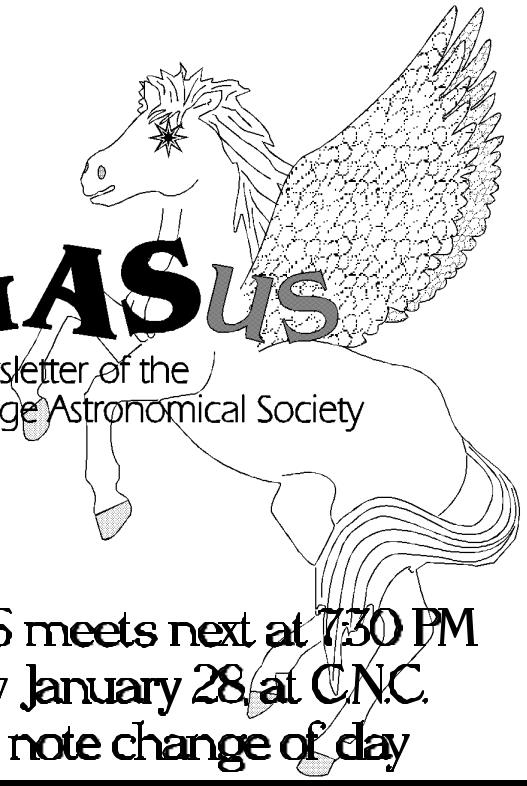
1997 JANUARY ISSUE #71

the PeGASus

Newsletter of the
The Prince George Astronomical Society



The PGAS meets next at 7:30 PM
Tuesday January 28, at C.N.C.
Please note change of day

INSIDE :

P.G.A.S. WEB SITE http://www.pgweb.com/astronomical/

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 FEBRUARY 12

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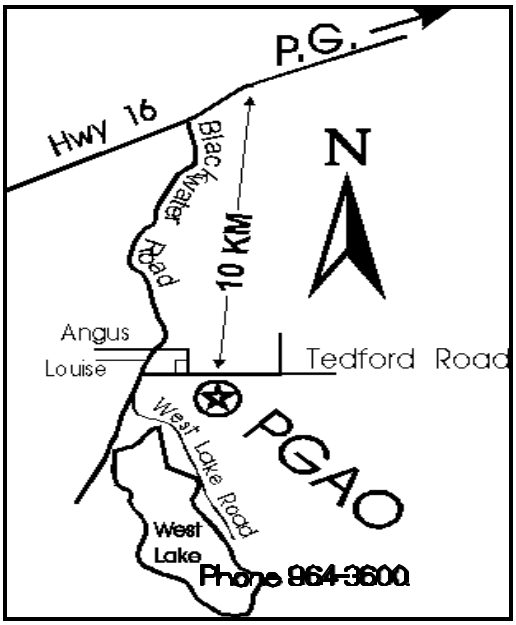

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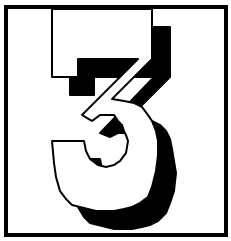


EDITORIAL

by Gil Self

Longing for spring----!!

This is a tough time of year for everyone, especially astronomers who don't really like cold. Some of our heartier members hesitate only long enough to find their mitts and toque when a clear nite beckons. I debate with myself (clear nites are fairly rare)---or stay in my warm house with my warm slippers and my warm T.V. Half the time, the warm house wins. But when I brave the cold I am always glad I did, winter viewing is outstanding. The skies are crystal clear and dark early enough that you can spend a good long evening observing and still get up for work in the morning, AND NO BUGS.

There are only a few things that work against good astronomy. I think they are; bad equipment, cold weather, bugs and late sunsets (and sometimes wives). The first is not a problem for us - our equipment is first rate and now we have a bit of a bank account to upgrade here and there. Besides , Bob does a great job of ensuring everything works smoothly.

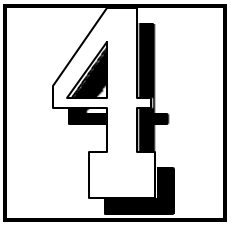
As for the fifth item, I shall leave that up to you, but I might suggest getting her interested--it worked for me with computers--she is more of a cone-head than I am now. Or perhaps, some backyard astronomy with wine and binoculars? Enough said.

The other mentioned items are what this is really about. As the winter weather moderates and spring approaches , you can't help but look forward to spring evenings.

Its only about 7:00 pm, still cool enough you want a jacket. My youngest daughter has come out to the observatory with me (I think she has the astronomy bug too), Beethoven is playing on the CD player. You can hear nite sounds in the distance, a coyote off to the south, a dog at the farm up the road and sometimes, a squirrel in the woods next to the building. The winters' snow is all but gone, not like a month ago when I spent a half hour shovelling before I could even move the dome. It is still too early for the bugs to hatch out and, probably, best of all, the moon is going to set shortly after the sun. The air is clear, no shimmering summer air cells, and since the ground is still damp, there is not much dust. The sun set a short while ago and we are into that magic time -twilight- the brighter stars are just starting to appear. The moon is still above the horizon, a good target for some early viewing . Up in the dome I look out at the tail end of the day from up on the ladder and there, coming out of the south, across the valley, is a flight of Canada geese at about 50 feet right over the dome. True story - I've got it on video. A Quintessential evening.

Then Aimee asks - " Dad , when are you going to put a bathroom in out here?"

GS



Coming Events

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

Jan 28 -monthly meeting (please note -Tuesday nite)
Feb 25 -monthly meeting (please note -Tuesday nite)
both meetings at cnc
Mar 25 -monthly meeting (please note -Tuesday nite)
at the observatory

The Night Sky for January - February '97

by Bob Nelson, PhD

Well, as our winter progresses, we live in hope that there will be clear weather ahead. It is sobering to remind ourselves that the Sun, Moon and planets continue in their celestial clockwork, completely oblivious to us here on the good Earth and our annoying weather patterns.

MERCURY, in Sagittarius, is visible in the morning sky. It's a couple of degrees west (upper right) of the much brighter Venus just before dawn. It's half illuminated as it approaches greatest western elongation (the largest angle to the right of the Sun that it gets this time around). If you're up early, pull out your binoculars (or a telescope if you have one) and see if you can see it. (You'd need a telescope to see the phase.)

VENUS, also in Sagittarius, is barely above the southeast horizon at dawn. You should still be able to see it with naked eye or binoculars after the Sun has risen as it is very bright (reaching magnitude -3.9). However, it's only 18 degrees away from the Sun, is in the gibbous phase, and is only 10.5" in diameter (and therefore appears as a fuzzy "blob"). As it races away from the Earth it will get closer to the Sun until it disappears behind it sometime in April.

MARS, in Virgo, now rises at about 10:30 p.m., local time; at midnight, it's about 10 degrees above the eastern sky and barely suitable for telescope viewing (it transits at 4:35 AM -- for you late birds!!). Better viewing is ahead. The big story about Mars is it attains opposition this year on March 18 at about 3:16 a.m. PST. The term opposition means that the planet is 180° away from the Sun and therefore opposite in the sky. Near that time, we are closest to Mars which will then appear as large as it can. This year's opposition is not a particularly favourable one as Mars only attains an angular size of 14" (the maximum is 24", the minimum, 13"). We will see the north pole inclined to us and should, if we are lucky, see the polar ice cap.

JUPITER is lost in the glare of the Sun.

SATURN, in Pisces, is the brightest object in the southwest in early evening. It sets around 10:30 p.m. and should still be good viewing.
URANUS and NEPTUNE are lost in the glare of the Sun.

Comet HALE-BOPP is with us still. It's both a morning object and an evening object! How can this be? It's because the comet is presently a dozen degrees to the north of the Sun and travelling northeast (towards closest approach which will occur sometime at the end of March). An ephemeris follows:

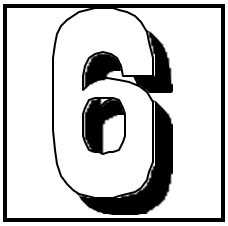
Date:	RA	Dec
Jan 22	19h 20.3m	11° 16'
Jan 26	19 28.7	12 53'
Jan 30	19 37.7	14° 39'
Feb 3	19 47.5	16° 34'
Feb 7	19 58.2	18° 40'
Feb 11	19 10.0	20° 57'
Feb 15	20 37.1	23° 25'
Feb 19	20 37.9	26° 05'

As for other things in the sky to look at, at mid-evening, at this time of the year, the constellations of Taurus, Auriga, Gemini and Orion are featured prominently overhead and in the southern sky. Therein lie the Crab Nebula, the Orion Nebula, clusters M34, 35 and 36 as well as the Beehive Cluster. All this and more are fine targets for astrophotography (film and CCD) or just plain viewing.

MEMBERSHIP DUES

If you have not paid your membership dues yet, we would really like you to do so as soon as possible. If you have not received a phone call by now ,we might have missed you . If you do not want to be deleted from our membership files, please call our treasurer and let him know you still want to be on the mailing list. Or better still--- please mail your dues to him .
Our Membership Dues are
$10.00 for students
$20.00 for adults
$30.00 for a family
our treasurer Steve Senger's phone number is 964-1202
or mail your dues to PGAS
c/o Steve Senger
7161 Hartford cres
Prince George, BC
V2N2W2

THANKS ...PGAS EXEC.



So you want to buy a telescope !

If you ask most amateur astronomers what telescope is best, they will probably advise you to check out the field and learn a bit about astronomy before you purchase.

This advice is good, but what if you have already bought a small telescope? There is still hope for you!

Read on and find out!

As defined here, a small telescope is a refractor (a telescope with a big lens in the front of the tube, and an eyepiece holder at the back) with a lens diameter (D) or (aperture) between 50mm (~2 inches) and 90mm (~3.5 inches). Any refractor smaller than 50mm will be practically useless for astronomy, and any larger than 90mm is too large (and expensive) to qualify as a "small" telescope. Newtonian reflector telescopes (with a mirror at the back of the tube and the eyepiece holder near the front) between 3 inches and 4.5 inches will probably fall into the small telescope category as well.

In the eyes of overly serious amateurs, most inexpensive telescopes in these size ranges are useless. It is true that they have their shortcomings, but it is possible to do astronomy with these telescopes. If a small telescope was all you could afford, and/or you can't return your purchase, read on.

ESSENTIALS

There are some features a telescope needs in order to be useful for viewing astronomical objects. First, the main or objective lens or mirror must be intact and relatively well-aligned. With a refractor, any large defect is usually apparent.

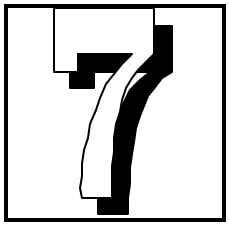
The telescope must have at least one eyepiece, and preferably two. A detailed explanation of eyepieces is given below, since the quality and sizes of the eyepieces you use will greatly affect your telescopic view.

The telescope must have a mount. Most inexpensive small telescopes will be mounted on a tripod and can be moved vertically and horizontally. Check the mounting for any excessive wobbles or shakiness. Unstable mountings, rather than poor optics, are the major disadvantage of these small scopes If the mounting is shaky, try to steady it as much as possible.

The telescope should have a finder. Usually this is a small telescope that rides piggyback on your main telescope. In principle, it has a wide field of view and makes it easier to locate object. Many small telescopes have unacceptable finders, so you may eventually want to replace yours.

MY TELESCOPE IS SUPPOSED TO MAGNIFY 236x!

Any telescope can be made to magnify any amount, simply by changing the eyepiece. In practice, the high powers advertised with many small telescopes will be unusable. The eyepiece determines the magnification, so here is the scoop on eyepieces Eyepieces are marked by their focal lengths. The longer the focal length of the eyepiece, the lower the



magnification when used with a given telescope. The objective lens or mirror also has a characteristic focal length. The longer the focal length of the objective, the higher the magnification when used with a given eyepiece. You can find out the magnification (or power) a telescope will give by dividing the focal length of the objective (often marked on the box as F=700mm or something similar) by the focal length of the eyepiece. For example, I use 4 eyepieces with my 60 millimeter refractor. The focal length of the objective is F=710mm. The focal lengths of the eyepieces are 20mm, 12.5mm, 9mm, and 6mm. The 20mm gives a magnification of 710 / 20 = 35.5x . This is a good low power for finding and viewing most objects.

Make sure you have a low power eyepiece in the range of 20x-40x. If you don't, you will have a tough time finding anything! The lower the power, the wider the field of view and the easier it is to locate objects. When you have a small, bright object like a planet in the field of view, you may wish to zoom in on it. This is where a higher power eyepiece will come into play. My 9mm eyepiece gives a magnification of 710 / 9 = ~79x.

Ridiculous eyepieces with focal lengths of less than 6mm are sometimes shipped with small telescopes. These are, without exception, poorly made and useless. They serve only to allow the manufacturer to advertise a high magnification. In practice, the view through a 4mm eyepiece will be uncomfortable, dim, and blurry. Just as useless is the Barlow lens, which effectively increases the magnification between 2x and 3x. A well-made Barlow might work, but the ones shipped with small telescopes have poorly-made lenses and sometimes will not even focus!

THIS IS TOO COMPLICATED! I JUST WANT TO LOOK AT THE sky !!

OK. This is actually a good time for it, if it's clear out and the Moon is up. Bundle up and take your scope outside. Put in your low power eyepiece and point the scope at the Moon. Center the Moon in the finder. Look in the eyepiece of the main scope. If you don't see the Moon, your finder isn't aligned. Luckily, the Moon is so bright that you don't need a finder. Just keep looking in the eyepiece and sweep the scope around the area until the Moon comes into view.

When you come across the Moon, it will probably be out of focus. So, find the focus knob and twist it until the Moon comes into focus. Did the scope move much when you did this? If so, your mounting is not the steadiest. You can either try to fix this or just live with it. What about the Moon's image? Can you see craters? The best part of the Moon to look at is the terminator, the line separating the sunlit side from the night side of the Moon. Shadows are long here, so detail will be enhanced. You should be able to get a very sharp image, with lots of craters and bright spots and dark spots visible. The Moon will be the most detailed astronomical object you will ever see in your telescope, so if it doesn't look good, then nothing else will.
If something doesn't seem right, you might want to find someone to evaluate your telescope's optics.

8

Take some time to look at the Moon. You'll notice that the Moon appears to move out of the field of view. This is due to the Earth's motion, so you'll have to push the telescope every couple of minutes to keep up. Put in a higher power eyepiece and refocus. You may not be able to fit the whole Moon in the eyepiece field, now that the image is larger. Details are larger as well, but on the whole the image doesn't look as sharp. That's the trade-off of high power. You'll want to try different powers to find the eyepiece that gives the best view. Before you leave the Moon, adjust the finder scope so the Moon is in its center when it is centered in your main scope. This may take a bit of work, but it will help when you are looking for fainter objects.

Do you want to look at a planet? Do you know which planets are out now, and where to find them? If so, turn your scope on them. If not, you'll have to put off this step until you find out. Monthly astronomy magazines give the locations of the planets,usually on easy-to-read sky maps. In the meantime, let's look at a star. Any star will do, but you might want to choose a bright one. Center it in your finder, and it should be in the field of view of your low power eyepiece. If you were using a different power on the Moon, you may need to re-focus. The star will be in focus when it is smallest and sharpest. In fact, it should look just like a very bright point of light. Stars are so far away that they will always appear as tiny points when in focus. This doesn't mean that they are uninteresting. With your naked eye, you will notice that some stars are colored. You can study these colors more carefully with the telescope. In addition, some stars are double.

THE PLANETS

Small refractors are often said to be good for the moon and planets, if nothing else. The planets will usually not be as detailed as they are through a larger telescope, but they are still worth looking at. You will be able to see the rings of Saturn and the moons of Jupiter and the phases of Venus when these planets are favorably placed in the sky. Because images powers than you would in a larger telescope. This can make the planets' disks appear disappointingly small. However, if you stick to powers in the range of 80x-120x, you should be able to make out increasing amounts of detail as your eyes become trained.

THE NEXT STEP: DEEP SPACE

If small telescopes are regarded as good planetary performers, they are usually written off for deep-sky objects Galaxies, nebulae, and star clusters are very faint compared to the Moon and planets. The larger a telescope's aperture, the fainter the objects it can see. Telescopes with apertures of over 6 inches have become standard for deep-sky work. It is true that larger scopes will allow you to see fainter objects--there is no getting around that. In addition, more detail will be observed in bright objects with larger scopes. However, the brighter deep-sky objects are also visible in small telescopes, and there is no reason you should not observe them if you want to. First, you will need to have a good knowledge of the sky. There are many

books on observing the sky with binoculars and small telescopes; many
of them have star charts with the brightest deep-sky objects labeled. You should also get a planisphere, so you know what can be viewed when. Objects like the Orion Nebula (M42), Hercules Cluster (M13), and Andromeda Galaxy (M31) may even be labeled on the planisphere. Perhaps the best objects to view with small telescopes are open star cluster

It is true that small telescopes are not the easiest (or even the most cost-effective, when purchased new) way to view the cosmos. Still, if you have one you can get a lot of use out of it and learn a lot about the sky before you graduate to a larger scope.

Created by wstone@lclark.edu

THE ORBITAL ELEMENTS

Seven different numbers are needed to accurately describe an orbit in space and time. Although many different sets of numbers will do (including position and velocity at a given time) there is a standard set called the Keplerian elements that are most used and most useful.

The Keplerian orbital elements define an elliptical orbit around the Earth, orient it three-dimensionally, and place the satellite in time.

In Keplerian mechanics, all orbits are ellipses, but reality is more complex and models include small corrections called perturbations

Epoch

The time when the elements were made.

Inclination

The angle between the orbital plane and the equatorial plane.

Right Ascension of Ascending Node

The angle between the ascending node, where the orbit crosses the equator going south to north, and the point of Ares, the reference point for the right ascension.

Argument of Perigee

The angle between the perigee and ascending node, or between the major axis and the line of nodes.

Eccentricity

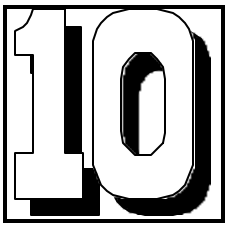
A parameter that determines how squished an ellipse is. Also, the ratio between the center-to-focus distance and the semi-major axis.

Mean Motion

The average rotation rate of the satellite.

Mean Anomaly

The position of the satellite in the orbit at the epoch, measured in an angle of



Sunrise / Sunset

by

Orla Aaquist

I have to admit that there are not very many things which amaze me. For example, many people claim to be amazed when they 'experience' the myriad of stars on a clear winter night. Not me. I look up and think, "That's nice. God, its cold out here!"

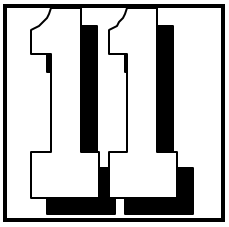
Also, I have heard of people who exclaim awe at a colourful sunset or sunrise. Not me. There are more colours in my crayon box than there are in the best sunset, and I have a few tee-shirts which were considerably brighter than a sunrise, when they were new. I know what you are thinking: "The man still has a box of crayons; so, of course, he wouldn't find sunsets awe inspiring!" You could be right, but I'll bet that there are more people who have seen the far side of the moon than there are people who get excited about a spectacular sunrise or a myriad of stars on a clear winter night. Why should they care about these things when they can stay inside and watch such wonderful entertainment as "The Simpsons" or "Married With Children".

Ok, ok! I'll include people who have seen pictures of the far side of the moon. How many readers remember ever having seen a picture of the far side of the moon?

The only difference between sunset and sunrise is the motion of the sun relative to the horizon. So, from a photographer's point of view, the two phenomena are identical. There is really no way to tell from a picture whether the sun is rising or setting, unless, of course, you recognise the landscape. As a time sequence, the two phenomena are completely reversible. If someone filmed a sunset, and ran the movie backwards, you would not be able to distinguish it from a sunrise, unless a bird flew through the field of view. Therefore, if I was to get excited about sunrises or sunsets, I would limit myself to one of them because they are virtually identical phenomena.

I do believe that people witness more beautiful sunsets than sunrises. Most people simply don't get up early enough to see the sunrise except on weekdays in the fall and spring when the sun rises at around 7:30. Then nearly everyone is driving towards the sun (Murphy's 554th Law).

On the other hand, most of us have seen plenty of sunsets. I see them every summer evening when I sit on my back porch drinking my evening beer; and to tell the truth, I enjoy the beer just as much even if the sun doesn't set, which sometimes happens



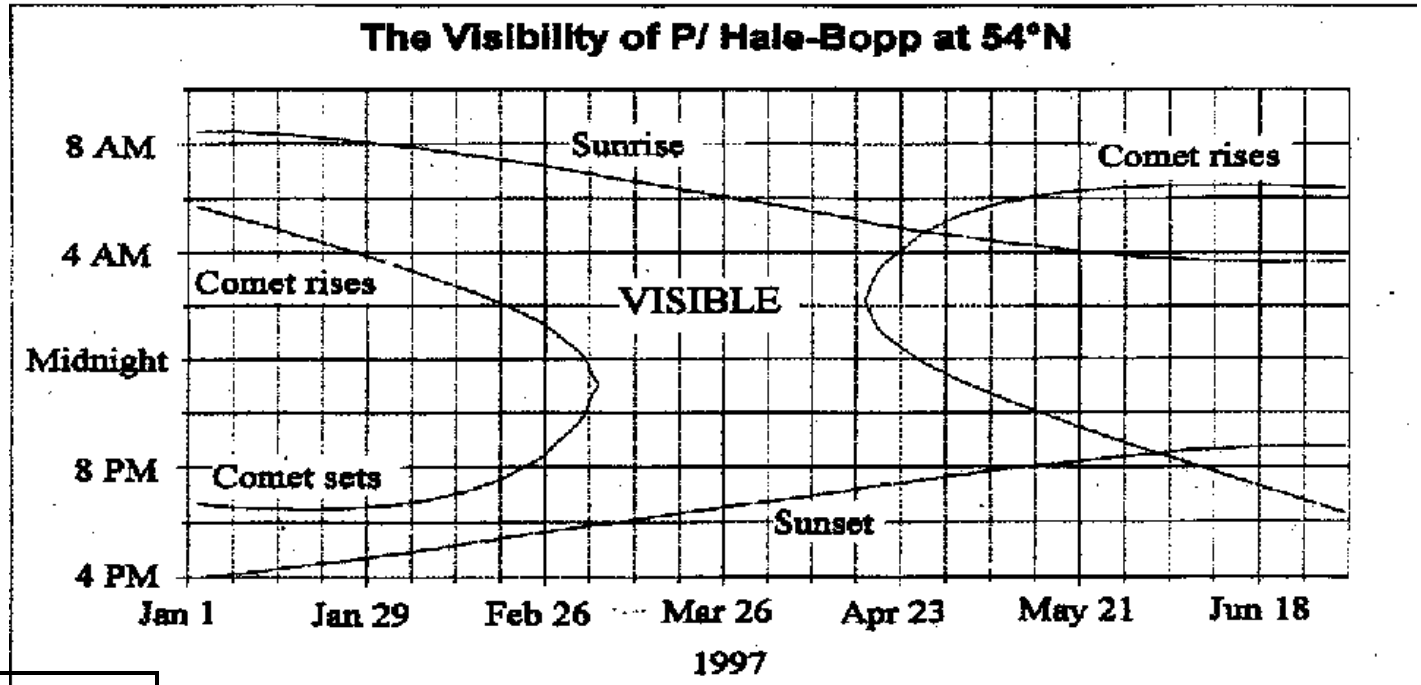
if I drink a lot of beer.

Now, even though there is one sunrise and one sunset every day for most of us (this is pretty basic astronomy, folks), the colourful ones do not occur with this same frequency. So, when you see what is supposed to be an awe inspiring picture with the sun near the horizon, you are more likely to think that it is a picture of a sunrise rather than a sunset. This is because you have seen very few sunrises, and you know from common experience that sunsets are rarely awe inspiring, so it must be a picture of a sunrise. Does this want to make you rise early to see that most splendours sunrise? Not very likely. Perhaps you go as far as to set your alarm, but when it comes time to actually drag yourself out of bed, you opt, instead, to curse the idiot that set the alarm last night. The prospect of beautiful sunrises simply do not inspire us to rise early enough to see them. How many of you have risen early just for the sake of seeing the sun rise? I don't see very many hands!

I don't see very many hands because I, along with the rest of the working class, am not fooled by the bright shades of red in a sunrise. This is due to the fact that when you have driven directly into the sun on your way to or from work, you are less likely to be awe inspired by the wonderful colours. There is nothing more irritating than driving towards setting ball of hot plasma after a hard day at work (except, perhaps, being cut off by a speeding teenager in a jacked-up mini-truck which looks like a gravel truck that shrunk in the wash). It's dangerous! You are a fool if you think that anything so dangerous should be admired for its beauty. Besides, when it comes right down to it, the striking colours only appear when the air is dirty. Due to the wave nature of light, light interacts with small atmospheric particles in such a way as to scatter blue light more than red light. This causes red light to penetrate the hazy polluting smog better than blue light. Because the blue light is scattered away from our line of sight, the sun, and the field of view immediately around the sun, looks red. These particles are an indication that something bad has happened somewhere. The particles may be composed of small bits of carbon from car exhaust, road salts thrown into the atmosphere from speeding jacked-up mini-trucks, ash from volcanic eruptions, or dandruff from migrating birds.

So, don't be fooled by those awe inspiring sunsets.

O.A.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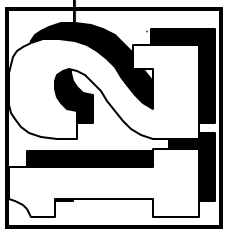
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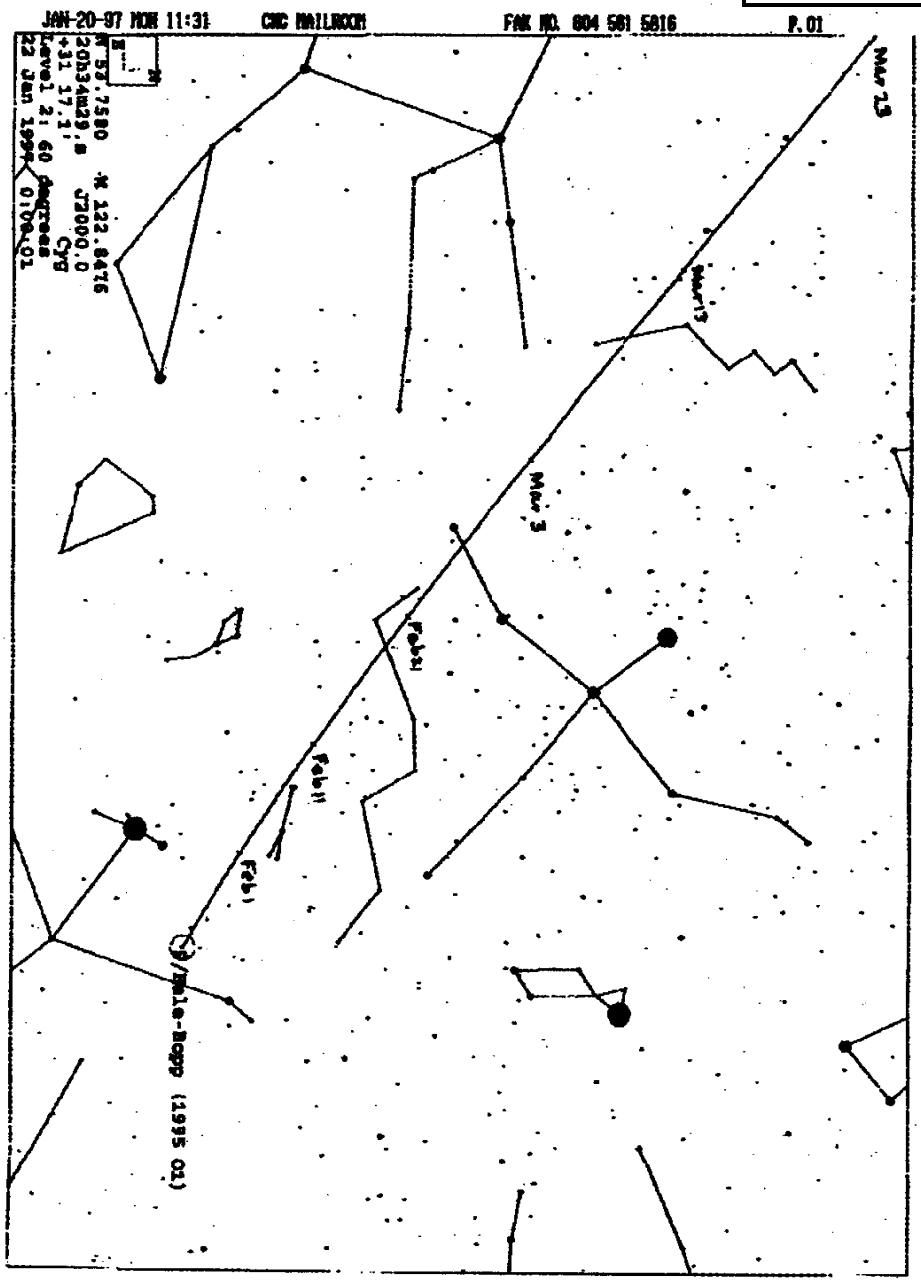
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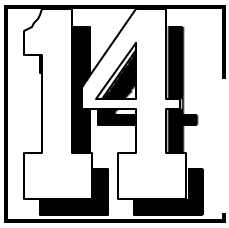

ICE VOLCANOES RESHAPE EUROPA'S CHAOTIC SURFACE

Ice-spewing volcanoes and the grinding and tearing of tectonic plates have reshaped the chaotic surface of Jupiter's frozen moon Europa, images from NASA's Galileo spacecraft reveal

The images, captured when Galileo flew within just 430 miles (692km) of Europa on Dec. 19, were released at a news briefing today at NASA Headquarters, Washington, DC.

Although the images do not show currently active ice volcanoes or geysers, they do reveal flows of material on the surface that probably originated from them, said Galileo imaging team member Dr. Ronald Greeley of Arizona State University, Tempe.

"This is the first time we've seen actual ice flows on any of the moons of Jupiter," said Greeley. "These flows, as well as dark scarring on some of Europa's cracks and ridges, appear to be remnants of ice volcanoes or geysers."

The new images appear to enhance Europa's prospects as one of the places in the Solar System that could have hosted the development of life, said Greeley.

"There are three main criteria to consider when you are looking for the possibility of life outside the Earth -- the presence of water, organic compounds and adequate heat," said Greeley. "Europa obviously has substantial water ice, and organic compounds are known to be prevalent in the Solar System. The big question mark has been how much heat is generated in the interior.

"These new images demonstrate that there was enough heat to drive the flows on the surface. Europa thus has a high potential to meet the criteria for exobiology," Greeley added.

"This doesn't prove that there is an ocean down there under the surface of Europa, but it does demonstrate that it is a scientifically exciting place," said Galileo imaging team member Dr. Robert Sullivan, also of Arizona State University.

The images also reveal a remarkable diversity in the geological age of various regions of Europa's surface. Some areas appear relatively young, with smooth, crater-free terrain, while others contain large craters and numerous pits, suggesting that they are much older.

The icy crust bears the signs of having been disrupted by the motion of tectonic plates. "There appear to be signs of different styles of tectonism," said Greeley. "In many areas we see that the crust was pulled apart in a spreading similar to the processes on the sea floor on Earth. This is different from the tectonic processes at work on, say, Jupiter's moon Ganymede. This suggests that Europa's interior may be different from Ganymede's."

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PGAS CONTRIBUTORS

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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.

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