Hamilton Amateur Astronomers

Event Horizon

March 1997 Volume 4 Issue 5

Saga of the Winter Star Party

It seems that when one decides to take a trip somewhere, the elements join forces to either try to discourage, or speed one on ones way. In our case, it sped us on our way.

"We can see that it is going to be an astronomer's dream. It is beautifully warm, 73 F, and the skies are clear"

It was cold and snowy, but the 401 was delightfully clear, so we made excellent progress into the United States. There, the elements fought against us. At 1700 hours we decided to head for some warm sheltered spot like a motel. Ah. Good move on our part.

Bowling Green, Ohio. The temperature is hovering at -5C and the sky turns clear. Ah, there's the Dipper. It does not seem to be oriented the same as when it is seen in Rockwood.

So we are on our way again.... What's that clunk sound? Aaah a big chunk of ice and snow fell off the trailer, must be getting warmer. Hark, what is that sound I hear? No it couldn't be, but it is. There they are, a least a hundred robins on the lawn in front of us, just singing their little hearts out. We must be getting in to warmer climes, that accounts for the fact that so many people we see are wearing short sleeve shirts, and short pants.

After a short stay in Nashville, where we took part in the taping of a country and western show, we made a beeline for Florida. Here the weather is warm. The trailer is now free from ice and snow, and we are no longer a curiosity.

We are now just south of the site of the Winter Star Party. We are the 65th vehicle in line to get in. Admission time is set for 12 noon, so we are all parked on the shoulder of the road awaiting that time. My trusty navigator, in less than half an hour, has gotten a sunburn on her right arm. The sun is brilliant, and there is not a cloud in the sky. At this point, the temperature is 28C. Eat your hearts out you northerners!

Finally, we are moving. At the gate we show our passes and proceed to find a good setup site. We park directly across from where we were last year. A good spot. After an hour, we have

(Continued on page 5)

Mirrors on the Move

Refractors and Newtonian-type reflectors have fixed primary objectives and focus by having the eyepiece move back and forth. Cassegrain-type reflectors, including the ever popular Schmidt-Cassegrain, have fixed eyepieces and achieve focusing by having the primary mirror move up and down the optical axis.

It is difficult to machine to close enough tolerances so that the mirror does not tilt as it moves back and forth, causing some image shift when focusing. It has to be more expensive to produce than just fastening a rack-and-pinion focuser to the end of an SCT. Why, then, is it done this way?

The answer lies in the ability of a such a reflector to focus on objects much closer than can refractors or Newtonian scopes. In addition to viewing objects at infinity, compact SCTs can be used to examine and photograph wildlife or close-by objects a matter of only a few meters away.

The secret lies in the amplifying effect (convex shape) of the secondary mirror. A very slight change in the separation of the two mirrors is enough to produce an enormous change in the focus. A typical 8 inch f/10 (80" focal length) SCT can focus on objects as close as 8m (~25 feet) away. Calculations show that to do the same, a refractor or Newtonian reflector with the same 80" focal length would have to move the eyepiece back 69cm (~27")- a totally impractical possibility.

(Continued on page 6)

inside...

Editorial	page 2	Hipparcos	page 6
Ask the "Expert"	page 2	Digital Flashlight	page 7
Comet Lottery	page 3	April Night Skies	page 9
Rob'serving Report	page 3		

Editorial

The big news this month is comet Hale-Bopp. On page four is a finder chart for the comet . I doubt that you will actually have to use this chart for anything other than noting how the comet will be moving through the sky in the next short while. As I write this, all you have to do is step outside and look to the north-west just as the first stars begin to appear after sunset. The comet is the most obvious object in that area of the sky.

Juliana Light has a very timely article, on page 3, about a talk on Hale-Bopp that she recently attended.

Ann and Bill Tekatch reported seeing a spiral/corkscrew effect in the comet's tail at 140 power from their backyard in Hamilton on March 11 and 12. My observing conditions were not very favourable - in a neighbours driveway standing under their light above the garage with the comet less than 10 deg away from a street light. At 120X, with a 6 inch Newtonian, I was able to see what I can best describe as waves coming from the comet down towards the horizon and then blending into the tail which made a 90 degree turn to the north.

I hope that all of you are going to take every opportunity to view this comet. It could be years before the next bright one comes along.

Stewart Attlesey

Ask the "Expert"

I have seen pictures of Halley's Comet when it appeared in 1910, and I was eagerly looking forward to seeing it when it returned in 1986. However, to my great disappointment, I could hardly see it at all, even in binoculars. Why was there such a difference in the two appearances? The nature and orbit of the comet doesn't change, does it?

Brian Chire

The comet's orbit is relatively constant (although Jupiter's gravity causes some minor changes) but the position of the Earth relative to the comet was different for the two appearances. In 1910 the Earth actually passed through the tail of the comet (and will again in 2062) but in 1986, Halley's comet was quite far from the Earth at its closest approach to the Sun (perihelion).

I have always wondered why the Milky Way is not horizontal to our horizon when we look at it in the sky. In fact, in the summer, it appears overhead, almost 90 degrees to our horizontal perspective. Is this because the plane of our solar system is sharply different to the plane of the main part of the stars in our Milky Way galaxy? Is our solar system plane really that different (90 degrees) to the main galactic plane? Or does it also have something to do with the tilt of the earth on its axis?

Brian Chire

It is a combination of factors. Not only is the plane of the solar system (the ecliptic) tilted with respect to the plane of the Milky Way (galactic equator) but the Earth's axis is also tilted with respect to the ecliptic. The north pole of the solar system (north ecliptic pole) lies about 23.5 deg away from polaris in the constellation Draco (18h 00m R.A.) and the North pole of our Galaxy (north galactic pole) lies about 27 deg away from polaris in the constellation Coma Berenices (12h 51m R.A.). By the way, it is our tilt of 23.5 degrees from the ecliptic that accounts for the seasons. Also, during the winter the night side of the earth is facing away from the centre of the galaxy and during the summer the opposite is true.

(Continued on page 8)

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

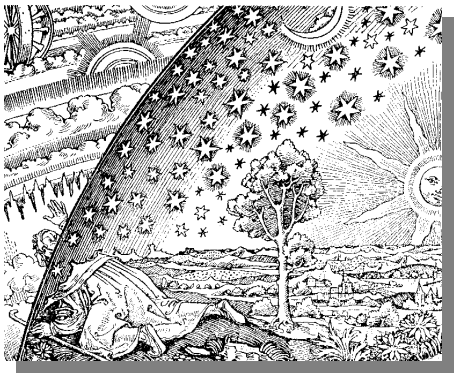
The cost of the subscription is included in the $15 individual or $20 family membership fee for the year. Event Horizon is published 10 times a year.

HAA Council

Chair	Doug Welch
Second Chair	Grant Dixon
Honorary Chair	Jim Winger
Secretary	Patricia Baetsen
Treasurer	Barbara Wight
Education Dir.	Grant Dixon
Obs. Dir	Rob Roy
Editor	Stewart Attlesey
Recorder	Tracy Webb
Membership Dir	Ann Tekatch
HAJA Coord	Rosa Assalone

Councillors

Patricia Gassmann
Alan Shinn
Bill Tekatch



Winning the Comet Lottery

Thomas Bopp, co-discoverer of Comet Hale-Bopp, spoke recently at the Ontario Science Centre at a meeting of the RASC Toronto Centre.

Tom lives in Arizona and opened his talk with a series of slides of the Arizona night sky. He is a lifelong amateur astronomer, and his story of the discovery of the comet could be one which many in the HAA could have told ... if they had been as lucky as Tom; lucky like winning the 649 lottery that is.

"Using a 17-inch Dobsonian, Jim had turned his attention to M70 and offered Tom a view of it."

The day Tom won the comet lottery was July 22, 1995. It had begun with his friend Jim inviting him to go observing that night at a site ninety miles from his home. Tom had wanted to make an early start to get to the site well before dark, but various things delayed him including the fact that his car wouldn't start, so he had had to borrow "Dad's car," he said. It was dusk after all when he finally got to the site, and he was mortified that he was unable to turn off the headlights of the car, night-blinding everyone as he drove up to the observing site. He and his friend then began their observing session looking at the usual assortment of Messier and NGC objects. Using a 17-inch Dobsonian, Jim had turned his attention to M70 and offered Tom a view of it. Jim was doing something else now, and as Tom gazed steadily at M70, which is a small globular cluster in Sagittarius, he let it drift across the field of view. As it drifted, he noticed that a curious bright object had appeared to the left of the image.

"Hey Jim, do you know anything else near M70?" he asked. Jim said he didn't. They looked up their various star atlases but nothing fit the bill. Intrigued, they started to watch for motion. After a while Jim thought he could detect movement. Yes, a bit, Tom agreed, but he wanted to wait a while longer. After about another fifteen minutes it was agreed that the object was definitely moving. But what to do next? Another observer advised not to bother reporting anything. He had once reported a super nova, but it had turned out to be Venus! But Tom and Jim were sure it had moved. Not quite sure what to do next, they thought the best thing to do would be to report the discovery to the nearby Lowell Observatory. Tom attempted to contact the Observatory but only got an answering machine, then he tried to call the International Astronomical Union's Central Bureau but his car phone was out of range, he said. He hoped he could send a telegram from a nearby truck stop, but no luck there either. Confounded, he drove the ninety miles home. There he tried another phone number, but only got the Visitors' Centre with a recording telling him when visiting hours were. Finally through Western Union he was able to send a telegram, and with that accomplished he collapsed into bed beside his wife who was thinking he

(Continued on page 4)

Rob'serving Report

Deep Partial Lunar Eclipse

Lying deep in the shadow of this month's growing excitement over Comet Hale-Bopp is the partial eclipse of the Moon (pun intended.) On the night of March 23/24, the Moon will enter the Earth's shadow and be very nearly totally eclipsed. Don't ignore it, saving up your time for Hale-Bopp later.

It could prove to be a beautiful and spectacular event. The Moon should take on a ruddy-orange hue as it nears mid-eclipse. Some say that the view becomes three-dimensional in binoculars. I personally hope to get some great photos.

Below are listed the times of the key phases of the eclipse.

8:41pmEST- Moon enters the faint penumbral portion of the Earth's shadow.
9:58pm- Moon enters the dark umbral portion of the Earth's shadow.
11:39pm- Mid-eclipse with the Moon 92% in shadow.
1:21am- Moon exits the umbral shadow.
2:38am- Moon exits the penumbral shadow.

Monthly In-Sights

March

- 17-3am Mars at opposition to the Earth.
- 20-8:55amEST **SPRING IS SPRUNG!** (equal day and night)
- 22- Hale-Bopp's closest approach to Earth.
- 23- partial (92%) lunar eclipse.
- Mars 4 deg. N of eclipsed Moon (photo opp?)
- 25- Hale-Bopp 5 deg. N of M31 (photo opp?) best period for viewing Hale-Bopp sans Moon, lasting until April 8.
- 31- Hale-Bopp's closest approach to the Sun.

April

- 3-3am Moon 4 deg. N of Jupiter.
- 4&5- BCA observing nights.
- 5-8pm Mercury at greatest eastern elongation in the evening sky (12 deg. altitude!)
- 8-9pm Mercury 7 deg. to the right of thin crescent Moon.
- 8- last date for Hale-Bopp without interference from the Moon.
- 10-midnight Moon 0.5deg. N of Aldebaran.

(Continued on page 7)

Comet Lottery ...

(Continued from page 3)

had really lost it.

Early on the morning of the 23rd, Tom was awakened by the phone ringing. It was Dan Green from the Harvard-Smithsonian Centre for Astrophysics. "Congratulations, you've found a new comet!" Dan said. In his kitchen Tom proceeded to invent a new comet dance just for the occasion.

As more observations of the comet were reported, Dan Green and colleague Brian Marsden attempted to compute the orbit of the new comet, but even with observations from Japan no parallax could be measured. This meant that the comet was very far away and as such it must be a "monster" comet or very peculiar indeed. Only a rough estimate of the comet's orbit was possible by July, and by August they had determined that the comet would come into the near solar system and that perihelion was roughly predicted for April 1, 1997. Finally, a previously unnoticed image of the comet was discovered on a photograph taken over two years previously in Australia. It revealed that the comet was 9.6 a.u. away, and with this information a more exact orbit was determined.

In closing his talk, Thomas Bopp showed slides of the comet taken from various sources ranging from the Hubble Space Telescope to amateur 35mm photographs and CCD images. Each image was amazingly different revealing different aspects of the comet such as close-ups of the coma (the comet's nucleus is thought to be about 40km in diameter, travelling at a speed of about 60 km/s) to whole images of the comet with its distinctive long and slender ionized gas tail and shorter and wider dust tail. The last slide, however, was quite different. It was a picture of a tall ship sailing in the Caribbean on which, Tom said, comet discoverers are invited to sail. *It is a bit like winning the lottery*, I'd say.

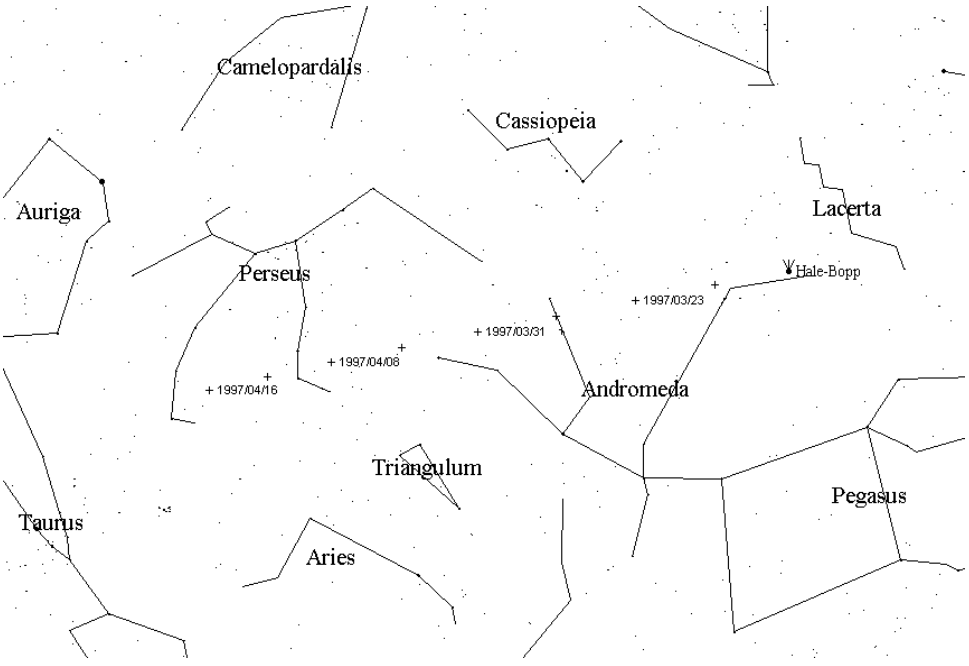
Someone in the audience asked about the comet's other discoverer, Allan Hale. How had he discovered the comet? Allan also happens to live in Arizona, Tom told us. His evening of observing seems to have gone a lot smoother than Tom's. Coincidentally, he was in his back yard that night observing known comets. Between comets he turned his telescope

Thomas Bopp

to look at M70. As he was at home when he made his discovery, he had simply e-mailed his report in. (Allan Hale has written a book on the discovery called *Everybody's Comet: A Layman's Guide to Comet Hale-Bopp*.)

The meeting also included a short talk by Peter Ceravolo who showed his amazing video "Comet Hyakutake, The Motion Picture" which was shot in Arizona, and David Levy, who lives in Arizona, gave a poetic talk about comets and their discoveries. At the conclusion, Ivan Semeniuk reminded everyone that the Observer's Handbook published annually by the RASC has instructions on how to report a discovery on page 8.

Submitted by Juliana Light, with apologies to Tom Bopp for any misinterpretation of his talk.



The finder chart on the left shows comet Hale-Bopp's position at four day intervals starting on March 15.

Winter Star Party ...

(Continued from page 1)
cranked up the trailer and gotten ourselves organised. At this point, our neighbours, two chaps from Findlay Ohio, come over and introduce themselves and give us a load of grapefruit. As it is still early, I set up my brand new 8" LX200 then go for supper. One cannot view the heavens on an empty stomach.

Monday evening. Spectacular. We can see that it is going to be an astronomer's dream. It is beautifully warm, 73 F, and the skies are clear. We are all chomping at the bit to get started. On our way back to our site, we see so many scopes pointing toward Polaris in order to get an early fix. The BIG, and I do mean Big, Dobs are all uncovered and ready to take on the sky. There are so many Dobs, that they have named their area, the Valley of the Dobs. And rightly so. From the smallest 6 inch reflector to the behemoth 36 incher, and all sizes in between we are in a telescope paradise.

As the first stars start to peek out, I look for my favourite spot, the Big Dipper. It is nowhere to be found. In vain I search.Orion is up there quite high in the sky, so I calibrate my scope on Rigel and Castor. With this step completed, I tell my scope to "Go To" Alcaid. Guess what? The message comes up, "Below the horizon" Now, the light is beginning to dawn. We are in a different part of the world. I am completely disoriented. Selah. (Pause and reconsider) (Greek) (Or is it Hebrew). Anyway, after a little reflection, I look to the north where I think Polaris should be, but I do not see it, but just to the right I see two stars which I conclude are the two stars in the
bucket of the Dipper. Discovery! The Dipper is completely vertical with the handle and two stars of the bucket indeed below the horizon. All the constellations are in the wrong place.

After this awesome discovery, I get back on track. Saturn I have never seen so clear. I try my 12mm eyepiece...awesome. I can see the moons, I can see not only the rings, but the shadow of the rings on the surface, and get this, I can see a shadow of a moon on the surface. Thinking I could push it a little further, I tried Oksana's 4.7mm Nagler. Too much power. The Owl Nebula? Stupendous. It just got better and better as the night turned into morning. Retired somewhat late, but utterly refreshed. So, the first day at the Winter Star Party, a resounding success.

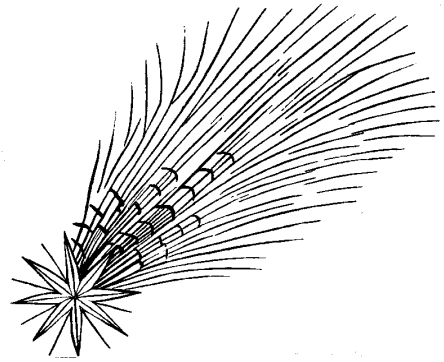
Naturally, one does not go to the Keys and spend the time looking at stars all the time, there are days. So the first day we thought we would investigate the marine life here by using a flexible rod connected to a tether of some sort, which in turn has a device on the end with some enticement to invite marine life to be a part of.(We went fishing). We were most successful in our endeavours, the final tab being: two pelicans, one speedboat, two cowfish, two puffer fish and various other specimens, the names of which we did not know. Oh, one thing we noticed along the highways was a billboard featuring three ladies, and a caption under them saying "WE BARE ALL" and not too far from there was a "Call Box". Any connection?

Tuesday the weather was iffy, so not much viewing was done, so we had ample opportunity to visit. Among those we had a nice social time with were Jack and Alice Newton. You all know Jack from his fantastic photos in S & T and Astronomy magazines. A nice couple. Actually, we met them two days earlier at the motel where we stayed prior to entering the camp grounds.

The Southern Cross was quite visible just above the horizon, and not only were all four stars visible, but we did see a fuzzy about one degree to the east of the lower star. As I mentioned earlier, the viewing was absolutely awesome.

Of course, we could not go all that way to Florida and not see Hale-Bopp, and see it we did, in all its splendour. We rose at 0445 hours, went outside and joined scores of others to see the comet. I could see it with my naked eye, and with my eyesight, if I can do that you can imagine what a spectacle the comet was. Through binoculars it was awesome. We oohed and aahed for at least an hour and a half until the dawn took it from our sight. At this time in the morning, the Big Dipper is parallel to the horizon, actually we could see that it was indeed circling Polaris.

We had ample opportunity to



look through many scopes, including the 36 incher. Some viewers were a little apprehensive having to climb eight or more steps up a shaky ladder in order to see through the eyepiece, but once that fear was overcome, the view took ones breath away. M51 indeed has spiral arms. M33 has a myriad of little galaxies keeping it company. Even with my 8 inch, we saw things that we had never seen before, because of murky skies.

And so it went, viewing night after night, seminars and fishing day after day, and the weather? What can I say? Wonderful. No, it was better than that, it was Twoterful. One home made scope that showed some ingenuity was demonstrated by its owner, a fellow from Wisconsin. As he deals with

(Continued on page 10)

ESA's Hipparcos satellite revises the scale of the cosmos

The observable Universe may be about 10 per cent larger than astronomers have supposed, according to early results from the European Space Agency's Hipparcos mission. Investigators claim that the measuring ruler used since 1912 to gauge distances in the cosmos was wrongly marked.

This ruler relies on the brightnesses of winking stars called Cepheids, but the distances of the nearest examples, which calibrate the ruler, could only be estimated. Direct measurements by Hipparcos imply that the Cepheids are more luminous and more distant than previously imagined.

The brightnesses of Cepheids seen in other galaxies are used as a guide to their distances. All of these galaxies may now be judged to lie farther away. At the same time the Hipparcos Cepheid scale drastically reduces the ages of the oldest stars, to about 11 billion years. By a tentative interpretation the Universe is perhaps 12 billion years old.

European teams of scientists and engineers conceived and launched the unique Hipparcos satellite, which operated from 1989 to 1993. Hipparcos fixed precise positions in the sky of 120,000 stars (Hipparcos Catalogue) and logged a million more with a little less accuracy (Tycho Catalogue). Since 1993 the largest computations in the history of astronomy have reconciled the observations, to achieve a hundredfold improvement in the accuracy of star positions compared with previous surveys.

Slight seasonal shifts in stellar positions as the Earth orbits the Sun, called parallaxes, give the first direct measurements of the distances of large numbers of stars. With the overall calculations completed, the harvest of scientific discoveries has begun.

The pulse-rates of the stars

Cepheid stars alternately squeeze themselves and relax, like a beating heart. They wax and wane rhythmically in brightness, every few days or weeks, at a rate that depends on their luminosity. Henrietta Leavitt at the Harvard College Observatory discovered in the early years of this century that bigger and more brilliant Cepheids vary with a longer period, according to a strict rule. It allows astronomers to gauge relative distances simply by taking the pulse-rates of the Cepheids and measuring their apparent brightnesses.

Nearby Cepheids are typically 1000-2000 light-years away. They are too far for even Hipparcos to obtain very exact distance measurements, but by taking twenty-six examples and comparing them, Michael Feast and his colleague Robin Catchpole of RGO Cambridge arrive at consistent statistics.
These define the relationship between the period and the luminosity, needed to judge the distances of Cepheids. The zero point is for an imaginary Cepheid pulsating once a day. This would be a star 300 times more luminous than the Sun, according to the Hipparcos data. The slowest Cepheid in the sample, l Carinae, has a period of 36 days and is equivalent to 18,000 suns.

Applied to existing data on Cepheids seen in nearby galaxies, the Hipparcos result increases their distances. It pushes the Large Magellanic Cloud away, from 163,000 light-years, the previously accepted value, to 179,000 light-years with the Hipparcos Cepheid corrections, an increase of 10 per cent. Feast and Catchpole feed this result back to our own Milky Way Galaxy, and into calculations of the age of globular clusters, which harbour some of the oldest stars of the Universe.

The reckoning involves another kind of variable star, the RR Lyraes, and the Hipparcos investigators arrive at an age of 11 billion years for the oldest stars. Other estimates of the oldest stars assigned to them an age of 14.6 billion years. This seemed, absurdly, to leave them older than the Universe. A team of astronomers using the Hubble Space Telescope recently declared the Universe to be only 9-12

(Continued on page 8)

Mirrors on the Move ...

(Continued from page 1)

The Schmidt-Cassegrain only has to move the primary mirror 2.2cm (0.86") to focus that close. In practice, the mirror is made to move several inches to allow for focusing while using different-sized diagonals and an assortment of astrophotography and CCD-imaging equipment. This is the main reason that they are such popular scopes.

You can't have you cake and eat it, too, as they say. For peak optical performance, there is an optimum distance between the primary and secondary mirrors. Changing that distance by as little as 1mm causes an optical defect known as spherical aberration, where the outermost and innermost rays of light don't focus at the same point on the optical axis. By comparison, SCTs tend to have rather large central obstructions, too.

Despite these problems causing less spectacular viewing, the Schmidt-Cassegrain continues to remain one of the most popular types purchased by amateurs, today.

Rob Roy
royrg@mcmail.cis.mcmaster.ca

Ann's Excellent Digital Astronomy-Flashlight

Here is a project for the amateur astronomer who has a good electronics background. If you're not good with electronics, maybe your electronics hobbyist friend would find this an enjoyable challenge.

There are two things that I find are weak points in astronomy flashlights. First, they do not have a variable light intensity. Since light levels and dark adaptation can vary a lot during an evening, a variable intensity light would be nice. Second, the switches are often poor. Either the switches don't last or they are awkward. The AEDAF gives you variable intensity with four brightness levels and uses an easy-to-use push-button switch.

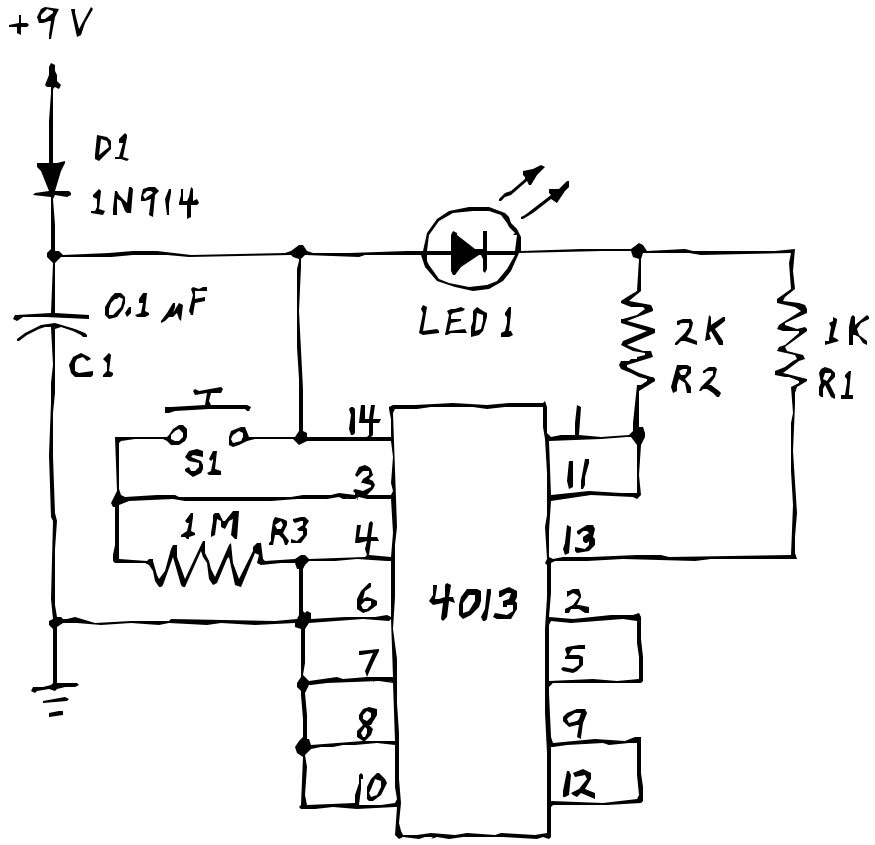
I used a pocket size infrared remote control case to house the circuit. It is a handy size, comfortable to hold, fits in a shirt pocket, will not roll and comes with a convenient built-in nine volt battery holder.

The heart of the circuit is the 4013 CMOS dual type D flip-flop. Diode D1 protects the 4013 and LED from being destroyed if the battery is accidentally connected in reverse. Capacitor C1 reduces multiple switching caused by voltage fluctuations when the 4013 switches. Switch S1 should be a good snap action SPST normally open push button switch. I used a PC mount keyboard switch because its low profile allowed it to be surface mounted. The large flat button seems ideal and the price is low. Resistor R3 pulls the input voltage on pin 3 down to low when S1 is not depressed. When S1 is depressed, pin 3 goes high and the first flip-flop output goes low. Current flows through R2 and the light emitting diode, LED1. The next S1 depression switches off the first output and the second, on. Current flows through R1 and LED1. Since R1 is half the resistance of R2 the current flow is higher and the LED glows brighter. The third depression of S1 turns on both outputs and current flows through both R1 and R2. The LED is a maximum brightness and about 8 mA will flow, 9mA if you leave out D1. With D1 in, R1 = 500 ohms and R2 = 1.4 K ohms, about 12 mA will flow. This is pushing the 4013 since the first flip-flop is passing about 8.5 mA, and the output limit is 10 mA. It is VERY important that a super-bright LED be used, otherwise you will have an ornament, not a useful flashlight!

Unfortunately, Radio Shack has discontinued the super-bright LED, but some stores still have it in stock. If you buy one elsewhere, make sure it is rated for at least 2,000 mcd at 20 mA.

Enjoy!

Bill Tekatch, (905) 575-5433
tekatcba@mcmail.cis.mcmaster.ca



Rob'serving ...

(Continued from page 3)

- 11&12- BCA observing nights.
- 19-2am Moon 4 deg. S of Mars.
- 21- Lyrid Meteor Shower peaks (washed out by full Moon.)
- 29-2am Mars stationary against the background of stars.

- Mercury is an evening *star* at the beginning of April.
- Mars rises at sunset in mid-March and is visible all night.
- Jupiter rises earlier each morning and will soon be worth getting up for.
- Neptune & Uranus are a bit west of Jupiter in the morning sky.
- Saturn & Venus are too close to the Sun for viewing.

Rob Roy, Observing Director
royrg@mcmail.cis.mcmaster.ca

ESA's Hipparcos satellite ...

(Continued from page 6)

billion years old. The Hipparcos Cepheid result increases that Hubble-inferred cosmic lifespan to 10-13 billion years.

"I hope we've cured a nonsensical contradiction that was a headache for cosmologists," Michael Feast says. "We judge the Universe to be a little bigger and therefore a little older, by about a billion years. The oldest stars seem to be much younger than supposed, by about 4 billion years. If we can settle on an age of the Universe at, say, 12 billion years then everything will fit nicely."

Feast and Catchpole have also cleared up a mystery about the nearest and most familiar Cepheid variable. This is Polaris, the Pole Star. Imperceptibly to the human eye, its brightness varies at a relatively high rate, every 3 days. That should make it, by the Cepheid rule, a feebler star than it appears to be.

Hipparcos fixes the distance of Polaris at 430 light-years, and the researchers conclude that Polaris pulsates with an overtone, at a rate 40 per cent faster than expected for a Cepheid of its size and luminosity. Several other Cepheids gauged by Hipparcos also exhibit overtones. Were these not recognized as fast pulsators they would give false impressions in the Cepheid distance scale.

The miraculous stars

Another famous variable star pulsates at more than twice the frequency that theorists would expect. This is Mira, the prototype of the class of stars investigated by Floor van Leeuwen and his colleagues, using the Hipparcos data. To an unaided eye, Omicron Ceti appears and disappears in a cycle of 11 months. In the 17th Century astronomers named it Mira, the miraculous star. Astrophysicists today interpret Mira as a senile star slightly more massive than the Sun. It has swollen into a red giant and started oscillating, as a prelude to greater instabilities that will in due course fling the outer layers of the star into space.

Hipparcos fixes Mira's distance at 420 light-years. Other astronomers have gauged the apparent width of the star, as seen from the ground, so the Hipparcos team can compute the diameter of Mira as 650 million kilometres -- somewhat wider than the orbit of Mars. If the Sun were in Mira's state it would swallow up the Earth and all of the inner planets.

Astronomers knew that Mira was big, but the Hipparcos result confirms that it is too large to be oscillating in a simple fashion. Again its variation is an overtone, and the same is true of some other variable stars of the
same type, known collectively as the Miras.

The sixteen Miras in the survey are mostly 300-1000 light-years away, at distances more comfortably within the grasp of Hipparcos parallaxes. Before Hipparcos, there was only one fairly good measurement of a Mira distance, for the star R Leonis. Even in that case, Hipparcos adjusts the distance
from 390 to 330 light-years.

Applied to the Large Magellanic Cloud, where Miras have been detected, the Hipparcos Mira scale puts the galaxy at 166,000 or 171,000 light-years, depending on the method of calculation preferred. This result is intermediate between the commonly accepted distance to the Large Magellanic Cloud and the new result from the Hipparcos Cepheid scale.

Only the beginning

Michael Perryman, ESA's project scientist for Hipparcos, anticipates a warm debate among astronomers. Should the Hipparcos Cepheid results be taken at face value, with all their implications for the size and age of the Universe? He remains confident that the issue will be settled by other results quarried from the Hipparcos data.

Further Hipparcos studies of variable stars, including the RR Lyraes, are in progress. Also relevant to the distance scale are differing quantities of heavy elements present in stars of different ages, which can affect their luminosities. Any remaining confusion on this point will be dispelled by mainstream Hipparcos research devoted to the basic astrophysics of stars of different ages of origin, and at different stages of their life cycles.

Information about Hipparcos is accessible on the World Wide Web: **http://astro.estec.esa.nl/Hipparcos/hipparcos.html**

Ask the "Expert" ...

(Continued from page 2)

Using the software program "Earth Centred Universe" to measure the distance between the north ecliptic pole and the north galactic pole shows that they are approximately 60 degrees apart. If you look in a star atlas such as "Sky Atlas 2000.0" you can see that the Galactic Equator is tilted 60 degrees from the Ecliptic.

It is probably a lot easier to understand this out under the night sky with a few star charts handy. Join us a one of our scheduled observing sessions to learn more.

April Night Skies

Winter Star Party ...

(Continued from page 5)

people with handicaps, his scope, a 20 incher, is so constructed that one can remain seated because the eyepiece is always at the same level. A long handle controlled the azimuth and as a wheelchair moves alongside, so does the scope rotate. He is much in demand in his home town and has had much success with his design.

We did meet some folks we met last year, and added some new acquaintances this year. Some folks left the site on Friday as they had to go to work on the Monday, and to fill the void next to us, two ladies from Jacksonville camped there. They just came for the weekend. Very nice folks.

The food in the starlight cafe was excellent. There was a good variety and lots of it. All in all, we rate the Winter Star Party with five stars out of five. The staff were great, the security was excellent, the site was A-one and the skies were just marvelous. Who could ask for anything more?

Too soon we had to break camp and start back for home, but the memories will be everlasting. The Dobs dominated the field, but there was a good smattering of LX200's 8" 10" 12" There was a goodly number of young people there which was good to see. The door prize, an 8 inch LX200 was not won by us, but we did cheer the person who did win it. There were some super prizes, but alas, Oksana's luck had run out and all we will return with will be our sun tans.

By way of the Kennedy Space Center, we made our way back. We were in the area for the space shuttle takeoff, but somehow, we slept right through it. Disney World was a nice diversion, so nice in fact, we stayed an extra day in the area.

Friday and Saturday we were seriously on our way back to Canada, and on Sunday morning at 0915 we left Toledo, Ohio in a snow storm which did not let up until we got to Rockwood. The 401 from Windsor to the Guelph Line was snowbound. Traffic moved at 40 kmh. Vehicles were in the ditches, vehicles were upside down , vehicles were facing west in the eastbound lanes, it was a real smozzle out there, but we took our perfectly good time and arrived home safe and sound to a driveway full of snow. A great homecoming.

Oh, lest I forget, I picked up a GPS 38 down in Key West. It was the last one the store had so they dropped 10 dollars off the price. Was 119 dollars U.S. a good price?

See you all at the next meeting.

Oksana and Lou Darcie
Astronomaires Extraordinaire.

CALENDAR OF EVENTS

♦ Tuesday, March 18, 7:00 PM	**HAMILTON AMATEUR JUNIOR ASTRONOMERS** - Mac Burke Science Building, Rm B148 (beside the planetarium) Topic to be "Comet Hale-Bopp". For more information contact Rosa Assalone at 540-8793
♦ Friday, March 21, 7:30 PM	**COUNCIL MEETING** - At the home of Stewart Attlesey. Call Doug at 525-9140 Extension 23186 if you are interested in attending.
♦ Thursday, April 6, 8:00 PM	**ROYAL ASTRONOMICAL SOCIETY OF CANADA Hamilton Centre** - General Meeting - McMaster University Medical Building Room 1A6.
♦ April 4,5,11,12. 8:00PM	**BINBROOK OBSERVING SESSIONS** - Proposed observing nights. For confirmation or directions call Rob Roy (692-3245) or Ann Tekatch (575-5433)
♦ Friday, April 11, 11:59 PM	**EVENT HORIZON DEADLINE** - Please submit your articles and pictures to Stewart Attlesey, **attlesey@interlog.com** or modem (905)827-9105 or snail mail to 1317 Mapleridge Cres., Oakville, L6M 2G8
♦ Friday, April 18, 7:30 PM	**HAA GENERAL MEETING** - at the Spectator Building auditorium. Speaker to be announced. Parking lot observing, weather permitting.
♦ Saturday, March 22, 8:00 PM	**COSMOLOGY DISCUSSION GROUP** - Room B148 (next to the planetarium,) Burke Science Building, McMaster University. The topic will be "Near,At, and Faster than the Speed of Light" For more information contact Bill Tekatch at 575-5433 or tekatcba@mcmail.cis.mcmaster.ca
♦ Saturday, May 24, 8:00 PM	**COSMOLOGY DISCUSSION GROUP** - Room B148 (next to the Planetarium) Burke Science Building, McMaster University. Topic will be "Reality". For more information contact Bill Tekatch at 575-5433 or tekatcba@mcmail.cis.mcmaster.ca