Hamilton Amateur Astronomers

Event Horizon

November 2000 Volume 8 Issue 1

Looking up in December

Margaret Walton

The highlight of this month's astronomical shows will be the partial solar eclipse on Christmas Day. The moon will pass in front of a portion of the sun and take a 'bite' of about 60% out of it (from our area). The eclipse begins at 10:58am, maximum is at 12:34pm and it ends at 2:10pm. As with all viewings of the sun, NEVER watch it with unprotected eyes. If you are watching through a telescope, be sure to have a solar filter over the front aperture of the scope. For naked-eye viewing, use special solar eclipse glasses, or get a piece of No. 14 welders glass and view the sun through that. For more information on the eclipse and how to view it, check out ***http://www.skypub.com/sights/eclipses/solar/partial001225.html***

Jupiter and Saturn continue to provide excellent views. Jupiter is the third brightest object in the sky (next to the moon and Venus), and Saturn shines brightly just to the right of it, in the constellation Taurus in the east. Venus is the evening star, shining brightly just after sunset in the southwest. On December 29th, Venus will make a lovely pairing with the crescent moon.

This month's meteor shower is the Geminids, which will peak on the 13th of December.

The next meeting of the Hamilton Amateur Astronomers is Friday, December 8th. Peter Ceravolo is the speaker. Meetings are held at the Hamilton Spectator Auditorium at 8pm. Everyone is welcome. We also have observing sessions at the Binbrook Conservation Area. This is a great way to get to look through other's scopes and get to know the night sky. Upcoming viewing nights are December 22nd, 23rd, 29th, and 30th. Viewing starts around 8pm. Please call ahead of time to let us know you are coming, so that we can let you in the gate. Margaret Walton 627-7361, Bret Culver 575-9492, Rob Roy 692-3245.

inside...

Chair's Report

"To everything there is a season"...

... and those seasons are passing more quickly the older I get. It seems only yesterday that I took on the responsibilities of Chair and now, my tenure finished, I am passing the torch to the new Chair.

A Chair can be only as good as his or her Council, and by that reckoning I must have been a great Chair! Thank you, all, for keeping the HAA running smoothly!

I have one regret, and that is the necessity of raising the membership dues. As you know, the dues have not changed since the inception of the Club several years ago. As you also know, the cost of living cannot make the same claim. We stayed doggedly with the original dues as long as possible, but ultimately felt that the continued success of the Club was more important than saving a few dollars. Therefore, starting this month, individual memberships are $25 per year, and family memberships are $30. With any luck, these will stay in effect for several more years.

Here's to clear skies and new rulings on street lights!

Grant Dixon, Chair
grant.dixon@home.com

MEETING LOCATION

As we are having difficulty with our room booking at the Hamilton Spectator, some or all of our meetings may have to be held elsewhere. Please check the web, or your email, or the HAA discussion group, or phone any council member before each meeting to confirm its location. If anyone knows of a suitable room (for free!) could you please contact Margaret Walton at 627-7361 or ***margw@icom.ca.***

Cosmology Discussion Group

The next cosmology meeting will be Saturday, November 11th, 2000, 8pm. In McMaster's Burke Science Building room B148. There will be free coffee, ginger ale, cola, and timbits. We welcome our members to bring a small entree. Everyone welcome, open discussion. For further information call Larry at 529-1037.

HAMILTON AMATEUR ASTRONOMERS

Event Horizon is a publication of the Hamilton Amateur Astronomers (HAA).

The HAA is an amateur astronomy club dedicated to the promotion and enjoyment of astronomy for people of all ages and experience levels

The cost of the subscription is included in the $15 individual or $20 family membership fee for the year. Event Horizon is published a minimum of 10 times a year.

Web Site
http://www.science.mcmaster.ca/HAA/

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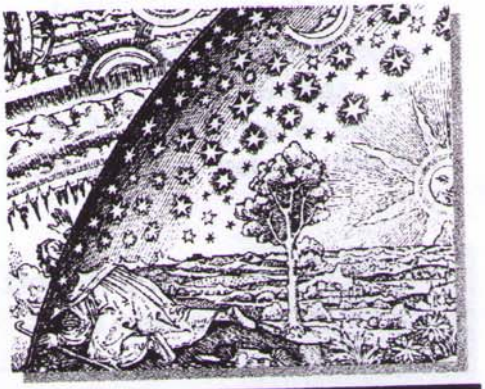

Carbon Stars

Stewart Attlesey
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Some of my favorite objects to look at in the night sky are planetary nebulae. These objects are formed when stars the size of our Sun and somewhat larger near the end of their lives. Most of you will have seen Hubble pictures of these complex and colourful objects. In contrast, the most massive stars come to a more violent end as a supernova. Before a star creates a planetary nebula it passes through a Red Giant stage. Towards the end of the Red Giant stage a star may become a carbon star. I had heard the term 'carbon star' in the past but I had never given them much thought let alone tried to look at one. A few weeks ago while visiting Rob Dick's observatory we were shown a number of carbon stars by Glenn LeDrew of the Ottawa Centre. These stars are probably the most intensely coloured objects in the night sky that you will ever see through a telescope, binoculars or even naked eye! I was so impressed that I decided to write this article about them.

To understand what a carbon star is I need to give you a brief picture of stellar evolution. Stars spend most of their lifetime fusing hydrogen into helium at their very center where the temperature and pressure is the highest. The helium remains in the core of the star and as the hydrogen is used up fusion continues in a shell around the core. The now inactive helium core contracts since energy production is not available to counteract gravity. This shell-burning phase causes the outer layers to expand and paradoxically cool forming a red giant. The core gradually gets hotter due to the shell of hydrogen fusing around it and eventually the core becomes hot enough for helium to start fusing into carbon. The star contracts again and the surface temperature increases. When the core helium is used up once again energy production occurs in the shell, which now consists of an outer hydrogen fusing portion and an inner helium fusing portion. The star becomes a red giant for a second time. The more massive a star is the more times it will go through such cycles producing a core of heavier and heavier elements such as oxygen, neon, silicon et cetera. For a star the size of our Sun carbon is the heaviest element that will be produced. At some point during the final stages of a star's life mixing of the stellar interior may occur bringing some of the heavier elements such as carbon up to the surface. Another phenomena that occurs late in a star's life is the shedding of material in a strong solar wind. Initially, a cool shell of material containing molecules such as C_3, C_2, CN and CH forms around the Red Giant star. These molecules act as a filter that absorbs light at the blue end of the visual spectrum. This results in a truly red object that is referred to as a carbon star due to the presence of carbon absorption lines in its spectrum. Carbon stars are variables with periods that are about one year on average. They have their most intense colour when at minimum brightness. As material continues to be ejected from the star the envelope thins and eventually the very hot inert core is exposed. Ultraviolet light from the core causes the gas shell to fluoresce giving rise to a planetary nebula.

Colour

A star's colour is often expressed by its colour index. This is the difference in brightness measurements through two different standard colour filters. One filter is a broad-band blue (B) and the other is a so-called visual (V), which passes yellow and green wavelengths. The colour index is equal to B-V. To put things into perspective, a star that appears white has an index near 0; our Sun has an index of +0.65 and a "normal" red star like Betelgeuse or Antares has a value of +1.85. Carbon stars however, have a colour index that ranges from 2 to almost 6!

Spectral Classification

Blue-White stars: A few dark lines due to hydrogen.
Sun-like stars: Additional weaker lines due to metals such as calcium.
Normal red stars: many fine lines and broad dark bands due to Titanium Oxide molecules.
Carbon stars: Dark bands due to carbon molecules. Angelo Secchi first identified these dark bands in the 1800's by comparing them with the spectra of a sooty flame from paraffin. A brief biography of Angelo Secchi can be found at http://www.hao.ucar.edu/public/education/sp/images/secchi.html. Carbon stars are usually classed using the designation Ca,b where a indicates decreasing temperature on a scale from 0 to 9 and b is the intensity of the carbon lines in the spectra on a scale of 1 to 5. Prior to the development of this new classification scheme carbon stars could be found as subtypes in the groups M, R and N. A couple of the stars in the examples below use the old scheme. If you want more detail on the spectra of stars visit the web page "The Classification of Stellar Spectra" at

(Continued on page 5)

Did You Know...

That in the late 1800's, the largest reflecting telescope in Canada was owned by a Hamiltonian?

William Bruce (1833-1927) was a registrar of patents, a justice of the peace and an amateur astronomer. Sometime around 1869, he built a home (called Elmwood) and an observatory near where the Bruce Park pavilion stands today on Hamilton Mountain. (Bruce Park is located between Queensdale and Brucedale Avenues at the foot of East 7th. Street.)

William Bruce also served as president of the RASC's Hamilton Centre from 1911 to 1915. According to Mountain Memories, my source for this article, Wm. Bruce opened his Elmwood Observatory to the general public on Thursday evenings. Could this be where the tradition of Thursday night meetings for the Hamilton Centre began????

The book, Mountain Mem

ories, has two photos to accompany the section on Wm. Bruce: one is a portrait of Bruce; the other is of Elmwood Observatory and two dapper gentlemen setting up telescopes beside it. One of the scopes is a familiar brass refractor and the other is a long focal length 8" reflector. The accompanying text explains that Bruce "and a colleague are seen preparing for the solar eclipse in 1925". That "colleague" may have been Rev. Marsh and what we know as the Marsh refractor!

If you can find a copy of "Mountain Memories: a pictorial history of the Hamilton Mountain", check out page 127 for yourself.

Ann Tekatch

Mountain Memories was published this year by The Hamilton Mountain Heritage Society. Copies are available for $25 (if memory serves) from the Bestsellers shop in Jackson Square (near the main entrance at King & James Streets).

MAGAZINES FOR SALE

Sky & Telescope 1979 to 1999

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(S&T charges $12 +S&H per single back issue!)

Makes for great armchair astronomy reading.

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Observing articles are never out of date.

Rob Roy
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Stars ....

(Continued from page 3)

http://lheawww.gsfc.nasa.gov/users/allen/spectral_classification.html

Observing

Carbon stars are relatively rare due to the short time a star spends in this stage of its evolution. Also, many of the identified Carbon stars are faint due to the dimming effect of the star's envelope. Unlike other objects averted vision does NOT help with faint Carbon stars. The appeal of these stars is their intense colour and to get the full effect you need to look directly at them using the colour-sensitive part of your eye. If you visit the web site http://shutter.vet.ohio-state.edu/astronomy/carbon_stars/carbon.htm you can download a list of thousands of Carbon stars. Here is a short list that you will want to check out:

WZ Cas
Position: RA 24h1m12s, DEC +60°21'19"
Magnitude: 7
Period:
Classification: N1p
Colour index:
Notes: Observed at Rob Dick's. This was my introduction to carbon stars. It is a spectacular sight due to pairing with a blue-white star. Because of the contrast with the red star the blue one seems to be intensely coloured. This pair puts Alberio to shame.

RS Cygni
Position: RA 20h13m2s, DEC +38°41'57"
Magnitude: 6.5 – 9.7
Period: 417
Classification: C8,2e
Colour index: 3.0
Notes: A nice red colour when observed at Rob Dick's but at Binbrook a week later the colour didn't seem to be as intense!

T Lyri
Position: RA 18h32m18s, DEC +37°0'4"
Magnitude: 7.8 – 9.6
Period: Irregular
Classification: C6,5
Colour index: 5.5
Notes: The high colour index is a good indication of just how red this star is.

TX (19) Piscium
Position: RA 23h46m22s, DEC +3°29'11"
Magnitude: 4.5 – 5.3
Period: 220
Classification: C7,2
Colour index: 2.5
Notes: One of the brightest carbon stars in the sky and visible to the unaided eye.

μ Cep
Position: RA 21h43.5m, DEC +58°47'
Magnitude: 3.4-5.1
Period: 730 days
Classification: M2Ia
Colour index: 2.5
Notes: Herschel's Garnet Star. One of the reddest stars easily visible to the unaided eye. binoculars or a small telescope makes the colour more obvious.

S Cep
Position: RA 21h 35.2m, DEC +78°37'
Magnitude: 7.4 – 12.9
Period: 486 days
Classification: C7,4
Colour index:
Notes: Observed at Binbrook with my 20" this star showed an intense red colour that made Herschel's Garnet star seem pale in comparison. In an 8" scope the star was much less obvious. It appears to be at or near its minimum right now.

R Leporis
Position: RA 4h59m35, DEC -14°51'6"
Magnitude: 5.5 – 11.7

Period: 427days
Classification: C7,4e
Colour index: 5.5
Notes: Hind's Crimson Star. Another high colour index star.

These stars are well worth the effort to locate. Enjoy…

Resources

1) Carbon Stars: Reddest of the Red, Brian W. Skiff, Sky & Telescope May, 1998
2) Burnham's Celestial Handbook, Robert Burnham Jr., 1978 Edition
3) A General Catalog of Cool Galactic Carbon Stars, 2nd edition, Stephenson C.B. Publ. Warner & Swasey Obs., 3, No. 2 (1989)

Ask Stella: Lookback Time

Greetings, mirror-grinders. It's time for another installment of EH and another question from a perpetually curious stargazer like yourselves. Michael Brown, an university student from Windsor, ON is the seeker of truth this time. He writes:

Because we use light to see the universe there's a large time delay for distant objects. The further we look the less certain we can be of what is there at our instantanious present. Is it possible to know what the present looks like in futher regions of space, or is this another circumstance of the uncertainty principle?

Michael is asking about a pretty unintuitive concept: lookback time. The problem is that he seems to have made an association between two ideas which are actually quite distinct. Here's the way I see it:

The idea of lookback time has to do with the finite speed of light. Since light particles or photons can only go so fast, it takes longer for light from far away objects to reach us. So when you're out on a crisp fall night taking in the beauty of M31, you're actually seeing the galaxy as it was four million years ago.

This idea crops up a fair bit in astronomy, however, the lookback phenomenon isn't restricted to celestial objects. When you sit down on a crisp fall evening to hear a talk at an HAA meeting, you're actually seeing the speaker as he or she was a zillionth of a second ago.

So physics is consistent. (I like to reassure myself about this stuff. Makes it easier to go to sleep at night). Anyway, back to the question.

Michael is right to wonder about what those galaxies look like now. It's similar to asking what Vega is up to now. If it takes light from that star 26 years to reach us, how do you know that Vega will still be there when you look for it tonight? Twenty-six years seems like a long time. What if Vega went supernova two weeks ago?

The answer to this is one of relative time scales. Even though 26 years is enough for a human being to grow up, it's less than an eyeblink in the life of a star. Even a massive, hot star like Vega will keep shining brightly for tens to hundreds of millions of years.

Yet this answer doesn't work for distant galaxies and this is the crux of Michael's question. If you're looking at something like a quasar, you're seeing the galaxy not as it was tens, hundreds, thousands, or millions of years ago. The relevant time scale is billions of years. And that's a long time, even for a galaxy.

So what would the distant galaxies look like if we could see them as they are right now?

We believe that what happens is this:

Old generations of stars die off, new ones are born. The central black holes that make quasars and Seyferts and radio galaxies so bright stop pumping out all the X-rays and hard UV radiation. Eventually these active galalctic nuclei (AGN) calm down enough to resemble the black hole at the center of our own Milky way. The galaxies themselves begin to look like those in our own Local Group or in other nearby associations like the Virgo cluster.

Capiche?

Okay, cool. Then I have just one more thing to clear up.

The concept of lookback time is *not* linked to any "uncertainty principle". Heisenberg's uncertainty principle is a whole different kettle of cod. This tenet of quantum mechanics describes the probabilistic behaviour of very small particles like protons and electrons - the very small as opposed to the very large.

Astronomically Yours,

Stella

Do you have a question that's keeping you up nights? Then send e-mail to ***ask_stella@earthling.net.***

Ask Stella: your source for astro-facts.

Treasurer's Report

Barbara Wight

The financial statements for the year ended October 31, 2000 have been published in this issue of the newsletter. As you will notice, this year resulted in a deficit of $117.00. This is the third year in a row that we have shown a loss, clearly indicating that the membership fees are insufficient to cover the costs.

As a result, we have found it necessary to propose an increase in membership fees, which was passed in a vote at the October meeting. A charitable tax receipt will be issued for all fees and donations.

Thank you for your support and input, which are necessary for the continued enjoyment of our club.

HAMILTON AMATEUR ASTRONOMERS
BALANCE SHEET
AS AT OCTOBER 31, 2000
(Unaudited)

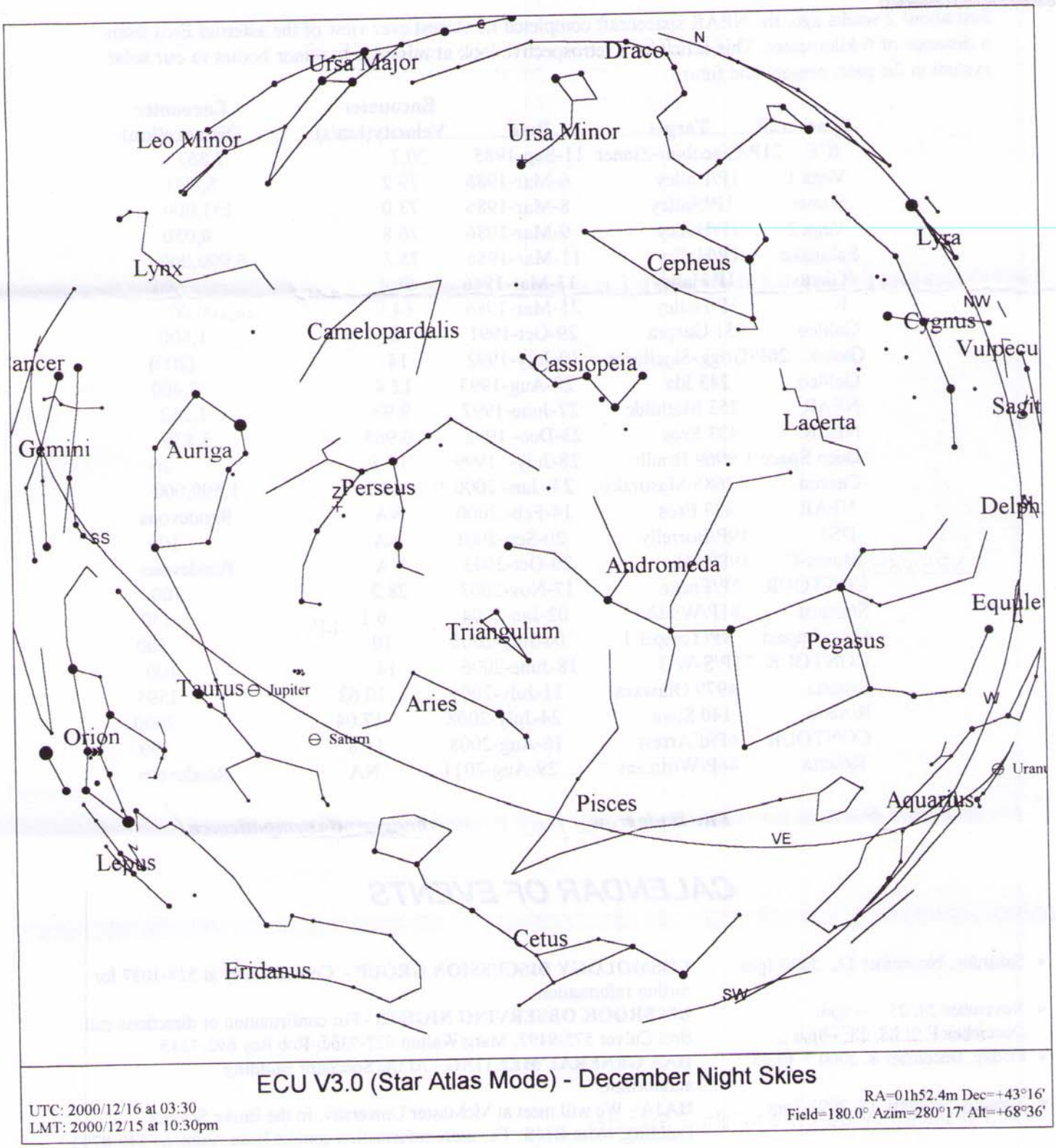
	Oct 31 2000	Oct 31 1999
ASSETS		
Bank	355	532
Investments	3000	3000
Inventory	0	193
Prepaid Expenses	80	77
Total Current Assets	3435	3802
Fixed Assets -Equipment	1287	1287
Total Assets	4722	5089
LIABILITIES		
Deferred Revenue	230	480
EQUITY		
Opening Balance	4609	4973
Current Year	-117	-364
Closing Balance	4492	4609
Total Liabilities and Equity	4722	5089

Prepared by Barbara Wight, Treasurer

HAMILTON AMATEUR ASTRONOMERS
INCOME STATEMENT
AS AT OCTOBER 31, 2000
(Unaudited)

	Oct 31 2000	Oct 31 1999
INCOME		
Donations -Membership Fees	1475	1460
Donations -Other	266	132
Raffle	136	0
Sweatshirt/T-Shirt sales	0	491
Observers Handbook/Calendar sales	442	366
Interest Income	0	140
Total Income	2319	2589
EXPENSES		
Newsletter printing	350	448
Newsletter postage	348	452
HAJA	13	0
Meeting and Observing Expense	173	75
Promotion	161	0
Sweatshirt/T-Shirt cost of sales	0	547
Observers H/B/Calendar cost of sales	442	397
Insurance	610	621
General Administration	162	243
Post Office Box rental	77	70
Donation Expense	100	100
Total Expenses	2436	2953
SURPLUS/DEFICIT	-117	-364

Prepared by Barbara Wight, Treasurer



ECU V3.0 (Star Atlas Mode) - December Night Skies

UTC: 2000/12/16 at 03:30
LMT: 2000/12/15 at 10:30pm

RA=01h52.4m Dec=+43°16'
Field=180.0° Azim=280°17' Alt=+68°36'

Space Missions to Asteroids & Comets

Just about 2 weeks ago, the NEAR spacecraft completed its closest ever view of the asteroid Eros from a distance of 6 kilometers. This article is a retrospective look at missions to minor bodies in our solar system in the past, present and future.

Spacecraft	Target	Date	Encounter Velocity(km/s)	Encounter Distance(km)
ICE	21P/Giacobini-Zinner	11-Sep-1985	20.7	7,862
Vega 1	1P/Halley	6-Mar-1986	79.2	8,890
Suesei	1P/Halley	8-Mar-1986	73.0	151,000
Vega 2	1P/Halley	9-Mar-1986	76.8	8,030
Sakigake	1P/Halley	11-Mar-1986	75.3	6,990,000
Giotto	1P/Halley	13-Mar-1986	68.4	596
ICE	1P/Halley	25-Mar-1986	64.9	28,100,000
Galileo	951 Gaspra	29-Oct-1991	8	1,600
Giotto	26P/Grigg-Skjellurup	10-July-1992	14	(200)
Galileo	243 Ida	28-Aug-1993	12.4	2,400
NEAR	253 Mathilde	27-June-1997	9.93	1,212
NEAR	433 Eros	23-Dec- 1998	0.965	3,830
Deep Space 1	9969 Braille	28-July- 1999	15.5	26
Cassini	2685 Masursky	23 -Jan- 2000	18.7	1,500,000
NEAR	433 Eros	14-Feb- 2000	NA	Rendevous
DS1	19P/Borrelly	20-Sep-2001	NA	100
Muses-C	1989 ML	20-Oct-2003	NA	Rendevous
CONTOUR	2P/Encke	17-Nov-2003	28.2	100
Stardust	81P/Wild2	02-Jan-2004	6.1	150
Deep Impact	9P/Tempel 1	04-July-2005	10	500
CONTOUR	73P/S-W 3	18-June-2006	14	100
Rosetta	4979 Otawara	11-July-2006	10.63	1595
Rosetta	140 Siwa	24-July-2008	17.04	2000
CONTOUR	6P/d'Arrest	16-Aug-2008	11.8	100
Rosetta	46P/Wirtanen	29-Aug-2011	NA	Rendevous

Ray Badgerow *rbadgerow@sympatico.ca*

CALENDAR OF EVENTS

- Saturday, November 11, 2000 8pm
- November 24, 25 ~8pm
  December 1, 2, 22, 23 ~8pm
- Friday, December 8, 2000 7:30pm
- Tuesday, January 15, 2001 7pm

COSMOLOGY DISCUSSION GROUP - Contact Larry at 529-1037 for further information

BINBROOK OBSERVING NIGHTS - For confirmation or directions call Bret Culver 575-9492, Marg Walton 627-7361, Rob Roy 692-3245

HAA GENERAL MEETING - At the Spectator Building auditorium.

HAJA - We will meet at McMaster University, in the Burke Science Building, room B148. For more information contact Rosa Assalone 540-8793