
HAMILTON AMATEUR ASTRONOMERS

❖ Event Horizon ❖

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Editorial

I admit it. I recently committed what might be considered blasphemy in the astronomical community; I deliberately went out looking for light pollution, what's more is that I enjoyed it. This past month I had the opportunity to fly over Hamilton and Toronto at night in a Cessna, thanks to an aspiring commercial pilot friend.

I found the change in perspective to be most unusual. For the first time I was "ohing" and "ahhing" while starrng down at distant lights. This time, however, the lights were only a few thousand feet away and their sources were manmade. It was the most stunning display of wasted energy I have ever seen. For the first time I enjoyed the fact that streetlights are visible from directly above. I will have to thank the designer who was thoughtful enough to ensure that each and every street lamp would cast over 20% of its light skyward.

This experience, however, made something very clear; apart from Lake Ontario, most of Southern Ontario is criss crossed with lights. From 3000 feet the distinction between Burlington, Oakville, Mississauga and Toronto is lost in an endless band of glow which wraps around the end of the lake.

Toronto is so bright that in order to make the airport more visible, it is kept dimly lit. Toronto International airport stands out as a dark island in a sea of orange light. This underscores the plight of the amateur astronomer, who, in his attempt to escape the obscuring glow of city lights, must travel away from home. The problem of residents in our area is that there is nowhere to go; we are surrounded by the lights of cities and towns.



While it was enjoyable to see the city from above, I am a "prisoner of gravity" and must spend most the time looking up, past the glow of the lights. Bound to the earth now, it frustrates me to think that streetlights are visible from above. Maybe I am wrong, but I thought that streetlights were meant to illuminate the area under them, not over.

Lately I have heard a lot of talk about what new articles can go into Event Horizon. I don't want to sound like a nag, but talk is cheap. It is time to convert ideas into action. Everyone that had an idea should put pen to paper, or fingers to keyboard and get writing or drawing.

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*Some cause happiness
wherever they go, others
whenever they go.*
-Anonymous

Chair's Report

It has been a month for hardy observers, with plenty of clear sky, but very chilly temperatures. It was enough to freeze your clock drive off! However, spring is only a month away now and we should get a thaw any day now.

Thanks to our January speaker, Dr. Ralph Pudritz, for giving an outstanding talk on star formation. The knowledge base of our membership really was apparent in the quality of the questions. It was also our first talk in our new digs, the Hamilton Spectator auditorium, and this room is clearly well suited to the nature of our meetings.

We had a great time on our McLaughlin Planetarium excursion where we saw "The Great Dinosaur Caper". There was an excellent showing of members and their families. I apologize to anybody who couldn't hear the show above my son's laughter? Afterwards, we had a chance to talk with the planetarium operator and trade notes on operating star projectors.

Speaking of planetaria, this has been a very busy time for our public education folk. We have given over thirty shows

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since mid-November. Thanks, as always, to Grant who does such a great job of spreading the enjoyment of astronomy and organizing the shows.

Paging through an AAVSO publication recently, I couldn't help but notice that Ann Tekatch had racked up 83 variable star estimates during the reporting period. Ann is always willing to share her experience with anyone interested in learning more about variable star observing

We had a very successful display at the Valens Conservation Area Beach Party. Some 500 people were there and many took the opportunity to look through our scopes. Patricia Marsh unveiled our new HAA banner with gold lettering on black cloth. Now all we need is a parade!

The next month promises to be an exciting one. Please continue to forward your ideas for club activities and observing!

Doug Welch

Orion, Hunter of the Stars

In glancing through a copy of "Burnham's Celestial Handbook" I noticed interesting passages with regard to the Orion constellation. Here are a few examples:

According to Thomas Hyde in the 17th century, a very popular Arabian name for Orion was "Al Jabbar". Another version of this name appears in this poem by Longfellow called: "Occultation of Orion"

*"Begirt with many a blazing star,
Stood the great giant Algebar,
Orion, hunter of the beast!
His sword hung gleaming by his side,
and on his arm, the lion's hide
Scattered across the midnight air
The golden radiance of its hair..."*

Another poem famous for describing Orion and also for its "exquisite" tributes to the Pleiades is Locksley Hall by Tennyson:

*"Many a night from yonder ivied
Casement, ere I went to rest,
Did I look on great Orion, sloping
slowly to the west.
Many a night I saw the Pleiades
rising thro' the mellow shade.
Glitter like a swarm of fireflies
tangled in a silver braid."*

In describing the great nebula in Orion, C.E. Barns writes a passage as follows:

"For who would acquire a knowledge of the heavens, let him give up his days and nights to the marvels of Orion. Here may be found every conceivable variation of celestial phenomena: stars, giants and dwarfs; variables, doubles.. triples.. multiples; binaries visual and spectroscopic; clusters wide and condensed; mysterious rayless rifts and nebulae in boundless variety, with the supreme wonder of all supernal wonders at its heart - the Great Nebula - before which the learned and the laymen alike have stood silent in awe and reverence since the first lens unfolded to man's gaze its true vastness and intricacy; and which offers abundant field for all the geniuses of science, with their super-refinements of means and methods, for generations to come.. ."

Burnham writes: 'In describing one of the first successful photographs of the Orion Nebula, made by Henry Draper in 1881, R.A. Proctor found it difficult to find the words to express "the thought that seemed so impressive, so thrilling, as to surpass even the feeling of awe with which in the solemn darkness of night we see some mighty group of suns sweep into the field of view of the telescope... that here on this tiny square inch of shoreline, with its thin film of chemical sands, had been received the impress of waves which for years had been traversing the solemn depths of space... Here we have mirrored by Nature herself 'that mar-

*velous round of
milky light below Orion'... ''*

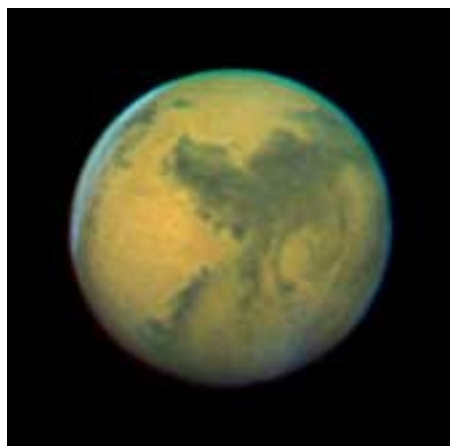
Submitted by Patricia Marsh

The Cosmology Corner

Thank you to all those that made Discussion Group's first meeting a success. We agreed on a free-for-all meeting format (!?), meeting every two months and selecting the next topic at the end of each meeting. Our next topic is "Magnetic Fields". The next meeting will be 8:00 p. m., Saturday, March 26, 1994 at the Burke Science Building, room B149 (Planetarium) at McMaster University.

Talking about "Magnetic Fields", anything that is charged and spins has a magnetic field. This is used in an analytical technique called magnetic resonance. You may have heard of MRI or magnetic resonance imaging, now used in many hospitals, that can make images of the inside of your body. The question I have is, if magnetic resonance works with the proton and the electron, why hasn't it been used for quarks which also spin and have charge?

Bill Tekatch 575-5433



Mars (care of HST)

Greek in the Round

This month I'll concentrate on one of the most endearing stories of mythology. It is also a long one, so I'm going to break it into two parts. The story of Perseus involves many other sky characters. Andromeda, Cassiopeia and Medusa just to name a few. We open this month with Perseus. So sit back, relax and enjoy.

Acrisius, the King of Argos, asked an oracle if he would ever have a son to become his heir. The oracle said NO, but foretold far worse: his daughter Danae, would bear a son who would grow up to kill him. Acrisius did not dare destroy his daughter for fear of the Gods punishment. So, he ordered that Danae be imprisoned in an underground chamber of brass with only small openings in its roof. No lover could attain her there, he thought. Mighty Zeus, king of the Gods, came to the lonely prisoner in a shower of gold, so that she conceived by him and bore in time a son named Perseus. When Acrisius discovered the secret child, he wanted to send them to a certain doom without actually taking a sword to them and he finally decided to place Danae and baby Perseus in a large chest, bound it shut, and threw it into the sea.

Andrew Lang's version of the famous passage of Danae's words to Perseus reads in part:

*"In the starless night and drear
You can sleep and never hear
Billows breaking, and the cry
Of the night-wind wandering by.
In soft purple mantle sleeping
With your little face on mine,
Hearing not your mother weeping
And the breaking of the brine."*

They drifted for at least one hundred miles when through fate or whether the will of Zeus favoured them, they washed up on shore where they were found and freed by the fisherman Dictys. This good man and his wife were child-

less and they adopted Danae and her baby, taking them into their home and hearts. Perseus grew up and all was peaceful for many years.

At last trouble came, when Dictys' brother King Polydectes, (very unlike his brother) developed a lust for Danae, yet was afraid to try forcing her into marriage as long as the now full grown and strong Perseus was around. He devised a plan to marry someone else and therefore presents were required. He knew Perseus had no fitting gift and that he was very proud, and so tricked the young man by daring him to brave peril in order to bring him a special gift. The gift the king wanted was the head of the Medusa. Perseus agreed hastily and was forced to carry out his agreement or leave his mother and hide in shame.

The Medusa was one of three Gorgon sisters. They each had snakes in place of hair and their faces were so dreadful, so full of hatred, that one look at any of the three would instantly turn a person or creature into stone. Of the three, Medusa alone was mortal. She had once been a priestess of Athena and lovely to behold, but either her boasts of beauty or her affair with Poseidon angered Athena, who punished her by changing her into a hideous sight.

The gods took pity on Perseus, counselled him and gave him wondrous devices so he might have a chance. He was given a shield from Athena, Hermes loaned him his winged shoes, and they told him where he could obtain other devices. He had to travel to the most distant of all lands, Hyperborea. To get there, he must first learn the way from the "Three Graiae" (Three Grey Ones), who would not tell him willingly because they were related to the Gorgon Sisters. The Graiae were almost as old as time itself with the bodies and wings of swans but with arms under their wings. They shared one eye and one tooth between them. Perseus hid from them until they passed the eye, than swept in and took it. He did not return it until they told him the way to Hyperborea.

He set out in haste and upon his eventual arrival he was greeted warmly and was given the Sword of Sharpness, which could cut through Medusa's scales; the Cap of Darkness, that turned its wearer invisible; and a magic wallet that changed size to enclose any object. Once he gathered everything needed to battle the Gorgon he set out in search of the monster.

He wore the Cap of Darkness and used his shield for a reflection of the Gorgons (only a direct view would petrify). When he found them he was in luck as they seemed asleep and he summoned up all his courage and swept down. Still using his shield, he swung one mighty stroke with the magic Sword and cut off the Medusa's head. From the dripping blood sprang up two wonders: the warrior Chrysaor and the winged horse Pegasus, both of whom Medusa had conceived before her transformation; she had been unable to bear them because of her punishment. The immortal sisters were now awake and Perseus thought he was doomed. But the power of the winged shoes and the Cap of Darkness kept him safe and he carried off the Medusa's head in the magic wallet.

Meanwhile...

Sorry! Can't tell you everything this month... Look forward to the rest of Perseus' adventures in the next Event Horizon.

"Wish Upon a Star"
Ev Butterworth

If the Lord Almighty had consulted me before embarking on the Creation, I would have recommended something simpler.

*Alfonso X of Castile
(medieval patron of astronomy)*

Upward Skybound

The month of Valentines, love and stars! The winter skies always are a delight because there are so many bright stars.

Cold nights mean less air turbulence and sparkly stars. There is also a multitude of winter objects to enjoy, so do so! Beginners can look for M42 in Orion and M35 in Gemini. Algol (representing Medusa), the variable star in Perseus is still placed well for observing. Check this month's Greek In The Round for the story behind this star. In older times it was also referred to as the "Demon Star" or the "Trickster". Every 2.9 days for a period of 10 hours, it will fade by 70%, and brighten again. Your Observer's Handbook will give you the times of Algol's minimum in the Month-by-Month section. Watch for the elusive Zodiacal Lights this month. February and March are the best months for this. It is a faintly glowing pyramid rising from the horizon to approx. 45° high. You'll need a clear horizon and dark skies to see this phenomenon. Comet Shoemaker-Levy 9 is only about 30' southwest of Jupiter in Libra and is shining at a faint magnitude of 14. If you can, keep tabs on it. Five months and counting until the big Crash.

Mercury - is visible for the first 10 days of the month. It will be a favourable apparition for northern latitudes. Low in the southwest, just after sunset.

Venus & Mars - will not be visible until the end of the month and both will be difficult to see, Venus in the southwestern and Mars in the southeastern sides.

Jupiter - in Libra will rise after midnight and is in the southwest by sunrise.

Member observing nights will always be held as close to New Moon as possible. Keep a look in your Event Horizon for upcoming dates and sites. Mark these dates on your calendar for Kinsmen Park in Beamsville: Sat Feb. 12,/ Sat.

Mar. 12,/ and Apr. 9. Come around 8:00 pm. and bundle up. You'll be notified of any changes in the newsletter or at the General Meetings. Hope to see you all then! Clear skies ahead.

"Watch the Skies"
Observing Director,
Ev Butterworth 632-0163

Planetary Rings Part 2

Much of planetary ring structure has already been discussed in conjunction with the current theories of ring dynamics in the previous section. Here we will investigate the composition of the rings further.

The complexity of Saturn's rings would seem to be a function of their greater mass relative to that of the other three ringed planets. The total mass of particles orbiting Saturn are on the order of 10^4 - 10^5 greater than those of Uranus, which has the second most extensive ring system. (See table #1) It follows that where there is more material, there will be a greater opportunity for different mechanisms to come into play and exhibit different features. But what is the material that orbits these planets and forms their rings?

Observations by infrared spectroscopy have revealed water ice as the main constituent of Saturn's ring particles. This would seem to be borne out by the fact that all of Saturn's larger moons (except Titan) have densities not far from that of water ice, specifically 1.1 to 1.4 g/cm³. The slightly higher density would imply that some rocky material is also present. The very high albedo of Saturn's rings (See table #1) would also indicate that highly reflective water ice could be present.

In contrast the rings around Uranus reflect only 1% of the light falling on them and are thought to consist of ei-

ther a carbon residue (resulting from irradiation of methane-rich ice by energetic electrons from Uranus' radiation belts) or carbon-rich meteoritic-type debris.

Jupiter and Neptune exhibit similarly low albedos (refer to table #1) and their compositions would seem to follow that of Uranus.

Formation & Stability

At present, there are three theories on the formation of planetary rings. The first asserts that the ring material is left over from the formation of the planet. Because this material lies within the planet's Roche limit, it cannot accrete into moons. The other two theories deal with the breakup of a moon either by having the moon tidally disrupted after fitting within the planet's Roche limit; or by having a moon smashed by passing comets, meteors, etc. with the resultant debris scattered within the Roche limit where it cannot re-assemble. There are difficulties with each of these theories. The existence of small moons or "moonlets" within the ring systems of the planets would seem to refute the first theory - how could bodies 10-30 km in diameter form within a planet's Roche limit? Saturn's rings consist of material very similar to that of many of its larger moons and it has been suggested that the total mass of ring particles would be equivalent to a moon comparable in size to Mimas. It is conceivable that the orbit of such a moon could have been perturbed by some outside body (a passing comet for example) in such a way that it fell within the Roche limit of Saturn and was torn to bits by tidal forces. It seems highly unlikely that such an event could have taken place not just once, but four times in our solar system! Likewise, the chances of catastrophic collisions between moons and solar system intruders occurring at each of four planets seem rather remote.

With the extensive dynamics at work in planetary rings, it doesn't seem likely that rings are stable and infinitely long-lived structures. Dust-sized particles tend to be subject to many more drag forces than larger particles are (i.e. atmospheric drag, Poynting-Robertson drag (due to impacts with solar photons), plasma drag (due to

collisions with the magnetospheric plasma), and, consequently, they have short lifetimes, perhaps only as long as 1000 years. As larger particles in a ring are ground down by collision with other orbiting particles or impacts with meteors, the supply of dust is eventually exhausted, and the ring system decays.

Why are planetary rings found around the four Jovian planets in our solar system and not the terrestrial planets? None of the reference material surveyed for this paper offered an explanation.

All of the known planetary rings exist within the Roche limits of their planets. The three most widely accepted theories for the formation of planetary rings assume that the Roche limit played an important part in their creation. Is there something unique about the Roche limits of the Jovian planets? Let us examine the equation that defines the Roche limit:

$$\text{Roche Limit} = 2.456 R(p'/p)^{1/3}$$

Where R is the planet's radius; p' its density; and p the satellite's (or orbiting particle's) density.

In the case of the Earth, if we assume the particle density to be similar to that of our moon (because particle densities in the Jovian ring systems appear to resemble those of Jovian moons), the Roche limit works out to about 18,500 kilometers. For Mars assuming a particle density similar to that of the Martian moons, the Roche limit is about 10,500 kilometers. For the Jovian planets, because their densities are close to those of their orbiting ring particles, the Roche limits are approximately 2.456 times their radii. For Saturn, this is about 148,000 kilometers. Is it possible that the relatively narrow Roche limits of the terrestrial planets are so restrictive that any debris that entered the area would quickly interact, grinding up into dust and be lost falling into the planet? Perhaps the Roche limit defines an area so small (on the scale of the solar system) that any outside body that might pass by and be caught in it would be just as likely to continue and strike the planet.

Another possibility may lie in the differ-

ent oblatenesses observed between the terrestrial planets and the Jovian ones. The terrestrial planets' oblatenesses range from 0 to 1/193 while the Jovian planets' run from 1/10 to 1/58. The Jovian ring systems are thought to lie in their planets' equatorial planes because of the differential gravitational force arising from the fact that the planets' radii are greatest at this point. Perhaps the gravitational field around the terrestrial planets is not strong enough to condense particles into a ring.

Finally, the terrestrial planets all lie very close to the Sun when compared with the Jovian planets. The radiation levels or gravitational influence of the Sun may prohibit the formation of rings through Poynting-Robertson effects or gravitational perturbations.

Summary

The knowledge garnered from the Voyager missions has provided us with many answers about planetary rings. Theories proposed to account for the marvels seen at Jupiter, Saturn, Uranus and Neptune, must be put to the test before we can know for sure how these magnificent structures formed; why their structures are so complex or what their exact composition is. Future missions will be needed if we are, to be successful in solving the riddles.

Ann Tekatch

Terry and Alan Way to Go, Guys!

I was watching television's "Northern Exposure", which takes place in Cicely, Alaska. This episode was about the characters having each other's dreams. Bizarre, yes? At the same time the Aurora Borealis (which was shown several times) had "gone ballistic" according to Chris, the Disk Jockey. All things being tied together, some of the folks associated these amok dreams with the intense aurora. Chris was relating to people over the radio, some peoples' legends and superstitions surrounding the aurora. As he was telling these tales, he was also browsing over the pages of a most popular astronomy book. My husband and I were excitably taken aback. "Oh! Look! Way to go Terry and Alan!" What other book would anyone use on National Television? **Terry Dickinson & Alan Dyer, "The Backyard Astronomer's Guide."** Is that great or what?

Ev Butterworth

| | Jupiter | Saturn | Uranus | Neptune |
|--|--------------------------------------|------------------------------------|------------------------------------|------------|
| Width of main and narrowest structure (km) | 7 000 <100 | 20 000 <0.01 | 100 <0.01 | 15 ? |
| Thickness(km) | <30 (halo 10 ⁴) | 0.01 - 0.1 | 0.01 - 0.1 | ? |
| Optical depth | 1-6x10 ⁻⁶ | 0.1-2 | 0.1-2 | 0.1-0.4 |
| Albedo | 0.05 | 0.2 - 0.6 | 0.03 | low (?) |
| Particle sizes | 10 ⁻³ mm | cm - 5 m | 10 cm - 10 m | cm - m (?) |
| Surfacemass density(g/cm ²) | 10 ⁻¹⁰ - 10 ⁻³ | 10-100 | 10-100 | ? |
| Total mass (g) | 10 ¹³ -10 ¹⁶ | 10 ²⁰ -10 ²¹ | 10 ¹⁸ -10 ¹⁹ | ? |

The Dinosaur Caper

On a snowy Saturday afternoon a few members participated in our first "Field Trip". The McLaughlin Planetarium was the target of this premier trek. For some of us it was our first experience inside this astronomically exciting structure. While in line waiting to enter the "show" we admired the displays illustrating the solar system in a fascinating way. We casually glanced over our tickets and noticed that the "star show" we had signed up for was called "The Dinosaur Caper". The ticket collector promptly assured us that we would in fact see stars, and we did. Inside the dome was found the large projector and a very large army of slide projectors that gave an informative show featuring a theory of the dinosaur extinction. Throughout the 45 minute show the night sky was displayed in such a realistic way; if I didn't know any better, I would have thought I was at any brother's cottage enjoying the best skies ever. Along with 10 adult members, we had with us 4 children members who were absolutely dazzled by the show. On that note, I would say the trip was worth it and quite enjoyable.

A future trip to the Science Centre is in the works and details will be announced in the coming months.

*A broad and ample road whose
dust is gold,
And pavement stars, as stars to
thee appear
Seen in the galaxy, that milky way
Which nightly as a circling zone
thou seest
Powder 'd with stars.*

-John Milton, "Paradise Lost"

Events and Announcements

◆ March's General Meeting

The next meeting will be on Friday March 11, 1994 at the Spectator Building, at 7:30. Come out and join the fun.

◆ Event Horizon Deadline

Send your articles, suggestions or drawings to the address on the first page by March 4, 1994.

◆ Amateur Telescope Makers

Meetings will be held on March 14 and 28. They take place at Jim Winger's place in Caledonia.

Valens Beach Party?

On Saturday January 30, 1994 our club was invited by the Hamilton Region Conservation Authority to set up a small telescope display at the "Valens Beach Party". It was on rather short notice but we were able to round up a few dedicated members to participate in this adventure. The day itself was nice, in that it was not raining ice pellets; but it was one of the coldest days of the year. As the sun was peaking through a thin layer of cloud, Ann Te-katch daringly zipped up her snowsuit and set up her 4-1/2" Genesis refractor outside with a solar filter. She had a steady line of people, young and older, eager to view the sun. The average temperature was -16 degrees C with a windchill of -28 deg C. Lucky for us there was little wind. Ann also brought her other telescope, the 8"-f/6 reflector which I had aimed at a distant tree. We

were amazed at the amount of people who attended this "Beach Party" in these frigid temperatures. The organizer at Valens advised Ann that approximately 500 people were in attendance. They had several events including snowshoeing, ice skating, snow sculpting, a frozen disc jockey and great quantities of hot chocolate. Ann and I were relieved when we saw Charles and Patti Baetsen coming towards us. Patti was knee deep in snow packing a tripod and telescope. Charles brought his "barn door" drive with camera mounted on it for display. It was quite the topic of conversation. During the afternoon we were treated to a solar halo and a sundog. I have to admit that after two hours outdoors (with the wrong boots on) I had to go inside the pavilion to thaw out my left foot. Ann however, stayed outside for the duration of the event (12:00pm til 3:00pm) only to take a moment out to purchase a load of hot chocolate for us. We managed to distribute approximately 50 brochures (with Abrams astronomy calendar attached) and flyers announcing our February meeting, featuring the Telescope Clinic. This was the first event that we had our new H.A.A. banner displayed.

In conversation Ann commented "what parents would be crazy enough to take their children out in these sub-zero temperatures"; then she realized that I had my two young girls and husband there (the girls didn't want to leave, must be their eskimo blood).

Would we do it again? Ask us in July.

Fun in the sun,
Patricia Marsh

*The next great author
[after Shakespeare] was John
Milton. Milton wrote "Paradise
Lost" Then his wife dies and he
wrote "Paradise Regained"*

*taken from The World
According to Student Bloopers, by
Richard Lederer*
