University Lowbrow Astronomers
Ann Arbor, Michigan

REFLECTIONS REFRACTIONS

of the University Lowbrow Astronomers

June 2000

The University Lowbrow Astronomers is a club of Astronomy enthusiasts which meets on the third Friday of each month in the University of Michigan's Physics and Astronomy building (Dennison Hall, Room 130 or 807). Meetings begin at 7:30 pm and are open to the public. Public star parties are held twice a month at the University's Peach Mountain Observatory on North Territorial Road (1.1 miles west of Dexter-Pinkney Road; further directions at the end of the newsletter) on Saturdays before and after the new Moon. The party is canceled if it's cloudy or very cold at sunset. For further information call (734)480-4514.

Photo by Clay Kessler *(see the following article)*

Refractor Madness!!

By Clay Kessler http://gatecoms.gatecom.com/~ckessler/

It all started out innocently enough. I was looking for a "super finder" for my 12" SplitRing Newtonian. I was on a trip to Ohio when I came across a dealer that had an Orion Short Tube 80 in stock. After looking it over I purchased it and took it home. It turned out to be too large for the Newtonian but looking through it was strangely satisfying. The wide field of view was, somehow, "clean" looking and the short tube made a great guide

This Month:

June 9 - Public Star Party at Leslie Science Center in Ann Arbor. Contact Bernard Friberg for details.
June 16 - Meeting at 130 Dennison - Full Moon and werewolves are our tonight.
June 24 - Public Star Party at Peach Mountain Observatory - Latest evening twilight this year.

Next Month and Beyond:

July 1 - Public Star Party at Peach Mountain Observatory -
July 14 - Meeting at 130 Dennison
Note: (1 week early) - Rescheduled from July 21
July 21 and 22 - Astronomy at the Beach, Kensington Metropark.
July 29 - Public Star Party at Peach Mountain Observatory -
Aug 4 - Lowbrows at the Leslie Science Center. Contact Bernard Friberg for details.
Aug 5 - Public Star Party at Peach Mountain Observatory -
Aug 18 - Meeting at 130 Dennison -
Aug 26 - Public Star Party at Peach Mountain Observatory -

scope for my equatorial camera platform. I did not think too much about this. I just enjoyed the views and perched the short tube wherever it was handy – the top rail on my 8" SCT was used frequently as a short tube mount. After a while I began to get strange urges for a wide field astrograph. Looking over the options it was clear that many of the astrophoto "big guns" used refractors in the 4" f6 range for wonderful astrophotos. The only problem with these is the cost. The high end APO refractors are expensive. There must be a mirror based solution! Lets see..... an 8" f6.3 SCT..... no, the field is too curved over a 35mm frame, and forget medium format. How about a Takahashi Epsilon 160 – only $4,500.00..... OK – so that is a little steep. Maybe a Ceravalo Mak-Newt, lets see $2,000.00 and a two year wait.... I don't think so. Maybe I should look – just look mind you – at refractors.

Elsewhere on my web site you can read about the 4" f6 BW Optik refractor that I built from a kit. This has turned into a very nice astrograph and can take much better pictures than I am capable of. What is odd, to me, is how satisfying this little scope is to look through. Star clusters take on a rich look of diamonds sprinkled on black velvet. Many nights, despite my best intentions, the cameras never get mounted and the entire night is spent with an eye glued to the eyepiece. This is by no means a planetary scope but the wide field views are spectacular.

Somehow my whole attitude about refractors has turned around. What started as a feeling that these were basically glorified "department store trash scopes" has turned into an appreciation of affordable precision optical systems. This is not to say that we should throw away our SCT's and Newtonians. Aperture is still king and a 12" or 16" or 20" refractor is not very practical. Still, this new crop of achromatic refractors that is showing up in astronomy stores lately have a lot going for them. I have had the good fortune to look through several of these scopes lately and I have been quite impressed. The "Short Tube 90" from Orion takes the "handyness" of the 80mm and adds 10mm of aperture. I was able to peak through Charlie Nielson's and I was amazed at how easy it was to split double stars and the higher power views showed very nice diffraction rings. I understand that there is now a 102mm f5 version of this scope with a 2" focuser. I have not seen this one but internet reports are very favorable.

All of this peering through refractors, and a timely income tax refund, got me all fired up and I found myself perusing the internet and looking at reviews of different refractors. The "itch" got real bad when I found some lens blanks on eBay. I now have some 5" ED glass blanks that may turn into an f7 triplet astrograph at some unidentified future time. Unfortunately, I do not know anything about grinding lenses. I can, however, make all of the mechanical parts and I am looking for a lens grinder who wants to "buddy up" on a pair of refractors. (hint - hint)

Looking at un-ground lens blanks was exciting for a while but it has not satisfied my itch for a larger refractor. I like my 4" f6, any new refractor must do duty as a photographic instrument and not duplicate the functions of my existing equipment. The next logical progression would be an instrument of about 1200mm focal length. I had a chance to look through the new Celestron 6" f8 refractor and I was doomed. I have read a lot of reviews of this new 6" scope and the "twins" marketed by Skywatcher and others. The reviews are almost universally favorable, the optical quality of these achromats is really very good. What bothered me were the mechanical aspects. All of these scopes are made in the same Chinese factory and the mechanicals may not be up to the demands of serious imaging. For example, my Short Tube is a very nice scope but there is some slop in the focuser and it does not lock tightly. I started reading about a scope offered by Photon Instruments - the Photon 127. This is a nice 5" f9 with a 1147mm focal length. Reviews on the internet mention not only the optical quality (reported to be better than the Celestron / Skywatcher clones) but also the well made mechanical systems.

I eventually weakened and paid a visit to the Photon Instruments web site. After I reviewed the info there the next step was a call to Owner Warren Kutok. Warren gave me the hot skinny on the genesis of the

Photon 127. Warren prototyped the design of the scope in his Mesa Arizona shop. Once the design was perfected the production work was contracted out to a Chinese optical company (not the same one that makes the Celestron / Skywatcher refractors). This company makes high quality lenses for the scope but they also make the mechanical systems to Warren's specifications. The tube, focuser and cell are all aluminum including the dew shield. The system employs multiple baffles (3 I think) in the tube. I was quite impressed with the focuser. While it is not as large an Astro Physics 2.7" the design is similar in that adapters are threaded into a 60mm diameter thread. This will allow me to make a special adapter for my Taurus Tracker and keep the Tracker/camera combination as short as possible. The 60mm thread diameter means that I will have a large "hole" for the light path to get to my camera. This will minimize vignetting.

Before I finished talking with Warren he had performed a "credit card-ectomy" and I was anxiously awaiting my new Photon 127. Waiting is always the hardest thing. We astronomers always seem to be waiting for something, a clear night, the new moon - even just waiting for darkness! Well, I made the most of the wait - I ordered the Losmandy adapter plates needed to mount this scope to my trusty G11.

Well, the big day finally arrived. The box was somewhat larger than I thought it would be - a tribute to the careful packaging. Once I removed the beast from its packing material I was impressed with the good looking and well made telescope that I received. It came with the 30mm and 15mm Plossl eyepieces that I requested, a nice finderscope (it did need to be focused) and a 2" mirror diagonal. I do have a minor gripe - why don't these things come with end caps? It was a simple matter to attach the supplied rings to the Losmandy universal plate and I am in business, or am I?

As I look out my office window I notice that the once clear and sunny sky has clouded over and now threatens rain! A bad case of "new telescope storms" appears to be imminent. As I wait for better weather I can fondle the accessories and dream of the great images I will take through this scope.

Saturday dawned bright and clear, and after work and helping a friend with a kitchen remodel job I set out for Island Lake and first light. Of course, as I set up the G11 the clouds started rolling in and I earned some wisecracks from some of the solar observers out there. After dark fell there were some holes and I was able to get a peak at Vega near the horizon.

Despite the very low altitude and the rolling atmosphere I could see a nice round set of diffraction rings both inside and outside of focus. A peek at the "double double" showed a rolling pair of "figure eight's" at 88X and considering the poor seeing I am very happy with this. Hopefully next weeks trip to the UP and Boon will allow me to make a more comprehensive evaluation and try some astrophotography with the system.

Man, this thing came with the worst set of "new telescope storms" that I have ever seen (maybe THAT was why the box was so large!). I suspect that this is how the weather stays so good in Arizona, they ship out the bad weather with the telescopes! Four days in the Upper Peninsula and not one good night. Fortunately Boon did not let me down. I finally got "First Film" on Friday June 2nd.

The Boon trip yielded a wonderful night on Friday. The sky was very dark and transparent – perhaps the best that I have seen in Michigan. I was able to focus the scope with the Taurus Tracker installed and my worst fear was alleviated. I managed to take four one hour exposures in about 5 hours of darkness – not too bad for a first use of a new scope. My shots did exhibit some slight trailing – or field rotation, I have not yet determined which. I suspect that I need to tighten the pick off tube on the Taurus. I shot STAR 21 – an asterism that included M 104 in the frame, STAR 20 – another asterism, The Swan Nebula (M 17) and NGC 6960 – the western part of the Veil Nebula. As you might expect with an achromat, the brighter stars were somewhat bloated. The extended objects however were wonderful. M 104 was small but distinct with a sharp dust lane, easily recognizable as the Sombrero Galaxy. M 17 was wonderful showing both the main nebula commonly visible in a telescope and clouds of nebulosity around the field. The Veil was dim, it could have used more exposure, but it showed very nice color and lots of delicate filamentary detail.

This scope is a real winner. While I have not looked at any planets yet – or even the moon (next week for sure) the photographs tell the tale. I will try to find a filter to cut some of the "star bloat" in the images but even if I cannot correct this it will be well worth while to take lots of astrophotos with this setup this summer. I am very pleased with this relatively inexpensive refractor and I think it represents a very good value for my telescope dollar.

See the front page for a larger view

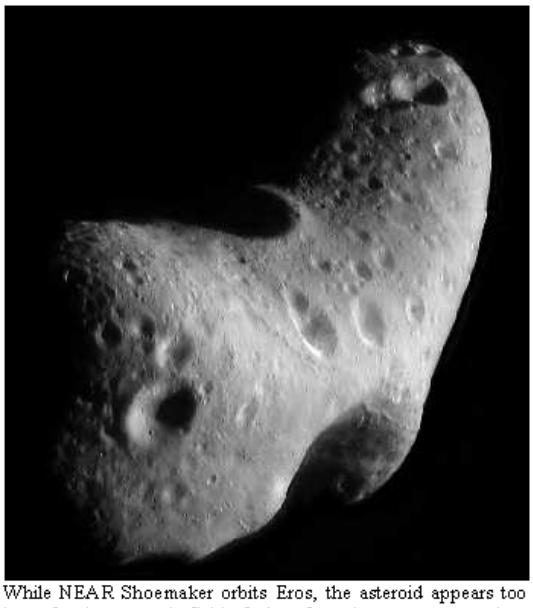
NEAR IMAGES OF EROS

Near an End of the Ridge
Image of the day for 2000 Jun 9

Just before the NEAR Shoemaker spacecraft began orbiting Eros on February 14, 2000, pictures of the asteroid showed an enormous landform: a long, low, asymmetric ridge wrapping around one-third of the asteroid's circumference. No analogous feature had been seen before on any other asteroid or asteroid-like moon.

As the spacecraft has descended into lower orbits and "seen" the surface at high spatial resolutions, the ridge has been photographed in ever-increasing detail. This image, taken on June 7, 2000, from an orbital altitude of 50 kilometers (31 miles), caught the ridge near one of its ends, where it dies out at the bottom of the frame. The whole scene is 1.9 kilometers (1.2 miles) across.

The spacecraft built and managed by The Johns Hopkins University Applied Physics Laboratory, Laurel, Maryland, NEAR-Shoemaker was the first spacecraft launched in NASA's Discovery Program of low-cost, small-scale planetary missions.



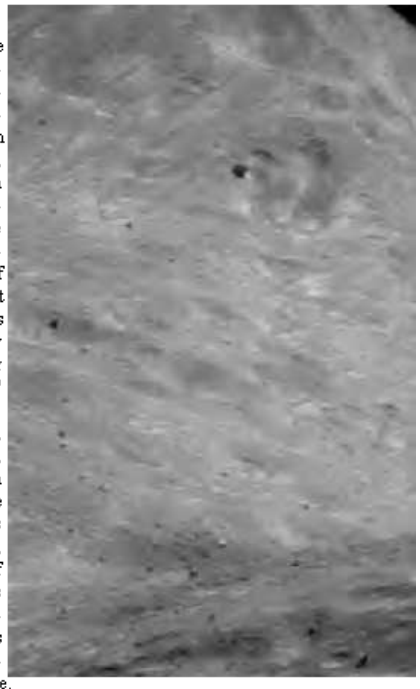
While NEAR Shoemaker orbits Eros, the asteroid appears too large for the camera's field of view. In order to get a complete view of the surface from a particular vantage point, several images are mosaicked. To do this, the digital images returned by the spacecraft are draped over a computer model of the asteroid's shape.
This spectacular view -- looking down on the north polar region -- was constructed from six images taken February 29, 2000, from an orbital altitude of about 200 kilometers (124 miles). This vantage point highlights the major physiographic features of the northern hemisphere: the saddle seen at the bottom; the 5.3-kilometer (3.3-mile) diameter crater at the top; and a major ridge system running between the two features that spans at least one-third of the asteroid's circumference.

Twin Pits

Mosaic of Eros' Northern Hemisphere

NEAR image of the day for 2000 Jun 13 ,Twin Pits (previous page)
This image, taken on June 10, 2000, from an orbital altitude of 51 kilometers (32 miles), caught an obliquely illuminated view of a double crater on Eros. The two craters are so close to each other that they merge into the single dumbell-shaped depression in the center of the image. Each of the two craters is about 550 meters (1800 feet) across. The whole scene is 1.9 kilometers (1.2 miles) across.
Some impact craters occurring on Earth and on other planetary bodies come in close pairs. These double craters are sometimes the result of the chance superimposition of two distinct impact events. However, a few double craters are also thought to have formed by the impact of two similarly sized bodies that are traveling in close orbit or touching each other. The near-Earth asteroid 4769 Castalia, which has been imaged by radar, is one of the most promising candidates for being such a "contact binary."

Around the Bend

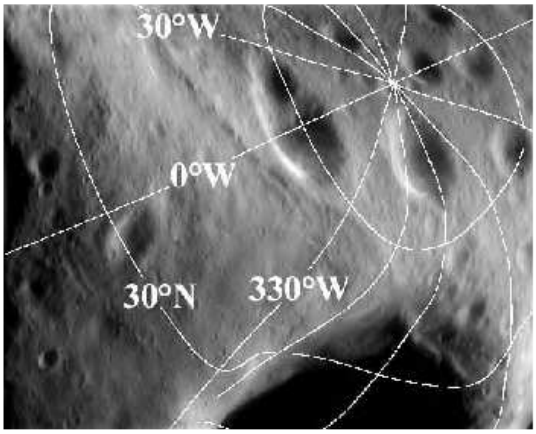


Around the Bend

Since the NEAR Shoemaker spacecraft began orbiting Eros on February 14, 2000, the Sun has been moving to more southerly latitudes. Most of the asteroid that was in darkness in late February is now sunlit for part of Eros' day.
This image, taken June 9, 2000, from an orbital altitude of 51 kilometers (32 miles), shows part of the asteroid's western hemisphere that was dark in the mission's early stage.
This side of Eros, where the large 5-kilometer (3-mile) diameter crater is located, is concave shaped. The surface slopes down and away in the lower part of the picture, then up for the top three-quarters. The whole scene is 1.2 kilometers (0.7 miles) across.

Eros' Latitude and Longitude Grid

The most familiar reference system for locating places on the surface of a planetary body is latitude and longitude. On a spherical body like Earth, these measures have a comfortable, predictable feel to them - despite the difficulty in showing a spherical planet on a flat map. However, the irregular peanut-like shape of Eros lends the asteroid's latitude-longitude grid a surprising character.
This image of the north polar region was taken from NEAR Shoemaker March 31, 2000, from an orbital altitude of 207 kilometers (129 miles). The image has been overlain with lines of latitude and longitude. Latitude is measured in degrees from the equator to the pole; longitude is measured in degrees west of a "prime meridian." In both cases, the vertex of the angle being measured is the center of Eros. The wandering, curved shapes of the lines are caused by the highly nonspherical and irregular asteroid shape.



Eros' Latitude and Longitude Grid

Galileo Images

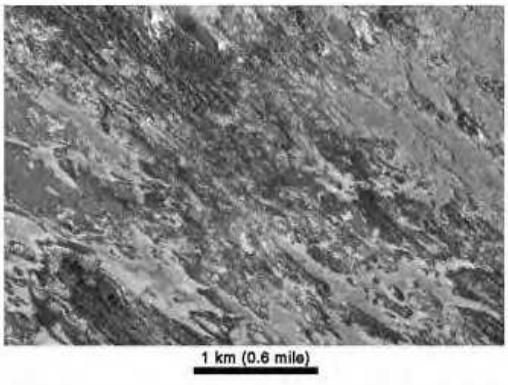
Credit: NASA - JPL

The margin of the lava flow field associated with the Prometheus volcanic plume on Jupiter?s moon Io is seen in this image, acquired by NASA's Galileo spacecraft on February 22, 2000. The image has a resolution of 12 meters (39 feet) per picture element. The dark lava has margins similar to those formed by fluid lava flows on Earth. This entire

area is under the active plume of Prometheus, which is constantly raining bright material. Hence, Galileo scientists interpret the darkest flows as being the most recent. They are not yet covered by bright plume fallout and perhaps too warm for bright gas rich in sulphur dioxide to condense.

The older plains (upper right) are covered by ridges with an east-west trend. These ridges may have formed by the folding of a surface layer or by deposition or erosion. Bright streaks across the ridged plains emanate from the lava flow margins, perhaps where the hot lava vaporizes sulphur dioxide. The bright material must be ejected at a low angle because it only coats the lava-facing sides of the ridges. North is slightly to the right of straight up.

An active volcanic eruption on Jupiter?s moon Io was captured in this image taken on February 22, 2000 by NASA's Galileo spacecraft. Tvashtar Catena, a chain of giant volcanic calderas centered at 60 degrees north, 120 degrees west, was the location of an energetic eruption caught in action in November 1999. A dark, "L"shaped lava flow to the left of the center in this more recent image marks the location of the November eruption. White and orange areas on the left side of the picture show newly erupted hot lava, seen in this false color image because of infrared emission. The two small bright spots are sites where molten rock is exposed to the surface at the toes of lava flows. The larger orange and yellow ribbon is a cooling lava flow that is more than more than 60 kilometers (37 miles) long. Dark, diffuse deposits surrounding the active lava flows were not there during the November 1999 flyby of Io.
This color mosaic was created by combining images taken in the near-infrared, clear, and violet filters from Galileo?s camera. The range of wavelengths is slightly more than that of the human eye. The mosaic has been processed to enhance subtle color variations. The bright orange, yellow, and white areas at the left of the mosaic use images in two more infrared filters to show temperature variations, orange being the coolest and white the hottest material. This picture is about 250 kilometers (about 155 miles) across. North is toward the top and illumination from the Sun is from the west (left).



Highest Resolution Picture of Io

This image, acquired by NASA's Galileo spacecraft on February 22, 2000, is the highest resolution image ever taken of Io. The resolution is 5.2 meters (18 feet) per picture element.
Galileo viewed the surface obliquely, tilted 72 degrees from straight overhead. Illumination is from the lower right, but the topographic shading is difficult to see because of the strong contrasts in brightness of the surface materials. The bright areas are generally higher in elevation than adjacent dark areas. The surface appears to have been eroded by an unknown process, in places exposing layers of bright and dark material. Evaporation of solid ice may also play a role in separating the bright and dark materials. North is toward the upper right.
Also shown is a version of this image processed to give a bird's-eye view over the terrain. This image maps out the true distribution of bright and dark surface materials.

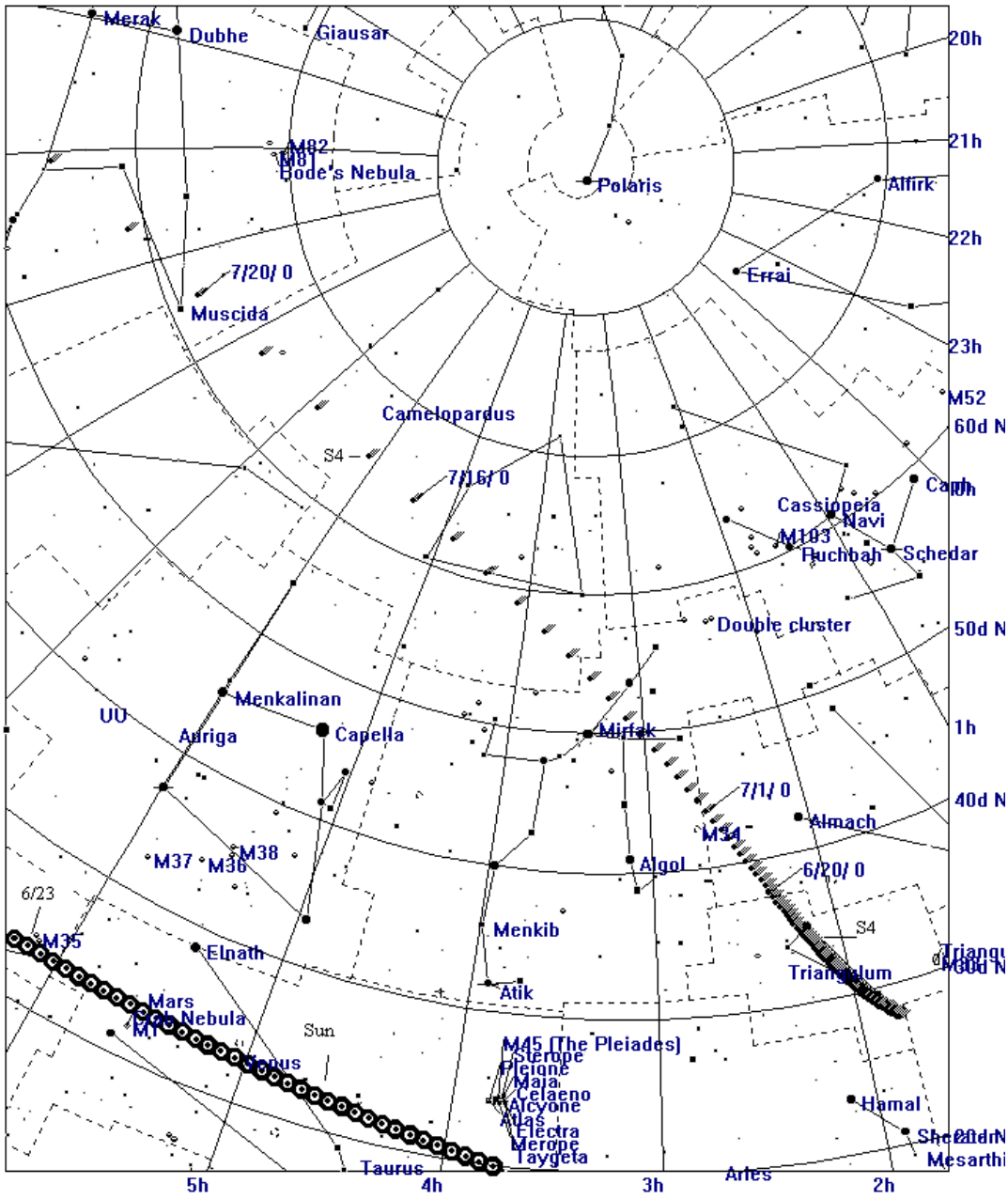
Linear S4 Comet

by Bernard Friberg

Comet Linear S4 was discovered in Sept 1999 by the MIT Lincoln Laboratory's LINEAR team using a robotic telescope. On June 16, 2000 the magnitude is about 8 to 9 at a 1.5 au distance from the earth and a 1.07 au distance from the sun 1.07 au. Recent pictures of the comet show a slight suggestion of a tail. The comet will reach a perihelion distance of .765 au, and the comet- earth distance .39 au on July 24. The minimum comet - earth distance is .373 au on July 22. It is not expected to reach the original magnitude estimate of 3 to 4. On July 21 the comet crosses the sun-earth plane that is perpendicular to the earths orbital plane. On Aug 11 the comet crosses the earths orbital plane moving to the Southern hemisphere.
The chart on page 7 shows the path of Linear S4 starting in the constellation Triangulum, a just before sunup object, passing below Polaris in the mid part of July, a cir-

Linear S4 Comet (1 day interval)

The Sky Software



cumpolar object, and then becoming an evening object before heading South. The last position on this chart is July 22, when it is about 16 degrees South of M81. Next months issue will include the chart for the latter part of July and August.

Linear S4 RA and Dec @ 5 AM edt

	hr	m	s	d	m	s	
6/23	2	23	17	39	3	50	N
6/25	2	26	1	40	3	53	
6/30	2	35	18	43	9	22	
7/1	2	37	47	43	54	14	
7/7	3	1	23	49	44	45	
7/8	3	7	44	51	8	37	
7/14	4	25	54	60	38	49	

Observations reported to NASA-JPL

2000 June 10.04 UT: m1=10.5, Dia.=3.0', DC=6, Tail 3' in PA 270 . . . 26.0cm MC (100x) . . . Vince TUBOLY (Hungary) [central condensation with starlike nucleus at m=11.0]

2000 June 10.44 UT: m1=10.1, Dia.=2', DC=6, ... 41 cm L ... Alan Hale (Cloudcroft, NM) [distinct fan-shaped coma, with an apparent condensation near the apex]

2000 June 12.85 UT: m1=9.9,Dia=2.0',DC=5...15cm L (40x)...Michael Mattiazzo (Wallaroo,South Australia) [Observation made at low altitude. Comet is moderately condensed - a good sign of things to come]

2000 June 12.97 UT: m1=9.5, Dia=2.0, DC=5...35cmL(80x)...Timur Kryachko, North Caucasus, Russia) [Corrected for atmospheric extinction.]

2000 June 13.208 UT: m1=10.3 , Dia.=3', DC=6... 20cm SCT(80x)... Francisco A. Rodriguez (Gran Canaria, Canary Islands)

*2000 June 13.59 UT: m1= 9.8, Dia.=3.5', DC=5, Tail 6' in PA 270 ... 25.6cm L (42x) ... Nicolas Biver (Mokuleia, Oahu, HI) [In 25.6cm L (169x), starlike nucleus at m=13.2]

Prospects of S4 (LINEAR)
Credit Alfredo Pereira, 1999 October 14

Improved orbital elements indicate this object will pass perihelion on 2000 July 24 at about 0.75 AU (111 Million Km) from the Sun. The comet is currently [99 Oct 13] still over 4 AU away from the Sun, a region where water production is not yet expected to be dominant in driving the comet's brightness. Water should take over other volatiles within 3-3.5 AU from the Sun, i.e. in December/January. A major concern regarding predicting the comet's peak brightness is that this might be a dynamically new object. If this should be the case, then naive extrapolations from its current brightness could yield too bright a peak m1, as dynamically new comets are long known to be typically very bright and active, brightening at a fast (but delusive) pace when still away from the Sun pre-perihelion. As such comets come closer to the Sun, this trend dramatically levels off, with the comet frequently even fading closer to perihelion. This photometric behavior is believed to be caused by the fact that comets that are coming into the inner solar system for the first time, have a pristine thin outer-layer of material that was never heated, and is responsible for the high activity while approaching perihelion. This "fuel" is wasted very quickly, and any extrapolations based on the initial very active stage risk being misleading. Overall, if we disregard details in the light curves, pristine comets tend to rise in brightness roughly following the inverse third power of heliocentric distance. A typical example among many, of such dynamically new comets that "fizzle" in their way to perihelion, is comet 1989 X1 (Austin). Such comets turn out deceptions for the public because some media irresponsibly spread only the most optimistic predictions, and do not echo the warnings of caution put forward by those acquainted with comet brightness trends.

One needs to be very cautious about extrapolating the brightness of an object still so far away from perihelion. Based on past experience, I do not expect anything brighter than m1=3, and my personal guess is m1=4.5-5.0, which means a faint naked eye comet for those of us with dark skies. The comet should be very nice in binoculars, but hardly anything impressive for the general public. Reinder Bouma has pointed out that the presence of a tail well South of the radius vector [i.e. a dust tail], at the current heliocentric distance, together with the high activity, does not give room for much optimism. Orbital computations when a reasonable arc has been observed, will give further clues whether the object is new in the dynamic sense or not. However, note that even if an orbit has its semi-major axis in the range 10000-100000 AU, this does not fully guarantee that the object did not make earlier visits to the inner solar system before being thrown into it's current orbit.

Acknowledgements, Suggestions and Comments
by Bernard Friberg

1. Thank you Mark Cray for making a scope collimator. He called me asking for project suggestions and a collimator has been near the top of my list for quite awhile. He completed the project the day after the initial telephone call. Mark, a master machinist, has donated many hours of machine time making items such as several eyepieces for the 24 " telescope, a 6 inch refractor telescope, mounting brackets for finders etc. The collimator has been tested and works quite well. I am planning to keep a collimator at the observatory for general use. This one is a central beam only collimator. The grid type is also available and is useful for evaluating and collimating a problem scope. If you are collimating your scope for the first time, using the grid type is a good idea. If you would like both types available, please e-mail, call, or leave a voice-mail message.

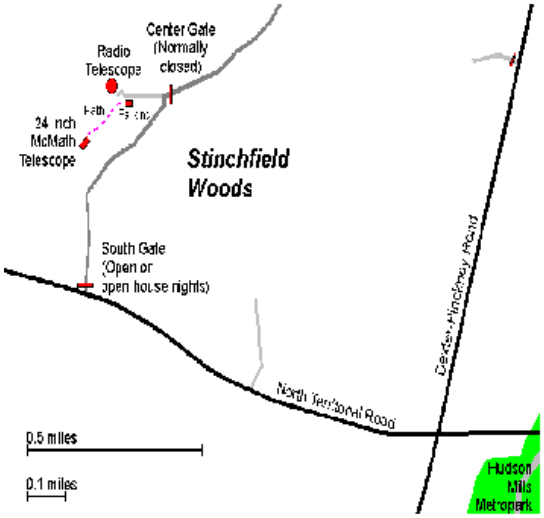
2. Suggestions: Marking the center of a mirror that is used in a

Newtonian type telescope greatly facilitates the collimation process. I will have free tabs available for those that would like one.

Providing an opening near the mirror of a Newtonian also helps in the collimation process. Using this opening reduces the risk of looking directly at the laser beam. Mike Huff has one in his 16" reflector.

Places and Times:

Dennison Hall, also known as The University of Michigan's Physics and Astronomy building, is the site of the monthly meeting of the University Lowbrow Astronomers. It is found in Ann Arbor on Church Street about one block north of South University Avenue. The meeting is held in room 807. Monthly meetings of the Lowbrows are held on the 3rd Friday of each month at 7:30 PM. During the summer months, and when weather permits, a club observing session at Peach Mountain will follow the meeting.



Peach Mountain Observatory is the home of The University of Michigan's 25 meter radio telescope as well as the University's McMath 24 inch telescope which is maintained by the Lowbrows. The observatory is located northwest of Dexter. The entrance is on North Territorial Road, 1.1 miles west of Dexter-Pickney Road. A small maize-and-blue sign marks the gate. Follow the gravel road one mile to a parking area near the radio telescopes. Walk along the path between the two fenced in areas (about 300 feet) to reach the McMath telescope building.

Public Star Parties:

Public Open House/Star Parties are held on the Saturday before and after each new Moon at the Peach Mountain Observatory. Star Parties are canceled if the sky is cloudy at sunset or the temperature is below 10 degrees F. Call 480-4514 for a recorded message on the afternoon of a scheduled Star Party to check on the status. Many members bring their telescopes and visitors are welcome to do likewise. Peach Mountain is home to millions of hungry mosquitoes - bring insect repellent, and it does get cold at night so dress warmly!

Amateur Telescope Making Group meets monthly, with the location rotating among member's houses. See the calendar on the front cover page for the time and location of next meeting.

Membership:

Membership dues in the University Lowbrow Astronomers are $20 per year for individuals or families, and $12 per year for students and seniors (age 55/+). This entitles you to the monthly REFLECTIONS newsletter and the use of the 24" McMath telescope (after some training). Dues can be paid to the club treasurer Charlie Nielsen at the monthly meeting or by mail at this address:
6655 Jackson Road #415
Ann Arbor MI 48103

Magazines:

Members of the University Lowbrow Astronomers can get a discount on these magazine subscriptions:
Sky and Telescope: $29.95 / year
Astronomy: $29.00 / year

For more information contact the club Treasurer. Members renewing subscriptions are reminded to send your renewal notice along with your check when applying through the club Treasurer. Make the check payable to "University Lowbrow Astronomers".

Newsletter Contributions:

Members and (non-members) are encouraged to write about any astronomy related topic of interest. Call or E-mail to Newsletter Editors at:

Bernard Friberg (743)761-1875 Bfriberg@aol.com
Chris Sarnecki (734)426-5772 chrisandi@aol.com

to discuss length and format. Announcements and articles are due by the first Friday of each month.

Telephone Numbers:

President: Mark Deprest (734)662-5719
Vice Presidents: Dave Snyder (734)747-6537
Paul Walkowski (734)662-0145
Doug Warshow (734)998-1158
Treasurer: Charlie Nielsen (734)747-6585
Observatory Director: Bernard Friberg (734)761-1875
Newsletter Editors: Chris Sarnecki (734)426-5772
Bernard Friberg (734)761-1875
Parking: Lorna Simmons (734)525-5731
Keyholders: Fred Schebor (734)426-2363
Mark Deprest (734)662-5719

Lowbrow's Home Page:

http://www.astro.lsa.umich.edu/lowbrows.html
Dave Snyder, webmaster
http://www-personal.umich.edu/~dgs/lowbrows/

This newsletter assembled by Bernard Friberg

The Carina Nebula in Infrared

(Astronomy Picture of the Day)
Credit: 2MASS Collaboration, U. Mass., IPAC

About three million years ago, the stars in the Keyhole Nebula began to form. The above picture of the Keyhole Nebula, also known as the Carina Nebula or NGC 3372, shows in infrared light many facets of this dramatic stellar nursery which lies only 9,000 light-years away. Fine dust reflects starlight while being heated and emitting light of its own. Open clusters Trumpler 14 and Trumpler 16 are visible in the lower left and upper right of the nebula. The bright star near Trumpler 14 is called Eta Carinae and is one of the most unusual stars known. A candidate for a supernova in the next few thousand years, Eta Carinae faded from being one of the brightest stars in the sky during the 1800s.

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Check your membership expiration date on the mailing label !

Linear S4 with the horizon line at 2:00 AM Sunday June 25
(not included in printed newsletter)