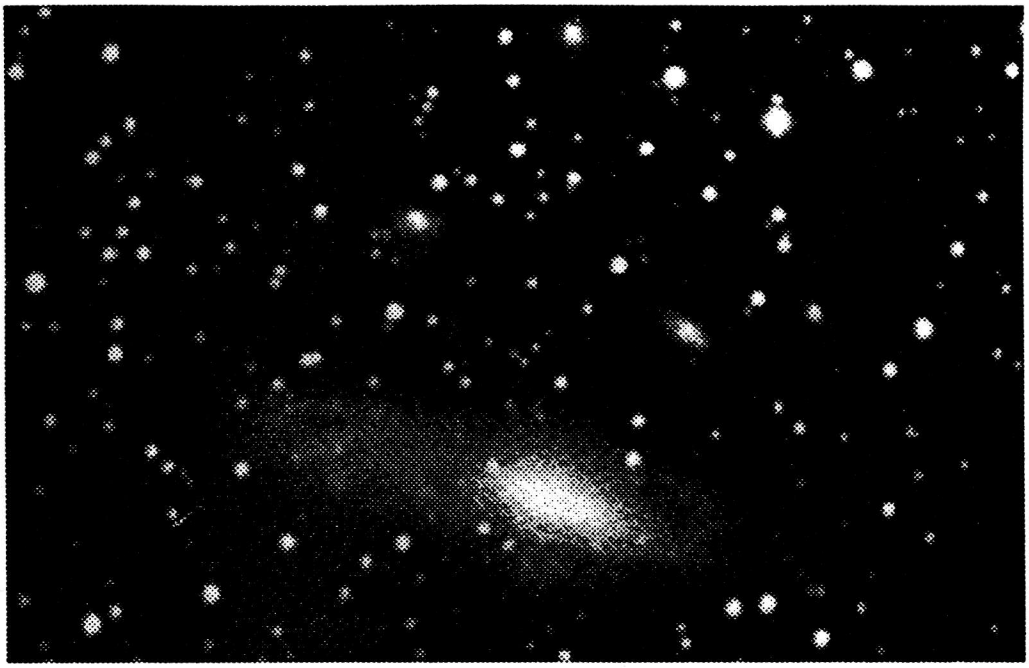
REFLECTIONS



REFLECTIONS

March , 1992

20 Minute CCD image of NGC7331 and its procession of satellite galaxies taken by Christian Buil with a homebuilt CCD camera based on a TH7863 chip and an 11" telescope.

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:

March 20 - Meeting, at the **Detroit Observatory in Ann Arbor. Bill Durrant,** a researcher at The U of M, will present a slide show about the **LDEF** (Long Duration Exposure Facility). This satellite was intended to be in low earth orbit for nine months, but because of the Challenger disaster, was up for almost 6 years.

March 28 - Club Observing Session, Peach Mountain Observatory.

Next Month:

April 1 - Computer Subgroup Meeting at Roger Tanner's house, 7:30 PM, (a Wednesday). Ryad Matti of the Warren Astronomy Society will bring his **Mac II Ci** over and demonstrate **Voyager** and a few other interesting astronomy programs for the Mac. The Voyager demonstration was very impressive at the Freezout and several people wanted to see it up close. There will also be a further discussion of the plans for the 24" computer and readout project.

April 4 - Club Observing Session, Peach Mountain Observatory.

April 17 - Meeting, at the Detroit Observatory in Ann Arbor. Elections, there will be a discussion of Officers Duties and then the election of new officers for the club. Here is your chance to contribute to the club and have some fun at the same time.

April 25 to May 2 - The Texas Star Party is held at the Prude Ranch near **Fort Davis, Texas**. This is the premier dark sky observing star party, typically attended by 600 + observers. The registration fee is $23 until April 15, after that it is $75. Camping (and bunkhouses if still available) are from $17 to $23 a night, and that includes 2 meals a day. The local astronomy clubs go all out to prepare the ranch; aluminum foil on all windows, internal lights are replaced with 25 watt red bulbs, and all external lights are turned off, **these people <u>are</u> serious**. When the weather is good, they have very dark skies, (2 out of 3 years). Yes, all the things you have heard about the Texas Star Party are true, you just have to go and experience them yourself. Further information is inside.

Naked Eye Nova in Cygnus!

Peter Collins of Boulder Colorado discovered a nova in northern Cygnus on Feb 18 with binoculars. At that time it was > 6th magnitude, by the 21st it had brightened to its peak of 4.5. The nova is expected to fade slowly over the next weeks. The nova is located at RA 20 hr 30 min, DEC +52 deg. 38', and would be well placed for observing just before morning twilight.

Club News

Texas Star Party Information

The Texas Star Party is held at the Prude Ranch from April 25 to May 2. The Prude Ranch is a dude ranch just outside of Fort Davis Texas, which is in southwest Texas. To attend you must send in a registration to the following address:

Bobby R. Braley, Jr.
TSP Registrar
P.O. Box 386
Wylie, TX 75098
(214) 442-6391

You must also get reservations at the Ranch if you want to stay there. The number to call for reservations is (915) 426-3201. The bunkhouses are typically gone by now but camping is always available. The fees mentioned on the front cover include two meals a day. Club members that have attended the TSP in the past have rated the food at the Ranch as pretty good, but then they were bachelors at the time.

Don't feel you can't go because you don't have a big portable light bucket. A lot of people just go and look through other peoples scopes, most people are happy to show you what they are looking at. There are talks during the day. The evenings feature special talks by such as people as Carolyn and Eugene Shoemaker, Dr. Harold Corwin, and , Peter Ceravolo. On the last night there is a is a keynote speaker and a big giveaway of door prizes. One person from the Warren Astronomical Society won a Mead 4" Schmidt Cassigrain Telescope a couple of years ago.

There is horseback riding, tennis, and a large indoor swimming pool for daytime recreation. Trips are available to MacDonald Observatory, and the Carlsbad Caverns are a day trip away.

When the weather is good the transparency is 9 or 10 on a scale of 1 to 10. The seeing is usually about 7 or 8. The horizons are only 10 to 15 degrees because the Ranch is in a vally in the Davis mountains. But you can observe objects right down to the edge and best of all you can see Omega Centuri, which fills up a 1/2 degree field and is spectacular.

Ratios of Ship Time and Accelerations

by

Alan C. Wilde

In Childhood's End, Arthur C. Clarke says that the alien spaceship travels 40 light years from Earth to its home planet, and that the passengers age only 2 months during the transit. He is referring to the fact that in special relativity a moving clock slows down, the rate of slow down being dependent only on the velocity. However, the alien ship must accelerate from rest to near light velocity, and down to rest at its destination. With velocity continually changing, the time rate also changes. Sebastian von Hoerner uses calculus on uniform acceleration to compute the time flow. A result of his formulas is this: if the alien ship accelerates at a constant acceleration rate halfway and decelerates the other half, then the rate necessary for Clarke's story is 99.4710 light years per year squared. Since one gravity is approximately 1.03227 light years per year squared, then this rate is 96.3613 gravity's. This rate is far too hard for human beings. However, the book says that space time is curved inside the ship so that the passengers do not feel the acceleration.

Now, in Newtonian acceleration, to acceleration a certain distance, taking half the time requires 4 times the acceleration. In Einsteinian acceleration, taking half the ship time does not always take 4 times the acceleration. Suppose that (as in the book) a ship accelerates uniformly through 20 light years in different ship times. We will compute the accelerations needed and put them in a table. For simplicity, we will start with a ship time of 4/3 years and halve it each time. Then between the lines, we will compute the ration of consecutive acceleration rates to see a pattern. (Note, however, that the earth time must always be greater than 20 years since the ship cannot exceed light velocity.)

Ship Time- Years	Accel,-L Y/Y^2	Ratio
4/3	3.77226	
2/3	8.80474	2.33408
1/3	20.0721	2.27969
1/6	44.9768	2.24076
1/12	99.4710	2.21161
1/24	217.738	2.18896
1/48	472.675	2.17085
1/96	1019.10	2.15602
1/192	2184.59	2.14365
1/384	4660.1	2.13317
1/768	9898.79	2.12416
1/1536	20,949.1	2.11633
1/3072	44,191.2	2.10946
1/6144	92,950.8	2.10338

The limit of the ratios as the acceleration gets large appears to be 2. Going to low acceleration rates, if the ship time is 100 years, the acceleration rate is .00394843 light years per years squared; and if the ship time is 200 years, the rate is .000996695 light years per year squared. Their ratio is 3.96695, which is near 4. High accelerations are more efficient on ship times.

In general, if a ship accelerates over a distance x, and the acceleration rate approaches infinity, 1/r times the ship time takes r times the acceleration; if the rate approaches zero, then 1/r times the ship time takes r squared the acceleration. Thus low accelerations behave more like Newtonian acceleration.

(Source of formulas: Sebastian von Hoerner, " The General Limits of Space Travel", Science, Volume 137, Number 3523, July 6, 1962.)

Predicting Aurora

Frederick S. Schebor

"No colour, no brush can picture its magnificence, no words describe its sublime beauty ... such is the Aurora Borealis in its utmost grandeur" Sophus Tromholt - 1885.

Background

In addition to bathing the earth in electromagnetic radiation, the sun also generates the so-called solar wind which consists of charged particles streaming continuously from the sun. When these particles encounter the earth's magnetosphere an electrical current is created (tens of millions of amperes at 40,000 to 50,000 volts). The earth's magnetic field directs this current into two rings or *auroral ovals* that circle the planet's north and south magnetic poles. When the current is strong enough to cause gases in the upper atmosphere (100 - 1,000 kilometers) to fluoresce we have an aurora borealis in the Northern Hemisphere and an aurora australis in the Southern Hemisphere.

The northern auroral oval passes over Alaska, northern Canada, southern Greenland, Norway and Siberia. At these locations the aurora can be seen nearly every clear night. Highly energetic solar events such as flares or coronal holes generate more charged particles which result in expanding the auroral ovals towards the lower latitudes. On average the aurora borealis will occur at our latitude 10 days a year. However, daylight, cloudy weather or near to full moons will reduce visible aurora to 1-3 nights a year.

Given the low probability of seeing the aurora on any given night, what can the amateur do to be prepared when the "big one" arrives?

Geoalerts

It is the responsibility of NOAA's Space Environment Laboratory (SEL) to collect solar data from observatories world wide, condense it and make it available to the government, business and general public. Those who own terminals and modems can establish a computer account at the SEL (303-497-5000, 300 or 1200 baud) and receive detailed solar reports.

The SEL also condenses the solar data into a 45 second audio report called a Geoalert. The Geoalert can be heard on WWV at 18 minutes past the hour. Those who don't have access to a shortwave receiver can call the SEL at 303-497-3235 and hear the recorded report.

The format for the Geoalert report follows:

"Solar-terrestrial indices for [date] *follow: solar flux* [number], *and Boulder A index* [number]. *Repeat, solar flux* [number] *and Boulder A index* [number]. *The Boulder K index at* [time] *on* [date] *was* [number], *repeat* [number]. *Solar-terrestrial conditions for the last 24 hours follow. Solar activity was* [very low, low, moderate, high, or very high]. *The geomagnetic field was* [quiet, unsettled, active, minor storm, major storm, severe storm]. *The forecast for the next 24 hours follows. Solar activity will be* [very low, low, moderate, high, or very high]. *The geomagnetic field will be* [quiet, unsettled, active, minor storm, major storm, severe storm]. "

In order to predict aurora activity we want to concentrate on the Solar Flux, the Boulder A Index and the Geomagnetic Field sections of the report.

Solar Flux

The daily noontime solar radio flux at 28000 MHZ is measured at the National Research Council of Canada's Algonquin Radio Observatory near Ottawa. The flux readings are not only highly correlated with the sunspot number but also take into effect X-ray and ultraviolet radiation and therefore are preferred by some as a more "physically meaningful" measurement of solar activity. Numbers above 250 indicate high or very high solar activity and are a precursor to aurora. Not all solar events produce aurora however. Particles produced by events occurring on the sun's limb will miss the earth entirely. We therefore only use high flux readings to indicate when to begin monitoring the geomagnetic activity.

Boulder A Index

As the density (number of particles) of the solar wind increases so does its bending or warping force affect our magnetosphere.

The Boulder A Index indicates the degree of disturbance in the geomagnetic field at the SEL in Boulder Colorado. Values above 30 signal Geomagnetic Storms. Values above 60-70 (in my experience) indicate that aurora may be visible at dark sky locations around Ann Arbor.

Geomagnetic Field

The Geomagnetic Field section of the report is simply the current level of geomagnetic activity stated in the English terms listed above. Minor Storm means look outside before you go to bed. Major Storm means sit out on the front porch for a while. Severe Storm means grab the camera and head out to Peach Mountain!

Results

Controlling a casette recorder with a digital timer which gives 1 second resolution, I record Geoalerts 4 times a day (12pm, 3pm, 6pm, 9pm) from WWV at 10MHz. The four reports guarantee that I receive at least one report free from static or other interference. These values are then entered into an Excel spreadsheet on my Macintosh. Cricket Graph is used to plot the data.

Figure 1. shows the solar flux, Boulder A index and major solar flares for the year 1991. Five spikes in the Boulder A index are apparent: 3/25, 6/5, 6/13, 10/29 and 11/8. My notes indicate that 3/25, 6/13 and 10/29 were cloudy so unfortunately I don't know if the aurora was visible. However on 6/5 and 11/8 I was treated to wonderful auroral displays. By monitoring the Geoalerts I was forewarned of their appearance.

Conclusion

As with any type of observing, proper preparation is required if it is to be successful. By monitoring the Space Environment Lab's Geoalerts you will be ready when the next "big one" arrives.

References

MacRobert, M.A. "The Aurora", Sky & Telescope, 71,1 (January 1986), pp30-32.

Rosenthal, D.A., "Solar Alerts for the Amateur", Sky & Telescope, 79,2 (February 1990), pp 166-167.

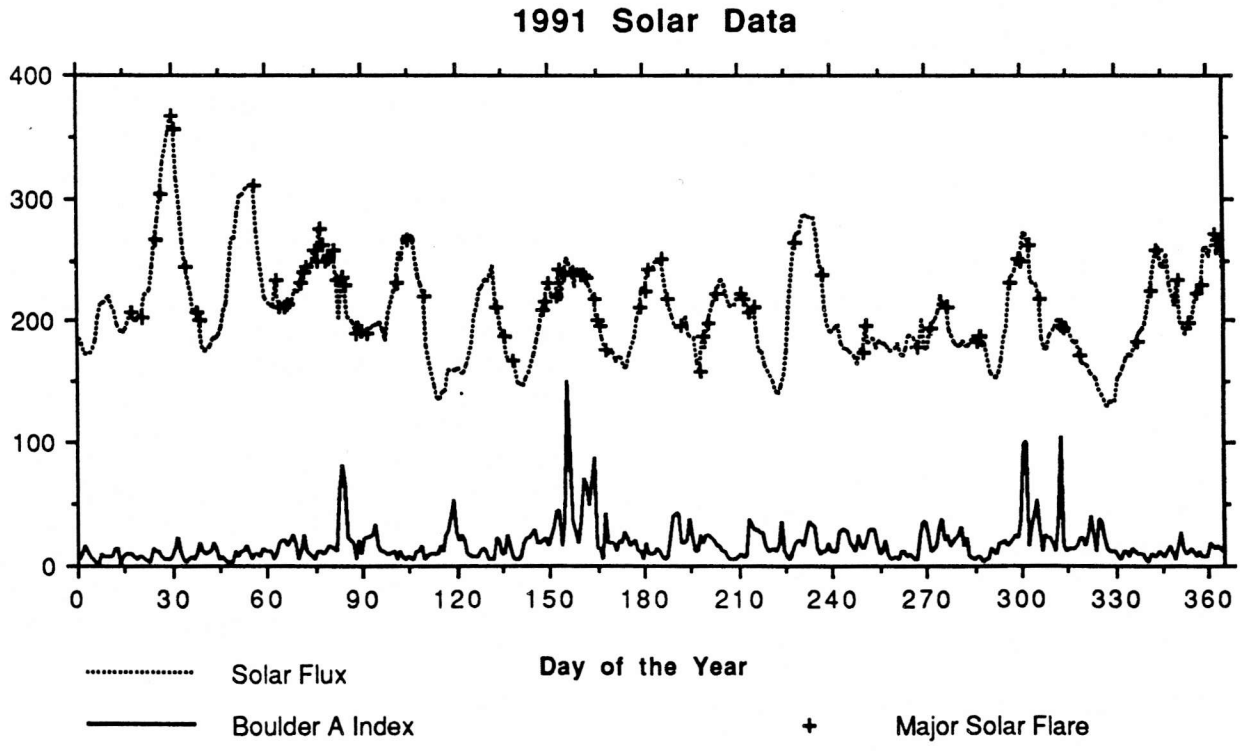


Figure 1.

Subgroup Reports

Computers in Astronomy Subgroup

The thirteenth meeting of the Computers in astronomy subgroup was held at Doug Nelle's house with a turnout of 5 members. The meeting started with Stephen Musko leading a review of his rough draft for the computer interface specification for the 24" telescope. When several people work on a project, it is necessary to write down exactly what signals are to be supplied by each part of the project. The discussion centered around refining the details of the connection between the computer, the telescope drive controller and the digital readouts for the scope.

RA and DEC Readout Design

The telescope will have digital readouts to continuously show where the scope is pointed which will function independently of the computer. Several different ideas were considered for the circuitry required to read the encoders and display the position of the scope. One proposal was to build a hard wired system which could just be wired up and turned on. The problems of compensating for the errors in the encoder drive ratios, and setting the RA and DEC after pointing the scope at a known star caused the circuitry to get rather complex. Since the field of view on the 24" is so small, the readouts need to be accurate to about 1 to 2 arc minutes, this caused some additional circuit complexity. An alternate idea was to dedicate a small home computer like a Commodore 64 or Atari 800 to this task and this would make the problems solvable with a short BASIC program. **The computer subgroup is looking for a club member who would like to donate a computer like this to the club.**

It has to be a system which runs without a disk or tape drive and is fairly small since this computer would be mounted in the drive controller box. The program would be burned onto a EPROM which will be permanently in the machine's game port. It would be handy if the computer had a serial port which would make the communication with the control computer much easier. It would also be handy if the computer could be programmable in some version of BASIC so that future members can maintain and enhance it.

Hand paddle Interface

The hand paddle will be used to slew the scope around and to provide centering and guiding motions. After much discussion it was decided that the computer and the paddle will connect to the drive controller via a Y box. The function of the Y box is to provide a physical connection point for the paddle and the computer system. The other function of the box is to provide the circuitry to allow the paddle or the safety switches to over ride the computer commands if necessary.

Control Computer

The computer itself will be a very minimal unit and will probably be kept in the warm up room. The unit will always be on to keep it warm or have a heater under it to keep condensation off the components. The computer will be able to read the encoders, drive the position readouts, and, drive the motors through the drive controller. The computer would be able to display a list of objects for viewing, and slew the telescope to the object. It would also be able to set the readouts and make a more accurate compensation for the errors in the encoders and alignment of the scope. An important part of the computer and interface design is to make sure the scope is fully functional in the manual mode without the computer on.

Some discussion centered on the type of signals to communicate with the drive controller an the axes encoders. The drive controller takes CMOS signal levels and the output of the encoders depends on the design of the DEC and RA readout electronics discussed earlier.

Deep Space 3D

Doug Nelle demonstrated Deep Space 3D to several club members who hadn't seen it before. Deep Space is a comet plotting program which also has quite a number of deep space objects. The program can do a good job of producing maps, the newsletter map is produced this way. A really useful feature of this program is the comet rise and set display. This is done in a text mode screen and uses the dash and equals sign to show when the object is above the horizon and when it is 15 degrees above the horizon.

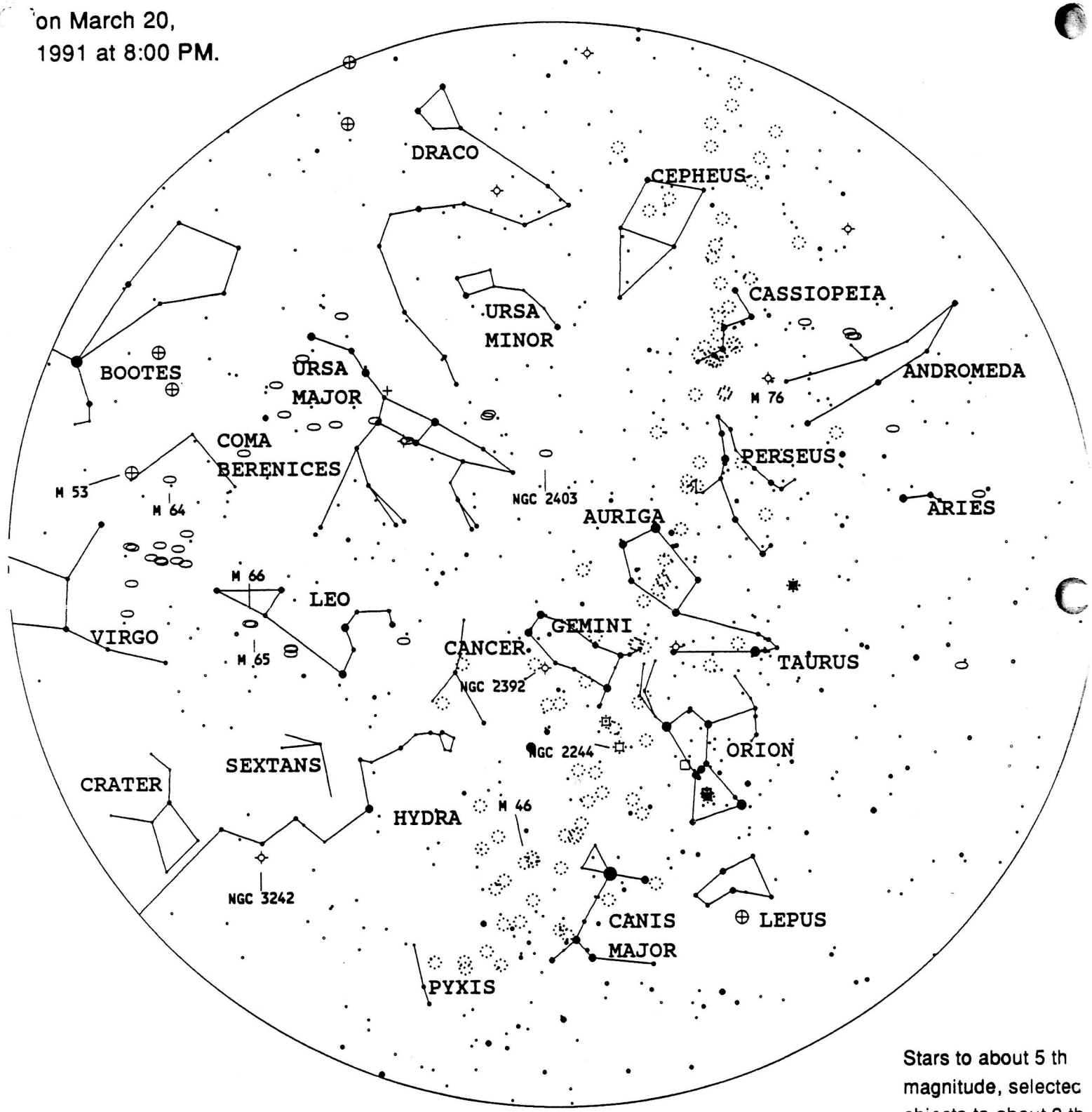
Doug then showed a Basic program he had modified from a program in Sky And Telescope. The program determines the unvignetted field for a Newtonian and the field for a given size diagonal. Several people were building Newtonians at the time and everyone was asking to run the numbers for their scope through the program.

Next meeting

The next meeting will be held at **Roger Tanner's house on April 1 at 7:30, a Wednesday**. If you need directions call 981-0134. Ryad Matti from the Warren Astronomical Society will bring his **Mac II Ci** over to demonstrate **Voyager** and a few other astronomy programs for the Mac. There will be further discussion on the plans for the 24" computer and the readout project.

Sky Map

Peach Mountain
on March 20,
1991 at 8:00 PM.

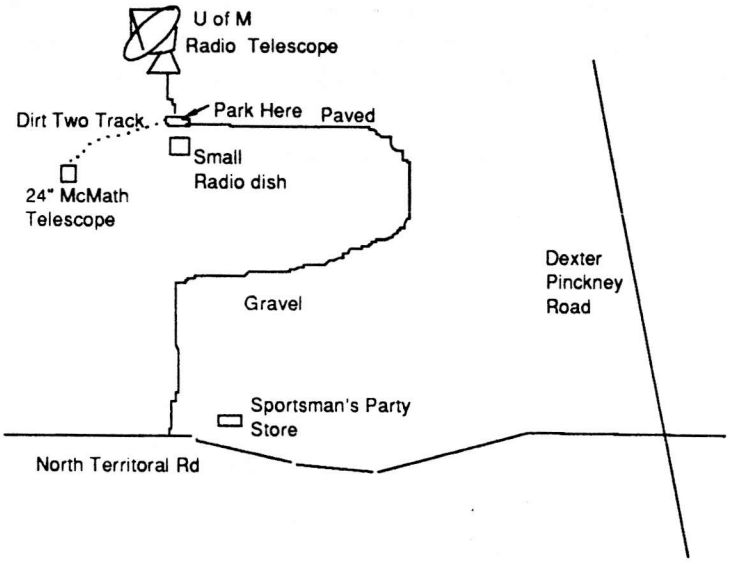


Stars to about 5 th magnitude, selectec objects to about 9 th magnitude.

☞ 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, see map below.



☞ 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 front 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. See Dick Sider at the meeting or send your dues to his address below.

☞ Magazines:

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

Sky and Telescope : $18/yr.
Astronomy : $16/yr., 12 issues.
Odyssey : $10/yr., 12 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 this issue of *REFLECTIONS* is produced by Doug Nelle using the program Deep Space 3D.

☞ Newsletter Contributions:

Please send any information, short articles, or drawings to the address below. The closing date is 7 days before the meeting.

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

☎ Important Numbers:

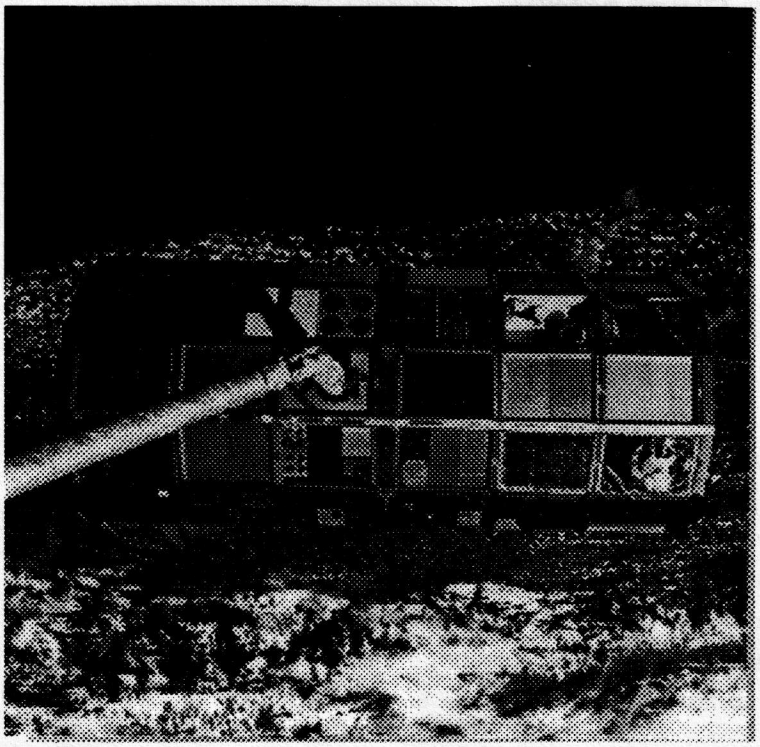
President: Fred Schebor 426-2363
VicePres: Stuart Cohen 665-0131
Doug Nelle 996-8784
Paul Etzler 426-2244
Treasurer: Richard Sider 663-3968
Observatory: D.C. Moons 254-9439
Newsletter:Roger Tanner 981-0134
Membership: Ron Avers 426-0375

Peach Mountain Keyholder:
Fred Schebor 426-2363

Monthly Meeting:

Long Duration Exposure Facility

At the
Detroit Observatory in
Ann Arbor



This is the LDEF,(Long Duration Exposure Facility), which NASA lofted in April 1984, and was supposed to be up for 9 months, but was retrieved almost 6 years later in Janruary of 1990.

University Lowbrow Astronomers
9287 Chestnut Circle
Dexter, MI 48130