay the undue *&%!!!. increase in the natural gas bill ,,, which is due!, but not overdue!!

Ok! Thanks

Please send your fees to

Paul Roberts Treasurer PGAS

3330 - 22nd Avenue

Prince George , BC

V2N 1P8 Or bring them to the next meeting

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	

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