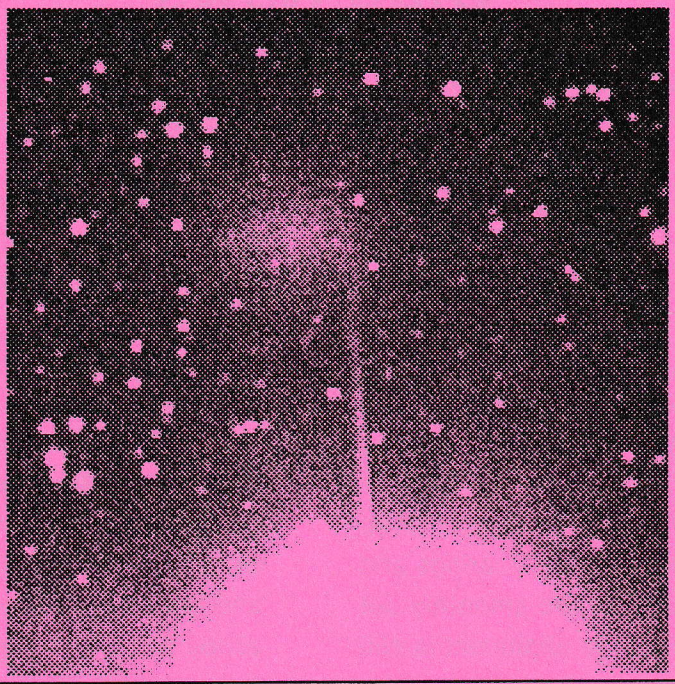
REFLECTIONS



REFLECTIONS

October , 1991

This CCD image of the Leo I dwarf galaxy just north of Regulus was taken by a Star 1/A camera and a 6" f5 scope.

R. Tanner, ed.

University Lowbrow Astronomers

The University Lowbrow Astronomers is a club of astronomy enthusiasts which usually meets in the historic "Detroit Observatory" on the corner of Observatory and Ann Streets in Ann Arbor. The meetings start at 7:30 on the third Friday of each month and are open to the public. For further information, call Fred Schebor at 426-2363.

This Month:

October 18 - Meeting, Detroit Observatory in Ann Arbor. A slide show on the **1991 Astrofest Star Party** will be presented by club members that attended. Also, there will be a **demonstration of astronomy software** by the computer subgroup.

Next Month:

November 1 - Computer Subgroup Meeting

The next meeting will be on **November 1**, a **Friday** at **Roger Tanner's house at 7:30**. The topic for the meeting is star maps.

November 2 - Open House, Peach Mountain Observatory, bring scopes.

November 9 - Open House, Peach Mountain Observatory, bring scopes.

November 15 - Meeting, At the **Pioneer High School Planetarium**, Ann Arbor. **Steve Schaefer** will present a **demonstration** of the **planetarium** with a inside look at how the planetarium is run and how the planetarium produces the stars and images.

9th Mag comet in evening sky - Comet P/Faye, 1991n

During the last computer subgroup meeting Doug Nelle found a 9th magnitude comet that will be making a appearance in the evening sky in the constellation of Pisces. The ephemeris is included in the newsletter. It is rare enough to find a comet that appears in the evening sky, but this comet will also pass within 1 arc minute of the spiral galaxy NGC 676 on October 27th. NGC 676 is a 10.5 magnitude S0-a spiral, and is 4.3' x 1.5' across. This should make for a interesting sight in the eyepiece. This would make a good object for the November open houses. The only draw back is that the comet is going to be rising almost due east in the light dome of Ann Arbor. The comet is near Alpha Pisces and will be 45 degrees above the horizon by midnight.

Club News

Substantial Progress Made on the 24" Renovation

D.C. Moons has reported that very significant progress has been made on the renovation of the 24" at Peach Mountain. During several work sessions the pier and all of the related castings have been painted blue. The cage, mirror cell and secondary cell have been painted flat black. All of the painting has been professionally done by Yon Yakobian. Painting of the remaining pieces continues.

A crew headed by D.C. and Fritz Bausch have assembled the polar shaft into the new bearings and the polar gear. The assembly turned smoothly but there were some concerns that the alignment is still not good enough for the weight of the rest of the scope. The declination housings and shafts will be assembled and the friction level checked again. If it is acceptable, the rest of the scope will be assembled. If it has too much friction, it will have to be disassembled, and some minor machining done on the bearing mount to Improve the alignment.

The optics of the 4.5' refractor have been disassembled, professionally cleaned, and reassembled. The roof has been recoated by the University after the club recoated it, it *really* shouldn't leak now. D.C. and Tom Ryan have some fabrication to do on the mount for the polar drive differential gear box.

D.C. estimates that if the polar axis doesn't have to be disassembled, the remainder of the components can be reassembled in a few weeks. Stuart Cohen has the drive electronics completed and tested on a breadboard. It is possible that the scope will be usable by the November open house but more likely that it will see first light at the December open house, if there is one. Completion of the electronics installation and alignment will take a few weeks after that. Finally, we can glimpse the light at the end of the tunnel.

Acceleration in Relativity

by Alan C. Wilde

In Time For The Stars, Robert Heinlein tells of trips to the stars by ships accelerating at 1G halfway, and decelerating at 1G the other half. He also relates that clocks slow sown for people on the ship. Sebastian von Hoerner in "The General Limits of Space Travel", Science, Volume 137, Number 3523, July 6, 1962, does a more mathematical treatment of the possibility. This article attempts to describe the phenomenon without showing formulas, but giving some figures.

Many people know that the space-time plot of uniform acceleration in Newtonian physics is a parabola. Conceivably, one could reach the velocity of light in finite time and then surpass it. However, special relativity states that it is impossible for a finite, nonzero mass to achieve the velocity of light. Who is right?

The actual plot of accelerated motion depends on one's assumptions. Newton believed that time was absolute and that in acceleration, velocity increased uniformly with time relative to an observer, thus getting the parabolic plot. However, von Hoerner states that in uniform acceleration, momentum increases uniformly with time relative to an observer. Momentum is mass times velocity in both Newton's and Einstein's theories. Newton thought mass was absolute. Einstein says mass relative to an observer increases with velocity and approaches infinity as the velocity approaches the speed of light. Thus momentum approaches infinity as the body approaches light velocity. Since von Hoerner assumes momentum increases uniformly with time, the accelerating body cannot reach the velocity of light in finite time. The resulting space-time plot is a hyperbola asymptotic to

straight lines with the velocity of light.

The other phenomenon of acceleration is the slowing down of clocks. Einstein says that a clock traveling at any nonzero velocity relative to us runs at a slower rate than our clocks. The rate depends only on the velocity. During acceleration, velocity increases continuously and the rate of the clock continuously slows down. People who are familiar with calculus know that it takes integration to figure the relation between time on the accelerating body from rest and time for us as it accelerates. Indeed, a linear error in time for the accelerating body results in a quotient error for us.

A body in uniform motion cannot achieve light velocity in finite time no matter the rate. The velocity of light is approximately 300,000 km/sec. If the body accelerates at 300,000 km/second squared, it will still not reach light velocity in finite time. (Newton would say it could reach light velocity in 1 second.)

What does this all mean for starships? 1 G is approximately 1.03 light-years per year squared. If Newton were right, the ship accelerating a 1 G would reach light velocity in 0.97 years. In Einstein's theory, the following is possible. If a ship accelerates half the distance to a star at 1 G, decelerates at 1 G the other half the distance, and returns to the earth in the same manner, then in a ship time of 60 years for the round trip, the ship could go 5,000,000 light-years away and back in a earth time of over 10,000,000 years. This fact seems remarkable. Within a lifetime, 1 G acceleration could definitely get us to the stars and back. The hitch however is energy. Von Hoerner calculates that if the ship carries its own fuel, then even if the fuel were changed 100% into energy, the mass ratio 1 G takes would be too high. (A mass ratio of a rocket is the ratio of its initial mass to its mass upon burnout.)

My own calculations for a one-way trip to Alpha Centauri (4.3 light-years away) would illustrate the problem. Suppose s is the ship time in years; t, the earth time in years; v, the maximum velocity; and M, the mass ratio for the trip. A table for five acceleration rates is below.

G	s	t	v	M
.01	40.7	41	.21c	1.5
.1	12.7	13.6	.57c	3.7
1	3.56	5.93	.95c	39.4
10	0.74	4.49	.999c	2150
100	0.12	4.32	.99999c	199,000

1 G is prohibitive enough for reaching Alpha Centauri if the ship carries its own fuel. Other methods of propulsion (like a ramjet) may be possible, but they too have limitations.

Let us conclude with an observation I made about uniform acceleration. As a body accelerates, the value of the ship time in years is at first greater than the distance in light-years. After an amount of time, the ship time becomes less than the distance. The transition point can be calculated. In fact, the velocity of the ship at the transition point is independent of the rate of acceleration. The velocity is about 0.924c . The ship time and earth time at the transition point does depend on the acceleration rate; for 1 G, the ship time is 1.56 years and the earth time is 2.34 years. The table above is consistent with these facts.

Heinlein ends Time For The Stars with the development of faster-than-light travel and the statement that simultaneity is the rule. (Einstein says that simultaneity of events is not absolute.) Speculation of faster-than-light particles still goes on without them being detected. Science fiction writers tell how special relativity may be seen in the future to be partly or totally wrong. In the meantime, physicists still verify Einstein's formulas in experiments. If faster-than-light travel could be developed, the mathematics behind it must agree with Einstein's theory where it is already verified.

Subgroup Reports

Computers in Astronomy Subgroup

The eighth meeting of the Computers in Astronomy Subgroup was held at Doug Nelle's house. There was a low turnout of only 3 members. The topic was Astronomical Databases and I (Roger Tanner) brought over my computer to run the programs requiring VGA graphics.

Deep Space 3D 3.0

Doug started the meeting with a demonstration of an update (Rev. 3.0) of a program that he demoed at our first meeting. The program generates several types of basic observing information such as rise and set times and the ephemeris of a comet given the orbital parameters. The update adds map making capability so comet orbits can be plotted on star maps. The maps can be plotted onto printers (including laserjets) at their highest resolution. The updated software comes with the Saguaro deep sky catalog and a star catalog down to 7.9 mag. Doug also purchased the optional star catalog which added stars down to 10th magnitude. An optional comet database for 1100 comets is also available.

Doug demonstrated searching the comet database for comets which we could see from Peach Mountain. The software would calculate the position of the comet and show the period it would be visible on the screen graphically. The software would also show the dark period for that night graphically, so it was very easy to visualize when the comet would be well placed for observing. He then generated an ephemeris for the comet on the screen and showed several ephemerides he had printed out earlier.

Doug then demonstrated the programs ability to generate sky maps and plot the ephemeris positions on them. The program had several great features which made the maps very useful. The program would identify the deep sky objects on the map and you could move the location of the label so it would not cover something. The software use symbols similar to Uranometria for the various types of objects. You can choose a scale for the plot and the magnitude limit for the stars. This would allow you to match the chart to an existing format such as the Sky Atlas 2000. The finder chart and ephemeris for comet P/Faye included in the newsletter was done on Doug's 9 pin printer and reduced to fit on the page.

The cost of the program is $79, the 1100 comet database is $15, and the extension of the star map to 10th mag is $65.

The Arizona Database Release 7.0 and AZVUE 3.0

I demoed the Arizona Database (and the viewing program, AZVUE 3.0) which is a data base of non-stellar objects. The data base contains 43,000 objects, most of which are galaxies. Searches for a particular object by name or id number are very quick. The data base can search for objects in an area of the sky and filter objects by magnitude and type. We searched an area of the sky from 40 to 50 degrees in Dec. and 24 hrs in RA and looked for objects brighter than 13.5 magnitude and filtered out several things like double stars and asterisms. The program took about 40 seconds to find about 380 objects. The results can be printed out in detail or in an observing log.

The program lists the RA and Dec of the object, the distance, magnitude, and the cryptic NGC/IC description if available. It also lists the chart number in Uranometria, Sky Atlas 2000, the page number in the Luginbuhl and Skiff Observing Handbook, or Burnham's, or Tom Lorenzin's Field Guide for the object. The program costs $80 and takes up about 8 Mbytes on the hard disk.

We used the program during the demo of the map making capabilities of Deep space 3D to determine the magnitude and description of several objects shown on the map.

3DGC28A

This program produces a animated 3D display of colliding galaxies. You can control several variables in the simulation such as the number of particles representing the galaxies and the spacing and mass of each galaxy. The result shows up graphically on the screen in three views, each in a different axis. This program produces a really neat visual display giving a very realistic looking simulation. Both Tom Ryan and I have had problems trying to run it. The program evidently has a bug in the VGA driver software because it runs fine on Doug's Hercules graphics card. Doug felt that finally here was some justice, a neat program people with those fancy VGA displays can't run. The program is public domain and is definitely recommended.

Next Meeting

The next meeting will be on **November 1**, a **Friday** at **Roger Tanner's house at 7:30**. The topic for the meeting is star maps. As always, if anyone wants to demo some astronomy software feel free to bring it to the meeting.

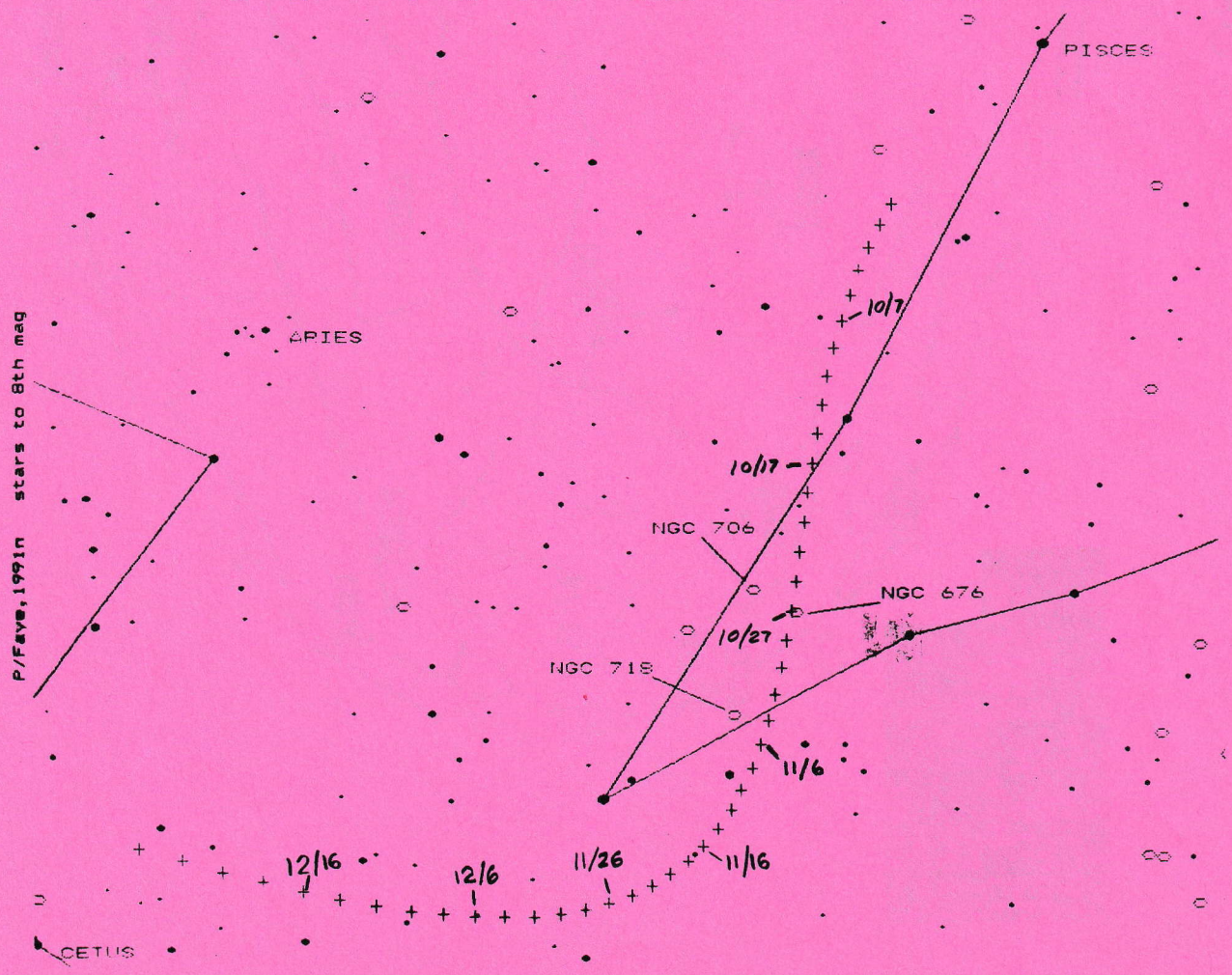
There are a couple of things I would like to hear members opinions on, like if the members want the computer subgroup meetings to be more organized, i.e. fix the meeting date, set specific topics for a meeting, etc. Also I would like to know if anyone in the computer group is interested in helping me produce a better star map for the newsletter.

p/Faye, 1991n

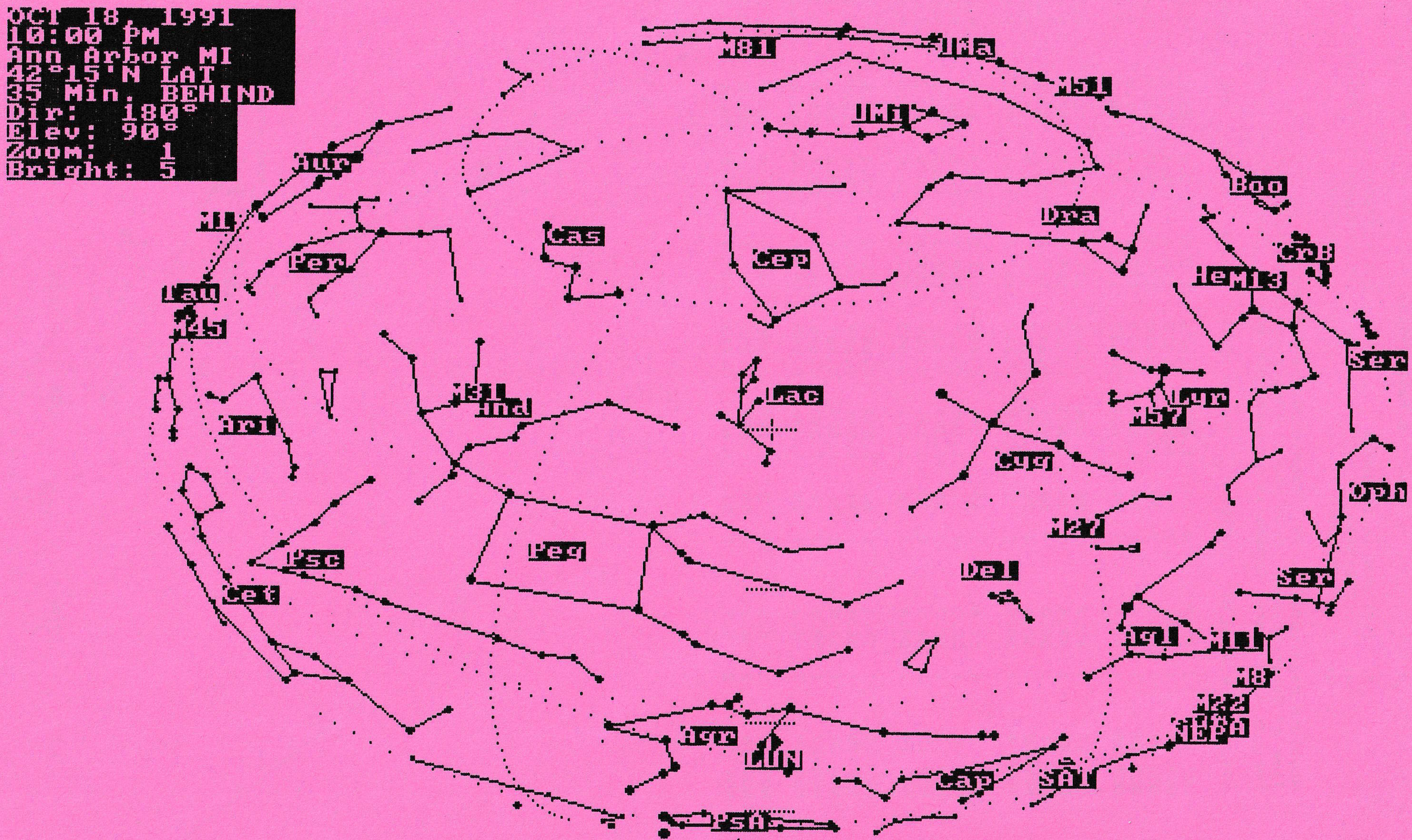
T:	1991 NOV 16.19368000	Peri:	203.95376000		
e:	0.57818450	Node:	198.88006000	:	(1950.0)
q:	1.59338550	i:	9.09095000	:	

Absolute Magnitude: 7.99 Magnitude Coefficient: 10.00
Time of Observations: 8:00 pm, 5 (Starting JD=2448527.5417)
Period: 7.34 Years Ephemeris computed for equinox 2000.0

1991	R.A. (H,M)	DEC (D,M)	R	DELTA	ELONG	PHASE	PA	MAG
OCT 17	1 47.7	8 24	1.622	0.626	175.5	2.8	283.2	9.1
OCT 19	1 48.1	7 54	1.618	0.623	176.6	2.1	310.5	9.1
OCT 21	1 48.3	7 24	1.614	0.620	176.5	2.2	346.4	9.0
OCT 23	1 48.6	6 54	1.611	0.618	175.2	2.9	11.6	9.0
OCT 25	1 48.9	6 24	1.608	0.617	173.5	4.0	25.2	9.0
OCT 27	1 49.3	5 55	1.606	0.616	171.6	5.2	32.8	9.0
OCT 29	1 49.6	5 26	1.603	0.616	169.6	6.4	37.7	9.0
OCT 31	1 50.0	4 58	1.601	0.617	167.6	7.7	41.0	9.0
NOV 2	1 50.4	4 31	1.599	0.619	165.6	8.9	43.4	9.0
NOV 4	1 50.9	4 5	1.598	0.622	163.5	10.1	45.3	9.0
NOV 6	1 51.4	3 40	1.596	0.625	161.5	11.4	46.8	9.0
NOV 8	1 52.0	3 17	1.595	0.629	159.5	12.6	48.0	9.0
NOV 10	1 52.7	2 55	1.594	0.634	157.5	13.7	49.1	9.0
NOV 12	1 53.5	2 35	1.594	0.639	155.6	14.9	50.1	9.0
NOV 14	1 54.4	2 16	1.593	0.645	153.7	16.0	51.0	9.1
NOV 16	1 55.3	1 60	1.593	0.652	151.8	17.1	51.8	9.1
NOV 18	1 56.4	1 44	1.594	0.659	150.0	18.1	52.5	9.1
NOV 20	1 57.5	1 31	1.594	0.667	148.1	19.1	53.2	9.1
NOV 22	1 58.8	1 20	1.595	0.676	146.4	20.1	53.9	9.2
NOV 24	2 0.2	1 10	1.596	0.685	144.6	21.0	54.5	9.2
NOV 26	2 1.6	1 2	1.597	0.695	142.9	21.9	55.2	9.2
NOV 28	2 3.2	0 56	1.599	0.705	141.3	22.7	55.8	9.3
NOV 30	2 4.9	0 52	1.601	0.716	139.6	23.5	56.4	9.3



Sky Map



OCT 18, 1991
10:00 PM
Ann Arbor MI
42°15'N LAT
35 Min. BEHIND
Dir: 180°
Elev: 90°
Zoom: 1
Bright: 5
M81
UMa
M51
UMi
Boo
Dra
CrB
M13
Cas
Cep
Aur
M1
Per
Tau
M45
M31
And
Lac
Lyr
M57
Ser
Ari
Cyg
Oph
M27
Peg
Psc
Del
Cet
Ser
Aql
M11
M8
M22
Aqr
LUN
Cap
SAT
PsA

☞ Places:

The *Detroit Observatory* is at the corner of Observatory and Ann Streets in Ann Arbor, across from the old U of M Main Hospital. The Detroit Observatory is an Historic Building which houses a 19th century 12-inch refractor and a 6-inch transit instrument.

The *Peach Mountain Observatory* is the home of the U of M radio telescope and the 24-inch McMath telescope used by the Lowbrows. This observatory is located northwest of Dexter, off North Territoral Road, West of Dexter-Pinckney Road. The entrance is just west of Sportsman's party store and is marked by a small maize and blue university sign. Go through the gate and follow the gravel road. Once parked at the observatory parking lot, follow the path away from the radio telescope and around the fenced in compound to the telescope.

☞ Times:

The monthly meetings are held on the 3rd Friday of each month at 7:30 pm. Meetings are either at the "Detroit Observatory" in Ann Arbor or at the Peach Mountain Observatory. Meetings held at Peach Mountain are cancelled if the sky is not clear at sunset.

Public Star parties (Open Houses) are held on the Saturdays before and after the new moon at the Peach Mountain Observatory. Star parties are cancelled if the sky is not clear at sunset. Many members will bring their own telescopes. Your scope is welcome. Wear warm clothes for the season and bring insect repellent. The next scheduled Open Houses are listed on the first page.

☞ Dues:

Membership in the Lowbrow Astronomy Club is $20 per year for individuals or families, and $12 per year for students. Among other things. this entitles you to use the club telescope after some training.

☞ Magazines:

The Lowbrow Astronomy Club offers discount subscriptions to popular astronomy magazines:

Sky and Telescope : $18/yr.

Astronomy : $16/yr., 12 issues.

☞ Magazines: (cont)

Deep Sky : $10/yr., 4 issues.

Odyssey : $10/yr., 12 issues.

Telescope Making : $10/yr., 4 issues.

Contact Dick Sider (663-3968) for more information or write to him at the address below:

Dick Sider
902 Pauline Blvd.
Ann Arbor, Mich. 48103

❒ Sky Map:

The *Sky Map* section in the issues of the *REFLECTIONS* are produced by printing the sky for the meeting night with the program SKYGLOBE.

☞ Newsletter Contributions:

Please send any information, short articles, or drawings to the address below. The closing date is 10 days before the meeting. Currently there are not many people contributing and we could use some fresh observations from the members.

University Lowbrow Astronomers Reflections
1770 Walnut Ridge Circle
Canton, Mich. 48187

☎ Important Numbers:

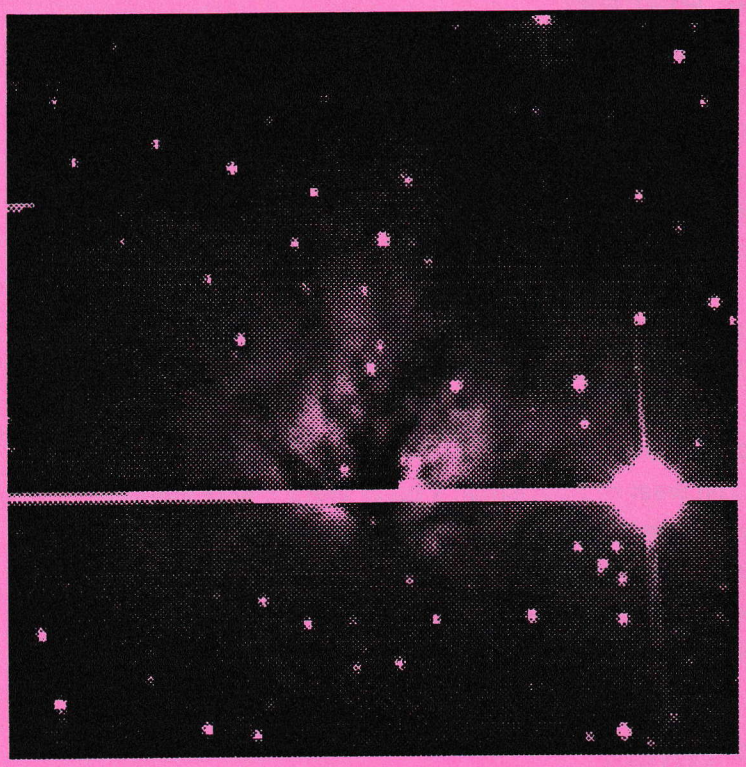
President: Fred Schebor 426-2363
VicePres: Stuart Cohen 665-0131
Doug Nelle 996-8784
Paul Etzler 426-2244
Treasurer: Richard Sider 663-3968
Observatory: D.C. Moons 795-8159
Newsletter:Roger Tanner 981-0134
Membership: Ron Avers 426-0375

Peach Mountain Keyholders:
Tom Ryan 662-4188
Fred Schebor 426-2363
Doug Nelle 996-8784

Monthly Meeting:

1991 Astrofest Slide Show -and- Astronomy Software Demonstration

At the
Detroit Observatory
in Ann Arbor



This CCD image of the Flame or "Tank Track" nebula (NGC 2024) in Orion was taken with a 5 minute exposure on a 6" f5 with a Star 1 camera.

University Lowbrow Astronomers
9287 Chestnut Circle
Dexter, MI 48130