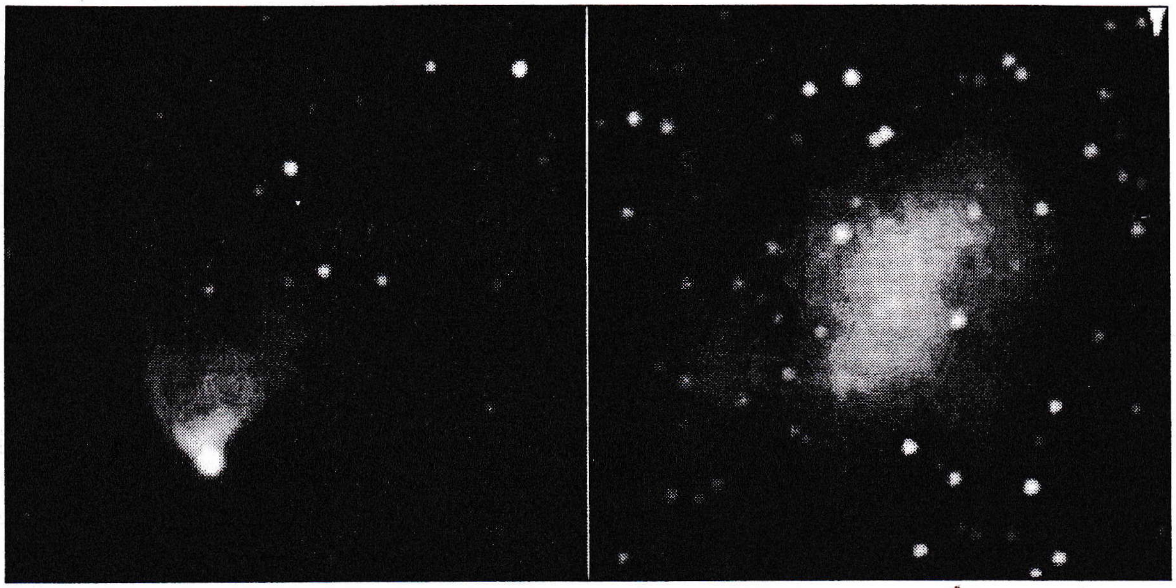
REFLECTIONS



REFLECTIONS

March 1994

On the right, Hubble's Varaible Nebula (NGC 2661), and on the left the Crab Nebula (M1). Images and processing by Roger Tanner at the 1994 Winter Star Party in Florida, using an SBIG ST-4 CCD camera at prime focus on a 17.5" f/4.5 telescope. Story on p. 2!

Kurt Hillig
Editor

Of the University Lowbrow Astronomers

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 Detroit Observatory at the corner of Observatory and Ann Streets in Ann Arbor. Meetings begin at 7:30 PM and are open to the public. Public star parties are also held twice a month, at the University's Peach Mountain Observatory on North Territorial Road (1.1 miles west of Dexter-Pinkney Road; map on page 7) on the Saturdays before and after the new moon; the star party is cancelled if it's cloudy or below 10°F at sunset. For further information, call Stuart Cohen at 665-0131.

This Month:

March 12 - Public Open House at the **Peach Mountain Observatory**. We've had a few good clear nights recently - though not too many on weekends - and it's new moon. If you can't make it to Lake Hudson (see below), try your own mini-marathon here!

March 12 - Messier Marathon at the **Lake Hudson State Recreational Area**. Call the Lenawee/Hillsdale Astronomical Societies for details, at 219/495-9991 or 517/547-7402.

March 18 - Meeting at the **Detroit Observatory** in **Ann Arbor**. Dr. Richard Teske, Prof. Emeritus of Astronomy (from UM of course), on "SETI: Will it Work?"

March 19 - Public Open House at the **Peach Mountain Observatory**. Time for the Messier Marathon part II – if there's anything you missed seeing last week, it will still be there tonight.

Astronomy Colloquia

The Astronomy Department of the University of Michigan holds regular colloquia on Monday afternoons each week (during the academic year, at least). While not intended for a general audince (the topics tend to be rather technical), visitors are welcome. Scheduled for March 14: Bill Sparks of the Space Telescope Science Institute, on "Dust and Gas in Elliptical Galaxies". Other scheduled speakers include: March 21 – Patricia Vader, STScI; March 28 – Charles Alcock, Lawrence Livermore National Lab; April 4 – Christine Wilson, McMaster University; April 13 – Howard Bond, STScI; and April 18 – Tom Herbig, Princeton. Coffee at 3:30 in room 845, and the talks at 4:00 in room 807, both in the Dennison (Physics/Astronomy) building on E. University.

Next Month and Beyond:

April 1 - Computer Subgroup Meeting at 7:30 PM. NOTICE: We will meet in room 1706 of the (new) Chemistry building on the UM campus in Ann Arbor (on N. University Ave. near the Michigan League); a tour of the Chemistry department's computing facilities will follow the meeting. On the agenda: more on the Lowbrow's May 10 solar eclipse cablecast project; also a look at GopherSpace and the World Wide Web.

April 9 - Public Open House at the **Peach Mountain Observatory**. Come welcome the spring! No mosquitos yet!

April 15 - Meeting at the **Detroit Observatory**. **LBA CLUB ELECTIONS!** You've just exercised your constitutional right to go broke – now come exercise your right to vote. Missing members may be nominated without warning!

April 16 - Public Open House at **Peach Mountain.**

May 1 - Computer Subgroup Meeting Location TBA....

Cheaper than Truth!

My latest machine shop project (it's a lot easier on the wrist than punching a keyboard!) is a spherometer - a device to measure the curvature of a surface. It's a block of aluminum on three feet, with a dial indicator (not cheap!) in the center to measure the depth of the curve. Of course the locations and shape of the feet have to be known pretty accurately for this to be useful. So for feet, I used ball bearings, resting in conical dimples (cut with a countersink) on the bottom. How to keep 'em in place? Simple! I drilled the center of each dimple 1/4" dia and 1/4" deep, and cemented in magnets (Edmund - $2.75 for 25) with beeswax. Easy!

WSP '94:
The Winter Star Party
by Roger Tanner

In February, Brian Close and I attended the Winter Star Party held by the Southern Cross Astronomy Society in the Florida Keys. We had planned to go down a few days early to do some observing from Brian's aunt and uncle's place on Marathon Key. On Monday, two days before we were to leave Brian heard that there was going to be a shuttle launch on Thursday morning. Having never seen a launch he called me up and tried to get our plans changed to go see it. As an enticement he called up a friend from college who is an aide for a senator from Houston, and managed somehow to get us VIP passes. The only problem was that they had to be picked up at the Kennedy Space Center on Wednesday! Brian arranged for a courier service in Orlando to go to the KSC and pick them up for us.

Brian had to teach a class on Tuesday night in Chicago. After class he drove home and loaded his car, and then drove to my place in Canton. We transferred his stuff to my (borrowed) van, and left at 2:30 (EST - 07:30 UT) Wednesday morning and started a 24 hour straight-through drive to the KSC. I was concerned that we might run into snow or ice in the hills of Kentucky, but the roads were clear and dry all the way. Of course for the last half of the trip the "Check Engine" light was on in the van. Everything looked all right so I concluded that some part of the emission control system had failed and the engine was OK. We arrived at the KSC Thursday morning with about 45 minutes to spare.

The center opened its gates at 3:00 Thursday morning for the launch at 7:00 AM. After checking in, we watched the preflight preparations on TV and at 5:00 they had a special briefing. We went into one of the auditoriums and listened to the heads of NASA and of the Russian space agency talk at length about how historic this launching of a Russian Cosmonaut was. We then took the buses out to a place about 3 1/2 miles from the launch pad. The launches are usually delayed so I wasn't getting too worked up (I was just a little bit tired too), however at T-10 seconds I realized it was going to go, and got pretty excited. It went up just fine, with the thick smoke from the solid rockets casting a visible shadow in the light from the morning sun.

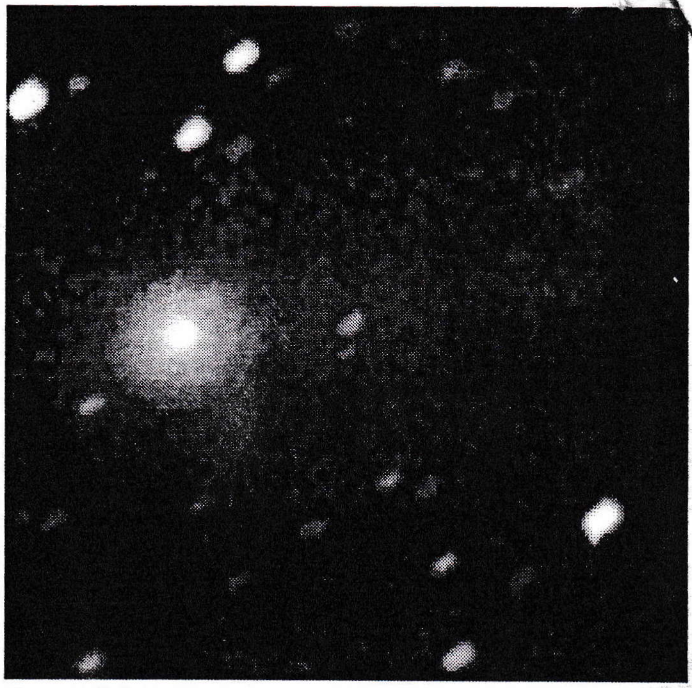
This is the closest I have ever been (and the closest you can get, at least legally) to a Shuttle launch, and the sound really shook my chest. Watching the main engines light off through the telephoto lens was fascinating. If you ever get a chance to see a launch I can highly recommend it. If you contact your congressman you can usually get causeway passes which get you 6 miles away and give a good view – especially if you bring along your scope.

After getting back to the center, while Brian took their tours and walked around to see the sights, I took the van in to get it serviced.

After that, the rest of our journey was pretty mundane. We got down to Brian's relatives and set up Brian's C-8 on the roof of their two story house. The view was great, except for the glare from the lights all around the bay their house is on. I tested out some heaters I had installed behind the secondary mirror, the Telrad and the primary and secondary on the guide scope. They kept the dew off even when a fog rolled in and the scope was dripping wet. For those inclined to try this, I put about 4 watts into the each element.

On Monday we checked into the star party and set up our equipment. There were only a few new scopes this year. Tom Clark didn't bring a bigger scope this year! (Each of the past 3 years he has brought a bigger Dobsonian to the WSP – last year it was a 36" called the "Yard Scope". I half expected a 40" "Meter Scope" this year! Oh well...)

The weather was 90°F and 90% humidity all day, and "dropped" to 80-85°F at night – a really welcome change from Michigan. The attendance at the star party was about 600 people, which was a little less crowded than in previous years. Each night would start out clear, then get cloudy from 1 to 3 AM, and then clear up again to allow viewing Jupiter and other morning objects. Several people had setup on the higher ground near the beach to get a clear shot at the objects on the horizon. Later in the week it became windy and soon we were surrounded by several people with 5" and 6" refractors trying to get out of the wind. But the next night it was very steady and the seeing was excellent, and a resolution and contrast contest broke out around us.



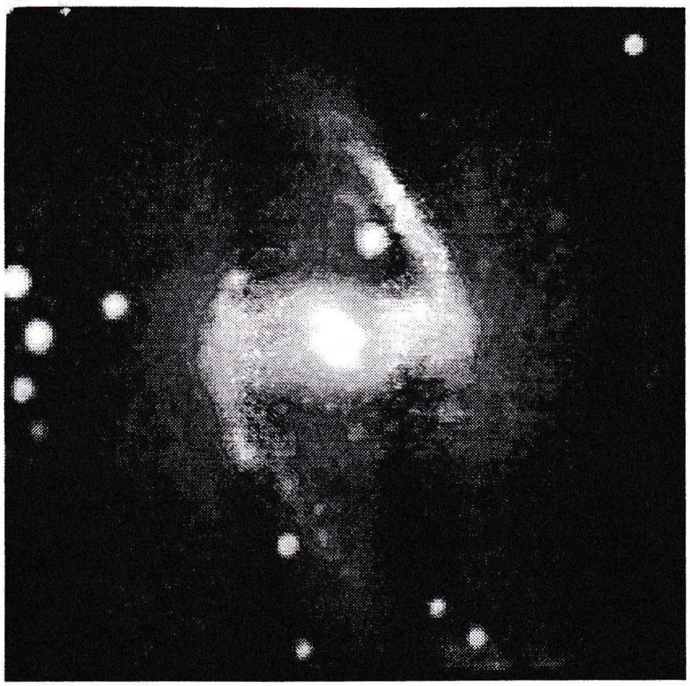
Comet Schwassmann, currently found in Cancer. This image is an average of four 300-second exposures, aligned on the comet and processed with an exponential contrast stretch. The images of the stars are streaked due to the motion of the comet between the successive images. RT.

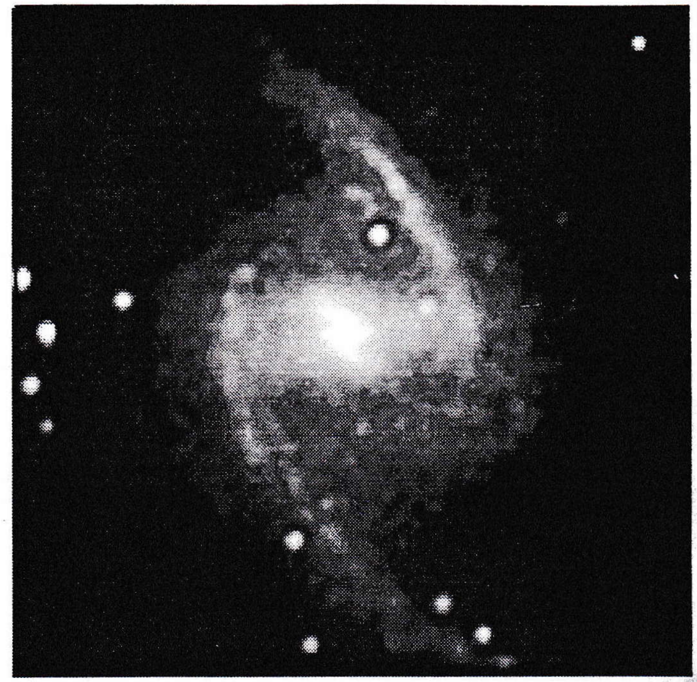
Groups of people travelled around to all of the telescopes and compared their images of Jupiter. One of the things they were looking at was to see one of the moons passing in front of the planet. Only in one scope – a 6" f/9 Astrophysics refractor – could people see it, as it was very low in contrast. They then looked to pick out the smallest detail they could see, and an 18" f/4.5 Obsession was the clear-cut winner, much to the distress of the refractor enthusiasts. I guess when the seeing is really sub arc second, the biggest diameter does give the most detail. The detail they were looking at was a swirl on the side of the main belt.

Alas, while others were taking this excellent tour of Jupiter, I was deep into trying to get an image of Shoemaker–Levy 9, the comet that is going to impact Jupiter in July. I got many good images this trip [see the accompanying pictures! - Ed.] but didn't find the comet. Bob Higgins did get it though, with a Lynx HPC-1 CCD camera on a 10" Schmidt-Cassegrain scope. It was very faint, at 15-16th magnitude, and about 4 arc minutes long. I finally did try some shots of Jupiter with my CCD camera, but without a shutter I could not prevent the image from smearing during readout.

On the last night the distant clouds near the horizon finally left and it was clear all the way down to the ocean. We got a good view of the Eta Carina cluster and of the Keyhole Nebula, which is a stellar nursery like the Orion nebula. It is very big – over 3/4 of a degree across – and gave a spectacular view in my 17" with a nebular filter.

The trip back went smoothly until Cincinnati, where a pothole bent the trailer axle. Oh well, it was still a great trip and the viewing was excellent, and I have already signed up for next year. Since they have such limited space they limit registrations, and you need to sign up as early as possible (like October the year before!) to make sure you will get a space. If you're interested in going next year, I know who to contact....

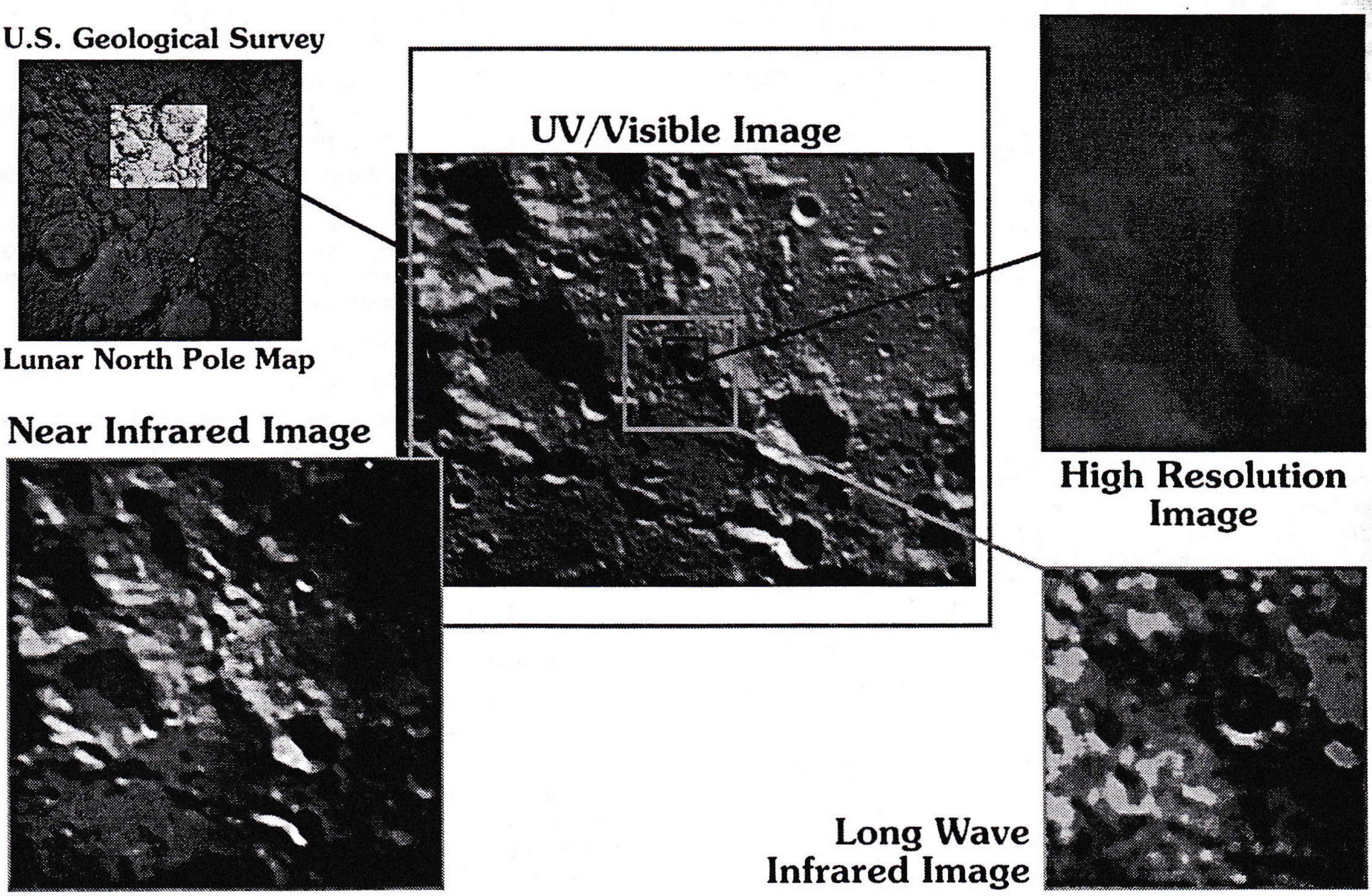




NGC1365, a barred spiral in Fornax. The image on the right is the average of three 300-second exposures, processed with an exponential contrast stretch. On the left is the same base image, but processed by A. Seghal with *Hidden Image* – a program which he co-wrote, and which does maximum entropy deconvolution to enhance the detail in blurred images. It has clearly brought out more of the hidden details, but has also (like all methods) added some processing artifacts. R. Tanner

Clementine Imagery

Alt. 2170 km; Lat = 82°N; Long = 104.6°E; Orbit#1; Time 21:40:20 (Z); Date Feb 19, '94



The Parallax View

by Douglas Warshow
and Kurt Hillig

Finding the distance to a nearby star is easy. Just take two photographs of the object in question six months apart and see how far it has moved with respect to the background stars, right? Wrong! The procedure is a bit more complicated than that...

In my junior year at the University of Michigan my astronomy class was assigned the task of determining the distance to Ross 248 in Andromeda (23h 39m +43°55'), an M6e star (the "e" indicates emission lines are seen in its spectrum). The photographic plates for the project were provided from the Sproul Observatory at Swarthmore College by Dr. Richard Sears. We used six plates, taken at two to four month intervals over a period of two years.

On each plate, four exposures of the Ross 248 region were made: two separated by a small amount in declination (the a and b images), and two more just the same but with the plate rotated 180 degrees (the c and d images). This gives four images of each star on every plate, and is done to average out any biases that may be present in the field of view or within the photograph emulsion.

Next, the plate is placed in a device called a Mann measuring engine. This marvel of technology is capable of determining positions on a plate to within 0.1 micron (0.0001 mm). Unfortunately, this means that the machine is extremely sensitive to accidental movement by the operator (no sneezing or hiccups!).

After the plate is set as "square" as possible in the engine, we measured the positions of the stars on the a and b images. The position of each of 4 background stars was measured three times, with the average values recorded; five position measurements were averaged for R248 itself. (Averaging multiple measurements reduces the possible errors in any single measurement, and makes it easier to spot mistakes.) Then the plate is rotated 180° and the same measurements are made for the stars in the c and d images.

The next task is to reduce all four sets of coordinates to a single common reference frame. We started by determining the "center of mass" of the reference stars for each of the four images – $\overline{X}_a = (X_1+X_2+X_3+X_4)/4$, etc. – to define the origin of the coordinate system for each image. This way, each star's position can be defined relative to this origin, and (if everything works perfectly), all four images should give the same coordinates for each star. Since the world isn't quite perfect, we calculated the mean over all four sets of images of the relative coordinates for each star, including the one we're interested in:

Star	$\langle X-\overline{X}\rangle$	$\langle Y-\overline{Y}\rangle$
1	-14.384 mm	-40.076 mm
2	33.206 mm	-10.510 mm
3	-31.974 mm	20.902 mm
4	13.153 mm	29.683 mm
Ross 248	14.011 mm	1.568 mm

Now we don't yet know for sure exactly which way is north on these plates – the X axis is supposed to be the dec axis, but it's probably off by a tenth of a degree or so – so the next step is to rotate our measurements into a standard reference frame, using the measured RA and declination of our reference stars (hopefully done by someone else – otherwise wait for the Hipparcos catalog to come out!). This is done with the dependence eqs.:

$$X = [D_{xs}] + X' - [Dx'] \quad \text{and} \quad Y = [D_{ys}] + Y' - [Dy']$$

where xs and ys are the coordinates of the reference stars in the standard frame as follows:

Star	xs	ys
1	-14.410 mm	-40.080 mm
2	33.200 mm	-10.510 mm
3	-31.960 mm	20.910 mm
4	13.170 mm	29.680 mm

Recent Results From OGLE

by Bohdan Paczynski
Princeton University
bp@astro.princeton.edu

There are five OGLE lens candidates that have been discovered so far in the 1992 and 1993 data obtained at the Las Campanas Observatory (operated by the Carnegie Institution of Washington) and analyzed by Andrzej Udalski and Michal Szymanski of the Warsaw University Observatory.

Approximately 1.1 million stars were observed to be constant in 1992 and were searched for the variability in 1993, and vice versa. The definition of a constant star is: at least 12 high quality photometric measurements in one season, with the standard deviation smaller than 1.6 times the nominal errors as indicated by DoPHOT photometric software. A star is considered a lens candidate if in the second observing season the star has at least 5 measurements that deviate by more than 3 standard deviations from the first season. The stars selected by these criteria are looked at and are subjectively judged to be good lens candidates. So far there are five of them. In addition, there are a few for which the data is much less convincing. A formal analysis will be done in the next few months and the will provide a more objective set of lens candidates.

The following is the summary of the results for the five very

Continued ☞

Parallax continued...

X' and Y' are our measured coordinates of Ross 248 from the above table, x' and y' are the reference star coordinates, and the D is the dependence for the reference star. (Here D_1=.144, D_2=.432, D_3=.081 and D_4=.343; their derivation is lengthy trigonometry which we'll skip here.) Then, if you're a purist, you can add corrections for atmospheric refraction, plate tilt, etc.

So now, finally, we have the reduced coordinates of Ross 248:

$$X = 14.012 \text{ mm} \quad \text{and} \quad Y = 1.567 \text{ mm}$$

Simple, right? Wrong! There are five more plates to be measured; better put on the coffee pot...

But eventually, after hours of poring over plates and calculations, we've got a series of coordinates as a function of time. A quick plot of the position versus time shows that in two years it's moved about 0.17mm (the proper motion μ), and there's a ripple on the line of almost 0.02mm! We can solve for more precise values of parallax and proper motion using the following equations:

$$\text{Dec:} \quad X = C_\delta + \mu_\delta t + p P_\delta$$

$$\text{RA:} \quad Y = C_\alpha + \mu_\alpha t + p P_\alpha$$

where t is the time measured from epoch 1940.000, C's are heliocentric coordinates when t = 0, P's are parallax factors (more trig, based on the location of the star relative to Earth's orbit) and p is the parallax. For the plate that we were using:

$$\text{Epoch} = 1945.656 \quad P_a = +0.31 \quad P_d = +0.78$$

After massive amounts of simultaneous-equation solving (I'll show anyone who is interested) involving the results of 5 other plates, and throwing in the plate scale of the Sproul telescope (its focal length of 10.989 meters – a touch over 36 feet – gives 18.77"/mm), we get the following results:

$$\mu_\delta = -1.595'' \quad \mu_\alpha = +0.014'' \quad p = 0.390''$$

or:

$$\text{Distance} = 3.26 \times 1/p = 8.36 \text{ light years}$$

This is not quite equal to 10.3 light years – the accepted distance – but then we did come within two standard deviations... At least the proper motion is better determined; 1.5955"/yr. Look, I never said that this was easy!

OGLE continued...

good looking OGLE lens candidates.

T_{max} (JD - 2448000)	t_0 (days)	Amplitude (min light)	I mag
803.4	45.0	6.5	19.1
807.3	14.0	5.8	19.3
824.3	12.4	11.5	17.9
831.5	10.7	1.26	15.89
1153.9	25.9	2.7	18.8

t_0 = (radius of Einstein ring) / (transverse velocity)

Many figures (compressed postscript files) are available over the Internet by anonymous ftp from astro.princeton.edu (login as ftp, use your E-mail address as password), in the bp/ogle* directories. [Those of you without Internet access can contact Kurt Hillig for help - Ed.]

The most up-to-date information is available from the Warsaw University Observatory. Login via anonymous ftp to sirius.astrouw.edu.pl (148.81.8.1) and look in the ogle directory. In particular, CCD sub-frames (150 x 150 pixels) for all the lens candidates for which good photometry was done are available in ogle/frames/ogle/V and ogle/frames/ogle/I.

Unrolling the Earth

David I. Bell

Canberra, Australia

We all know that space is unimaginably vast. But is it really? Here is a simple problem to make those large distances a little more (or maybe a little less) comprehensible.

Take the Earth, and squeeze it like a tube of toothpaste to form a long cylinder of material one meter in diameter, without changing its volume. How long would the resulting cylinder be? Similarly, if a 100km diameter asteroid was squeezed into a one meter diameter cylinder, how long would it be? Try to work these out before reading the answers below!

An intuitive way to visualize the squeezing process is to think of "unrolling" the Earth by skimming a strip of earth off it which is about one meter by one meter in cross section. Then think about traveling over the whole Earth in a spiral pattern to take off the top meter of it - sort of like peeling an apple in a single continuous strip. After that is done start the spiral over again to remove another meter of what's left. And so on.

The answers are pretty interesting – at least to me!

For the asteroid, you can solve it in your head - if you make a few approximations. The volume of a sphere is $4/3\,\pi\, r^3$; and since π is almost equal to 3, this is just $4\, r^3$ (within 4%). A 100 km diameter asteroid has a radius of 50 km = 50,000 m = 5×10^4 m. So $r^3 = 53 \times (10^4)^3 = 125 \times 10^{12}$; multiply by 4 and we can call it 500 billion kilometers. Now 1 AU = 93 million miles, or about 150 million km. Set 500 equal to 3 x 150 – astronomers don't even quibble about mere 10% differences – and you've got 3000 AU!

Now the Earth, it's a bit bigger. With a diameter of about 8000 miles, the radius is roughly 6000 km. This is 120 times larger than the asteroid, so the volume is about 120^3 times bigger, i.e. a factor of about two million. We end up with six billion AU's worth of toothpaste! Let's try to unboggle a bit: 6×10^9 AU is 9×10^{17} km, and one LY is about 10^{13} km, run the calculation again with the real numbers ... whaddaya know – the earth is 145,000 light years long!

G'day, mates!

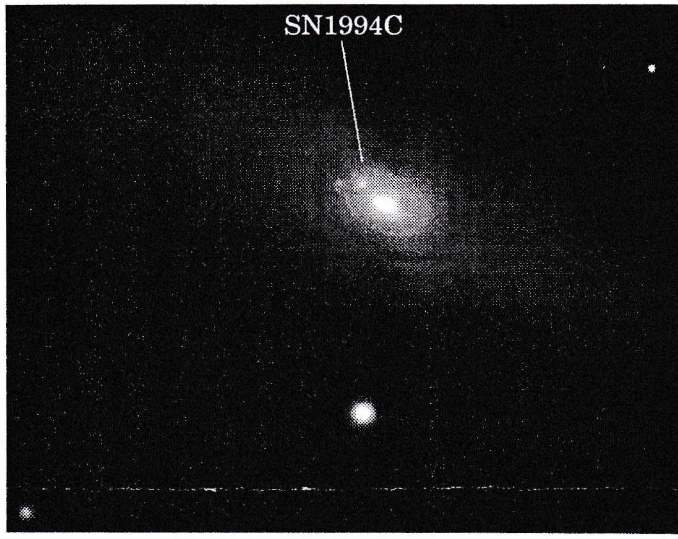
SN1994C – 9 March 1994

by Michael Richmond

Princeton University

We got another one! SN 1994C in NGC 4526 is a type Ia on the rise, perhaps one week before maximum. You can find it in Virgo about 9 arcsec West and 7 arcsec North of the nucleus of NGC 4526 (1950: RA 12:31:31, Dec +07:58:30); there is a faint foreground star (or HII region?) a little farther from the nucleus in the same general direction. It was about R=15 on Mar. 6, and brighter last night. It may rise to about twelfth magnitude if all goes well.

The image below is from the Berkeley Automatic Imaging Telescope (Alex Filippenko, prop. :-); North is up. The SN is the brighter (and closer) of the two features near the nucleus; it should appear MUCH brighter by now, since these pictures were taken several nights ago and the SN is on the rise.



Computer Subgroup Report

by Kurt Hillig

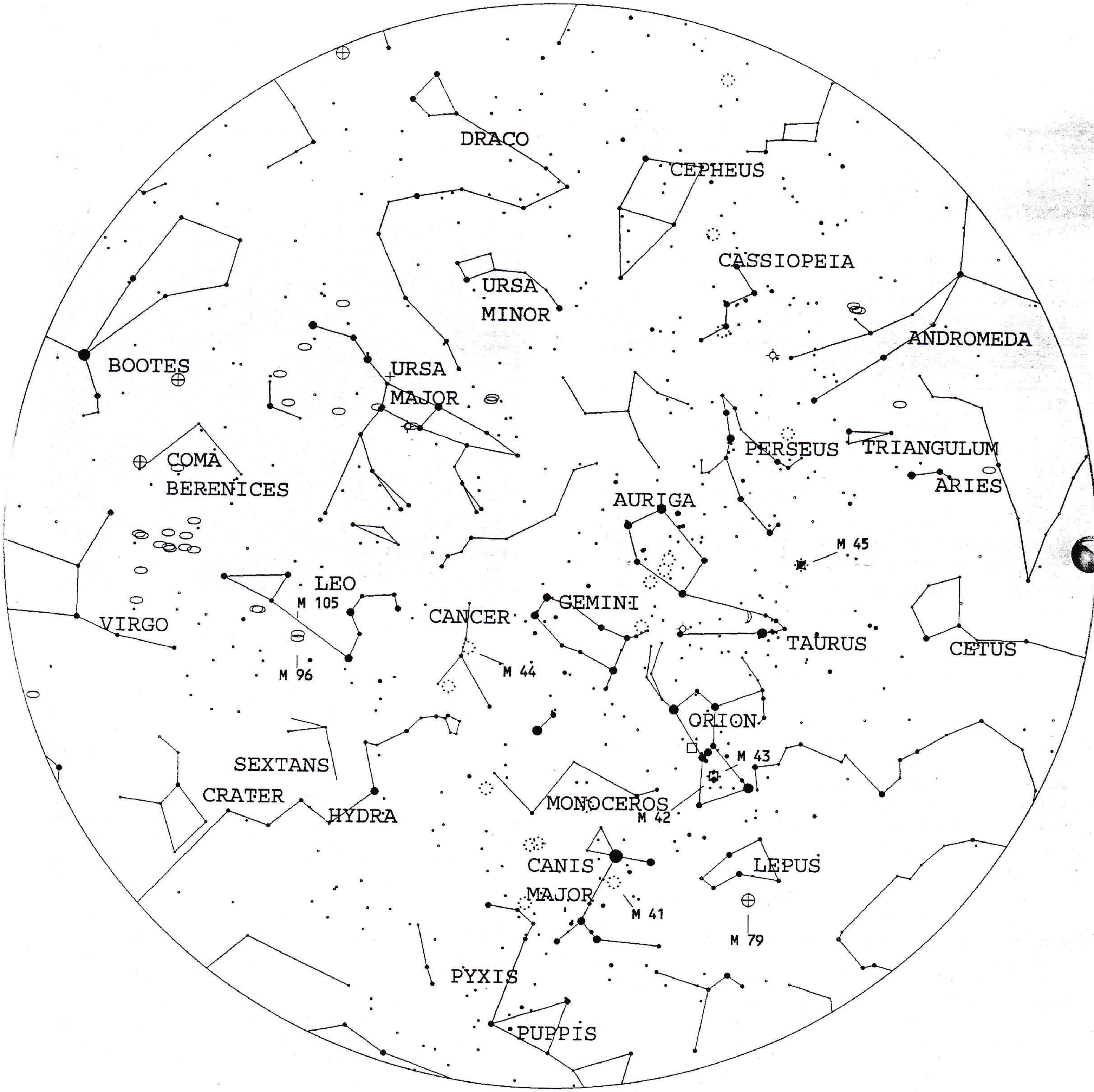
This month's report is rather truncated, as I wanted to make room for the SN announcement above – so if you need more details, talk to one of the LBA computer gurus! We met on March 1 at Doug Nelle's house, with eight people attending; primary topic was more on the May 10 eclipse broadcast project.

Doug has built a mini-fork mount clock drive platform for his video camera / 400mm telephoto combination, and demonstrated that he can get a good image of the Moon (filling about 2/3 of a TV screen) at f/32; several minutes of videotape showed quite a bit of detail, though it's clear that these old cameras aren't exactly network broadcast quality. Still they should be adequeate, with a little tweaking, and sensitivity isn't too bad – with the shutter wide open at f/6.7, seven stars of the Pleiades just fit on the screen! Of course for the Sun a good solar filter will be needed; we're looking into finding some aluminized Mylar sheet to make our own.

We're planning on putting together a number of short pre-recorded segments for use in the broadcast, to minimize the amount of 'real'time' engineering that's needed; five members have taken on the task of scripting a short segment, and training on the AA Cable public access studio equipment is scheduled for Monday, Mar. 14. There's still time and opportunity if you want to get involved; contact Stu Cohen if you're interested, but do it soon!

After a brief postlude, when Tom "Rodan" Ryan demonstrated the use of shareware in the corruption of hard disk directories, we performen the unusual task of scheduling the **Next Meeting: Friday, April 1 at 7:30 PM in room 1706 of the (new) Chemistry building!** Come join Kurt Hillig as he leads a tour of the Internet!

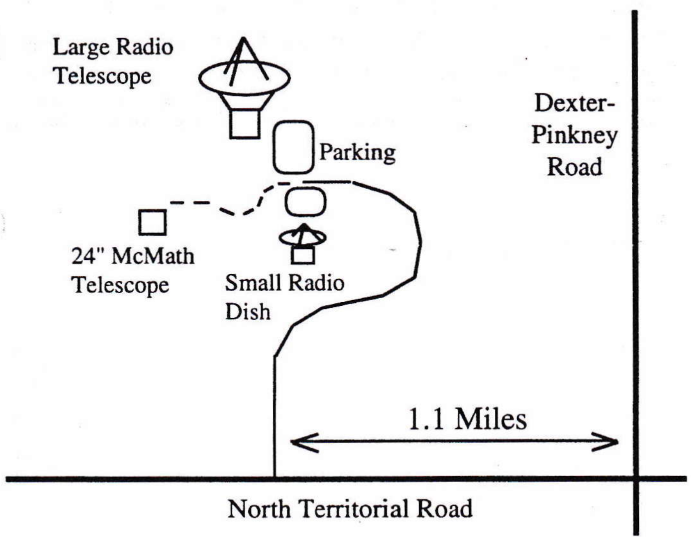
3/18/94 8:20pm EST stars to 5th mag



☞ Places:

The Detroit Observatory is in Ann Arbor, at the corner of Observatory and Ann Streets, (across from the old University of Michigan hospital and between the Alice Lloyd and Couzens dormitories on the UM campus). The Detroit Observatory is an historic building which houses a 19th century 12-inch refractor and a 6-inch transit telescope.

The 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 and used by the Lowbrows. The observatory is located northwest of Dexter; the entrance is on North Territorial Road, 1.1 miles west of Dexter-Pinkney 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.



☞ Times:

The monthly meetings of the Lowbrows are held on the third Friday of each month at 7:30 PM at the Detroit Observatory. During the summer months, and when weather permits, a club observing session at Peach Mountain will follow the meeting.

Computer group meetings are held on the first of each month, rotating among members' houses. See the calendar on p.1 for the location of the next meeting.

Public Open House / Star Parties are held on the Saturdays before and after each new moon at the Peach Mountain Observatory. Star Parties are cancelled if the sky is cloudy or the temperature is below 10°F at sunset – call 426-2363 to check on their status. Many members bring their telescopes; visitors are welcome to do likewise. Peach Mountain gets cold at night, so dress warmly – and bring mosquito repellant!

☞ Dues:

Membership dues in the Lowbrow Astronomers are $20 per year for individuals or families, and $12 per year for students. This entitles you to use the 24" McMath telescope (after some training). Dues can be paid to the club treasurer, Doug Scobel, at any meeting or by mail at this address:

1426 Wedgewood Dr.
Saline, MI 48176

☞ Magazines:

Members of the Lowbrow Astronomers can get a discount on these magazine subscriptions:

Sky and Telescope: $20 / year
Astronomy: $18 / year
Odyssey: $16.95 / year

For more information, contact the treasurer.

❒ Sky Map:

The sky map in this issue of *REFLECTIONS* was produced by Doug Nelle using *Deep Space 3D*, drawn for the end of twilight on the monthly meeting date.

✎ Newsletter Contributions:

Members (and non-members) are encouraged to write about any astronomy-related area in which they are interested. Call the editor (Kurt Hillig) at 663-8699(h) or 747-2867(o), or send e-mail to khillig@umich.edu, to discuss length, format, etc. Announcements and articles are due 14 days before each monthly meeting. Contributions should be mailed to:

Kurt Hillig
1718 Longshore Dr.
Ann Arbor, MI 48105.

☎ Telephone Numbers:

President:	Stuart Cohen	665-0131
Vice Pres:	Doug Nelle	996-8784
Moved to Las Vegas: Gone, but not forgotten!	~~Paul Etzler~~	~~426-1939~~
	Fred Schebor	426-2363
	Tom Ryan	662-4188
Treasurer:	Doug Scobel	429-4954
Observatory:	D. C. Moons	254-9439
Newsletter:	Kurt Hillig	663-8699
Membership:	Steve Musko	426-4547
Open House:	Keith Bozin	810/435-8964

Peach Mountain Keyholder:
Fred Schebor 426-2363

Monthly Meeting:

Dr. Dick Teske

Dept. of Astronomy
Univ. of Michigan

on

SETI: Will it Work?

March 18, 1993 at 7:30 PM

At the
Detroit Observatory in
Ann Arbor

NGC 2903, a 9th-magnitude barred spiral (Sa-Sb) galaxy in Leo, imaged by Roger Tanner at the Winter Star Party in Florida, using an ST-4 CCD camera on a 17" f/4.5 telescope with a 2:1 focal reducer. This is an average of four 200-second exposures, and has been processed with an exponential stretch to enhance the fainter features in the galactic disk and halo.

University Lowbrow Astronomers
840 Starwick
Ann Arbor, MI 48105

Check your membership expiration date on the mailing label!