NOVA NOTES

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THE NEWSLETTER OF THE HALIFAX CENTRE OF THE RASC
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NOVA NOTES, the newsletter of the ***Halifax Centre of the Royal Astronomical Society of Canada***, is published bi-monthly in February, April, June, August, October, and December. The opinions expressed herein are not necessarily those of the *Halifax Centre*. Material for the next issue should reach the editor by **November 10, 1993**. Articles on any aspect of astronomy will be considered for publication. "Letters to the Editor" or to our resident expert: *GAZER* are also most welcome. The editor can be reached at:

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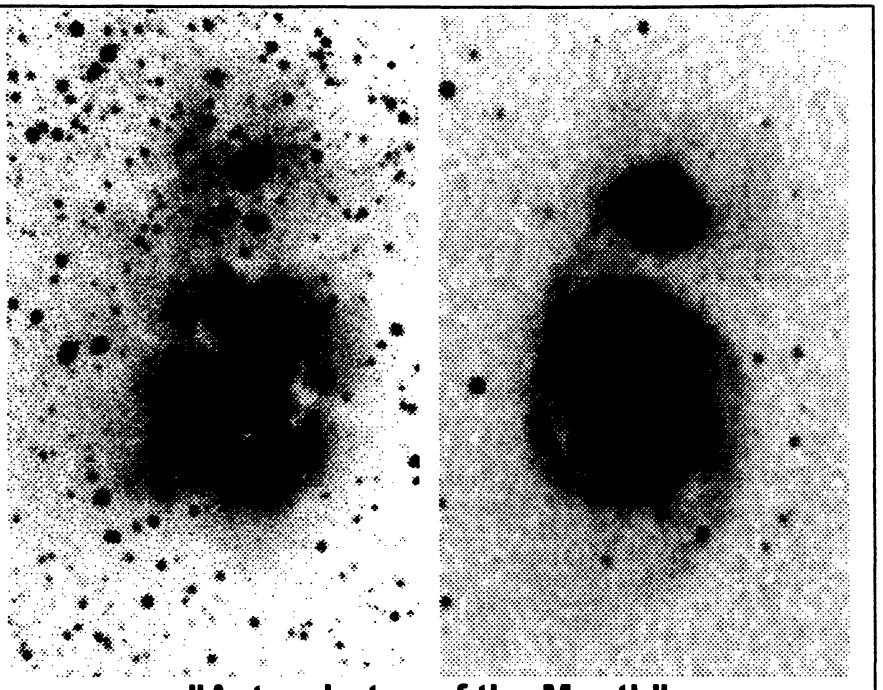


"Astrophotos of the Month"

M20 - The Trifid Nebula and M51 - The Whirlpool Galaxy

These 30 second exposure CCD images were taken by David Lane and Greg Palman at this year's Nova East using an Astro-Physics 6" f/8 refractor and the Burke-Gaffney Observatory's ST-6 CCD camera.

Inside This Issue...

Nova Notes is printed on recycled paper

Editor's Report

Well, this is the largest issue of *Nova Notes* that I have produced to date. I'd like to thank all of those who took the time to write an article. *GAZER* especially liked to received some mail. *GAZER* has also renamed the gossip column to better reflect his/her source of material. Ω

THE HALIFAX 1993 GENERAL ASSEMBLY

(Another Report)
by Mary Lou Whitehorne

Thursday, July 1st,. delegates are arriving to register for the GA and all the doors to the residence building are closed and locked. An auspicious beginning for the GA, wouldn't you say? But that didn't make it any less of a pain for the GA organizing committee! Then I got a call from Roy Bishop, right in the middle of my daughter's birthday party, stating that David Levy's plane was stuck on the

ground in Tucson, Arizona and that he might be 24 hours late arriving! What next?!?!?

The GA was a smashing success. We had a pretty good turnout and everybody seemed to enjoy themselves immensely. At least that's the message I get from all the letters that I've received in the mail so far. Very gratifying indeed!

Thursday was not an official GA day; all we did was register a number of delegates. Friday began very early (2:30 AM) when I met David Levy's plane which finally got off the ground. A few hours later we were at the Mount, greeting more delegates and doing media interviews with David. Things began for real Friday afternoon with the first National Council meeting. I wasn't in attendance for it, but I hear through the grapevine that it ran smoothly without any incidents of fisticuffs.

Friday evening we gathered for the traditional Wine & Cheese reception followed by the Song Contest. We were joined by an astronomer of note from a bygone era (our own Nat Cohen was all dressed up as Kepler) who emceed the song contest and silly story telling. A real departure (and treat!) was the National Council skit that nearly ran away with the trophy and they didn't even sing! Except for Cathy Hall, of Ottawa, who kept singing about abolishing the Journal! Fortunately, the sound meter registered a higher decibel reading for me and my kids singing "The 12 Days of the GA", and we walked away with the award. Whew! There was all kinds of singing going on; most notably, David Levy managed to get the entire room singing Peter Jedicke's "Astronomer's Anthem" along with him. Strange but nice!

Saturday brought the paper sessions. These were chaired very capably by Dave Chapman; he's one smooth operator who really deserves a pat on the back. We broke earlier than usual in the afternoon for an early supper and followed by the cruise on the Bluenose II. Everybody enjoyed it except for Mike Watson and Bob May (of Toronto) who came madly and vainly running down the dock just in time to see the rest of us sail away! I can imagine what they must have felt...

The final paper session was held Sunday morning; the Annual Meeting began after lunch. It ran overtime due to the use of many proxy votes on a couple of issues, but we managed to complete the agenda anyway. National Council met a second time following the Annual Meeting while the rest of us had a bit of a breather before the Awards Banquet.

The Banquet was about 40 minutes late (another flub by the Mount) so the awards ceremony was necessarily rushed. But not so rushed that we didn't have time to admire and appreciate the lovely silver medals, so carefully hand cast by our own Nat Cohen, as Display Competition prizes. Anybody lucky enough to receive one has something very special!

We were late getting to the auditorium for the Northcott Lecture by David Levy. It was a great lecture; sure to be remembered by all in attendance. Who would not be totally caught up in the prospect of a comet about to crash into one of our Solar System neighbours? David is a very dynamic speaker, easily able to convey the magic and mystery of the night; the thrill of discovery; and the challenge of bringing the night sky into all people's lives, thereby enriching us, one and all. The Northcott Lecture brought an end to the formal GA activities. Monday was set aside for fun.

We toured a bit of Halifax by visiting the Citadel and the Maritime Museum of the Atlantic and the old WWII Corvette - "Sackville". We saw the Russian missile ships leave the harbour and then went in search of lunch. After lunch we boarded the buses for a trip to Peggy's Cove on a beautiful sunny afternoon. I think everybody brought back a souvenir sun burn that day. After supper at the Mount, we headed for the buses one last time to see the Nova Scotia International Tattoo. It really was the icing on the cake - a fabulous show and a fabulous way to finish off the best GA in recent years.

After the Tattoo, some of us went to SMU for a quick tour of the BGO. By this time we were all pretty tired and ready to collapse. Most good-byes were said on Monday night but a few remained for Tuesday morning when the last of the die-hard GA go-ers finally signed out of residence. The doors had been unlocked by now!

I watched the GA wind down with a sense of total exhaustion; immense satisfaction that it had gone so well, thanks to all the wonderful help from so many Halifax Centre members; relief that it was finally over; and regret that it would be at least a year before I would get to rub elbows with so many terrific people from across the RASC again.

My sincerest thanks go to everyone who helped out - no matter how little or how much - it all added up to a highly successful and memorable event. I want to send my best regards to everyone who attended from across Canada (and beyond our borders) and I hope to see many of you next year in St. John's! Ω

Scheduled Observing Sessions

Club Observing Session
Saturday, October 16
Beaverbank Observing site
of if cloudy on Sunday, October 17

Club Observing Session
Friday, November 12
Beaverbank Observing site
of if cloudy on Saturday, November 13

For information or for directions to the Beaverbank site, call Paul Gray (864-2145) or Dave Lane (443-5989)

NSPAC Reps Visit Spitz Plant

by **Mary Lou Whitehorne**
Chairman, NSPAC

Spitz Inc., manufacturers of Spitz planetarium instruments, invited Dave Lane and I to visit their production facility in Chadds Ford, just outside Philadelphia. We traveled there on

August 6, 1993, where we were met at the airport in Philadelphia by Jim Mullaney, an astronomer and Spitz sales rep.

After driving to Chadds Ford and checking in to our hotel (without our luggage, which had mysteriously disappeared) we were off to lunch with two Spitz people and then on to a complete tour of their production facility. We met a lot of friendly, knowledgeable people with a real interest in bringing astronomy to the world.

One fellow, a sales rep, is also the unofficial Spitz historian, and he was able to tell us that our present old Spitz instrument is a hybrid model A1-A2. We treated him and the rest of the crew to a slide show of our old projector and they were all keenly interested in seeing that this instrument is still in good working order.

We saw where and how both the domes and the planetarium instruments are made and then tested before being shipped out to customers. They have two drilling rigs: one for drilling the star balls of the System 512 and another much larger rig for doing the huge Space Voyager projector.

We met and chatted with the folks who cut and form the dome sections; the people who wire the electronic control systems; the guy who does the programming; the technical rep who sets up all the Spitz systems all over the world; the President of Spitz, Charlie Holmes (nice guy!); the clerical staff; everybody at Spitz, in other words! These people really are dedicated and firmly committed to the belief that Spitz is a unique company with something really special to offer to the world.

Much of our time, however, was spent in the 30 ft. test dome putting a System 512 machine through its paces. A day and a half was almost enough time to see how all the little bits and pieces worked together to produce a beautifully realistic night sky. We were definitely impressed with what Spitz has to offer: a basic and very complete planetarium at an affordable price. The particular instrument that we were working with was for delivery to someone else and was set up in the test dome for a shakedown. It had a few problems that needed work: the stars in Orion's belt were out of alignment. M13 was out of place and a bit too bright. There was a 4th mag star missing beside M31. Alcor was not correctly oriented with respect to Mizar. The colours in some of the planets were incorrect.

The major drawback that I see with the System 512 is the "black hole" in the Southern sky. This is a problem inherent to the design of the 512 (and the our current A1-A2), the severity of which is somewhat influenced by the size of the dome that the 512 is installed in. In spite of these things, the Spitz sky is beautiful and their instrument offers some real advantages other than price alone.

Time spent working with and learning about the 512 instrument was punctuated by pleasant meals with the Spitz crew at several local restaurants. We saw some of the lovely Pennsylvania countryside and even found twenty minutes for a dip in the hotel pool.

The day before we flew home, we rented a car and drove into Philadelphia to visit the Franklin Institute Science Museum and the Fels Planetarium (a Digistar). Of particular interest in the Franklin Institute was the observatory and the Astronomy displays. We came back with plenty of ideas for our future exhibits gallery.

The Fels Planetarium has a modern Digistar projector and Dave and I sat in a children's show. It was AWFUL!!! The star field was unbelievably bad with fuzzy star images swollen to 1/2 - 1 full degree! Needless to say, the program went to great lengths to de-emphasize the very poor star images and draw attention to slides, panoramas, video, and special effects; none of which were anything to write home about. While there we were able to talk with one show operator and the assistant director. Interestingly, they both said, in different ways, that they were sorry they had gotten rid of their old Zeiss. Need I say more?

It was a very worthwhile trip. We learned a lot about Spitz; their instruments, their people and their company philosophy. We learned even more about the planetarium business and this project that we're taking on.

We also encountered head-on one of the major problems facing planetaria everywhere today. That is to say, due to fiscal restraint, institutions are hiring people to put on planetarium shows who know nothing about astronomy. The end result of this strategy can be nothing but disastrous for everyone. I was both saddened and embarrassed to witness this first hand in the Fels Planetarium. We had best be careful that the same does not happen in our planetarium! Ω

Ramblings of an Observer
(and Nova East 93 Report)
by Douglas Pitcairn

Well, its been quite a time since I put the ol' hands on the keyboard and contributed to Nova Notes, so here we go.

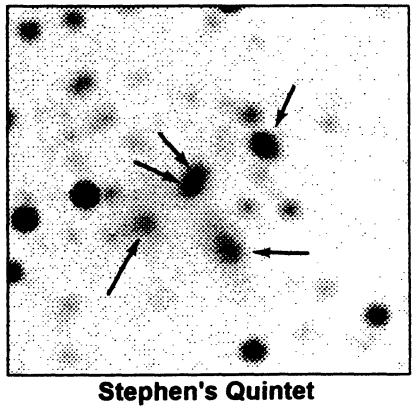
Nova East was a great success this year, due largely to the enthusiasm of its participants, and also due to the cooperation of the weather. Friday night was totally socked in, but Saturday was superb with MVM about 6.5 and seeing which started poor but improved to average as the night progressed. Sunday night saw a still respectable MVM of 6.0 but with better seeing conditions.

I personally feel that it was the best sky I have seen since Mount Pinatubo belched. I guess its OK to start observing regularly again. The public talks were held on both Friday and Saturday nights, with three short talks each session. After the talks on Saturday, a dozen astronomers took the effort to bring down their telescopes and show wonders to a crowd which averaged about 200 people (I estimated from the turnover that there was about 600 public shown eyepiece views over the hour and half). I would like to thank all those people who took this effort.

It is difficult to leave the campsite under such perfect conditions to do some public viewing sessions. Yet, I

spoke with several people who came to the park that weekend specifically to look through a telescope. The benefits of this type of program to the long term health of the astronomical community cannot be over emphasized. These people leave with an greatly increased awareness which I am sure will spawn astronomers and sympathy for the fight against light pollution down the road.

The viewing back at the site was stunning, with lots equipment and images to remember. I tracked down for the first time Stephen's Quintet, a tiny group of 5 galaxies of some fame. They are very difficult in a 10" scope visually, but easy in the 13" under such ideal conditions. Dave Lane and Greg Palman (of Maine) were astounding everyone (and themselves) when using a CCD detector on Greg's 6" refractor. The quality of the images they obtained were absolutely incredible.



Stephen's Quintet

150 second exposure taken at Nova East using a 6" f/8 refractor and an ST-6 CCD Camera (image by Greg Palman and Dave Lane). The galaxies are marked by arrows.

What else is new? ... well as a result of viewing through Dave Lane's 13mm Naglar eyepiece, I have decided to trade my 7.4mm Plossl and my 15mm Wide-Field in for a Naglar, most likely the 9mm model. This is one place I like to indulge myself a bit. Allow me to share my thoughts on this. On starting observing, I quickly discovered that eyepieces make a tremendous difference in the final image. I started out in the eyepiece game with two eyepieces which came along with my Bausch&Lomb 4" SCT. These were an 18mm symmetrical and a 32 mm symmetrical. A design which I understand to be very close to a Plossl. The funny thing about these two eyepieces, was that the 18 had a much larger apparent field, so much so that the actual field in the two pieces was almost identical. Now, I can't imagine why you would ever want to half the magnification without increasing the actual field. After a few observing sessions, I sold the 32 and purchased a 32mm Tele Vue Plossl. This was an excellent eyepiece, except that it gave me a bad blind spot when my eye was not dark adapted. Unable to use this in the daytime, I traded for a Celestron 26mm Plossl. This workhorse of eyepieces is the standard low power which comes with Celestron telescopes. It is a good deal as a second hand eyepiece, there are lots of them out there, and when scope owners upgrade, they sell 'em off. Expect to pay between $40 and $50.

Then along came the 10" f4.5 Coulter Odyssey. Now, I discovered that I could make more use of a shorter focal length eyepiece. I purchased a 10.5mm Tele Vue Plossl, then a short time later, sold the 26mm Celestron for a 24mm Tele Vue Wide-Field. I really like both these eyepieces and would recommend them for f4.5 scopes. I later expended the 10.5 into a 7.4 Plossl and a 15mm Wide-Field. The 6-element Tele Vue Wide-Field series are a "poor man's Naglar" and are a good trade off between optical quality, performance and price. However, I found that the 7.4mm Plossl was less useful. It did not perform well with my bucket *(Editors Note: 'bucket' = '10" f4.5 Coulter Odyssey')*, and I found myself wanting to use the 10.5mm, which I had sold to Pat Kelly (I thought about trying to swindle it back from him, but he's an Irishman, and well, you know what they're like...).

Then, came the Panoptic (from Tele Vue), a 5 element low power design with improved optical properties over the Wide-Fields. I traded the 24mm Wide-Field for a 22mm Panoptic, and I am convinced that this is the ultimate low power eyepiece. The coma which was supposed to be present in an f4.5 was obvious, whereas before it had been largely hidden in the Wide-Field's astigmatism. Also, I can see the entire 67 degree field with my eyeglasses on. A nice feature.

So now I'm going for a single high power, the 9mm Naglar. It has almost the same actual field as the 15 Wide field, yet at the magnification near that of the 7.4mm Plossl, and with good eye relief to boot. The very wide apparent fields of view of the Naglars would seem to make a large assortment of eyepieces quite unnecessary. Even the high powers can frame all but the largest deep sky objects. Also, the wide field of view means that I do not have to reposition the bucket nearly as often, a real bonus for us alt-azimuth telescope owners.

You may have noticed that I seem to be stuck on Tele Vue. The reason is two fold. Whenever I have tried two comparable models, I personally preferred the Tele Vue over the Meade. Secondly, they are perceived as better, and thus fetch a higher resale price - an important consideration if you are as quick to upgrade as I am. Try them if you are able, your preferences may be quite different than mine. So, now I have a 22 Panoptic and a 9mm Naglar. Are they expensive? You bet - a total cost of 700 dollars. Yet the views are very impressive and comfortable, hard to beat., but I feel its worth it. Besides, my total system cost is still less than a C8. Something to think about. Ω

The 1993 Perseid Meteor "Sprinkle" in Europe

by David M. F. Chapman

This year, astronomers were paying special attention to the annual Perseid meteor shower in August, for a couple of reasons. Over the last few years, keen-eyed meteor counters around the world have been reporting a short, intense "storm" of meteors that occurs about a half day before the traditional maximum. Also, the parent comet of the Perseid shower, Periodic Comet Swift-Tuttle, was observed to pass though the solar system last winter.

As this only happens every 130 years or so, there was some speculation that there may be an especially strong Perseid shower in 1993 due to an increased density of particles in the comet's vicinity. (A full description of this can be found in the August 1993 issue of *Sky & Telescope* magazine.) Meteor specialists expected that the passage of the Earth through the thin stream of extra particles would take place very quickly, lasting only about an hour, so it would be important to be in the right place at the right time to observe this event. In *Sky & Telescope*, the storm was predicted to peak at about 22:30 UT, 11 August 1993. This time (if correct) indicated that Western Europe would be prime observing territory, as the storm would take place after the end of twilight but before the rising of the last-quarter Moon. Farther West, the sky would not yet be dark; farther East, the Moon would already be up.

As luck would have it, on the night of the expected storm I was staying in a house in the countryside of southwest France near the town of Jegun, about halfway between Toulouse and Bordeaux and almost due south of London, England. (The lat/long is 43° 46' N, 0° 28' E). Most years, I try to get out and look for the Perseid meteors, but I haven't properly observed (i.e. counted) them in a long time. This year's impending storm suggested a more serious approach, especially as I was to be in a favourable location. I prepared myself accordingly: notepad, red-lensed flashlight, timer, sky transparency chart, chaise longue, etc.

The nights leading up to August 11th were cloudy, so I had no chance to make a dry run. Miraculously, the sky cleared at dusk on the 11th and I started observing towards the southeast when it became dark at 11 P.M. (Despite the longitude, the French operate one time zone ahead of UT and were on summer time as well, so the clocks were 2 hours ahead of solar time.) I counted the number of shower meteors (NSM) and the number of non-shower meteors (NNM) in 15-minute time intervals, estimating the limiting visual magnitude (LVM) at the start of each interval. Later, using the computer program Voyager II, I calculated the altitude of the radiant (AOR) in degrees at the mid-point of each interval. Here are my raw observations for 11 August 1993:

UT	LVM	AOR	NSM	NNM	Comments
2100	5.0	20	7	1	end of twilight
2115	5.0	22	3	0	
2130	5.0	23	1	1	
2145	5.0				no data
2200	5.5	26	5	0	
2215	5.5	27	6	1	
2230	5.5	29	10	1	
2245	5.5	30	0	0	
2300	6.0	32	10	2	
2315	6.0	34	10	2	
2330	5.5				no data
2345	5.5	37	6	1	Moon interfering
0000	5.0				no data

In summary, I saw about 6 meteors per quarter hour, or about 24 per hour, with large fluctuations in the numbers. (Statisticians will tell you that this is to be expected for this kind of measurement.) Even taking into account the pre-midnight observing time, the low altitude of the radiant, and the less-than ideal sky conditions, these numbers do not spell "meteor storm", in my opinion. I had hoped to observe the very next night to calibrate my observing method, but the weather did not cooperate. I managed to observe 4 nights later (15 August 1993), but the numbers were well down as show below:

UT	LVM	AOR	NSM	NNM	Comments
2100	5.0	22	1	2	end of twilight
2115	5.0	23	2	1	
2130	5.0	24	4	0	
2145	5.0	26	1	0	
2200	5.0	27	1	1	
2215	5.0	29	1	2	
2230	5.0	30	1	1	
2245	5.0	32	1	1	
2300	6.0				no data

The observed average on this night was about 1.5 per quarter hour, or 6 per hour. This rate is about 25% of the 11 August rate, which is consistent with the 5-day duration of the shower. (The duration is the time interval during which the rate is 25% or more of the peak rate.) I am not certain how to convert these raw observations into zenith hourly rate (ZHR) to compare with the observations of others, but my gut feeling is that these numbers do not indicate that anything remarkable took place during the Perseid meteor shower in the time interval 2100-2400 UT on 11 August 1993. Perhaps observers elsewhere had more luck. Ω

Constellation of the Month: Pegasus

by Joe Yurchesyn

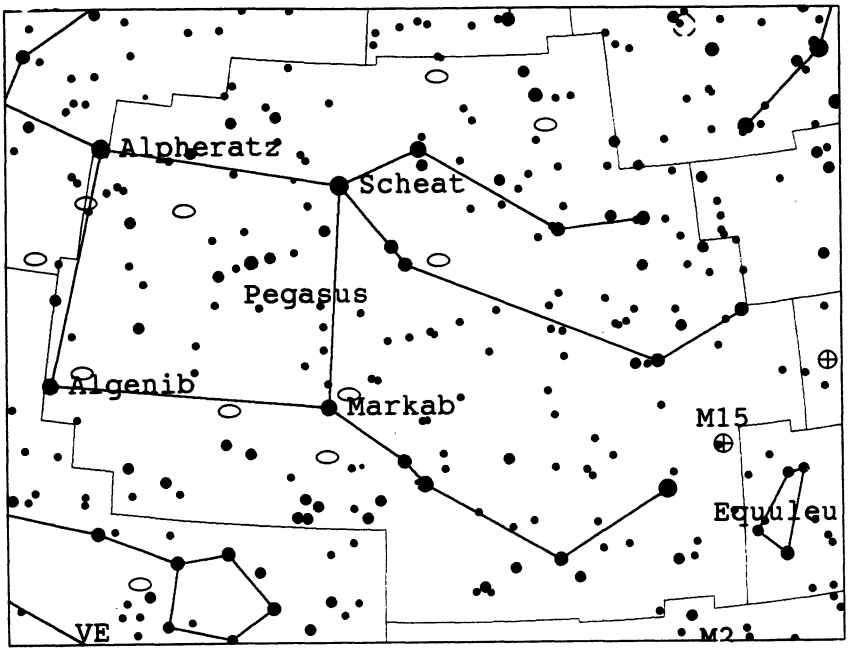
According to Greek mythology, Pegasus was the famed *Flying horse* that was born from the blood of the Medusa, when that monster had been slain by Perseus. After his creation, the Winged Horse made his first landing on the rocky heights above Corinth, where the blow of his hoof caused the famous spring of Peirene to gush forth. The spot was scared to the Corinthians and Pegasus was held in special reverence. In fact, Pegasus appears on Corinthian coins as early as 550 BC.

In one tradition, Pegasus carried the thunder and lightning for Zeus. In another, he was tamed by Athena or Minerva and (according to Greek legend) was given to the Muses; in whose service he became the symbol of poetic inspiration.

In still another classic tale, he became the steed of the Greek hero Bellerophon, Prince of Corinth, and slayer of the fearsome Chimaera, a most unlikely combination of lion, serpent, and goat (!?). Bellerophon tamed the fabulous Flying Horse with the aid of Athena, after spending a night of prayer in her temple. Bellerophon had many fabulous adventures with the great horse, but eventually he became so bold as to attempt to fly to the top of Mount Olympus itself. The wiser Pegasus, however, refused to attempt the flight and threw his rider to Earth.

The constellation has also been identified as the *Horse of Nimrod* by ancient Jewish writers and with the Archangel *Gabriel* in later times.

Surprisingly (at least to this author), the tradition that connects Pegasus with the hero Perseus is of more modern origin, and is not supported by the ancient myths. The presence of Pegasus at the rescue of



(Chart produced by The Earth Centered Universe™)

Andromeda is also a part of this modern mythos.

In the sky, Pegasus appears turned over on his back, with his body outlined by the stars of the Great Square - Alpha (Markab), Beta (Scheat), Gamma (Algenib), and Alpha Andromeda (Alpheratz). His front legs are marked by Eta (Matar) and Iota, and his head by Epsilon (Enif). His wings are not indicated, but would lie more or less at the position of the "Circlet of Pisces", about 10° below the southern edge of the Great Square.

The northern edge of the constellation lies about 20° south of the plane of the Milky Way, and as such contains twenty extra-galactic nebulae (brighter then 15th magnitude), two planetary nebulae, one globular cluster (M-15), and one faint sparse open cluster. The best galaxy object includes NGC-7331, with the nearby (½° distant) Stephan's Quintet offering a challenge for large aperture telescopes *(Editor's Note: Doug Pitcairn and other were able to see this faint grouping at this year's Nova East - see "Ramblings of an Observer" in this issue).*

NGC-7331, located about 4.5° north of Eta, is often used to illustrate the probable extragalactic appearance of our own Milky Way system. It is a type Sb spiral galaxy similar in type and structure to the Andromeda galaxy, M-31, but 23 times more distant. Half a degree toward the south southwest is the tight little group of remote galaxies called Stephan's Quintet, consisting of NGC-7317, 7318A, 7318B, 7319, and 7320. This is the best known case of an apparent cluster of galaxies displaying widely discordant redshifts. NGC-7320 has a redshift of 480 miles per second, while the other four members have redshifts that average about 3,600 miles per second. The obvious explanation is that NGC-7320 is simply a foreground object, but on long exposure photographs, it appears to be connected to the other objects by faint tidal streamers. In addition, the degree of resolution possible in the other members implies a distance for the other objects that is not as remote as their redshifts would indicate. Also, recent radio observations of the NGC-7331 region reveals sources that appear to engulf the nearby galaxy cluster.

The star Epsilon is named Enif, from the Arabic *Al Anf*, "The Nose". It is a 10 solar mass star lying some 780 ly's distant and has a luminosity of 5,800 suns. Lying about 4° to the northwest is the globular cluster M-15. It lies 34-39,000 ly's distant making it 1.5-1.7 times more remote then the M-13 Hercules cluster. It was discovered by Maraldi in September 1746 during the search for the de Cheseaux Comet of that year, and was rediscovered by Charles Messier in 1764. This globular is easily resolved in moderate apertures and shows a distinct central condensation. It is also an intense X-ray source, leading to speculation about the presence of a central black hole. Indeed, M-15 has one of the most intensely brilliant cores of any globular. It also has 110 known variable stars (mostly RR Lyrae)!

A unique feature of M-15 is the presence of a small planetary nebula (K648 or Pease 1) on the northeast side of the cluster - the only one known to reside in a globular cluster. From radial velocity measurements of the nebula's spectrum (taken with the 100" Mt. Wilson telescope), it has been determined to be an object actually in the cluster, and not a foreground object. With a diameter of 1", a photographic magnitude of 13.8, and hundreds of surrounding stars, this planetary not visible in amateur telescopes.

Lying 1.8° west northwest of M-15 is the planetary nebula NGC-7094. It appears as a faint mist surrounding a 13.5 magnitude star! The other planetary, PK 104-29°1 (popularly known as Jones 1) is located just north of the Great Square, about 3/4° south of 72 Pegasi. It was discovered photographically in 1940, but is visible in a 6" telescope with a nebular filter. It appears as a faint annulus about 5.5' in diameter, with bright sections located in the north northwest and south southwest directions, and with a very weak on the eastern periphery. There appears to be no apparent central star.

Marking the southwest corner of the great square is Alpha Pegasi. It is 110 ly's distant and shines with a luminosity of 95 suns. It provides a bright guide post, in a rather blank part of the sky, to the beautiful S-shaped barred spiral NGC-7479, which lies 2.9° directly south.

Marking the southeast corner of the great square is Gamma Pegasi. It is a giant star lying some 570 ly's distant

and shines with a luminosity of 1,900 suns. It also provides a bright guide post to the precisely edge-on spiral galaxy NGC-7814 located some 3° to the northwest. It is easily visible in a 3" or 4" scope, but a 6" is needed to reveal the galaxies broad equatorial dust lane, which splits the object into two halves.

Also located near Gamma (3.8° west and slightly north) is the variable star U Pegasi. It consists of two dwarf stars (0.88 and 1.10 solar masses, each with a 0.60 solar diameter) separated by 1.9 million kilometres, with an orbital period of just under 9 hours. The visual brightness variation is from magnitude 9.2 to 9.9, with two eclipses during each revolution; the primary minimum being 0.1 magnitude fainter then the secondary minimum. The primary minimum occurs with the more massive star being in front. The orbital period is slowly decreasing, indicating an exchange of material between the two stars.

Observers with access to a big aperture telescope may wish to check out the Pegasus I galaxy cluster. The two brightest members (NGC-7619, 7626) are visible in a small aperture and are located on the Pegasus side of the border with Pisces, about 3° east southeast of the parallelogram formed by the four stars 55, 57, 58, & 59 Pegasi. These galaxies are separated by 7', so both can be viewed in the same high power field.

Just a little something to ponder, when you next gaze in the direction of Perseus. Now, if I could just figure out a way to solve this Stephan's Quintet controversy once and for all? Ω

Micro-Guider II:
A Telescope to Computer Interface Device You Can Build

by David Lane

INTRODUCTION

Micro-Guider II (MGII), is a second generation telescope to computer interface device, based on my previous project, the Micro-Guider I. The original Micro-Guider I is a self-contained device which provides a telescope with digital setting circles, complete with a database of almost 8,000 celestial objects including the Messiers and the NGCs. It interacts with the user using a two line by 20 column LCD and a 16 button keypad. An overview article describing it, was published in the December 1991 **BULLETIN**, the newsletter of the *Royal Astronomical Society of Canada*. A more detailed multi-part article entitled: *"MICRO-GUIDER I: A Computerized Setting Circle/Database Device You Can Build"* was published beginning in *Observatory Techniques #6* (Summer 1993).

The MGII is a scaled down version which only reads the telescope's azimuth and altitude and transmits it to a computer upon request. This article will describe the MGII's operation, hardware, software, and construction. It is the author's intent to provide enough information here to allow the electronics-inclined telescope maker to build the device themselves. To aid in building the MGII, the author has available a supply of blank printed circuit boards and the programmed EPROM chip needed to complete the device.

DESCRIPTION

The MGII is a device which connects to a telescope by using two optical encoders, one attached to each axis of rotation. The optical encoders translate the rotational movements of the telescope into electrical signals which are interpreted by the MGII's on-board microprocessor.

The current position of the telescope is transmitted to a computer upon request using a standard RS232 interface. The MGII is used in conjunction with a suitable computer program which can translate the telescope's coordinates into right ascension and declination and act as an aid in locating objects at the eyepiece (preferably in a graphical way).

The MGII is designed to be compatible with the commercial DOS or Windows™-based **TheSky™** Astronomy Software available from **Software Bisque** (912-12th Street, Suite A, Golden, Colorado, 80401 Phone: (800) 843-7599).

TheSky™ provides the interface between the telescope, the MGII, and the user. By the time you read this, the author's own sky visualization program for Microsoft® Windows™: **The Earth Centered Universe** (ECU) will also be compatible with the MGII.

I will not discuss the operation of **TheSky™** in this article, since it is well documented in its user's manual, however, I will explain the sections relevant to making the MGII operate with **TheSky™** (the DOS version), since the basic manual only briefly mentions the telescope interface functions.

As is normal practice with modern digital setting circles, the MGII will work equally well with equatorial or alt-azimuth mounted telescopes, since it does not require polar alignment or mount leveling. Once aligned, **TheSky™** provides all the necessary mathematical conversions to use the elapsed time and the azimuth and altitude (from the MGII) to calculate the current right ascension and declination. To initialize the system, **TheSky™** asks the user to point the telescope to two bright stars.

OPERATION

The operation of the MGII with **TheSky™** is quite straight forward. Its opening menu screen provides a selection called: "Telescope" which contains a selection called "Telescope Data". When selected, it presents a dialog box allowing the telescope functions to be configured. This includes the resolution of each optical encoders, the direction of each encoder (these settings will have to be determined experimentally), the serial port number which the MGII is connected to, the BBox type (always set to Type 1), and finally the two alignment objects.

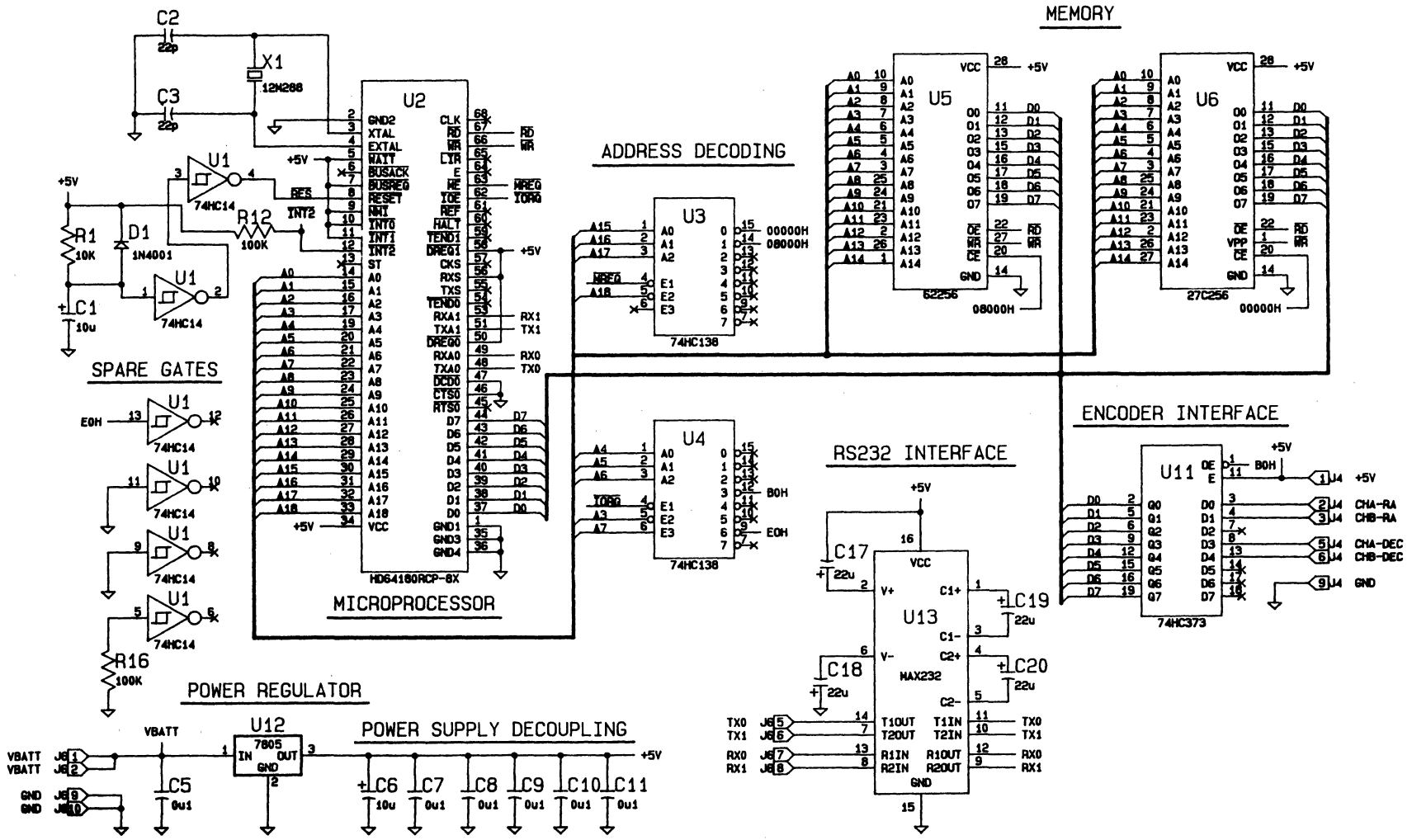


Figure 1 - Schematic Diagram

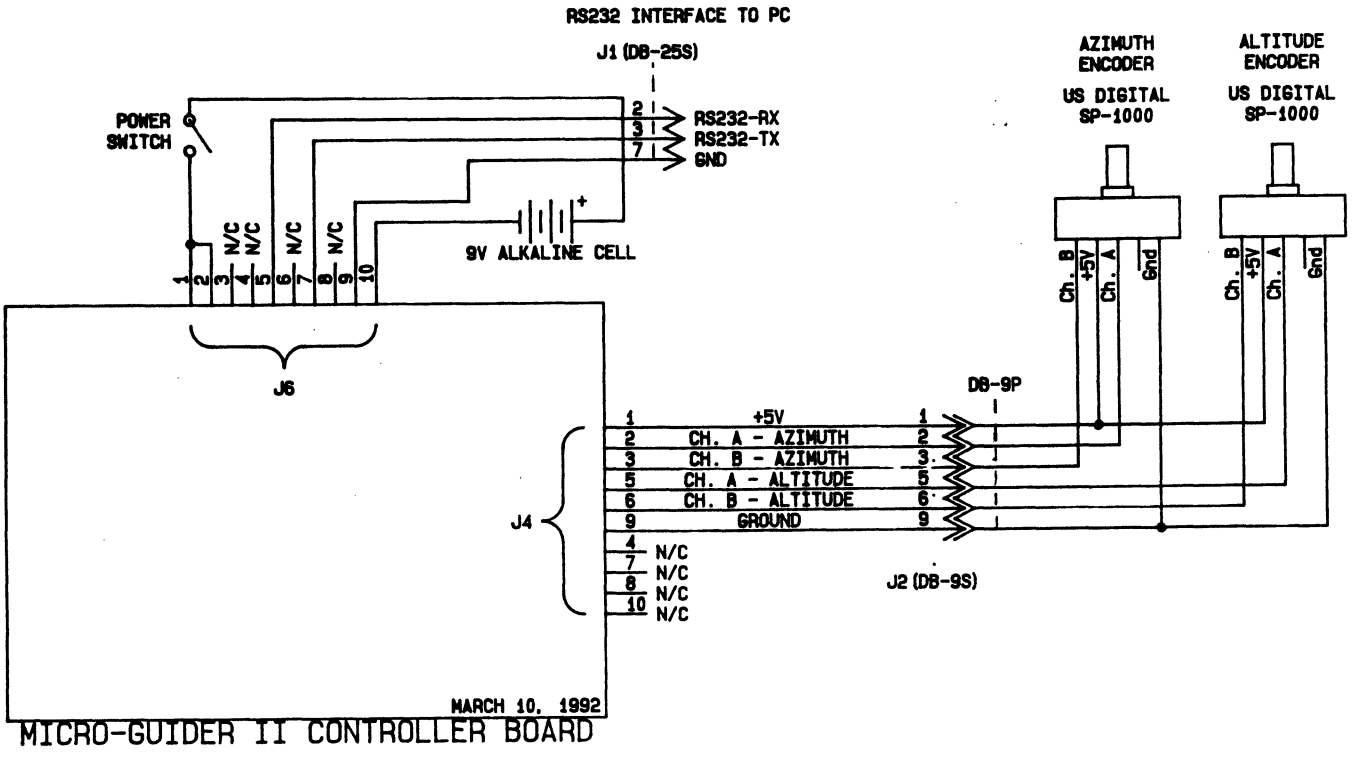


Figure 2 - Wiring Diagram

For maximum accuracy, the alignment objects should be selected such that there is a significant amount (more than 30 degrees) of movement of both encoders between the two objects. These settings are saved with the "Save Options" command.

The initialization process is performed from the sky display screen. Select the "Scope..." selection from the menu. Then select the "Do Complete Alignment". Do the following steps:

1) Set the telescope's altitude to +90 degrees; press return
2) Position the telescope on the first alignment object; press return
3) Position the telescope on the second alignment object; press return
4) A dialog box will appear allowing the user to accept the alignment. The error in the alignment is calculated. The user can accept the alignment or reject it and try again.
5) The telescope pointing system is now aligned and ready for use.

A cross hair will now "track" the telescope's movements on the sky display screen. Also, the "Srch" function has a special mode that makes it easy to center the telescope on a specific object.

HARDWARE

The MGII's hardware consists of one printed circuit board; the same one used in the original Micro-Guider I except with fewer components installed. The schematic diagrams of the circuit board are depicted in Figure 1. The chassis wiring interconnecting the circuit board and the other components is shown in Figure 2. This section provides a brief description of how the MGII works, however it is not required for the reader to understand how the hardware works to build the device.

The architecture of the MGII is based on Hitachi's HD64180 microprocessor. This microprocessor is a highly integrated version of the older Z80 microprocessor. Components C2, C3, X1 comprise the main oscillator which is used to time all functions of the computer. U6 is the EPROM chip (32k bytes) which is used to store the MGII's software. U5 provides 32K bytes of RAM for use by the software. Not all of this RAM is used; in fact an 8K byte device is sufficient.

The components mentioned in the previous paragraph form a complete fully operational computer. But a computer by itself, with no input/output, is all but useless. U11 is used to read the outputs from the encoders. Components U13, and C17-C20 are used to provide the RS232

interface. U12 is used to regulate positive five volts, which powers all of the circuitry. The minimum operating voltage is seven volts, but it will operate properly up to at least 15 volts. The current consumption of the complete MGII is about 25mA, plus the current used by the encoders (the US Digital encoders consume about 17mA each). This will provide several hours operation from a standard 9V battery. I use a 12 volt gel-cell battery.

SOFTWARE

As mentioned above, the MGII is basically a dedicated computer, thus the software reflects greatly in its functionality. The software was written in a combination of the 'C' programming language and assembly language.

The software was scaled down version from the original Micro-Guider I. The largest part of the software is the encoder routines, written in assembly language. The optical encoders are read by the software at a rate of 2048 times per second. Each optical encoder produces two signals which are used to determine the direction of motion of each shaft. These two signals when combined, form a "grey code". A grey code is a binary sequence whereby only one bit (or signal) can change from one state to the next. The software interprets these grey codes to determine the new azimuth and altitude of the telescope given the old and new grey codes.

The remaining part of the program is the interface with the RS232 port. The port is configured at 9600 baud, eight data bits, and one stop bit. This portion is written in 'C'. It waits for a 'Q' to be sent to the MGII. It responds immediately by sending the azimuth and altitude out the RS232 port to the connected computer. The format transmitted is shown below:

+00123<tab>+00456<cr>

where: +00123 is the azimuth in signed fixed length format
<tab> is an ascii tab character (decimal 9)
+00456 is the altitude in signed fixed length format
<cr> is an ascii carriage return character (decimal 13)

The resolution of the encoders define the range of output expected in the azimuth and altitude readings. If 4000 count encoders are used, the range of output is -2000 to +1999 representing the angles -180 to +180 degrees. When programming the EPROM, I will need to know the resolution of the encoders to be used.

CONSTRUCTION

The construction of the MGII is quite straight forward. The parts list shown in Figure 3 lists all the materials necessary to build the MGII. Most are available from mail order outlets which cater to the hobbyist such as Jameco or Digi-Key (consult the advertisements in a recent electronics hobbyist magazine). If materials sourcing proves difficult, I am willing to assist the prospective builder. Many of the actual components listed in the parts list are only suggestions, and many substitutes are possible. The total cost of the parts is approximately $175, including the two optical encoders.

The hardware for mounting the encoders to the telescope axis' will not be discussed here, since every telescope will require different mounting hardware.

The circuit board should be populated according to the silk-screen markings on the PCB. Be careful to note the polarity of the diodes and capacitors and the orientation of the integrated circuits. Only install the components identified in the parts list. All of the other components are not required, since they are used only by the original Micro-Guider I, which has a real time clock, an LCD, and a keypad.

Components U2, and U6 should be socketed. The remaining IC's can be socketed, if desired. The chassis wiring can be performed using ribbon cable, as I have used, following the wiring diagram shown as figure 2.

CONCLUSION

The MGII provides an inexpensive and easy to build digital setting circle device for those who have an observatory telescope or for anyone who can operate a PC computer in the field. The PC program **TheSky™** provides a suitable user interface for the MGII. Anyone wishing to write their own program should contact the author for details on the algorithms required. The author's program for Microsoft® Windows™: **The Earth Centered Universe** (ECU) will support the MGII by the time you read this. ECU, a full featured sky visualization program, is available from the author for $35 ($55 with the SAO Star Catalog) for the registered version. It is also available as "shareware" from many astronomy bulletin board systems and shareware vendors (such as Andromeda Software). Ω

Figure 3 - Part's List

RESISTORS	
R1	10K, 0.25W, 5%
R12,R16	100KΩ, 0.25W, 5%
R11	100Ω , 0.25W, 5%

CAPACITORS	
C1,C6	10uF, 25V tantalum (0.2" lead spacing)
C5,C7,C8, C9,C10,C11	0.1uF, 50V, ceramic (0.2" lead spacing)
C2,C3	22pF. 50V, ceramic (0.2" lead spacing)
C17,C18,C19, C20	22uF, 16V, tantalum (0.2" lead spacing)

SEMI-CONDUCTORS	
D1	1N4001 Diode
U1	74HC14 hex invertor
U2	Hitachi HD64180RCP-8X microprocessor
U3,U4	74HC138 decoder
U5	Hitachi HM62256LP-15 32K static RAM
U6	27C256 EPROM Programmed chip available from the author for $15
U11	74HC374 octal buffer/latch
U12	7805 regulator (TO-220 case)
U13	Maxim MAX232CPE RS232 interface

CRYSTALS	
X1	12.288MHz (HC-18/U case style)

MISCELLANEOUS	
Quantity	Description
1	professional quality printed circuit board available from the author for $35 (includes a photograph of the completed circuit board, encoder datasheet, and a disk containing the hex files used to program U6)
1	68 pin PLCC socket (for U2)
2	28 pin IC sockets (for U5, U6)
2	10 contact double row straight male headers (for J4, J6)
1	Enclosure
2	US Digital Corp. S1-1000 (0.09° resolution) optical encoders. Phone (800) 736-0194 or (206) 260-7451
1	SPST switch
1	9 volt battery and holder
1	DB-25S connector
1	DB-9P connector
1	DB-9S connector
2	10 pin IDC ribbon cable connector
2	Encoder mountings (telescope specific)
	Assorted wire and ribbon cable
	Assorted hardware

The Quest for a New Observing Site and Observatory for the Halifax Centre
by Shawn Mitchell

I would like to welcome back returning members of the Halifax Centre and a stellar hello to our new members who are reading Nova Notes for the first time. The Halifax Centre has had a very successful summer. The GA was a big success and the events were enjoyed by all who attended.

The executive council, however, has not been idle this summer, last April a new committee was established to search for a new permanent observing site with observatory for the Halifax Centre. This discussion was prompted by complaints about our use of the field on the Beaverbank Road north of Lower Sackville. Several members of the executive committee privately discussed this complaint and the possibility of locating and establishing a permanent observing site of our own. After a month or two of deliberating, I proposed a motion at the April executive committee meeting to establish a site selection committee. The members of the executive passed the motion and several members volunteered to be members for the committee.

The site selection committee met once during the summer to discuss the areas that would be investigated first. The area around Dollar Lake Provincial Park was the first area to be considered. It is in a relatively dark area and within 1 hour drive from Halifax. Most of the land in the area is owned by the province or Scott Paper opening up the possibility of leasing land. Two drawbacks to the area around Dollar Lake exist. First, the area is developing and a permanent site may begin to suffer from light pollution in a few years. Secondly, the area is in the Musquodoboit River valley and is very low land and is sometimes subject to ground fog.

The second area being seriously considered at the moment is highway 14 between Chester and Windsor. This area is sparsely populated and the land is relatively cheap; some areas of the highway are not even serviced with electricity yet. There are several high hills in the area that would get an observatory above ground fog and provide horizon to horizon seeing. Also, the Saint Mary's University Astronomy Department considered this same general area for a professional observatory several years ago.

The committee has also been discussing possible designs for the observatory, equipment, building schedules, and funding. We are hoping to find a site by next summer and present it to the centre, so the membership can decide if the centre is ready to commit to owning and building an observatory of our own. If anyone has any questions or would like to be involved in this project they can contact one of the other committee members (Dave Lane, Paul Gray, Joe Yurchesyn, Nat Cohen, Doug Pitcairn). Ω

"Heard in the Dark"
by *GAZER*

Joe Y has single handedly managed to amass the largest CompuServe ASTROFORUM message thread to date with his "Handguns in Astronomy" letter, which resulted in a *Focal Point* article in the August S&T - congradulations Joe! Word has it that he has applied to the RCMP School of Incognito Studies in order to safely travel south of the border.

Sleezy-Guider (alias D.J.L.) continues to blaze new trails for the Halifax RASC by proving that sophisticated CCDing can be done in the field out of the back of a pickup truck! Seems that he's gouged some "tired old eyes" with this development.

El Presidenté (alias P.K.) was recently heard talking to his Apple computer. Seems that Apple has released voice recognition software that really impressed him. Problem is, that Pat reportedly did all the talking, the Apple got bruised and nearly fried its circuitry attempting to keep up with the with the flow. Sound familiar?

And finally, we are taking a collection to send Doug to the optometrist of his choice for his "tired old eyes" affliction (see Ask *GAZER*). Better yet, do we have one in the Chapter? Anything to hasten his optical rejuvenation!

Keep your chips cool!
GAZER

Ask *GAZER*
by *GAZER*

Dear GAZER,

I am a professional astronomer and, as such, you realize, I almost NEVER look through a telescope. Occasionally, as a condition of employment, I am obliged to oversee things when the public is invited to partake of the celestial view through one of our fine professional instruments at this institution where I do my research.

Recently I showed some visitors Saturn, as I have done many times previously over the years. I have

noticed a strange thing, however. People make a very particular sound when they see Saturn for the first time. It's always the same noise. I pointed it out to a colleague and we stood listening to the noise as each visitor put his/her eye to the eyepiece. I enjoy the noise that people make when they see Saturn for the first time. You must try it sometime. But why do they do it?

Puzzled Pierre Professional

Dear Pierre Professional,

It has been this scribes experience that, at least over the last several years when Saturn has been in the evening sky, that the sound you reference may be physiological. Let me lead you through the logic.

Evening observing follows supper. Following this meal, which tends to be substantial for most, the body begins the digestive process. There are certain releases of by-products of the process that, simply put, make people feel better. This is often enhanced by physical activity, such as stooping or climbing to reach the eyepiece. The sounds you reference are overt acknowledgments of simply feeling better.

Perhaps you can co-investigate this theory with the imminent physiologist of your choice. As a head start, you should consider the number of times you hear the "Tums" bottle rattling or the staid requests of "which way to the facilities?"

GAZER

OK Gazer,

Here's a problem. CCDs are too nice. I mean, you get a telescope, you start observing, your neighbour builds his outdoor skating rink and wires 60,000 Watts of light so that it looks impressive to his other neighbour, and you discover the world of computers.

Then one day, while playing Dungeons and Cowflops on your computer, it dawns on you that you haven't bought a toy in a while, so you buy a CCD set-up for your 986DX-99GHz PC. The following evening, you pull in fantastic images of M27 while staring at your computer screen (You equip a glare shield to hide your screen from the rink lights). Next you discover that with multi-tasking, you can continue to play Dungeons and Cowflops while your computer stores up the next image. Then comes the long cables so you can remotely operate the telescope from your living room.

I mean, KRIPES! Before too long, your telescope image is just one of the channels your monitor hits from time to time as you "channel hop" with the TV remote! The encroachment of those electronic marvels into the world of amateur astronomy may seem like a miracle to some, but to me, if them tired old photons aren't hitting my retina, it just ain't the same! They seem most useful for PAWBs, don't you think? (*PAWBs = Professional Astronomer Wanna Bees)*

Doug

Here folks, we are confronted by the quintessential reactionary! Yikes, this is going to be a toughee.

Doug,

"if them tired old photons aren't hitting my retina, it just ain't the same!" Now isn't that just what you would expect from someone who drives a Japanese car and spends all his money keeping it road worthy? Doug, what we are talking about here is REAL progress in the advancement and enjoyment of amateur astronomy. We humans are afflicted with some of the worst vision in the animal kingdom.

Aside from stereoscopic and color vision our eyes are the pits. CCD's are the long overdue answer to amateur reams of being able to get small aperture equipment to show the true wonders of the universe.

And after all, aren't we all interested in seeing objects as they are and not as "gossamer wisps" in the eyepiece? Let me chip in with this final piece of advice: Accept it Doug, a revolution in backyard astronomy is upon us. Don't fight it, it will only serve to heighten your frustration level. Besides, what's wrong with watching the Maple Leafs and M31 on split screen? That's enough to rival another Stanley Cup or the return of Wayne to home turf!

GAZER
Member of AACCCDUC*
(*Amateur Astronomers Contented CCD Users Club)

Dear GAZER:

I understand that one of the primary goals of the space program is to help develop and test new technologies for use on Earth (If astronomers can learn new things about the universe at the same time, that is a nice bonus). However, the recent Mars Observer mission has left me puzzled. If the prime purpose of this mission was to test the reliability of a certain brand of power transistor, would it not have been easier (and cheaper) to do it here on Earth.

After all, the Saturn car company was able to test its new products for spontaneous engine ignition right here on Earth and I'll bet they used a lot less than a billion dollars to do it. Could you help set me straight on this?

A Ticked Off Taxpayer

Dear Ticked-Off,

Let me first acknowledge that the Americans have never been able to build a small car that doesn't seem to toast itself black at first, before all the bugs are exterminated. It's just a shame that they don't build as many satellites as cars. The failure rate wouldn't seem quite so high then. Of course they don't build many billion dollar cars either! If I were not still drying the tears from my eyes over the failure of this first mission to Mars in decades I might have a glib answer for you. What is a shame will be the inevitable political head hunting that is sure to follow. The windbags won't settle for anything less that blood on this one. US bankruptcy chapter 11 status for the transistor builder! I can hear the rallying cry now.

Now, I assume you are a US citizen? If not, just because the Americans let us build the robotic arm for the Shuttle doesn't mean that we have free reign to criticize their noble efforts. After all, they built the Shuttle itself, and we still need them to

maintain and fly the thing so that our illustrious appendage can flex its muscle now and then. C'mmon, where do we Canadians come from when we speak so presumptuously? Remember, where do our Coulter mirrors come from, our Astro Physics refractors and SCT's, our Apple Computers? We need them vastly more than they need us, don't we? I trust Gazer has helped "set you straight on this?"

GAZER

p.s. I understand that NASA is accepting any and all circa 1960's transistor radios for the possible relaunch of another Mars observer. Stay tuned! Ω

Notes from the Chair
by Paul Gray, Observing Chairman

Well, its that time of year again and I do believe that in the past, the observing chairman usually wrote an annual observing summary for this issue. The editor told me the night before his deadline that if I wanted to get it in this issue, I'd better get busy! At first I thought that it would be a hard task this year because the weather has been so terrible and everyone has been complaining about their lack of observing. Upon going though my notes, I found that there was plenty to share, so here we go.

First of all, what are the comments about "lack of observing" all about! I have recorded observing on 12 nights from January until the end of August. Now that isn't the 300 clear nights a year that Arizona sees, but hey, we live in Nova Scotia! I will admit though, that many of those nights exhibited poor conditions, but it was still observing.

The year started that same way as 1992 did for a few of us who ventured forth for to observe the Quadrantid Meteors again. You can read about that adventure in *Nova Notes* earlier this year. We also got a mention of our efforts in *Sky and Telescope*.

The next night of note would be January 25th. Dave Lane, Mary Lou Whitehorne, Joe Yurchesyn *(Editor's Note: see Joe, you did get your telescope out this year!!!)*, Jason Adams, and myself ventured forth on a cold and very breeze night. I was different that the others that night and set up my scope next to the trees instead of on the pavement with the others, hopefully to use trees as a wind break. Later Jason joined me and we remained quite warm and comfortable while others packed up due to the cold. It was a very good deep sky night; I logged 31 objects in my notes.

Then the bad weather of February set in, and it was the end of March before clear (but not -20°) skies returned. Of course this first clear night was the night of our Centre meeting (what else is new!). Dave Lane, Darren Talbot, and I began a Messier Marathon immediately following the meeting.

The next thing we knew it was the 23rd of March and we were out again at Beaverbank to try again. You can read all about both these adventures in an issue of *Nova Notes* earlier this year.

Strange things are done in the midnight sun by the men who moil for gold. The Arctic trails have their secret tales that would make your blood run cold. The northern lights have seen queerer sights but the queerest they ever did see, was the night on the Marge of Lake La Barge, I cremated Sam MacGee.

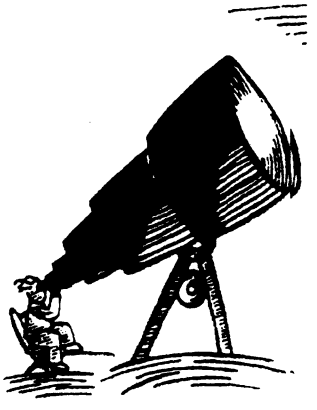
This was probably the highlight of the night of May 9th when Dave Lane, Doug Pitcairn, and my girlfriend, Susan, and I were at Beaverbank. There happened to be a very impressive display of aurora that night which started Doug and Susan reciting this famous poem by Robert Service. It was a cold night which reached almost freezing, but it was nice to be out with the large scope under the dark skies. We also had a nice view of the supernova in M81 and tested the limiting magnitude of the 13.1" buckets. Dave Lane and I observed to 14.6 magnitude in M67 when it was only 30 degrees above the horizon. Not bad at all! Look out Pluto for we will find you now!

Summer came. What else needs to be said! Blah, horrible skies, Blah! However the skies did cooperate when August came, providing some clear skies for the Perseids. Now I know what you are thinking - "It rained, right". Well, for some strange reason, one of the only patches of clear sky was centered over Avonport! Hmmmm? Is Bishop really "almost irrelevant" as a Borg *(aka Star Trek TNG)* once wrote in the pages of *Nova Notes*! Oh well, I now know where to go to observe when there is another big event.

That night, however, there were several members at Grand Pré along with about 100 members of the public to watch the shower which provided an impressive show to us of 108 Perseids in one hour. A ZHR of 35-400 was calculated, probably the best meteor shower that I have observed yet.

A few days later on the 15th, Jason Adams and I were back at Beaverbank with the scopes and had a nice night of observing along with the strangest aurora we have ever seen. It consisted of a band 5 degrees wide that went from the eastern horizon to the western horizon passing just south of the zenith. It was also broken into segments and was moving to the west at a rate of 6 degrees per minute. If you can explain this please do.

As you can see, we have a very active observing group of people who are always ready to go when the skies clear and who over the past year have observed many interesting things. Why not come out and join us sometime during one of the scheduled observing sessions (or anytime the skies clear!) at our Beaverbank site and enjoy the beauty of the heavens. Ω



Nova Notes Editor, Halifax Centre
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Halifax, Nova Scotia
B3M 1E2

Notice of Meetings and Events

Date: **Regular Meeting - Friday, October 15th: 8:00pm**, 7:00pm for the executive meeting (all are welcome).
Place: Lower Theatre, Nova Scotia Museum of Natural History, Summer Street, Halifax. Access from parking lot.
Topic: Dr. Larry Bogan, from the Department of Physics at Acadia, will be speaking on **"Deducing Asteroid Shapes from the Earth"** (or "An Amateur Astronomer Having Fun with a CCD on a Research Telescope")

Date: **Annual Meeting - Friday, November 19th: 8:00pm**, 7:00pm for the executive meeting (all are welcome).
Place: Lower Theatre, Nova Scotia Museum of Natural History, Summer Street, Halifax. Access from parking lot.
Topic: This meeting will be **Member's Night**. Various informal short talks will be presented by **you**,the membership. **Prepare your talks now!!!** This meeting will also mark the start of a new regular feature, where the use of a specific section of the handbook will be explained. In addition, the business associated with the Centre's annual meeting will be conducted.

Halifax Planetarium Shows

The Halifax Planetarium, located in the Dunn Building at Dalhousie University, provides shows each week on Thursday evenings at 7pm. Contact the *Nova Scotia Museum of Natural History* at 424-7353 for show information.

1993 Halifax Centre Executive

Honorary President	Dr. Murray Cunningham	
President	Patrick Kelly	798-3329
1st Vice-President	John Connelly	679-1333
2nd Vice-President	Nat Cohen	434-3103
Secretary	Jason Adams	864-9783
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Nova Notes Editor	David Lane	443-5989
National Representative	Joe Yurchesyn	422-8030
Librarian	Shawn Mitchell	865-7026
Observing Chairman	Paul Gray	864-2145
Councillors	Dr. David Turner	435-2733
	Doug Pitcairn	463-7196
	Mary Lou Whitehorne	865-0235

Nominations for 1994 Executive

A nomination committee consisting of Pat Kelly and Nat Cohen has been formed to fill the executive for next year. If you would like to nominate someone or be nominated yourself, or if your would like more information give either committee member a call. It really can be a lot of fun!