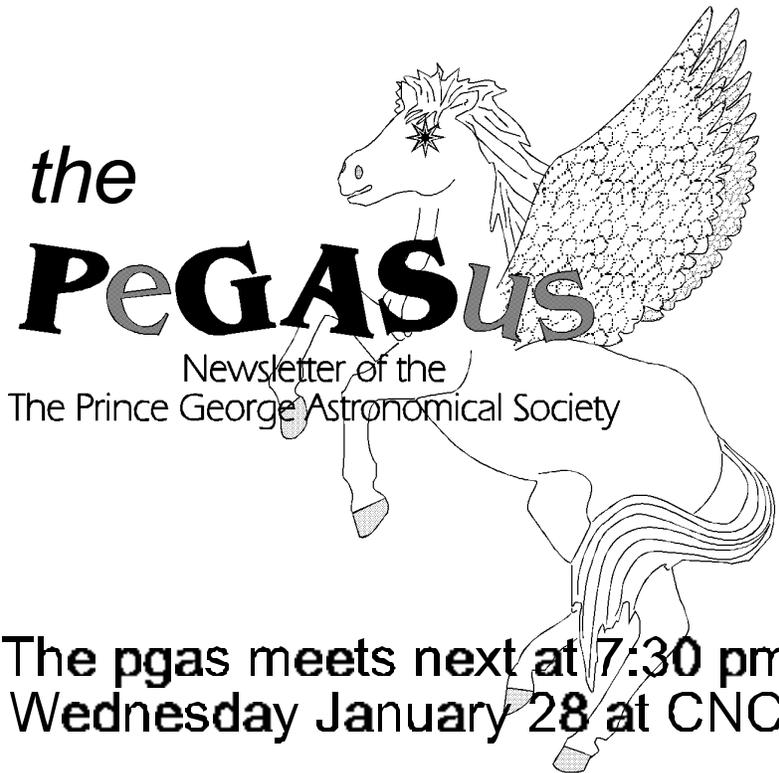


# 1997 DECEMBER ISSUE #80



The pgas meets next at 7:30 pm  
Wednesday January 28 at CNC

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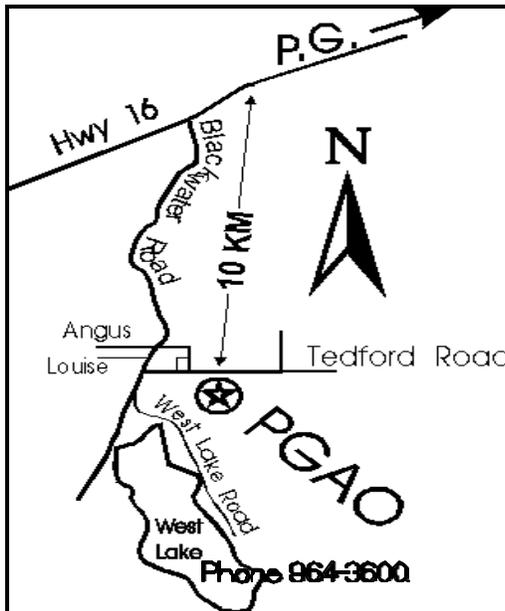
Our pursuits are out of this world.  
Our activities are astronomical.  
Our aim is the sky.

Contributions to the newsletter are  
welcome.

**Deadline for the next issue is**

**Jan 16**

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



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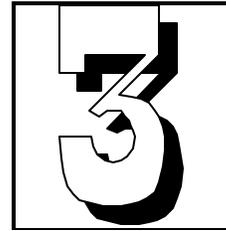
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## EDITORIAL

Some Christmas thoughts from Orla  
December 17, 1997  
Christmas Giving



by Orla Aaquist

I always think of things that need to be done when its almost too late to do them, like buying Christmas presents and sending Christmas cards. Afterwards I feel guilty, for a little while, but eventually I get over it, sigh, and a promise to do better next year.

But, I never do better. I get too caught up in the details of my own life to pay attention to the lives of others. Somehow, my life seems more important than theirs. I don't think that this is bad, but I do think that once a year I should look at life from a broader perspective. Christmas is the designated time of year to do this. But in order to think of others to their satisfaction, it seems that I have to get started early. This year I started getting tense in mid November when Christmas lights and decorations began appearing around town. I knew back then that, despite my resolution last year, this year was not going to be any different. Now, it is the 17th of December. It's too late to send Christmas cards, and almost too late to buy presents. So, I want to talk to you about the cards and the presents.

First the cards. Personally, I like the idea of Christmas cards, but why must they arrive before Christmas? Why can't they arrive after Christmas? Why must there be such a rush to send out Christmas cards? It's very stressful. To alleviate the stress, we send meaningless, pre-printed cards to all our friends, except for the ones who haven't sent one to us for the last two years. (Now there's a Christmas spirit to foster!)

Christmas should not be a time of stress. It should be a time of relaxation, a time to reflect on our lives, the lives of our friends and other fellow human beings. A good time to write Christmas cards is while we are relaxed and reflecting on the meaning of Christmas. At such times we can tell our friends how much we miss them, and really mean it. So, this year, I am going to do just that. I am going to start a tradition of writing my Christmas cards during Christmas when I have the peace of mind to do the task properly. Then, all I have to do after the Christmas holidays is pop them in the mail.

Next, lets consider the presents. Many children have come to believe that Christmas is a time for them to get presents. This attitude is not one that rational people should endorse, yet it is an attitude that has come to pass. It is a terrible attitude, and we, as parents, should be embarrassed that our children think this way. They will carry this attitude into adulthood where they (we) feel guilty when they (we) do not give 'enough' presents, and hurt when they (we) do not receive enough presents.

To me, a gift is NOT something you should expect to get. A gift is something you should want to give. This is the attitude we should foster at Christmas. Of course, most of us know this, but we seem unable to practice it. O.A.



## Coming Events

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

January 28 — General meeting at CNC

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### The Night Sky for January '98

by Bob Nelson, PhD

Happy New Year, everyone! As I write this it is just over a week before Christmas, I have yet to do my Christmas shopping, it's a balmy +8 deg C outside, and grass is showing everywhere. (Only tiny scraps of snow remain here and there, and even that will probably be gone soon.) This, evidently, is El Nino. Will this be a green winter? Will we have a wonderfully mild and clear January for observing? Will the flowers bloom? Only time will tell.

Meanwhile, I have to write about the night sky in January. I have yet to obtain my copy of the 1998 'Observer's Handbook' (my security blanket, and source of much wisdom and knowledge), so I'll just have to depend on my software to predict what will happen. Here goes ...

**MERCURY**, in Sagittarius (until the 15th when it passes into Ophiuchus) is lost in the glare of the Sun for most of January. (It's a thin crescent of diameter 9.9" at magnitude 4.5). According to Redshift 2 (and the Observer's handbook for 1997), Mercury reached inferior conjunction on 1997 December 17th, at 8:00 UT. [Inferior conjunction of a planet means that the planet has the same longitude as the Sun. If the planet's orbital inclination to the ecliptic -- that is, the plane of the Earth's orbit -- were zero, the planet would lie directly between us and the Sun. However, Mercury's orbit is inclined at 7d 00' to the ecliptic, and, on this inferior conjunction, it will pass about 2 deg north of the Sun.] On the 15th of January, it rises at 8:33 and sets at 16:13; the rise time is only 12 minutes before sunrise, so Mercury is way too close to the Sun to observe.

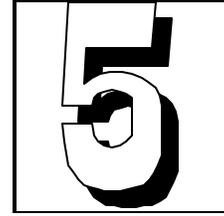
**VENUS** too is lost in the glare of the Sun for most of the month. It reaches inferior conjunction on January 16th (and because of the inclination of Venus' orbit (d 24'), it will pass some 6 deg north of the Sun). It's a crescent of diameter 43.8" and magnitude -4.7.

**MARS**, in Sagittarius (until the 16th when it passes into Capricornus), is low in the southwest at sunset and sets about two hours later. It's a 4.5" disk at magnitude 1.2.

**JUPITER**, in Capricornus (until the 23rd when it passes into Aquarius), is low in the southeast at sunset and sets around 8 P.M. It's a 35.6" disk at magnitude -2.1. It rises at 11:28 and sets at 20:32, local time.

**SATURN**, in Pisces, is in the south at sunset and sets at midnight. It's a 18.4" disk at magnitude 0.1; it rises at 13:07 and sets at 1:49. It's a fine object, and worthy of study.

Right now, Saturn's rings are inclined some 10 degrees to our line of sight and we see the southern side, which is also the illuminated side. Over the next few years, the rings will open up until they reach maximum inclination (of 27 deg) on 2001 Dec 4. Thereafter, the rings will get closer and closer until (owing to the complexities of the orbits of the Earth and Saturn), they reach a minimum inclination near 1 deg on 2008 Dec 25, increase to



nearly 10 deg on 2009 May 14, then decrease to zero on 2009 Sept 1. (Thereafter, we will see the other side -- the northern side. There is another minimum near 2010 May 25.) The cycle follows Saturn's sidereal period (29.457 years) but is complicated, as we said, by the Earth's orbital motion. Depending on viewing conditions, and their distance from the planet and its glare, we are, at any time, likely to see up to seven moons (the others are quite a bit fainter).

The first three moons transit (pass in front of) and are occulted by (disappear behind) Saturn in January at various times; Dione at the beginning of the month does the same, but towards the end, it misses Saturn entirely. All the moons except Titan are likely too small to cast a shadow on the planet that we can see from Earth or to let us see a disk in transit. Titan is, of course, a very large moon (larger than our own moon), the second largest in the Solar System (the largest is Ganymede). Both are larger than Mercury, but, like most of the moons in the outer Solar System (and unlike Mercury), they are both icy worlds having only perhaps a small rocky core. Titan is also unique in that it has an atmosphere of almost pure nitrogen at twice the pressure of our own atmosphere. Titan is also (like Venus) perpetually hidden in cloud. Because of its distance from Saturn and because Titan's orbit lies in the plane of Saturn's rings, Titan cannot transit Saturn until the rings are near zero inclination. This will not happen until after 2008 Oct 12. Let's hope that we are all around to see this phenomenon!

**URANUS**, in Capricornus, is lost in the glare of the Sun. It reaches conjunction on the 28th. It's a 3.4" disk at magnitude 5.9. It rises at 10:58 and sets at 19:18.

**NEPTUNE**, in Sagittarius, is a 2.3" disk at magnitude 8.0. It rises at 10:27 and sets at 18:35 and therefore is hard to observe..

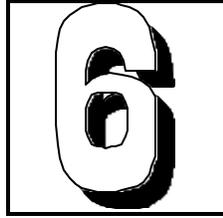
**PLUTO**, in Sagittarius (until the 21st, when it passes into Capricornus), is a 0.1" disk at magnitude 13.9. It rises at 5:59 and sets at 16:09.

So there you have it -- the only planet worth looking at these days is Saturn. Soon there will be no planets suitably located for observation (that's what we have pay for last month's super conjunction of most of the planets).

**CONSTELLATIONS** to look for in January are Eridanus (a sparse constellation just south of the celestial equator with no Messier objects but, according to my copy of Norton's 2000.0 Atlas, a handful of NGC objects), Orion (mentioned last month with all its splendors), Lepus (which has M79, a magnitude 8.4 globular cluster), Monoceros (which straddles the Milky Way and contains M50, a fine open cluster), and, further south, Canis Major and northern Puppis (both of which straddle the Milky Way; the latter contains M47 and M93 which are both open clusters).

**I have no news of other events, but maybe we should keep our eyes peeled -- our public will expect us to produce a comet again this March!**

B.N.



## Life in the Universe Part 11

Steve Senger

(Continued From Nov. PGAS article Life in the Universe)

In episode one we last left our readers pondering the equation:  $N = R_s N_p F_p F_b F_i F_c L_c$ . To do a program like SETI (search for Extra Terrestrial Intelligence), it would be good to estimate the number of alien civilizations in the Milky Way that have communication technology. (other galaxies are too far away for even one way conversations,... I think??). I've come to the conclusion that it is absolutely impossible to give an Estimate. Too many unknowns ! Frank Drake and astronomer at the University of California created a formula to attempt this estimate. Depending on which author you read you can get any number you like , from 100 % done to 0 % . There is nothing wrong with the equation itself. The problem lies in that some of the factors you plug into the equation are variables. Perhaps sometime in the future there will be more facts known and fewer variables. Anyhow, I will give my interpretation of the Drakes Equation.

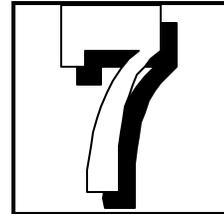
I will quote from one author who will give an optimistic view of the equations factors , then I will give mine. N stands for # of current communicative civilisations in our present Galaxy.  $R_s$  stands for the Rate of new stars forming per year in our galaxy. This notable author gives a rate of 10 new stars created per year. I will have to concur (because I have no idea how this was calculated, nor am I qualified ).. So lets say  $R_s=10$

$F_p$  : The number of stars that will form planets. The author gives a value of 1 (100%). However he did not state what kind of stars were been formed. A star like are sun is a G class star, we have O B A F G K M N S ( Oh Be a Fine Girl and Kiss Me Now .....Smack .....ouch). The O & B Stars may have fewer or no planets forming , because during its creation it hogs all the gas and dust for its self ( i.e. No protoplanetary disk formed at its solar nebula stage). The other problem is, that about 2/3rds of the stars we observe are at least binary system ( 2 or more stars dancing around each other) this would create a very unstable environment for any planet that was formed to hang out. Perturbations may kick them out of the pool, or give them highly elliptical orbits. But there is overwhelming evidence rest of the stars in there fetal stage started to form planets. So I will give this value ( as I reach into the hat ).....  $F_p = .3$  (30%).

$N_p$  : average # of planets in a solar system that are suitable for life. The author gives a factor of 1 (100%). The O and B class Stars are much too large, their mass dictates that they must burn their hydrogen at a furious rate compared to our Sun . Their life span is in the millions of years, not billions. So they jump off the main sequence before any life has had a chance to evolve, assuming they have planets to begin with. Other star systems would also have to be 2nd or 3rd generation stars in order to have heavier elements to form life as we know it. Come to think of it, a lot of red dwarfs are very very old and

would probably have only H<sub>2</sub> and He gas formed planets. Also any terrestrial planets orbiting Red Dwarfs would have to be so close to feel the heat that tidal forces would eventually cause only one side of the planet to face the star. So I will be give a factor of .5.  $N_p=.5$

$F_b$  : is the fraction of suitable planets for life that LIFE actually occurs on. Most biologists believe given enough time, life will evolve.



The Author also agrees and gives a value of 1 (100%). This I feel is the most controversial factor in the whole formula, so I will talk later in greater detail on this subject.  $F_b=1$  (100%)

$F_i$  : is the fraction of planets with life that evolve to intelligence. Most biologists also believe given enough time and natural selection that this could occur, because of the time involved (our Earth 4.5 billion years), plus the fact that we are the only species on Earth to have evolved into so called intelligence. The author gave a value of .01 (1%). I think 1 out of 100 is a fair estimate. So  $F_i=.01$

$F_c$  is that fraction of intelligent beings that can and want to build wireless phone sets. Again given enough time I think they probably would. The question then is would they have a curiosity to build powerful transmitter for interstellar transmissions. I'm in a forgiving mood tonight and will again concur with the author of 1 out of 10.  $F_c=.1$  (10%)

$L_c$  is the average lifetime of those critters. The author feels that this is the most uncertain factor and decided to leave it open to any value in order to get a optimistic or pessimistic answer to the question: Are we alone? Some people feel that once an alien civilisation reached communication capabilities it would destroy itself within 100 years. (that  $E=mc^2$  fission-fusion stuff). On the other hand if one could survive the childish stage (like a kid playing with a loaded gun), then a civilisation could live millions or even billions of years. So lets plug the other estimates in and see what we get.

$N=(10)(.3)(.5)(.01)(.1)(?)$   $N=.0015$  (?) if  $L_c=100$  years then  $N=.15$  and we are alone in are galaxy. Perhaps every 200 years or so 1 to 2 civilisations that can communicate will come along. Unfortunately the odds that these star systems are close enough to us for communication would be very low.

If  $L_c=5$  billion years then  $N=.0015(5.0 \times 10^9)$   $N=7.5$  million that would mean a galaxy peppered with intelligent life, with an average perhaps of 1 star every 80pc away that can communicate (1 way conversation). The author gave a value of 20 million stars or 1 every 30pc away.

What if we just asked the question. Is there any kind of life in the Galaxy presently? Now we can get rid of  $F_i$ , and  $F_c$  Giving us  $Life=(10)(.3)(.5)(1)(5 \text{ billion})=7.5$  billion stars with Life! How about we forget about  $R_s$  rate of star formation, and just ask how many stars that we see now in the galaxy had life at one time? Okay how many stars are there in our Galaxy? I believe since the Hubble telescope the number has been increased to 300 Billion. Since a lot of those stars are poor candidates, I will keep the other values and create the formula Milky Way Life =  $F_p N_p F_b (300 \text{ Billion})= 45$  billion stars that suggest for every 7 stars out there, life occurred at some time. " Boy, its fun playing with numbers. "

(cont on page 12)

## PeGASus Photo of the Year

One of the nice things about editing the PeGASus is that once a year I get to pick the astronomical picture of the year. Last years photo was the Hubble deep sky image showing the richness of galaxies in a “blank” piece of sky. This years photo is certainly on a par with Hubble’s memorable image if not as widely published. The photo of our observatory with Hale-Bopp in the sky above was taken last March by Steve Senger, for more details on the photo please see Steve . Congratulations Steve G.S.



## On Flying Saucers and Science

by Bob Nelson, Ph.D.

Recorded human thought goes back around five thousand years. Of the portion that I am most familiar -- mathematics, astronomy and physics -- relevant thought goes back around 2500 years to the early Greeks with their geometry and astronomy. Every year or so, I teach an introductory astronomy course, and I am always fascinated by the story about how humankind progressed from the early animistic views of the universe, to the clumsy and complicated Earth-centred model of the Solar System (Ptolemy, circa 140 AD), to the startling new idea of Copernicus (circa 1543) that put the Sun correctly at the centre, to the observations of Galileo (1604-38), to the fundamentally new physics of Newton, to the increasingly precise observations and orbital calculations of the last century, and to the modern spacecraft that have explored the Solar System in the last 35 years.

In spite of the fact that science has been extraordinarily successful in explaining our world and giving rise to modern technology, it is amazing how poorly science is understood by the average person. Science is not just a body of knowledge, it is a reasoning process (originally enunciated by Descartes and Bacon in 1605-23) that seeks, in an unbiased way,

cont on page 10





to find truth. Galileo had to battle superstition and lack of reason, and it is disconcerting that we have to fight many of the same battles today. For example, in Arkansas and Louisiana in the early 1980s, laws were passed -- on the basis of "fairness" -- requiring educators to teach a so-called alternate theory to evolution, that of "creationism" which asserts that the Bible is literally true, that the biblical succession of

'begats' can be treated

as fact, and, counting back, one can deduce that God created the world in around 3000 B.C. This is, of course, ridiculous; that course of events is easily refutable by the evidence of continental drift (South America once lay alongside Africa), radioactive dating of rocks, stellar evolution theory, and so on. Of course, one could always argue that God created the universe in such a way as to make it seem as old as science says it is; however, it's less likely. In a nutshell, to believe creationism is to abandon human reason in favour of blind faith. Why couldn't one, for example, be even more extreme and assert that all of our memory is just an illusion, and that all of us were created last week? Clearly most people would not deviate from logic that far, but why deviate at all? [One must, in all fairness, report that most of the traditional churches do not believe in creationism; they agree that science and religion do not conflict and that their regions of validity do not overlap. Also, in the 1980s, the U.S. Supreme Court ruled that laws supporting creationism were unconstitutional, largely ending this particular problem.]

Other examples of lack of reason are the widespread beliefs in astrology, witchcraft, palmistry, mystic advisors, water diviners, and superstition of all sorts that pervade our modern society. Lack of knowledge of science and the reasoning process seem to be endemic in our society.

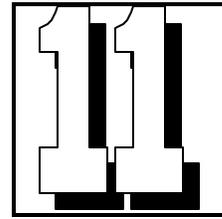
What brings me to write on this topic, you ask? Well, an acquaintance of mine phoned me up a while ago with what she thought was striking 'evidence' of a flying saucer that she and a friend had seen recently. This object reportedly moved at high speed across the sky and what is more, they had photographs -- would I like to see them? Busy at the time, I said, "well, maybe the next time we meet". Well, I saw her at a

Christmas party and, sure enough, she had the photographs with her. I looked at them and, quite frankly, the object looked to me exactly like a frisbee (the image quality was not the greatest -- it never is with UFOs). I said something to that effect and was met with great indignation. "It was very real, I saw it, and so did several others. If it wasn't a flying saucer, what was it?", she asked. Having some knowledge of science, I was expected to come up with an alternate explanation, and if I couldn't, I must accept this wild theory. Well, I said, "I don't know what it is, but I don't have to prove anything; the burden of proof lies with you who are proposing this new theory". I was accused of having a closed mind and dismissed angrily.

This event troubled me somewhat, in light of all that I said in the opening paragraphs. A famous scientist (not Carl Sagan -- I can't remember who) said recently that if he told his friends that he was a concert pianist, that he would immediately have to prove it by playing something appropriate (and quite rightly so).

However, many people are quite ready to believe, on the flimsiest evidence, a theory that is millions of times less likely.

The theory of aliens visiting us in flying saucers has been around since 1947 when the remains of Japanese wartime balloon-borne weapons were discovered in California. Since then, reports of UFO sightings have 'ballooned' (if you'll pardon the expression). (The vast majority of reports can be explained away, but a few remain unexplained.) But yet, visits from aliens are so unlikely on the basis of all we know from science (the same



science, as previously noted, that has been so successful in explaining our world). As all who have any knowledge of elementary astronomy know, there are enormous distances out there, hardly comprehensible to the human mind. Further, at the present time we believe, from a vast amount of evidence, that the absolute speed limit of anything in the universe (that has mass) is the speed of light -- some 300,000 km/s (and that limiting value would require take an infinite amount of energy). Now the distance to the closest star (other than our own) is Proxima Centauri, at 4.2 light years distant. If alien beings were able to accelerate a spacecraft the size of the International Space Station (mass 456,000 kg) to one tenth the speed of light, it would (on the basis of current knowledge) take the world's total hydroelectric energy output (the only figure I was able to find) for 30 years (and then, energy would have to be found to de-accelerate the same spacecraft at the end of its journey). Even then, it would take the hypothetical spacecraft 42 years to reach us from Proxima Centauri. Theoretically possible but extremely unlikely.

Now the radio spectrum of radiation that we receive from Proxima Centauri (and many other nearby stars) has been searched diligently for signs of intelligent life; none has been found. What about stars further out, you say? Well, maybe; however, it would take proportionately longer for such hypothetical beings to reach us. Beings from another galaxy would have to take tens of millions of years to reach Earth. What about some unknown form of transport, some kind of "warp drive" -- well there is utterly no evidence for such a thing. "Worm holes"? -- Same thing.

Now the careful reader will notice that I have not said that flying saucers do not exist or are categorically impossible. For all I know, maybe they really do exist. What I have said is that there is no substantial evidence that they exist and that, on the basis of current knowledge, it's extremely \*unlikely\*. What people choose to believe is their own business. However, if provoked, I assert that I choose the cautious approach (consistent with the best scientific tradition) and believe only what I am compelled to believe on the basis of overwhelming evidence. (All of us have our private 'hunches', but they are not at the same level as a strongly- held conviction.) Again, I say, the burden of proof is on the proposer of a new theory. The more improbable the theory, the stronger the evidence required. I would suggest that it is not I that has the closed mind, it is possibly my friend at the Christmas party. To believe fervently something that is extremely unlikely on the basis of very flimsy evidence is not logical. Way, way more evidence is required, at least to this writer.

The methods of science will take us far -- we just have to learn to follow them. If I can find the time, I'll write more about the scientific method next month. B.N.

cont from page 7



ENTROPY! Getting back to Fb. The fraction of planets suitable for life, where life actually arises. We do not have any experimental evidence to prove it can happen. Scientists in the Lab have been able to create Amino Acids, and some proteins ( Amino Acids are the building block of proteins). Of course it can be argued that we have only been doing the experiment in a few laboratories for the last few decades. Perhaps a vast ocean covering the entire planet containing

trillions

upon trillions of amino acids and proteins, could, given enough time, produce complex molecules. Some of these might in turn form a simple organism. An organism that could metabolize, survive, and even replicates itself. Most biologists believe this is how it happened here on Earth. Most would agree that given similar conditions on other planet, life would just happen.

This is where I think Physics and Biology CLASH. We have fossil evidence that indicates simpler organisms are found the further we go back in time. In fact right down to some simple single cell bacteria and earlier forms of virus that did not require a host. This is done by radio dating them to confirm. This surely suggests the above hypothesis. But if we look at Physics we have the 2nd law of thermodynamics that states : Heat flows spontaneously from a hotter to a colder object but not vice versa, unless external forces act upon it. Therefore if a system is allowed to undergo spontaneous change its disorder will increase. This describes its ENTROPY. The 2nd law of thermodynamics can then be restated as : If an Isolated system undergoes change it will change in such away that its entropy will increase, or at best remain constant. Entropy is therefore a measure of disorder. Usually the end product of this disorder is released as energy in the wavelength of heat (part of the infrared spectrum). So if you are walking, talking, scrambling an egg, or even dreaming, you just increased the disorder of the universe in the form of HEAT.

Experiment after experiment has shown this. An example would be if you drop an egg to the floor, its entropy has increased SPLAT. Now you can toss that egg back into the air till the cows come home, it is not going to reassemble. In fact each time you throw it in the air it becomes more disordered. The same goes if you threw a pile of tools at a car. It is not going to change your spark plugs even if you throw it with the same energy required to do several changes. Both above comments are common sense. But the point being made is, that unless intelligent energy is applied against this randomness, the car will be less fuel-efficient and as for the egg? Well I don't think we've reached the technology yet to help the egg, especially if a Rooster was involved. You would think then that the 2nd law of thermodynamics is being broken by living organism. Cells are metabolizing glucose to produce ATP, other complex molecules are being produced. The cells are even going through mitotic division and replicating themselves. Have they broken the 2nd law? No, your NET Entropy has increased. Whether your cells have divided, or Joe has fixed his car, or even a thought crossing your mind (complex synaptic transmission), you have produced more HEAT as a by-product than all the other organised products produced. Thus once again you have increased the chaos of the universe. This will eventually lead to the heat death of the universe but that's another topic. This reminds me of the problem of Black holes ! For quite awhile physicists were quite concerned that

Black Holes were breaking the law. Here they were taking in anything they could grab and concentrating it to a single point with no heat being emitted. In fact they even have the audacity to take in photons from other entropic sources. A student at Princeton suggested, that since the area of Black Holes event horizon increases as matter falls into it, the event horizon is its Entropy. The problem is it still violated the 2nd law. The Black Hole must also emit radiation. This leads to Hawkings famous " Hawking Radiation", being emitted from the Black Hole, but that's another story.



So where were we? Oh yes why do the random motions of simple amino acids, proteins, and complex molecules, create highly organised living cells . I have heard the argument that " Given enough time a room full of monkeys banging on typewriters, one monkey could accidentally type a page of Shakespearean Poetry". The key word is given enough "TIME". Are we talking about Infinity? Simple life appears to have formed shortly after the Earth cooled, so possibly a billion years or less. And if something did form, why did it not follow the law of entropy and fly apart immediately after. No, it decided to maintain itself. Then it even had the audacity to replicate its DNA and divide. This should not happen! BUT it did happen, it happened right here on Earth. This suggests an outside force could have been involved. What other conclusion can I come to! Things left on their own become more and more disordered. Was an intelligent designer involved? Or is life on Earth an incredible fluke? If so are we alone in our Galaxy, the Universe? The very fact that I'm sitting here typing this article drives home the fact that whatever the cause, IT DID HAPPEN! In fact it happens deep in the ocean where inhospitable lava flows are occupied by sulphur eating bacteria. It may have even happened on Mars a long time ago when it had some liquid water. (ALH84001 Martian meteorite)

So with little proof , some logic, lots of emotion , I'll will give Fb: the fraction of planets suitable for life where life has actually occurred? A value of 1 (100%). And if there is a force involved it's probably the same force that causes people in a Grocery Store to aggregate at the check out counter at the "SAME TIME!" What's life without humour!

STEVE SENGER

( wow -I think Steve will likely be the next Dr. in our club, one thing I know he won't have any trouble with---writing a thesis.... G.S.

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## **Membership is due as of SEPTEMBER**

please mail to our treasurer Steve Senger @

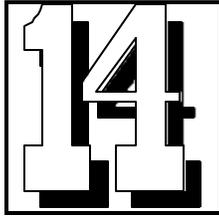
7161 Hartford Cres,

V2N 2W3

PH# 964-1202

Or bring to the next meeting on January 28

Thank-you



**Hello !** to all members of the PGAS. Allow me to introduce myself. I am your newly appointed Member At Large, Owen Salava. Along with this position I am also taking over the position of Building Director from Rob. I have met many of you, be it at monthly meetings or at the open house for Hale-Bopp this past spring. As a result, I know many only by their darkened silhouette. With luck, this will change with time.

As I sit at my desk this cool December evening, with Orion shining brightly overhead, I can't help but think of all the time that I've spent in ignorance of the sky above. While many of you have no doubt had an interest in astronomy for quite some time, others such as myself are still new to the science and the hobby of backyard astronomy.

For me, the only stellar objects that I could identify were Polaris, the Big Dipper, Orion and Cassiopeia. For a long time, a moon-lit night was a welcome sight, as it meant that the night was not so dark. It's funny how drastically one's opinion can change with new knowledge! This past spring, I was driving back to Prince George from Victoria. It was dark long before I got home. As I prefer to make this drive at night, this was not a problem. As I was cruising northward through the rolling terrain of the Caribou north of Williams Lake, I pulled off to the side of the highway on impulse and shut off the car. With no moon, no city lights, no farms, no vehicles, no nearby light at all, the view overhead was incredible. I was completely blown away by the beauty and the majesty of our galaxy spread out across the sky above me. The view was marred by a cloud bank approaching from the south, but it was enough to spark me off head-long into astronomy.

I went to my most convenient resource to learn more, the internet. What a wealth of information there is to be found there! Imagine my surprise to discover, via the Sky & Telescope site, that there was both a society here in Prince George, and a large telescope and observatory as well. I felt like I had been handed a gift.

The birth of my interest, and ultimately, my love for astronomy couldn't have come at a better time. I will always remember it for the great markers that have occurred since my newfound interest: a brilliant comet in Hale-Bopp, a partial lunar eclipse, the Mars Pathfinder landing, the launch of the Cassini spacecraft to Saturn.

We are presently in a great period for astronomy. With Hubble, we are coming across new and amazing discoveries on an almost regular basis. We've sent probes to Mars, Jupiter, and now Saturn that together are vastly increasing human knowledge about our solar system. For armchair viewing, television has produced a wealth of quality shows such as Steven Hawking's Universe, Cosmic Highway, Solar Empire and others that give a great deal of easily comprehended information. The listing of exciting things in astronomy right now could fill this publication just listing recent discoveries and revelations about our solar system, our galaxy, and our universe.

In summary, the meaning of all this? Firstly, you have a new executive member who is highly enthused about astronomy. Secondly, you as local people interested in astronomy have a great opportunity to help this society.

In the coming year, there are a great number of things to be done around the observatory to both improve it for the use of the members and to present a great face to the community. Donations of time and materials in the coming year will be highly appreciated as we work as a society to improve the capabilities of the equipment, and increase the comfort and usability of the building overall.

I wish you all a joyous holiday season, clear skies and warm nights! See you in the new year.

Owen Salava

P.S. If anyone has cruise tickets to the southern Caribbean to include February 26, donations are welcome ;-)

## **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.

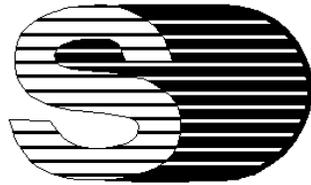


Ministry of Adv. Ed. Training and Tech.	\$25,000
BC Science Council	16,000
BC Lotteries	3,900
Helmar Kotsch (Acme Mas.)	1,932
Northwood Pulp and Timber	1,665
Electrical Services Ltd.	1,583
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Art Beaumont	

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.*

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