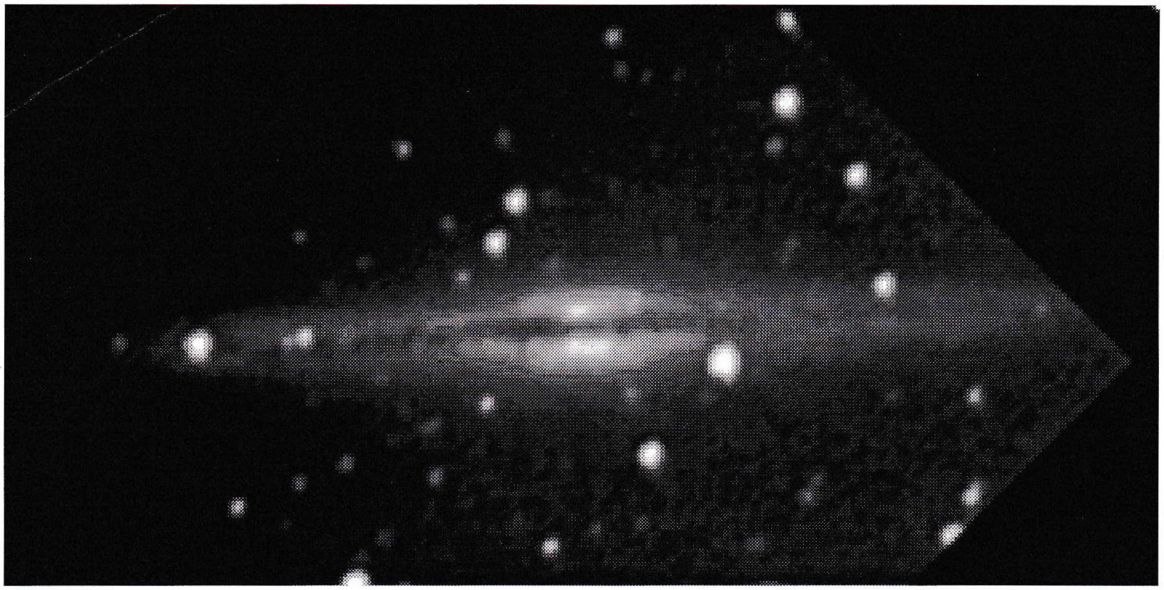
REFLECTIONS

REFLECTIONS



November 1993

The galaxy NGC 891; a 12th-magnitude edge-on spiral in Andromeda. This is an average of three 200-second CCD images made by Roger Tanner on Oct. 23, 1993. The galaxy was barely visible by eye in the a 17" f/4.5 telescope used.

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 at sunset. For further information, call Stuart Cohen at 665-0131.

This Month:

November 13 - Public Open House at the **Peach Mountain Observatory**. Even if we don't get clouded out on the 6th, come on back and see what you missed the first time. A new moon means dark skies....

November 19 - Meeting at the **Detroit Observatory** in **Ann Arbor**. Joady Ulrich, of the Royal Astronomical Society of Canada, Windsor Centre, will talk on "The Earth as a Planet" – a look at our world from a slightly different perspective. Also updates on various projects, officers' reports, fun for all!

November 20 - Public Open House at the **Peach Mountain Observatory**. Hey! No mosquitoes! What more reason do you need? Don't let the snow stop you....

Cheaper than Truth!

Well, this time it's something just a bit more commercial! Last month we held the judging for the Lowbrows Official T-Shirt Contest. Several of our more creative (or at least extroverted) members submitted artwork, and all were warmly received (no, we did NOT burn them!). Two designs were chosen to represent The True Spirit Of Astronomy And Fellowship As Experienced By People With Short Foreheads – one from Chris Sarnecki, and one from Kathy Hillig. The designs can be seen inside, along with an order form – hey, what did you expect?

Take a look, check 'em out – T-shirts, sweatshirts, they make great gifts for grandparents (or grandkids)! Get your order to Doug Scobel this week! Do it! Now! Or I'll have D.C. call you a "schmizz" in public!

Next Month:

December 1 - Computer Subgroup Meeting at **Roger Tanner's** house (a Wednesday) at 7:30 PM. On the agenda are three projects: The CCD camera kit (see inside), televising the May solar eclipse, and hooking up a video camera to the 24" (or other) scope. Call Roger at 981-0134 for directions.

December 3 - Deadline for Newsletter Articles.

December 5 - Friends of Stinchfield Woods. Meeting/potluck at the observatory, 5:00 PM. Call 426-4922 for more info!

Decemner 11 - Public Open House at **Peach Mountain**. Sooner or later we'll get lucky and have a clear night....

December 17 - Meeting, PROBABLY at the **Detroit Observatory (see below)**. Our annual slide show, choreographed by our own Dr. (Hon.) Fred Schebor; also a report by Elizabeth Blakeley on the Internet Astronomy Database project.

Decemner 18 - Public Open House at **Peach Mountain**. I'm dreaming of a white star party....

We're Moving!

Sometime in the next few months, our monthly meeting site will move from the Detroit Observatory to the Dennison building (the Physics and Astronomy building) on UM's Central Campus. Although the new location is prime - two blocks from the Brown Jug - this move is actually mandated by the impending renovation of the Observatory into museum space.

WATCH THIS SPACE – WE WILL ANNOUNCE THE CHANGE AS FAR AHEAD AS POSSIBLE, BUT THAT MAY ONLY MEAN ONE MONTH"S ADVANCE NOTICE!

Tien He, Arianrod, and Linnunrata:
What's in a Name?
by Kurt Hillig and the sci.astro news group

It seems odd – at least, it did to one participant in the sci.astro group on UseNet – that we continue to call our home galaxy (the Milky Way, in case you didn't know) by such a "childish" name, now that we know so much about this magnificent celestial structure. Does the Milky Way have a better name, or could it or should it be renamed? What is our galaxy called in languages other than English?

A good reference for the historical basis for the names used for astronomical objects is Richard Hinkley Allen's "Star Names, Their Lore and Meaning"; an edition is published by Dover, ISBN 0-486-21079-0. There is a section on the Galaxy (pp. 474 – 485) which gives various names that have been associated with the Milky Way by other cultures.

In many European languages (at least those that were once part of the Roman empire) the name is essentially the same: in French – *La Voie Lactee*; in German – *Die Milchstrasse*; in Spanish – *Via Lactea*. In Norwegian and Danish, it's "*Melkeveien*", another direct translation.

According to the ancient Greek mythology – which the Romans rather freely borrowed from – the Galaxy was created when Zeus (translated by the Romans to Jupiter) tried to help his baby son Hercules, become 'semi-god'. Since Hercules was a product of one of the many extra-marital affairs of Zeus with human females, he was a mortal.

In order to achieve that, Zeus had to persuade his wife Hera to suckle the child. As you can imagine Hera was not very enthusiastic with the idea and she made some really nasty comments about his habits... Zeus though, wanted the baby to become immortal. So he took Hercules, on mount Olympus and put the baby into Hera's arms while she was sleeping. He was hoping that little Hercules would get the milk that he needed to become immortal. However, since Hercules was a rather strong baby, Hera woke up in the process and pushed the baby away from her. When this happened milk from Hercules mouth spilled over a region of the sky and created the Galaxy.

Incidentally, the word "galaxy" comes from the Greek words "gala", meaning "milk", and "xias", which means "road" or "way", so "the Milky Way Galaxy" is really redundant!

The Romans never made it far into Scandanavia, and so the Swedish "Vintergatan" really means "The Winter Road", and the Finnish "Linnunrata" means "The Way of the Birds" – both still based on the idea of a road or path, but without the dairy connotation. In Icelandic it is "Vetrarbrautin", synonymous with the Swedish "Winter Road".

Some other names for the Milky Way, which you've probably not run across before (and, alas, I've only found translations but not the actual names for some of these) are:

Who/Where	Name	Translation
German	Melkpfad	The Milky Path
	Muhlenweg	The Mill's Way
	Kuhpfad	The Cow's Path
Cherokee	Gilli-utsunstanunyi	"Where the dog ran"

Who/Where	Name	Translation
Creek		Path of the Spirits
Iroquois		Path of the Dead
Tewa	Opatuky	Spine of the World Man
Hungarian		The Country Road
Estonian		The Way of the Herd
		The Way of the Souls
Slovakian		The Gypsy Road
Central Europe	The Hunter's Way	
Eskimo (Bering Strait)		The Track of the Fox
Tschuktscheys (Siberian)		River of Quartz
Turkish	Samanyolu	The Straw Way
Basutos (South Africa)		The Way of the Gods
Japanese		River of Heaven
Korean		River of Heaven
Chinese	Tien He	Celestial River
Arabic	Al Nahr	The River
Hebrew	Nhar di Nur	River of Light
Celtic	Arianrod	The Silver Street
Indian	Akash Ganga	River in the Sky
	Bhagwan ki Kachahri	The Court of God
	Swarga Duari	Door to Paradise
Polynesian		Long, Blue Cloud-Eating Shark
Indonesian	Bima Sakti	Bhima's Strength

"Bhima Shakti" is how an Indian would spell this last one. Bhima is one the protagonists in the Hindu epic "The Mahabharata". He is supposed to have been a very strong person, an equivalent of Hercules if you will. "Shakti" refers to strength, or divine power, or energy. This translation would make the Milky Way a visible manifestation of Bhima's Strength. Tremble o ye Kaurvas, enemies of Bhima!

A pattern emerges here: in the far East and in the Arabic/Hebrew cultures, the Milky Way is considered a river, while in Europe it's considered a way/road/path of some kind. This also seems to be valid for the American Indians, who often considered it a path of some spiritual or mythological being. In India, other interpretations seem to exist, and in the Pacific the Milky Way is considered a fish! I suppose there aren't very many rivers or roads/paths on the small islands in the Pacific.

When Christianity spread in Europe, the Milky Way received several new names: the Way of Jesus / Mary / Jacob / Joseph, the Way to Rome, the Way of Pilgrims, etc. However, none of these names seem to have survived to the present day.

Is this childish? Most celestial objects are named after Roman (planets, asteroids) or Greek (constellations, stars...) or Arabic/Babylonian (stars) mythology and history. If this is childish, then the names of nearly all celestial objects are childish. I'd rather think of them as a reminder of all the peoples of the past who gazed with wonder and awe at the night sky, and tried as best they could to understand it. To me they're a link with thousands of years of human history.

You Think You're So Smart!

by Kurt Hillig & sci.astro

Here's a little quiz to humble those of you who think you're smart just because you can spell "Betelgeuse" correctly two times out of three. Answers might be published next month - if you're nice to me... Of course if you think you can come up with a better answer than I can, write it up and send it in – getting published in Reflections looks great on your resumé.

In Michael Collins book "Carrying the Fire", he lists the 37 stars used by the Apollo astronauts for determining the orientation of their spacecraft for navigating their way to and from the moon. A mistake in their identifying these could make them miss the proper re-entry to earth's atmosphere. Needless to say, they knew these lights well. Here is the list as taken from the book. The numbering system is base-8, as that is what they had to enter into their computer!

For question 1, please supply the common <Greek-letter>/ Constellation name for each. On your first pass through this, use ONLY your memory - no notes, books, charts, or references (for extra credit, write down the RA and Dec!). After you've exhausted your "on-line memory", feel free to use any references you wish. Add any other names or designations you find for these stars, and any other information you care to include.

Give yourself one point for each correct identification. Anyone who gets them all right wins satisfaction. Answers might be published next month, but I might just be mean enough to hold off for a couple....

1. Alpheratz
2. Diphda
3. Navi
4. Achernar
5. Polaris
6. Acamar
7. Menkar
10. Mirfak
11. Aldebaran
12. Rigel
13. Capella
14. Canopus
15. Sirius
16. Procyon
17. Regor
20. Dnoces
21. Alphard
22. Regulus
23. Denebola
24. Gienah
25. Acrux
26. Spica
27. Alkaid
30. Menkent
31. Arcturus
32. Alphecca
33. Antares
34. Atria
35. Rasalhague
36. Vega
37. Nunki
40. Altair
41. Dabih
42. Peacock
43. Deneb
44. Enif
45. Formalhaut

Strictly Commercial

Doug Scobel, ULA Treasurer

The 1994 "Wonders of the Universe" calendars, published by the Hansen Planetarium, are now available. These calendars have excellent photos (though not always strictly astronomical), but even better are the daily notes on the sun, moon, planets, meteor showers, eclipses, and other astronomical phenomena. They have raised their prices slightly this year, so we will be asking $8.00 from Lowbrow members and $9.00 from non-members (including non-members to which a club member may sell them). This is a major fund raiser for the club, so you are encouraged to sell as many as you can to people you know. They also make great Christmas/holiday gifts! I've only got 80 of them, so it will be first come first served for these.

Who wants a 1994 RASC Observer's Handbook? I am also prepared to order the Royal Astronomical Society of Canada's "Observer's Handbook 1994". This almanac contains a wealth of information regarding astronomical subjects and events throughout the year. It's a must for anyone that really wants to keep on top of what's going on up there. Your price will be $15.25 (that's my cost).

Finally, I can order anything from the Sky Publishing catalog (that you should have received with your December Sky and Telescope) at a ten percent club discount.

An order form for Calendars and Handbooks, and also for our club T-shirts and sweatshirts is included in this issue of *Reflections* (see the order form for clothing prices). Fill out the form and bring it to the November 19 meeting, or mail it to me [address on p.7 - Ed.]. Give me a call or let me know at November's meeting if you are interested in anything from Sky Publishing.

I will be placing orders for Handbooks in early December, and I only plan to order as many as are requested. The T-shirts and sweatshirts will be ordered shortly after the November meeting so they should arrive by the December 17 meeting.

Computer Subgroup Report

by Kurt Hillig

The computer group met at my home on Monday, November 1. There was a pretty good crowd, as these meetings go – by 8:30 there were nine of us sitting around the living room. And, wonder of wonders, we didn't have any computers in use!

Aside from our traditional discussions of everything under (well, in orbit around) the sun, we identified three serious topics, to which the rest of this report will be addressed.

The lengthiest was a presentation by Roger Tanner on the new CCD camera kit being developed by Richard Berry et. al. Since he wrote up a nice article on this, which will be found on pp. 4-5 of this issue, I won't go into more detail here; suffice it to say that it looks like a good way to get into modern electronic astronomy without having to sell your children or mortgage your chicken farm.

Number two in this unordered list is the upcoming annular solar eclipse on May 6, 1994 (I think that's right... and I'm too lazy to check right now!) As the path of the eclipse runs dead through the center of Toledo (Ohio, not Spain), Stu Cohen (in cooperation with other Lowbrows and the Ann Arbor and Toledo school systems) is trying to put together a live community-access TV show, cable-cast (well, it isn't broadcast, so what would you call it?) from Toledo and starring some of the Lowbrows as commentators etc. Call Stu at 665-0131 if you'd like to help!

Last, but not least, is The Next Big Bang - when comet Shoemaker-Levy whacks Jupiter next July. I've got a video camera which I'm in the process of making a scope adapter for; what we'd like to try is to videotape (laserdisk?) the impacts to look for reflections of the impact flashes from the Jovian moons (the actual impacts will be on the back side of Jupiter and won't be visiblefrom Earth), or for disturbances in Jupiter's atmosphere when the impact sites come into view 90 minutes later.

Next month's meeting is at Roger Tanner's (981-0134) on Wednesday, Dec. 1. You can hear more on these topics then!

A New CCD Camera Kit

by Roger Tanner

If you have been interested in CCD astronomy, but haven't been able to get past the cost and performance tradeoffs of the commercially available cameras, this new camera kit (marketed by Willmann-Bell and University Optics – it doesn't have a name yet), will offer a much more enticing price/performance ratio. This kit is based on a camera design by a couple of amateurs, and with software and instruction book written by Richard Berry (former editor of *Astronomy*). I have been gathering information on it since seeing its impressive performance at Astrofest this year. It appears to have an unbeatable combination of performance and price, but you have to spend about 20-40 hours to put it together depending on your electrical and mechanical skills.

At Astrofest, Richard was very confident on the robustness of the design and the completeness of the manual (150 pages). He said "if you can build a Heath Kit project and not hurt yourself with a hot soldering iron or a screwdriver, you can build this camera." In fact he is beta testing the kits on people who have no electrical or mechanical skills. The camera kit is expected to be available by January 1994.

What are the benefits of the do-it-yourself CCD camera? Basically, you can build a camera almost as good as the Santa Barbara ST-6 (which costs $3000) for about $500. This camera is based on a new Texas Instruments TC-245 CCD chip, originally intended for video use. While the chip measures 756 x 242 pixels, the software which controls the chip bins the pixels together horizontally to give either 373 x 242 or 252 x 242 pixels. The chip measures 4.78 mm by 6.43 mm (8 mm diagonal). This is about the same number of pixels as the ST-6, but the ST-6 chip is 11 mm diagonally.

The camera kit uses a 12-bit A-D converter, which is lower resolution than the ST-6's 16-bit converter, but is well matched to the dynamic range of the chip (about 80 dB). This is considerably better than the 8-bit A-D converter and 165 x 192 pixel size of the ST-4; the Lynxx PC camera has the same spatial resolution as the ST-4 but uses a 12 bit converter.

The camera is controlled by software in your PC (sorry, Mac users!). The software generates the control signals for the camera and reads the digital data back through the computer's parallel port. This is one of the reasons the camera is so cheap – your PC is an integral part of the camera. For imaging, just about any old PC will do, but it needs a VGA display. However, for processing the data you will need a computer with at least 1 megabyte or more of memory. Since the 373 x 242 pixel mode will take about 180K bytes of memory per buffer and the typical program needs 3 buffers, using extended memory or a Windows program will be necessary.

Let's take a look at this in more detail:

<u>The GOOD</u>

The camera has several features which can give especially good images:

First, the chip has on-chip correlated sampling. Basically this means that the chip re-zeros its charge amplifier between measurments for each pixel, which greatly reduces electrical readout noise. I don't think this feature is in the ST-4 camera, but it is available in the ST-6.

Second, the camera has a thermoelectric cooler which is cooled by pumping water through the hot side of the cooler, rather than using an air-cooled heat sink. Richard says that this will get the chip down to 40° C below the water temperature. This is almost as good as the ST-6 (-42° C from ambient) since the water will run very close to ambient. You could always dump ice in the water if you wanted another 10° of cooling. This is considerably colder than the ST-4 and will probably equal the ST-6 on cold evenings (one good thing to say for Michigan astronomy). The camera's temperature is not controlled, but instead relies on the thermal inertia of a five gallon pail of water (though a thermostat upgrade should be pretty easy). While this is not as good as the temperature-controlled ST-6, it won't fluctuate with the gusts of wind or orientation of the heat sink like the ST-4. A temperature-controlled camera allows you to take thermal frames at any time (like during the day) and use them to compensate the images at night with out wasting valuable scope time taking dark frames.

Third, the chip is interfaced to the PC clone through the parallel port, which can down load an image in a fraction of a second. This is quite fast compared to 11 seconds for the ST-6 and 7 seconds for an ST-4. It is about as fast as the Lynxx PC camera, which benefits from the being connected to a dedicated card in the computer.

Fourth, the camera has a reduced resolution, high sensitivity finder mode (126 x 121 pixels) which can image the sky almost in real time with 1 second exposures. The high sensitivity is simply done by binning four pixels into one, increasing the collection area 4 times. This makes finding objects and focusing on them very fast. For example at Astrofest, Richard had the camera hooked on to a 20" f4.5 scope. You could clearly see the globular cluster M5 on the screen in the finder mode with 1 second exposures. The camera's noise floor is so much lower than my ST-4 that his raw images with a 1 second exposure looked better than my dark frame-subtracted and much-processed efforts!

Fifth, the camera has the capability to do electronic shuttering by quickly moving the image into a covered storage area, and then reading it out. The ST-4 has no shutter, which means that the image array is always recording even while it is being shifted to the readout amplifier. This makes it nearly impossible to do a proper light frame calibration, or to image bright objects like the moon or the planets. The ST-6 and the Lynxx PC incorporate a mechanical shutter, like in a film camera; the ST-6 also has the electronic shutter capability.

Sixth, this camera is a kit! This means that you can make modifications to it to make it work better. You can also fix it when you break it, (of course it means you have to be able to fix it!). I can already envision a 16-bit A/D converter upgrade, thermal regulation, and various imaging chip upgrades, such as the 512 x 512 or 1000 x 1000 pixel TC215 series. These are the chips the professionals use, and they use the same signals and voltages as the TC245 – just change the chip and change the constants in the software, and you're ready to roll. The only slight problem is that these chips cost from $2,000 to $10,000. Just pray you don't static zap them on installation!

<u>The BAD</u>

A drawback of this kit is that you are going to have to find the parts from a variety of sources. Willmann-Bell is going to sell the construction book, plus a disk containing the software to build and run the camera, for $30. The software has a diagnostic program which checks out each part of the circuitry as you build it using the PC, and tells you what to check when it doesn't work. There are two small printed circuit boards which Willmann Bell will sell for $20 the pair. The machined aluminum parts are going to be supplied by University Optics for about $90. The rest of the parts listed in the construction book can be found at various electronic distributors. The Texas Instruments CCD chip is about $120. The Melcor thermoelectric cooler costs $20. The A-D converter is a standard part and costs about $20. The two small aluminum boxes and the remainder of the electronic parts, (resistors, capacitors, TTL logic chips, wire, etc.) can be found at Radio Shack [Well, maybe Jameco or some place like that. - Ed.] or in your parts box. These I estimate to cost between 0 and $60 depending on your scrounging abilities. The next thing is to find or build the power supply to power the cooler, and the windshield washer pump which moves the cooling water. Power supply and pump may cost 0 to $80. The miscellaneous mechanical items like surgical tubing, the copper coil to sit in the pail of water and fittings maybe running another $30- $50. So far I count $300 to $490 unless you don't have a five gallon pail, in which case you might be out another $3.95.

The next problem you will have is processing the images. The files are too big to be processed by the Willmann-Bell image processing program AstroIP. At Astrofest Richard was talking about his successor to AstroIP, which will be professionally written Windows program which will handle these images. He is adding many features including several automatic processing modes which give good results on typical images. He expects it to sell it for around $100. I am sure several other image processing programs which can handle ST-6 images will be able to process the images once the format is known.

The UGLY

The ugly side,(you knew it had to have an ugly side, didn't you), is, well, this is a home brew kit and looks it. There is the camera head, which is a aluminum cylinder with a small aluminum box on the side, which is connected by several wires and some ribbon cable to a second box with the computer interface in it. Then a printer cable goes to the parallel port on your PC. There is surgical tubing carrying water from the copper coil in the pail to the pump and up to the camera head on the scope and back. You didn't forget the five gallon pail of water did you? You will have to look out for the pail of water in the dark, as getting a soaker and a electrical shock from your own CCD camera would be embarrassing. Then there is a 5V, 5 amp power supply for the cooler, and the pump with wires running everywhere. This would probably look like some corner of Tom's garage; on the other hand, this could satisfy the mad scientist streak in you. Whatever, if you are more interested in results than looks, this camera produces.

The Bottom Line

I didn't see the camera perform on the planets, but it has the potential to work as well as the Lynxx PC on them, and to produce nearly ST-6 quality deep sky images. The 30 and 60 second images produced by the 20" f5 setup at Astrofest were very impressive even with no dark subtraction and no guiding. Several people asked about a version of the camera/software for the Macintosh, but Richard indicated that a Mac version was only a distant possibility.

I was wondering if anybody in the club was interested in building these kits together. We could help each other through the rough spots, do group buys on the parts, etc. I have talked to two people who are interested. If you are interested, you can call me at 981-0134, or see me at the club meeting or the computer subgroup meeting. I will keep you posted as things develop.

FUN FACTS

A Lowbrow forum designed to bring you the latest in biased information!

conducted by Martin Chuzzlewits and Dr. Phineas Buzfuz (a.k.a. Tom Ryan)

Q. How can I tell what my magnification is?

A. Ask your doctor. But if you want to know your *telescope*'s magnification, that's equal to its Objective's focal length divided by its Eyepiece's focal length. For example, a 13" f/4.5 scope has its objective's focal length of 13" x 4.5 = 54.5". With a 12mm (1/2") eyepiece, the magnification is 54.5 / (1/2) = 117 power.

Q. What magnification should I use to see as much detail as I can? Say for double stars, or counting barges on the canals of Mars?

A. A telescope will resolve objects separated by 5.5 / (Aperture in inches) arcseconds, while the eye can resolve objects separated by 60 arcseconds. The size that an object appears to be equals the magnification times its actual size. When the apparent size of the image [(mag) x (5.5/diam)] equals 60 arcseconds, then you're at the limit of the telescope's resolution; then Mag = 11 x Diameter, i.e. 11 power per inch of aperture. Above this magnification, the image gets bigger, but not sharper. [Sort of like what's happening to Buzfuz - M.C.] So a 6" telescope shows all available detail at 66 power, while a 24" does the same at 264 power. You can use a magnification two to four times this to make it easier on your eyes, but it won't improve the quality of the image.

Q. What is the lowest power I should use? What power will show the most stars in the eyepiece?

A. The answer to both questions is the same! [Marty has said that he saw the most stars while lying on the curb outside the Brown Jug, but if you prefer to use a telescope, please read on - D.P.B.] The lower the power that you use, the bigger the field is and the more stars it has in it. But as you lower the power, the exit pupil of the eyepiece (the size of the light beam coming out of the scope) gets bigger. If it gets bigger than 6 or 7 millimeters, then it won't fit through the pupil of your eye. If your pupil intercepts only part of the light that's coming through your scope, you're really using a smaller telescope. The field gets bigger, but the fainter stars drop out of sight. The exit pupil hits 7mm at about 4 power per inch of aperture – this is the lowest power you should use.

Q. How many eyepieces do I need?

A. Only two – one to give 4 power per inch of aperture, and one to give 11 power per inch; add a 2x or 3x Barlow lens for variety. Select their focal lengths (in mm) by using the following formulae:

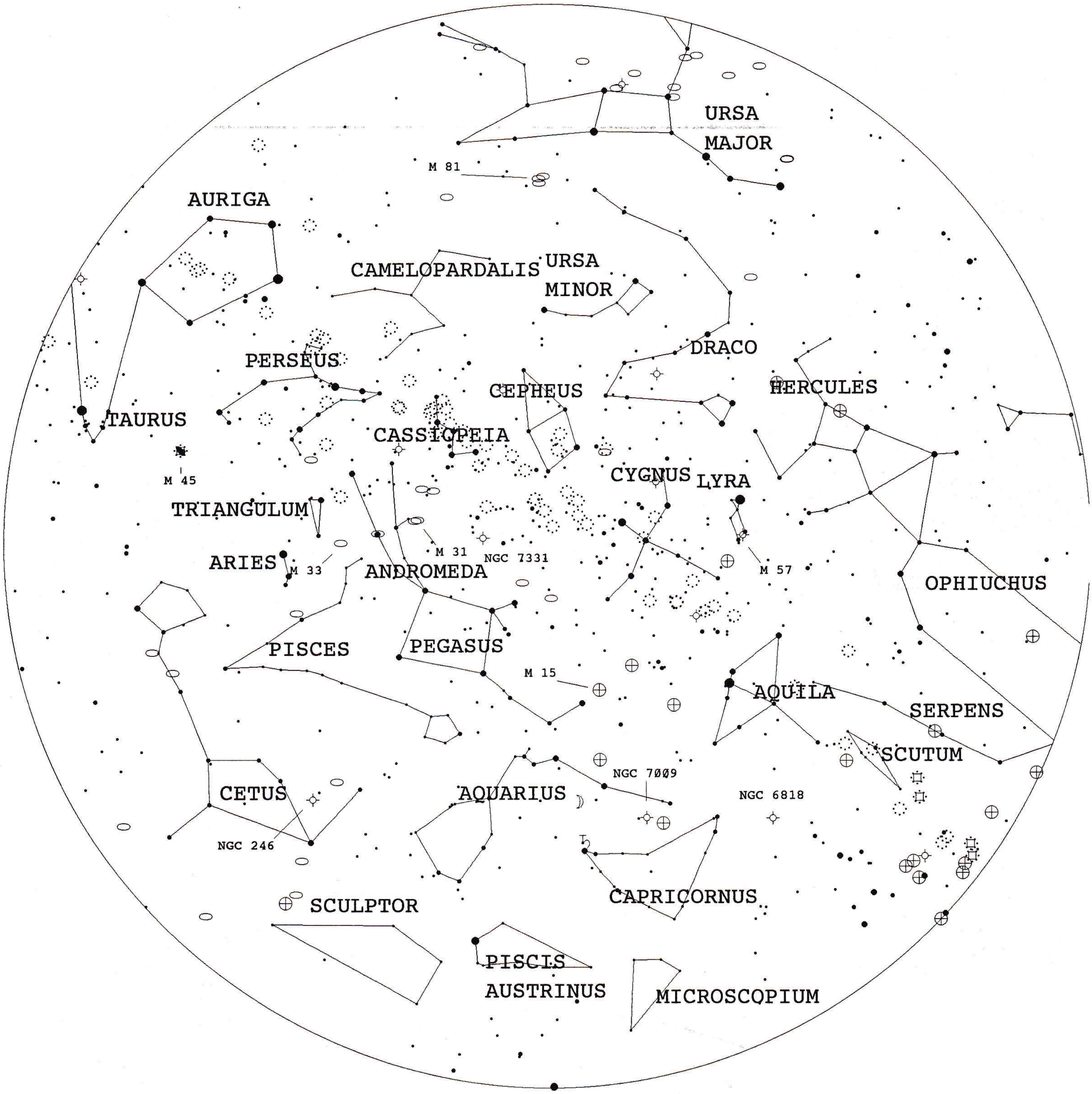
4 ppi: F.L. = 25.4 x (Obj. F.L.) / (4 x dia)
= (6.35) x (f/ratio).

11 ppi: F.L. = 25.4 x (Obj. F.L.) / (11 x dia)
= (2.31) x (f/ratio).

For example if you have one of the ubiquitous (bet you thought I couldn't spell that!) f/10 Schmidt-Cas models from Meade or Celestron, you should use a 63.5 mm eyepiece for wide-field viewing, and a 23 mm for details. These are odd sizes, but you can get away with one around 55 - 65 mm, and one of 15 or 20 mm; with a 2x Barlow you then get 28-33 and a 7.5-10 also. If you've got one of the also-ubiquitous 17" f/4.5 Coulter's, you'll want a 30 mm and a 10mm. And since you're only buying two, buy the best!

Clear Skies!

11/2Ø/93 6:47pm EST Stars to 5th mag.



Order Your T-shirts, Calendars and Handbooks Now!

The two winning T-shirts were selected in our design contest! Check 'em out – the designs are on the back of this page.

T-shirts can be ordered at the November meeting, or by mailing this form to Doug Scobel by Saturday, November 20. Members can order at member rates; for non-members, here's a good excuse for joining! Bring your order form and money to the meeting. This is the only way you can guarantee you get the size and style you want. We will get an assortment of sizes to sell at Open Houses at non-member rates. These will make up the difference between the orders and the minimum of 50 of each design required by the manufacturer. T-shirts will be available at the December meeting for pick-up, just in time for the holidays. If you won't be at the December meeting and can't wait until January to get your order, then arrange with Doug to pick it up.

Use this form for calendar and RASC Observer Guides as well. See Doug's report on page 3.

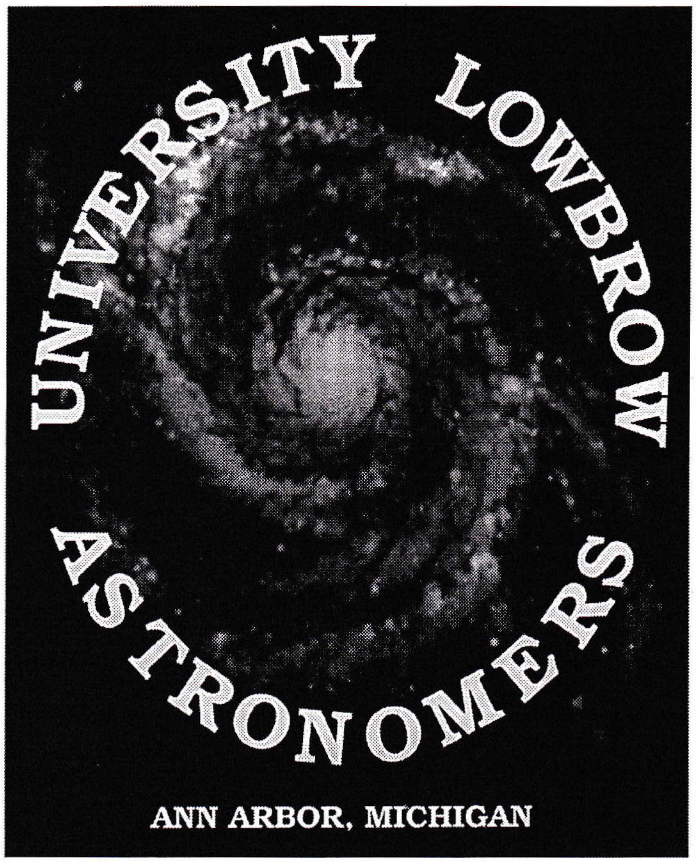
To order, return this form with your payment (make checks payable to "University Lowbrow Astronomers") to:

Doug Scobel
1422 Wedgewood Dr.
Saline, MI 48176
429-4954

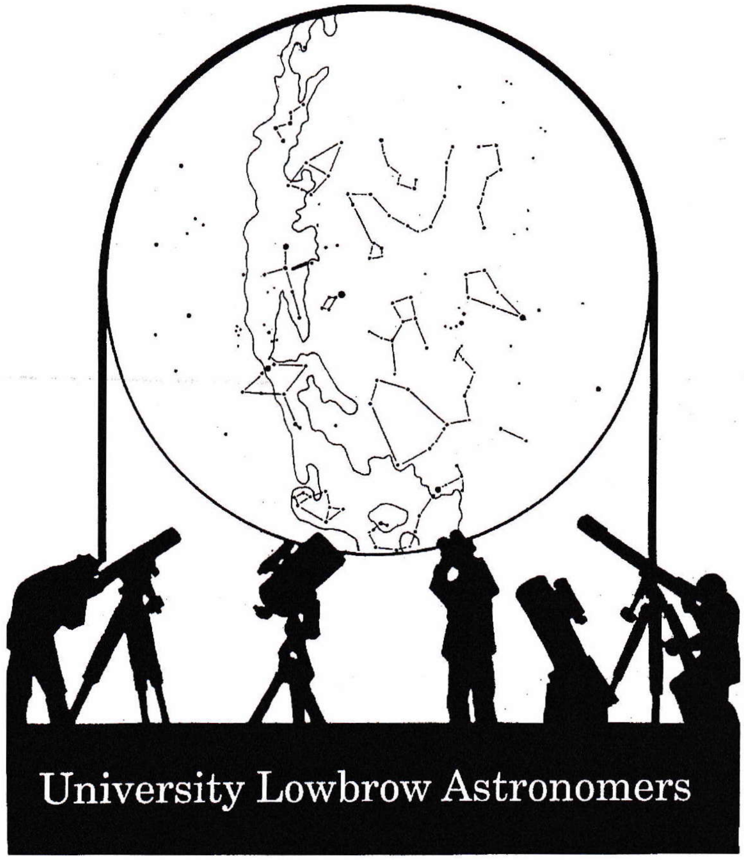
Remember, your order must be in by Saturday, November 20!

Name______________________________ **Phone No.** __________________

		Price	How many in each size?				Material	Total Quantity	X Unit Price	= **Total Price**
Tee Shirts			**S**	**M**	**L**	**XL**	50/50 or 100%?			
Galaxy		$10 - mbr $15 - non								
Silhouette		$10 - mbr $15 - non								
Sweatshirts			**S**	**M**	**L**	**XL**				
Galaxy	**Kids**	$13 - mbr $17 - non								
	Adults	$16 - mbr $20 - non								
Silhouette	**Kids**	$13 - mbr $17 - non								
	Adults	$16 - mbr $20 - non								
RASC Observers Guide									$15.25	
Calendars	$8.00 - members; $9.00 - non-members									
									Grand Total	



Galaxy, by Kathy Hillig
Yellow lettering and white galaxy
on a dark blue T-shirt



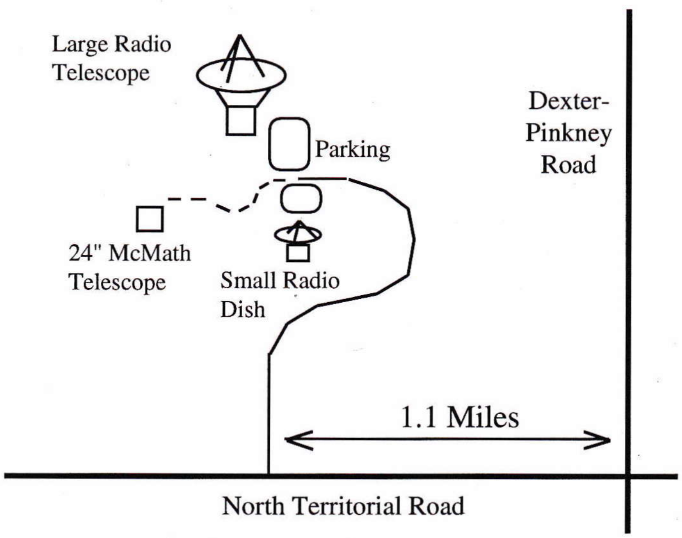
Silhouette, by Chris Sarnecki
Black silhouettes and a white sky
on a green T-shirt

	Members	Non-Members	Size
T-shirts			
50/50 cotton/poly	$10.00	$15.00	S, M, L, XL
100% cotton	$10.00	$15.00	S, M, L, XL
Sweatshirts			
7 oz. Kids	$13.00	$17.00	S, M, L
9 oz. Adults	$16.00	$20.00	S, M, L, XL

☞ 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 at sunset – call 426-2363 to check on their status. Many members bring their telescopes; visitors are welcome to do likewise. Peach Mountain is home to millions of hungry mosquitos – bring insect repellant, and wear warm clothes!

☞ 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
	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	549-9525

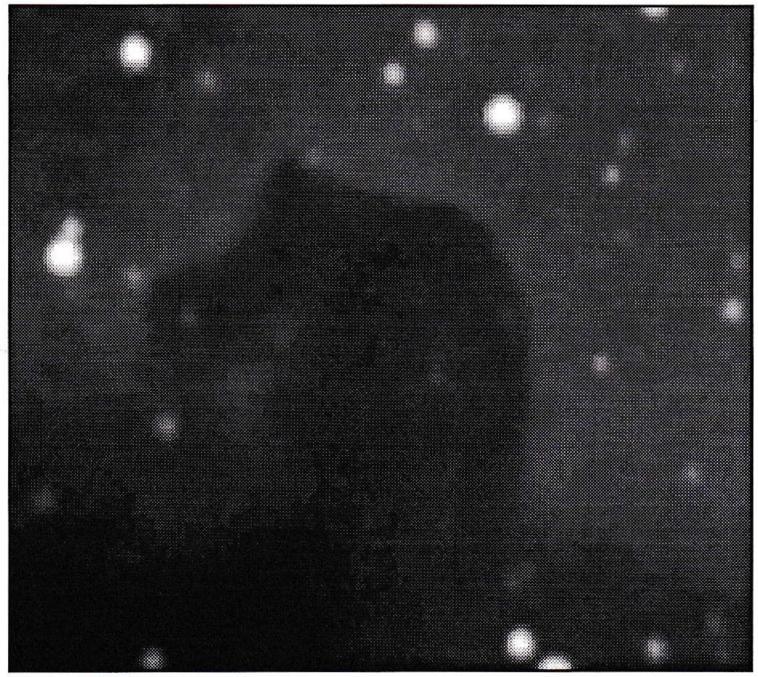
Peach Mountain Keyholder:
Fred Schebor 426-2363

Monthly Meeting:

Joady Ulrich
of the
RASC Windsor Centre
on
The Earth as a Planet!

Nov. 19, 1993 at 7:30 PM

At the Detroit Observatory in Ann Arbor



The Horsehead Nebula, imaged by Roger Tanner on October 22, 1993, 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 to enhance the contrast. Named for the renowned astronomer Horace Hedd, this nebula was discovered on April 1, 2001.

University Lowbrow Astronomers
840 Starwick
Ann Arbor, MI 48105