Hamilton Amateur Astronomers

Event Horizon

April 2003 Volume 10 Issue 6

What makes the stars twinkle 101 *by Bob Botts*

I was out with scope and web cam again, but the air was pretty turbulent and really not worth imaging. It's this turbulence in the atmosphere which causes the stars to twinkle..., astronomers know it as scintillation.

The effect of scintillation is greatest near the horizon, where the atmosphere is the densest and usually more unstable than overhead. The atmosphere acts as a prism and breaks light down to it's constituent colours.

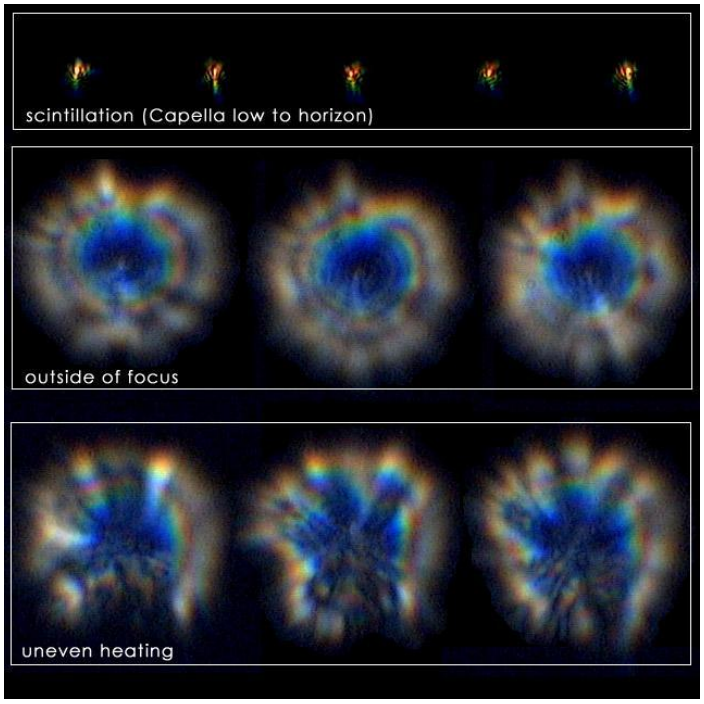

Photo by Bob Botts and Steve Barnes.

In this image, the top row is the star Capella, at or near focus at relatively high magnification. The broken coloured rings around the star are diffraction rings. Under ideal conditions, these concentric rings should be complete circles of dark and light concentric rings. What isn't shown here, is that the star would also appear to move in random direction, centered on it's actual location. The star is also very much redder than it would appear higher in the sky, for the same reason that the Sun appears redder when near the horizon. This reddening of starlight is known as atmospheric extinction.

The second row in the image, is the same star, Capella, only this time, the focus has been racked out. The diffraction rings are now spread further out. The prism effect is now producing more subtle colours of the spectrum.

The third row is again the same star Capella, only this time I held my hand in front of, but under and not touching the front element of the telescope. The change in the shape of the concentric rings and destruction of the pattern, is due entirely from the heat of my hand rising into the optical path. This small heat source changes the relative density of the air through which the light passes which in turn distorts the image through the telescope.

You've probably guessed by now, that the effect of scintillation on an exposure will cause the image to be blurred. The time scale here, is 5 frames/second. Stacking frames will even out the shape of the concentric rings, but fine detail will be lost.

Scintillation is much less critical for images at magnifications you are likely to use when photographing with a normal camera lens.

Bob Botts has been involved in the local astronomy scene for over 10 years. He is an avid and talented astrophotographer.

Chair's Report

I guess my prognostications regarding the end of winter in the Chair's Report last month were somewhat optimistic!!! Oy!! Well, I am going to go wayyy out on a limb here and say that April 2003 will be dramatically better!

Many plans are now afoot regarding observing during the next six months. We have an HAA Star Party planned at Silent Lake for the May 31/June 1 weekend. The last time we headed up there the dark skies were absolutely ruined by northern lights! There are also the many star parties which are held during the summer - the most famous being Starfest up near Mount Forest between August 21 and 24. Immediately following that, for REALLY dark skies, is the Great Manitou Star Party (Aug 27-31). Either or both are a great way to end the summer. See http://www.manitoulin-link.com/starparty/ for more details.

One of the most amazing events in the last month was the gamma-ray burst labeled GRB 030329 (HETE trigger 2652). It took place at approximately 06:37:14.67 a.m. EST on the morning of March 29th in a location near the back of of Leo. From Hamilton, this was below the horizon at the time. The so-called optical transient was first seen more than six hours after the burst at about magnitude 12 and could be followed by amateur CCD's for about 5 days!!! It is estimated that it peaked at a brightness of roughly magnitude 5 - naked eye! Not bad for an object that is at a redshift of z=1.52. This object continues to amuse and amaze - it has had three re-brightening episodes as it has decayed in brightness. Clearly amateurs can still play a useful role in monitoring the sky for such interesting objects.

Remember that Jupiter and Saturn continue to be well placed for evening observing and it won't be too long before Mars makes an appearance, too. If you make observations in the next month, why not report them in Event Horizon so that other folks can also enjoy them?

Doug Welch

Doug Welch is the current chair of the HAA and also a founding member. You can find out more about Doug at: `http://www.physics.mcmaster.ca/people/faculty/Welch_DL_h.html`

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 $25 individual or $30 family membership fee for the year. Event Horizon is published a minimum of 10 times a year.

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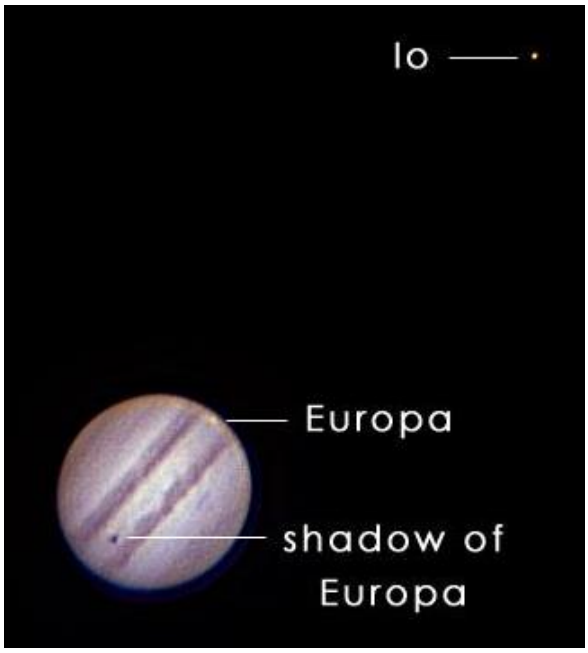
Eye Candy Department



See more images by Bob Botts and Steve Barnes and Derek Baker on the HAA web site: amateurastronomy.org

BIO BRIEF - CHARLES MESSIER (1729-1805) *by Rita Griffin-Short*

Canadians aren't the only people whose talents often are recognized elsewhere before they are in their own country. Charles Messier, "ferret of comets" as King Louis xv called him suffered such disregard for many years before France admitted him to its exclusive Academy of Science. It is to Messier, though, and his catalogue of nebulae that astronomers owe the foundation of sidereal astronomy.

Messier arrived in Paris from Badouvillier in Lorraine, an orphan, age 21. Of his education we know little but he must have had useful qualifications for Joseph-Nicolas Delisle (1688-1769), recently returned from Russia (1747) and now France's astronomer royal, hired him as a draftsman and recorder of astronomical observations for the College of France. He was assigned to copy a map of the great wall of China in the College's long gallery, an unheated space that Jean-Baptiste-Joseph Delambre (1749-1822) commented prepared him as an observational astronomer. Delisle also made sure he was instructed in the use of astronomical instruments which he mastered quickly. Comets became his passion, they were fascinating while nebulae were of secondary interest at least when he began his career in astronomy.

Some 50 comets were known in 1750, but by the end of the century Messier would observe and record almost as many again. He was an experienced observer by 1754 which led to a position of clerk at the Paris Marine Observatory at Cluny, where astronomers were anticipating the predicted return of Halley's comet. Messier was assigned to search for it using Delisle's map of its predicted path. He searched for some 18 months without success, foiled by Delisle's miscalculations. Comet Halley was spotted December 25th, 1758 by a German named Palitzsch in Saxony and a few days later others in Saxony saw it as well. However, news of its sighting didn't reach France until 3 months later.

Meanwhile, Messier found it on January 21, 1759, an occasion for some rejoicing one might expect, alas.... Delisle refused to allow him to announce the discovery for 2 months until word of the German's discovery had reached France. By then the comet was "lost in the twilight at perihelion". The French astronomers refused to believe either Delisle or Messier probably because Delisle himself refused to believe that a "poor Saxon peasant who had seen the comet with his naked eye", could have succeeded where the French had not. Palitzsch had used a telescope and had been diligently searching for the comet.

Adding insult to injury, Delisle suppressed two other Messier comet finds. Why would he do this? Why would he tarnish an otherwise excellent reputation? His admirable efforts to alert astronomers to Venus's potential for establishing solar parallax was instrumental in making the transits an international event. Was he embarrassed about miscalculating Halley's comet's path? He wasn't the first to err. He was getting old; was he simply jealous of his bright, young, assistant? This doesn't square with Delisle's praise for his assistant's skills and his attempt to have Messier's salary increased! Delisle pushed hard to have Messier observe the 1761 transit in Batavia, and he made every effort to secure Messier's position at the observatory while away, that his work would be continued in his absence, that he might take the instruments of his choice on the voyage. However, nothing came of these efforts because the British had decided to observe in Bencoolen negating Delisle's proposal.

After Delisle's death in 1768, Messier was free to

continue his work more or less unimpeded. From the Hotel de Cluny tower observatory, Messier went on to observe and record until his death, comets and nebulae, eclipses, occultations, transits, and sunspots, seldom doing more than tabulating his observations, leaving the actual positional calculations to his assistants. While some of Messier's discoveries have been downgraded, his eye for discovery, his patience and collegiality opened a door of opportunity for the new science of astronomy. The tower at Cluny, an historical artefact, remains available to France's leading astrophysicists.

The Hôtel de Cluny as it appeared in Messier's day. It was built in the late 15th century by Abbot Jacques of Ambroise, as a temporary residence for the abbots of the Cluny order and their guests. In 1748, Deslisle became one of the residents, and from his death in 1768 to 1817 Messier had his residence as well as observatory in the building. Lalande also lived here part of this time. The Marine Observatory was in the solid octagonal tower, shown below as it appears today. From the "Bulletin" of the French Astronomical Society, 1917.

Messier's discoveries were recognized all over Europe, including the Royal Society in London, the King of Prussia granted him membership in the Berlin Academy of Science, and Russia admitted him to St. Petersburg's Academy of Science. However, membership in France's Royal Academy remained illusive in spite of his name being proposed several times. The Academy was reluctant to admit a mere observer! Nevertheless, at that time, just after Nicholas de Lacaille's death in 1762, Messier was considered France's leading astronomer. This must have been humiliating for such a dedicated man. There is no doubt that his lack of academic credentials counted against him. He certainly wasn't the first nor the last to be patronized in this way. John Harrison, inventor of the chronometer, was such a victim, though his work finally won him the 20,000 lb. Longitude prize for his elegant chronometer that changed navigation for the better.

Messier had to wait until 1770 before he was admitted to his country's Royal Academy of Science. From that time on he contributed astronomical memoirs to the Academy regularly. The first of what would become known as his star catalogue on which he had been working for many years, the *Catalogue des Nebuleuses et des amas d'Etoiles* was published in 1774 in *Histoire de l'Academie*; it contained 45 objects. The Crab nebula in Taurus heads his first list, discovered in 1758. He revisted Hevelius's nebulae observations, all made with the naked eye, concluding that most could no longer be considered nebulous. He was careful to note when he wasn't sure, e.g. the last entry from his 1764 list, M40, included two small stars in Ursa Major, near the position given by Maupertuis (1698-1759), noting he couldn't find nebulosity. M40 has since been removed from his list.

Descriptions of astronomical instruments receive short shrift in too many works about astronomy and astronomers. They underwent constant tinkering to achieve the increasing demand for precision. We know what instruments were held at Greenwich, but not at Paris. Messier, we are told, followed the standard practice of listing his instruments by length and magnifying power rather than by aperture. In Messier's case there is information from his friend and fellow astronomer, Jean Sylvain Bailly (1736-1792). Bailly was a member of the Academy, he later was involved with the Revolution and one of the many academicians to face the guillotine during the Terror. His interests were directed at Jupiter's satellites and he used Messier's instruments regularly. He mentions that Messier's favorite telescope was a 104 power Gregorian, 32 inches long with an aperture of 7 1/2 inches, equal to a 28 feet long refractor with aperture of 3 1/2 inches. Messier also used Delisle's old octagonal 8 inch Newtonian, possibly one of the observatory's first instruments as well as a 3 1/2 feet long achromatic with 120 magnification.

Achromatic refractors had been perfected by John and Peter Dolland, father and son by 1758. Newton's premise that chromatic dispersion could not be eliminated from a refractor was being challenged by Continental scientists. Many astronomers, thinking they must be wasting their time trying to correct refracter problems, had turned to reflectors, though few opticians could master precision mirrors. James Short managed to achieve a high degree of perfection for his reflectors

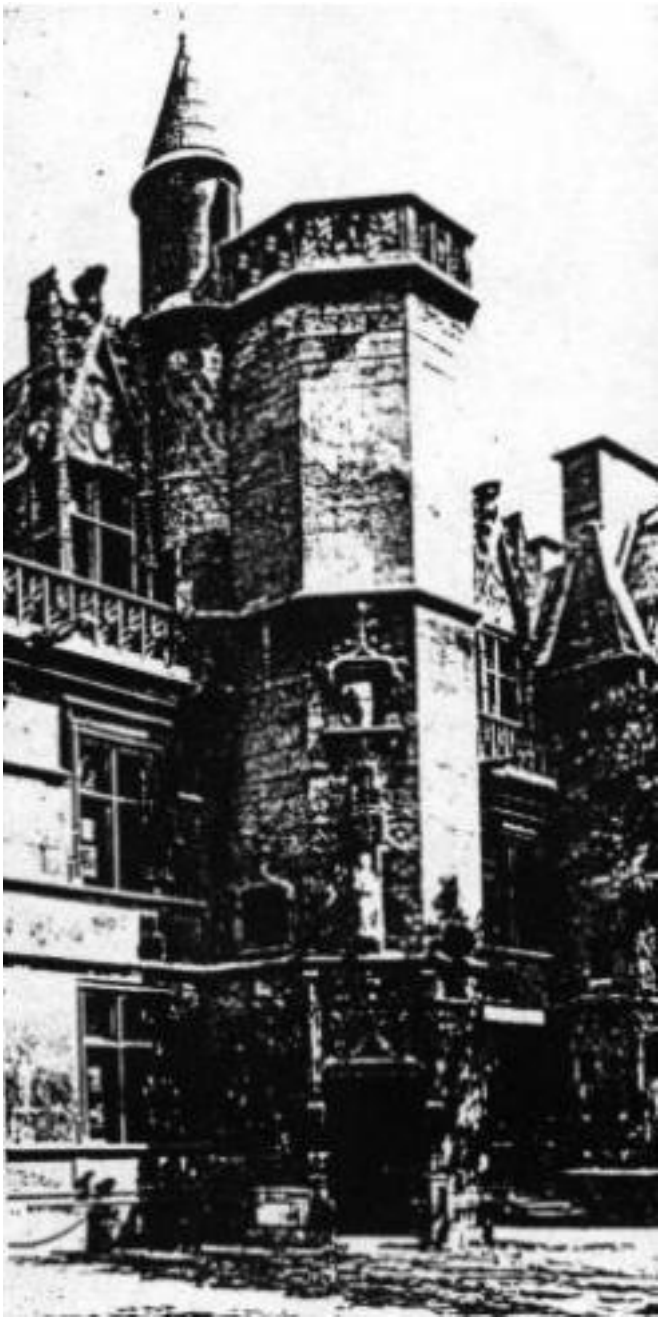
and it was Short who sponsored his friend, John Dolland, and his paper on the falsity of Newton's premise to the Royal Society in 1758. Dolland's compound object glass was composed of concave flint glass lens and a convex lens of Crown glass (1)

Messier appears to have favoured the smaller instruments which likely did not serve him as well as something larger. Herschel would correct many of his identifications but in such a way as not to detract from the importance of his overall corpus.

In 1781, Messier sustained severe injuries when he fell into an ice house, breaking a hip, arm, wrist and two ribs. Though he received the best attention he healed slowly. His physician had to rebreak his thigh bone to set it correctly. It was over a year before he was able to return to his observatory. He was well cared for financially though, his friends rallied to his aid. He received a royal grant, a pension and a private gift totalling 4,600 livres. All this would disappear during the revolution. The Academy was suppressed in 1793 and he lost his pension and salary, the rent on the observatory went unpaid.

Fortunately, before his accident he had been given an assistant: Pierre-Francois-Andre Mechain (1744-1804). Mechain, a brilliant and congenial young man, came from a professional but financially distressed family. He was a protege of the self-styled "most famous astronomer in the universe", Joseph-Jerome Lalande (1732- 1807). Working together Messier and Mechain continued their observations, adding to the catalogue.

Their work was interrupted in 1791 when Mechain was seconded with Delambre to survey the meridian line from which the meter was to be derived. At the end of the 7 years' project, Mechain suffered an accident that almost killed him. Fortunately, it was after his work was completed. With his friend Dr. Salva i Campillo, they were visiting an new water pumping station in Barcelona when something went badly wrong and Mechain was struck in the chest by an 8 foot beam. He sustained a broken collarbone and ribs, and the right side of his chest was crushed. He remained unconscious for three days, likely saved by the immediate care of his friend and other medical help. Lavoisier, spared no cost to make sure "a person precious to science, to France, to his colleagues" would receive the best care possible.



The present-day appearance of the observing tower of the Hôtel de Cluny, which became an art museum in 1844, as it still is.

Both Messier and Mechain survived the revolution. Messier received Napoleon's new decoration, the cross of the Legion of Honor while Mechain was appointed Director of the Paris Observatory until his death in 1805. In 1802 Herschel visited the aged Messier, who told him that he still suffered from his accident. Mechain had never fully recovered either, he had lost the use of his right arm. The pain, both physical and mental, must have been a torment to such determined and dedicated men.

NOTES:

1. Glass itself added to the problem of chromatic distortion. It wasn't clear unless it had lead or flint content. Sand impurities, e.g. iron oxides, gave it a slightly green tint. Short used glass coated with mercury with some success, but he turned to metal using a copper/tin alloy to his own ratio, succeeding in perfecting his parabolic mirrors.

In the mid 18th c. two methods of glassmaking were available for flat glass. Crown glass was made by spinning a blob of hot glass on a pontil into a disk 3-4 feet in diameter. The pontil was cut off leaving a bulb or bull's eye scar in the centre. Thickness was never uniform varying from thickest at centre to thinest at the edges.

Cylinder glass meant blowing a cylinder to a safe size, slitting it open and flattening it on a table which gave it a dull tint that required grinding and polishing.

Rita Griffin-Short March 26, 2003

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Gingerich, Owen. "Messier and His Catalogue - I", *Sky and Telescope.* August:1953 255-58, 265.

————- "Messier and His Catalogue - II", *Sky and Telescope.* September:1953 288-291.

Short, James. "An Account of some Experiments concerning the different Refrangibility of Light by Mr. John Dolland", *Philosophical Transactions of the Royal Society.* Vol. 50 Dec 1758 733-743. Short writes "...the theory of correcting the errors arising from the different refrangibility of the rays of light in the object-glasses of refracting telescopes; ...that telescopes made according to this theory are entirely free from colours, and are as distinct as reflecting telescopes". This from a man who was the sole and successful maker of reflectors!

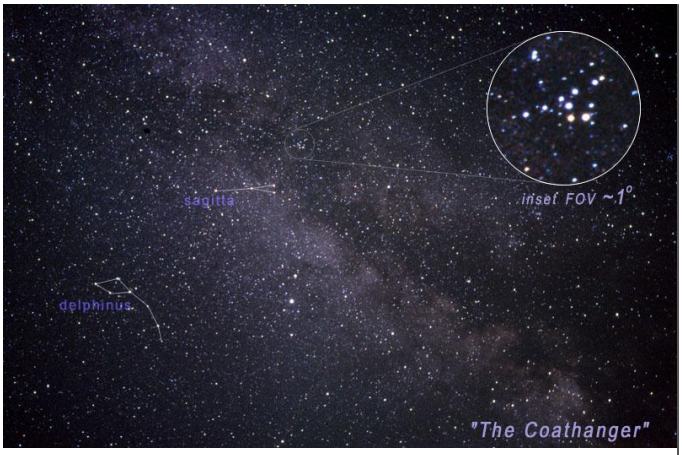
Turner, Gerard L'E. "James Short, F.R.S., and his contribution to the construction of reflecting telescopes", in Turner *Scientific Instruments and Experimental Philosophy 1550-1850.* Chap. vii. Variorum:1990.

Wallach, Rolf. "James Short and the Development of the Reflecting Telescope", *Journal of the Antique Telescope Society.* Issue 20, Winter 2001 3-18.

Woolf, Harry. *The Transits of Venus.* Princeton:1959.

Rita is a regular HAA Event Horizon contributor, you can also read one of her recent articles about the 1769 Hudson Bay transit in the April issue of The Beaver Magazine.

The Coathanger *by Bob Botts*



The "Coat hanger" ("Brocchi's Cluster") is a favorite binocular target in the summer sky for observers in the northern hemisphere. Here you see it perched, (apparently) upside down inside the Great Rift of the Milky Way.

The cluster is about one degree across (about twice the diameter of the full moon).

I've included the connecting lines for the constellations, 'Sagitta' ("The Arrow") and Delphinus ("The Dolphin"), though they can be tough to locate if you don't know your way around the sky.

I shot this last fall on Ektachrome 200 slide film, on a night with a fabulous auroral display.

IIRC, the exposure was approx. 30 minutes, but I don't recall which lens (I'll guess at 35 mm).

WebWatch

Radio Jove

Build and use your own Decametric Radio Telescope to study Jupiter and Solar radio emissions.

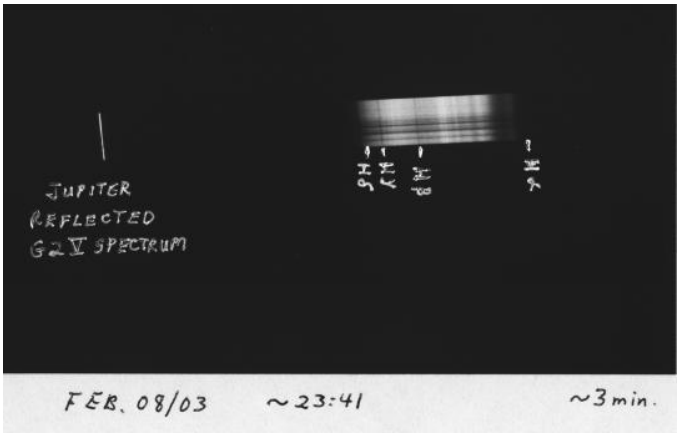
`http://radiojove.gsfc.nasa.gov/`

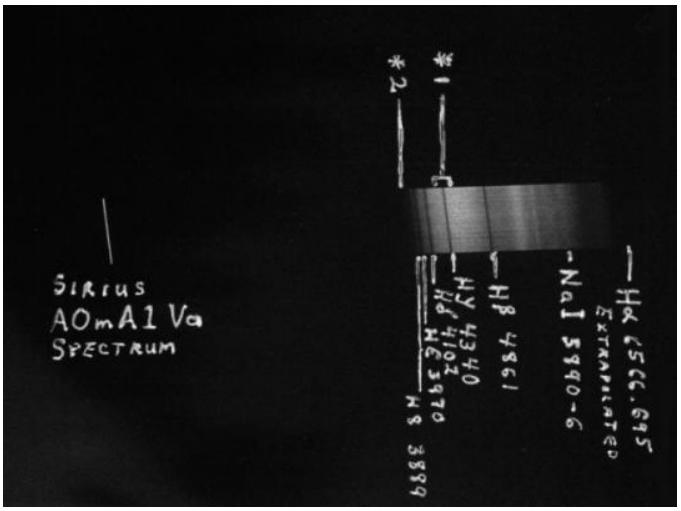
Link submitted by Doug Welch.

Star Spectroscopy images *by Mike Jefferson*

Here are some images that Mike Jefferson presented at the March 14, 2003 general meeting.

Read more about "Stars and their Spectra" in this James B. Kaler book: `http://www.astro.uiuc.edu/~kaler/books.html#ss`





m = strong metallic absorption
1 = an area from 4372 Åto 4298 Åwith strong bands of FeII, TiII, NiII, ZrII, FeI, & ScII.
2 = an area from 3752 Åto 3732 Åwith strong bands of ZrII, CaI, FeI, TiII, FeII, CaII & OIII.

Upcoming Events

Date Saturday, April 12, 2003

Location Delphi Hall in Niagara Falls

Details See Feb-2003 Event Horizon issue for details

Speaker Ivan Semeniuk

Date Friday, May 9th, 2003

Speaker Mark Robinson

Topic "Stormchasers: The Real Story"

Location Hamilton Spectator Building

More Info http://209.151.141.15/purechaseii/

Date Saturday May 31 and Sunday June1, 2003

Event HAA Star Party

Location Silent Lake Campground

More Info Article in this newsletter

Date Friday, June 13th, 2003

Speaker Dr. Peter Brown of UWO

Topic Meteors: Infrasound and Satellite Data

Location Hamilton Spectator Building

More Info http://www.astro.uwo.ca/ pbrown/

Date November 8th, 2003

Event HAA Anniversary Party

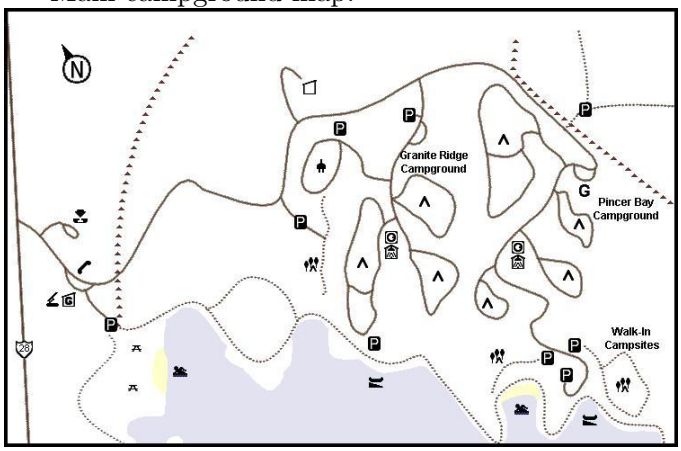
Location Royal Botanical Gardens

HAA Star Party

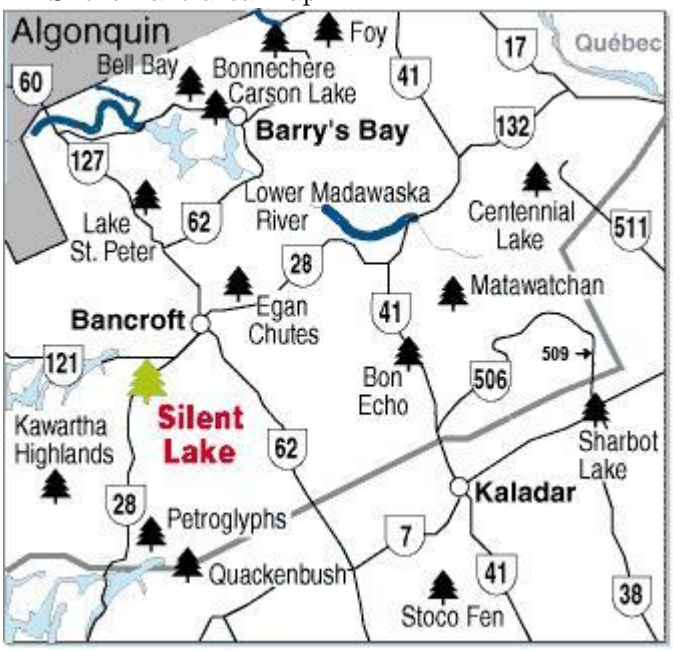
Summer is on its way, which means it will soon be time for star parties. There are a number of events held each summer in southern Ontario. Most offer astronomy related talks as well as the opportunity to experience dark skies and the chance to talk to other amateur astronomers. All events have dark enough skies that the Milky Way is very obvious, unlike observing close to home. The first event of the year is our very own HAA Star Party. Looking at the weather it's hard to believe but it will take place next month at Silent Lake on the May 31/June 1 weekend. Our star party doesn't offer any talks but the location is great. The night sky is darker than Starfest but not quite as dark as at Manitoulin Island. There are lots of daytime activities such as fishing, canoeing, hiking, wildlife viewing, swimming and cycling. In addition, you don't have to travel very far to do some rock hounding. The Bancroft Chamber of Commerce has a complete list of locations and you can even rent a rock hammer from them. The campsites at Silent Lake are not your typical star party quality. They are well shaded, level and quite large. Purists might say that it isn't real camping at Silent Lake due to the hot showers and flush toilets! The drawback to these nice sites is that you have to set up and take down your scope at the main parking lot each night. It's worth the effort though. We should try to camp in the same area but make your reservations soon since some sites have already been reserved for that weekend.

Cost: Camping $21.50/site/night. Silent Lake (613) 339-2807 `http://www.ontarioparks.com/english/sile.html`

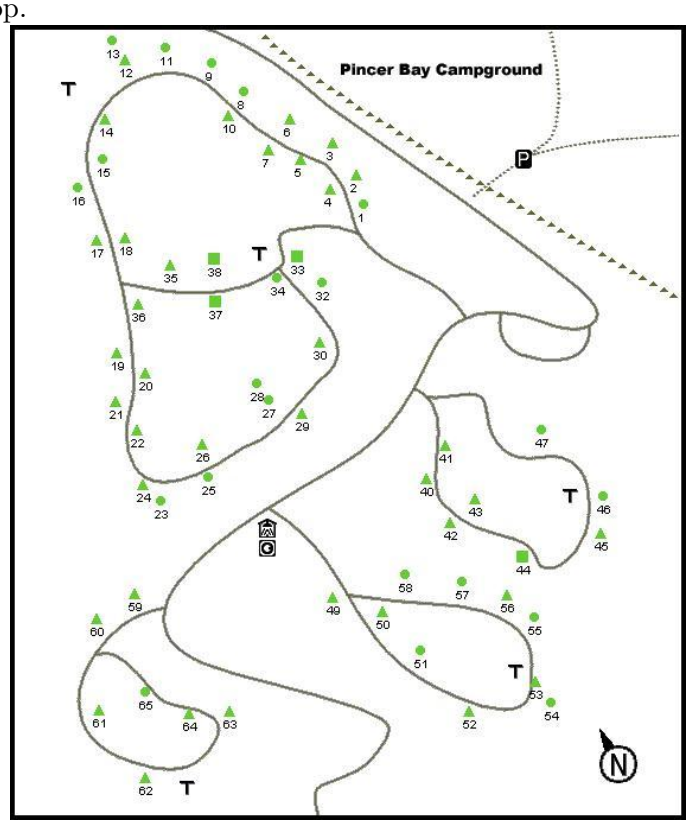
Main campground map:



Silent Lake area map:



I recommend that you make reservations in the 40-58 group of sites in the Pincer Bay campground. Note that only sites 41 and 43 are still available in the first loop.



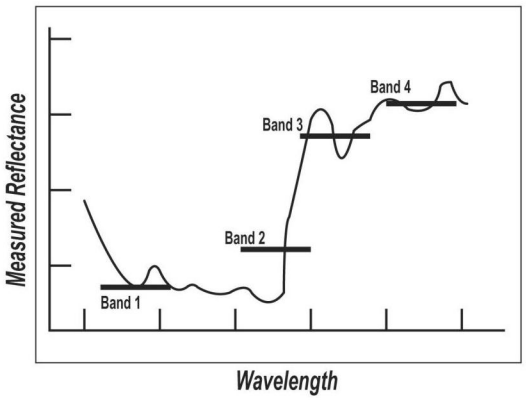
NASA's Space Place

Musical Satellites

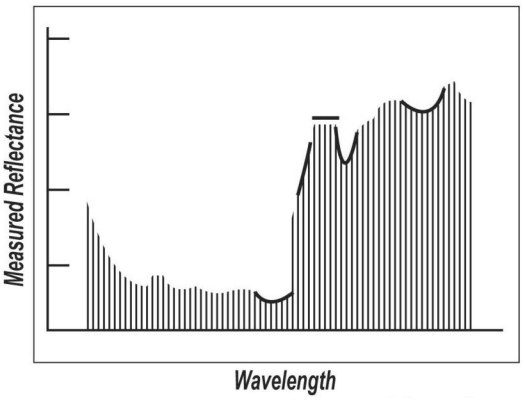
by Dr. Tony Phillips

If light were sound, then chemicals would play chords.

Water: C major. Cyanide: A minor. Chlorophyll: G diminished 7th. (Please note that the choice of chords here is only for the sake of illustration, and not meant to reflect the actual spectra of these chemicals.)



Multispectral Imaging (few bands)



Hyperspectral Imaging (hundreds of bands)

Hyperion instrument distinguishes hundreds of wavelength bands, while current Landsat instrument images only a few.

It's a loose metaphor, but an apt one. Musical chords are combinations of frequencies of sound (notes), while chemicals leave unique combinations of dips in the frequency spectrum of reflected light, like keys pressed on a piano. Spectrographs, machines that recognize chemicals from their "chords of light," are among the most powerful tools of modern chemistry.

Most earth-watching satellites, like the highly successful Landsat series, carry spectrographs onboard. These sensors measure the spectra of light reflected from forests, crops, cities, and lakes, yielding valuable information about our natural environment. Current satellites do this in a fairly limited way; their sensors can "hear" only a few meager notes amid the symphony of information emanating from the planet below.

EO-1 could change that. Short for "Earth Observing 1," EO-1 is an experimental NASA satellite in orbit since 2000. It's testing out a more advanced "spectrometer in the sky"-the Hyperion hyperspectral imager. How good is it? If Landsat were "chopsticks," EO-1 would be Gershwin's "Rhapsody in Blue."

The Hyperion sensor looks at 220 frequencies in the spectrum of visible and infrared light (0.4 to 2.5 microns) reflecting off Earth's surface. Landsat, in contrast, measures only 10. Bryant Cramer, who manages the EO-1 project at the Goddard Space Flight Center, puts these numbers in perspective. "If we flew Landsat over the northeastern United States, it could readily identify a hardwood forest. But using hyperspectral techniques, you probably can . . . tell the oak trees from the maple trees."

Future earth-watching satellites may use Hyperion-like instruments to vastly improve the environmental data they provide. EO-1 is paving the way for these future missions by taking on the risk of flight-testing the sensor for the first time.

For farmers, foresters, and many others, this new remote sensing technology will surely be music to the ears.

Read about EO1 at `http://eo1.gsfc.nasa.gov` . Budding young astronomers can learn more at `http://spaceplace.nasa.gov/eo1_1.htm`

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

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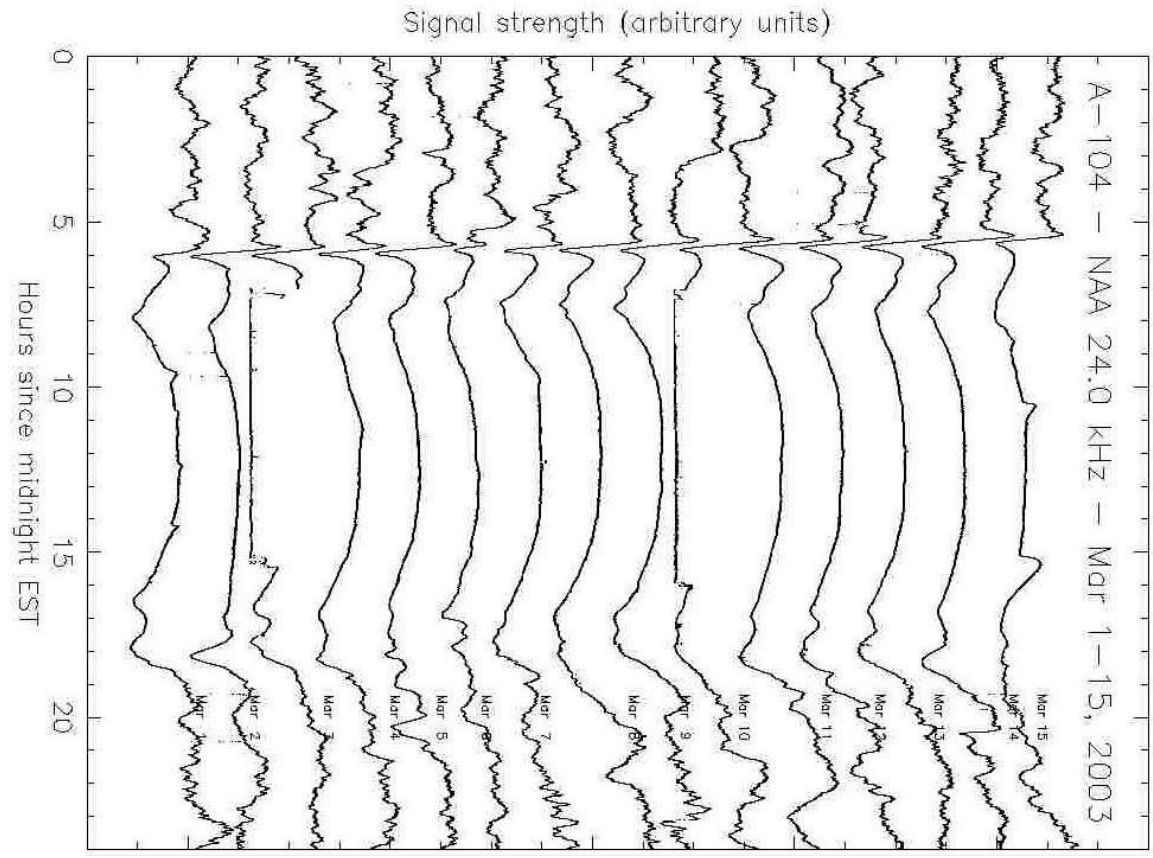
`http://spaceplace.nasa.gov`


A-104 — NAA 24.0 kHz — Mar 1-15, 2003
Signal strength (arbitrary units)
Hours since midnight EST
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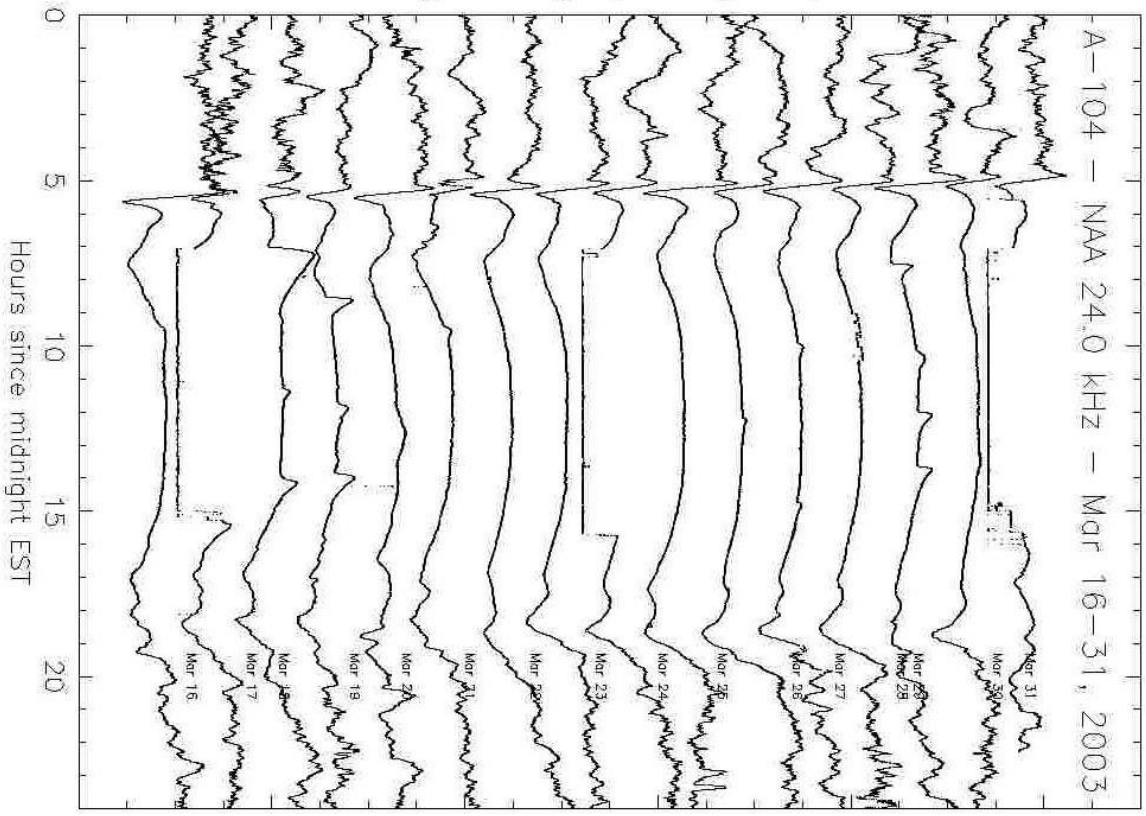
A-104 — NAA 24.0 kHz — Mar 16-31, 2003
Signal strength (arbitrary units)
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Mar 23
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Mar 26
Mar 27
Mar 28
Mar 29
Mar 30
Mar 31

May 2003

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1	2 **Observing Night**	3 **Observing Night**
4	5	6	7	8	9 **HAA General Meeting**	10
11	12	13	14	15	16	17
18	19	20	21	22	23 **Observing Night**	24 **Observing Night**
25	26 Penumbral lunar eclipse, centered on 12:03 UT and visible from Australia and the Pacific.	27	28	29	30 **Observing Night**	31 **Observing Night**
			For observing info, call Stewart Attlesey 827-9105, Rob Roy 692-3245, Ann Tekatch 575-5433, http://amateurastronomy.org/events.php			

April 2003

		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

June 2003

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
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