

July 1992

The galaxies NGC 4038 and NGC 4039. The "tails" are long streams of stars pulled from these two galaxies as they collided.

Kurt Hillig  
Editor

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

### This Month:

**July 17 - Meeting at the Detroit Observatory in Ann Arbor.** Stuart Cohen and D.C. Moons will talk about the restoration of the 24" telescope at Peach Mountain. If the skies are clear, a club observing session at Peach Mountain will follow the meeting – bring your scopes!

**July 25 - Public Open House at the Peach Mountain Observatory** (on North Territorial Road, 1.1 miles west of Dexter-Pinkney Road). Our gatekeeper this evening will be Tom Ryan. Remember to bring insect repellent!

**July 31 - Computer Subgroup Meeting** (note date change!) at Roger Tanner's home in Canton (call 981-0134 for directions). An update on the digital setting circle project, more shareware, and optical design are on the agenda

### Next Month:

**August 1 - Public Open House at the Peach Mountain Observatory.** Steve Musco is scheduled to be on gate duty this evening.

**August 21 - Meeting at the Detroit Observatory in Ann Arbor.** Topic to be announced.... A club observing session at Peach Mountain will follow the meeting.

**August 22 - Public Open House at the Peach Mountain Observatory.** D.C. Moons will be on gate duty.

**August 29 - Public Open House at Peach Mountain.**

### Other Events and Announcements:

The Eastern Michigan University Astronomy Club is sponsoring the "Fish Lake Under the Stars" party, August 28-30, at the EMU Kresge Environmental Education Center at Fish Lake, near Lapeer MI. Fliers will be available at the July 17 ULBA meeting, or call Norb Vance (313-487-4144) or Kevin Dehne (313-347-5844).

The Rose City Astronomers and the Oregon Museum of Science and Industry are hosting the Fifth Annual Oregon Star Party, August 27-30. The site in the Ochoco mountains of central Oregon is at a 5200' elevation, and 36 miles from the nearest town (150 miles from Portland). Call Chuck Dethloff at (503) 629-2145 for more information.

The Group 70 Large Amateur Telescope Project is a non-profit corporation dedicated to the design, construction and operation of a 1.8 meter telescope for amateur use. Work has already started on grinding the f3 primary; a 20" secondary will give an overall f10 system. Help is still needed on their Computer Systems, Mechanical, Site Selection, Architecture, and PR and Development task groups. For more information, contact Kurt Hillig or call the Group 70 project at (510) 784-1231.

Our illustrious Newsletter editor, Kurt Hillig, will miss the July and (probably) August meetings, thanks (so to speak) to conflicting travel plans. If you would like to write an article for Reflections, please call him at 663-8699!



## Computers in Astronomy Subgroup Report

by Kurt Hillig

The computer group met at Roger Tanner's house on July 1; eight members were in attendance. The initial discussion centered around some decidedly non-computer topics: a 12.5" semi-finished blank which one of the members brought, and the types of 16" scopes (or binoculars!) that those of us with 16" mirror blanks (and there are a lot of us now) would like to make.

While Tom Ryan didn't make it to the meeting, his Zemax optical design program did. At the June meeting we were introduced to Zemax. This time we sat down and worked on learning more about how to use it to optimize a design. Since I'd spend a long evening with Tom the week before learning the basics of Zemaxing, I was volunteered to be the test driver.

### How to Optimize a Scope Design

The best way to design a perfect scope is to find a design which someone else has already perfected. We re-proved this at the meeting, as we explored modifications to the "Rumak" - a variation on the Maksutov Cassegrain designed by one of the authors of the book "Telescope Optics". The original 8" Rumak design has a Maksutov corrector nearly 1" thick, an f4.5 primary, and a Cassegrain secondary suspended from the corrector - the overall length of this scope is less than three feet. It has two very nice features: 1) diffraction-limited images over a very large-diameter field (making it an excellent photographic scope), and 2) all spherical surfaces on the optics, making the grinding and polishing straightforward.

We began by simply scaling all of the dimensions by a factor of two - since we do have those 16" blanks - and re-optimizing the dimensions in groups of two or three while holding the rest fixed, cycling through all of the dimensions twice. This corrected for round-off error in the scaling (since we didn't punch all of the significant figures in), and gave essentially identical results as the 8" design - diffraction-limited performance over a 4 inch diameter field (use a large-format camera with this baby!), with a 1° field covering about a 2" circle.

Then the fun began. The biggest problem a telescope maker faces when attempting a complex design like this is sensitivity to small deviations in the dimensions. For example, the Maksutov corrector here is supposed to be 33.2 mm thick; what happens if it comes out at 33.1 mm? Unfortunately, sensitivity analysis on a complex optical system is a time-consuming job. For the Rumak, for example, there are three distances and four curvature radii which can vary, and changes in one can to an extent be compensated for by changes in another. If we try just three different values for each parameter, then there are 2187 different configurations to calculate! Zemax has some built-in routines to do this for you, but we're going to have to get Tom to figure out how to run them for us.

Our quick-and-dirty alternative was to vary each parameter individually and see what happens - and, unfortunately, for the Rumak thing get bad very quickly, and our conclusion was that this was a scope that really had to be made perfectly to work well.

Recognizing that building a perfect 16" Rumak was probably not possible (at least not as a first-time project), we went on to the next step in optimization: consideration of other designs. At this point, however, it was getting too late to continue, so we packed it in and called it a night. Our conclusion: even with a really fine piece of CAD software designing a good scope is not a trivial job, but what that CAD program can really do is help you decide which designs can actually be built.

### Next Meeting

The next meeting of the Computers in Astronomy subgroup will be on Friday, July 31 (NOTE THE DATE CHANGE - there's an open house at Peach mountain on Aug. 1) at 7:30 PM, at Roger Tanner's house in Canton. Call him at 981-0134 if you need directions. While we expect to spend more time with Zemax (hopefully to look at a few other scope designs), we will also get a progress report and discussion of the club project to add digital setting circles to the Peach Mountain scope, and also to look at some (DOS) astronomical shareware (bring blank disks!). All interested people are invited to attend. As always, interesting new software or hardware is welcome; please call first to make arrangements.

### Migrating Stars: The Case of Rho Aquilae

Many, if not all, of the nearer stars to Earth exhibit "proper motion" - a slow drift of their apparent position relative to the distant "fixed" stars. The proper motion reflects a real motion - stars are not fixed in space.

In an effort to organize the sky - a human organization, having little to do with stellar interactions - we have divided the sky into constellations. These are "cosmographic" divisions, generally along the lines between the traditional asterisms and constellations, much as the earth is divided by geographic borders which roughly reflect the traditional regional ethnic divisions of mankind.

Within the borders of each constellation, we assign labels to the stars (whether or not they have historic names) using Greek letters, in sequence starting with the brightest stars and working down toward the fainter ones. Of course there are many more stars in each constellation than there are Greek letters, but this works for the brightest stars.

This year, the star  $\rho$  (rho) Aquilae in the constellation Aquila (the Eagle) will drift across the border into the constellation Delphinus (the Dolphin). In the interest of continuity, it's name isn't going to change. But, you should enjoy this rare event now, because it won't happen again until the year 2400 AD (or thereabouts).



# A Report on Universe '92

by Christopher Sarnecki

The Astronomical Society of the Pacific (ASP) 104th annual meeting was held at the University of Wisconsin in Madison in mid-June of this year. Their weekend conference, exposition and star party, called Universe '92, was cosponsored by Astronomy magazine and by 11 other astronomy-related organizations. ASP tells me that over 1,000 people were in attendance for the event.

**The Talks** The conference featured talks by noted professional and amateur astronomers from throughout the US and Canada. The agenda presented 3 to 6 individual speakers six times during each of the two days of the event. Many of the talks were repeated at least once. With so many excellent speakers and topics most of the attendees had their schedules crash early on the first day. The University of Wisconsin and the ASP did an admirable job of keeping to the agenda and providing other attractions to keep everyone's interest up in between speakers.

One of the professional astronomers to speak was Dr. Donald Goldsmith, author of the companion book to the PBS series The Astronomers. He discussed asteroid impacts on earth, supporting the current proposal to fund the construction of up to five moderate telescopes around the globe, to be used to search for and catalog earth-crossing asteroids. Dr. William Kaufmann – author, professor and former director of the Griffin Observatory – gave talks on black holes and cosmology. While these talks were somewhat of a text book nature, he puts on an impressive show – if given an opportunity to hear him, do not pass it up! Dr. Frank Drake, of the Drake equation fame, talked about the NASA SETI program and the possibility of extraterrestrial life. It's not a question of if extra-terrestrial life will be found but when, according to Drake. Dr. Maarten Schmidt, one of the discoverers of quasars, talked about quasar astronomy from the early days on up to the present. He explored the quasar redshift limit believed to exist out to about 1 billion years after the birth of the of the universe. The biggest dilemma facing those who study quasars is that if quasars harbor massive black holes, and since it takes many billions of years to form a black hole, then why do we find the quasars to have formed so early in cosmic time?

"Amateur" astronomers speakers were also present too. Terence Dickinson, author and first editor of Astronomy magazine, gave a talk on the amateur astronomy experience and what it means to us, its practitioners. Dickinson also explored the history of amateur astronomy (who would have thought that we even had one?). Dickinson also discussed dark sky preserves. – an issue that surely

lies in our future. Deborah Byrd, creator of the "Star Date" and "Earth and Sky" radio series, gave an impassioned speech on our roles as Amateur Astronomers. She believes that we ought to give back to the public more of our appreciation of the Cosmos.

Other speakers were Richard Berry speaking on – you guessed it – CCD imaging. Alan Dyer, associate editor for Astronomy magazine, spoke on telescope selection. Rev. Robert Evans spoke on hunting for supernovae. Additional topics included planetary and deep-sky observing, Big Bang theory, cold dark matter, galactic evolution, the Magellan mission and reports from the Hubble Space Telescope. The only criticism voiced by the attendees was that there were too many speakers crammed into only two days of talks.

**The Show** The vendor exposition was a little shy in the telescope department but book-signing, door prizes and software distributors more than filled the gap. (I won a book against odds of about 50 to 1). The exhibitors at these events provide the function of filling the space between the speakers you want to hear and ones you don't, but again the show was so impressive that I did not see it all.

**The Party** The clouds parted, right on cue, in time for a Saturday night star party. Our host was the Madison amateur astronomy club who furnished many fine telescopes for the hundreds of enthusiasts (who braved what was probably the coldest summer solstice on record for Wisconsin) to view the stars. The University opened the Washburn Observatory for views through their 120+ year-old 15<sup>1</sup>/<sub>2</sub> inch refractor. This telescope has been maintained in its original condition – the only upgrade has been to add an electric motor to raise the weights on the mechanical clock drive. The University went through the trouble of blocking off the street in front of the observatory and turning off the street lights for a block around to aid in our viewing. We experienced a lot of high level turbulence that night which affected telescopes of all apertures. The crowd was friendly and I met amateur astronomers from all over the midwest (but none from Michigan).

ASP mentioned that the University of Wisconsin sponsored this event to the tune of \$16,000. Since they typically manage to have a university sponsor their annual meeting, one has to wonder if there could be a future ASP event here in Ann Arbor... Next year their 105th meeting will be in San Diego, California and in 1994 their meeting will be in Tucson Arizona. Think about it – Palomar's close to San Diego... I'm already making my plans to attend.





This month observers have a chance to see one of the brighter comets of this year (it's currently about mag 8.5) – Shoemaker-Levy 1991A1 – which makes close approaches to three deep-space objects: NGC 3471 (mag 13, RA 10h59m7s, Dec 61°32'1") about 3 AM on July 11; M97 (mag 11, RA 11h14m48s, Dec 55°0'57") at sunset on July 13, and NGC 3726 (mag 11, RA 11h33m18s, Dec 47°2'2") about 1 AM on July 17. These maps were prepared by Doug Nelle (many thanks to Doug!) to help you find this comet during the month. On the wider view, to the left, the position of the comet is marked every two days (11 PM EDT, starting on July 10) with the ⊕ symbols, as it moves through Ursa Major toward Leo. The map below shows its position every six hours beginning at 5 AM EDT on July 11. Doug has also prepared ephemeris tables, which space and time preclude reprinting here (maybe he'll bring copies to the meeting?).

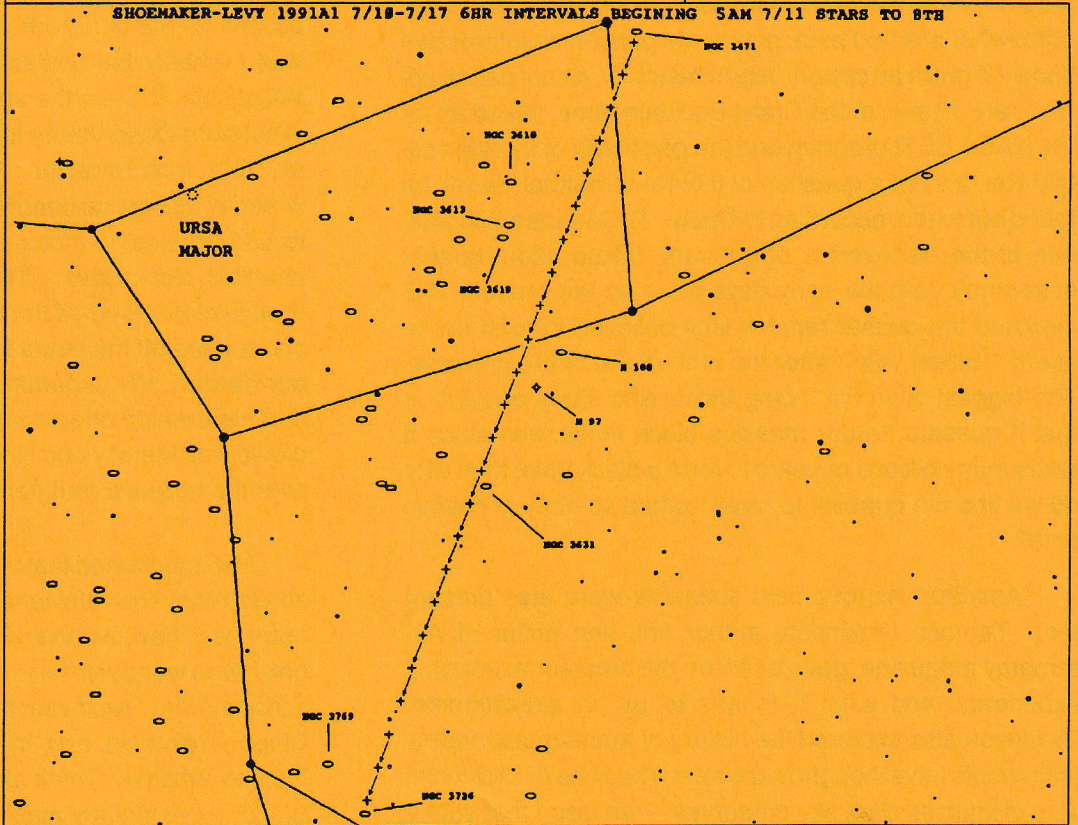
Planet enthusiasts might be interested in several new maps which are available from the US Geological Survey:

- Map I-2156 Enceladus at 1:2,000,000 scale
- Map I-2153 Triton at 1:5,000,000 scale
- Map I-2154 Triton at 1:15,000,000 scale
- Map I-2157 Tethys at 1:5,000,000 scale

The USGS has a number of other planet and moon maps available, including Mars, Mimas and Iapetus. Map prices range from \$2 to \$4 depending on the number of colors needed; some are two-sheet sets.

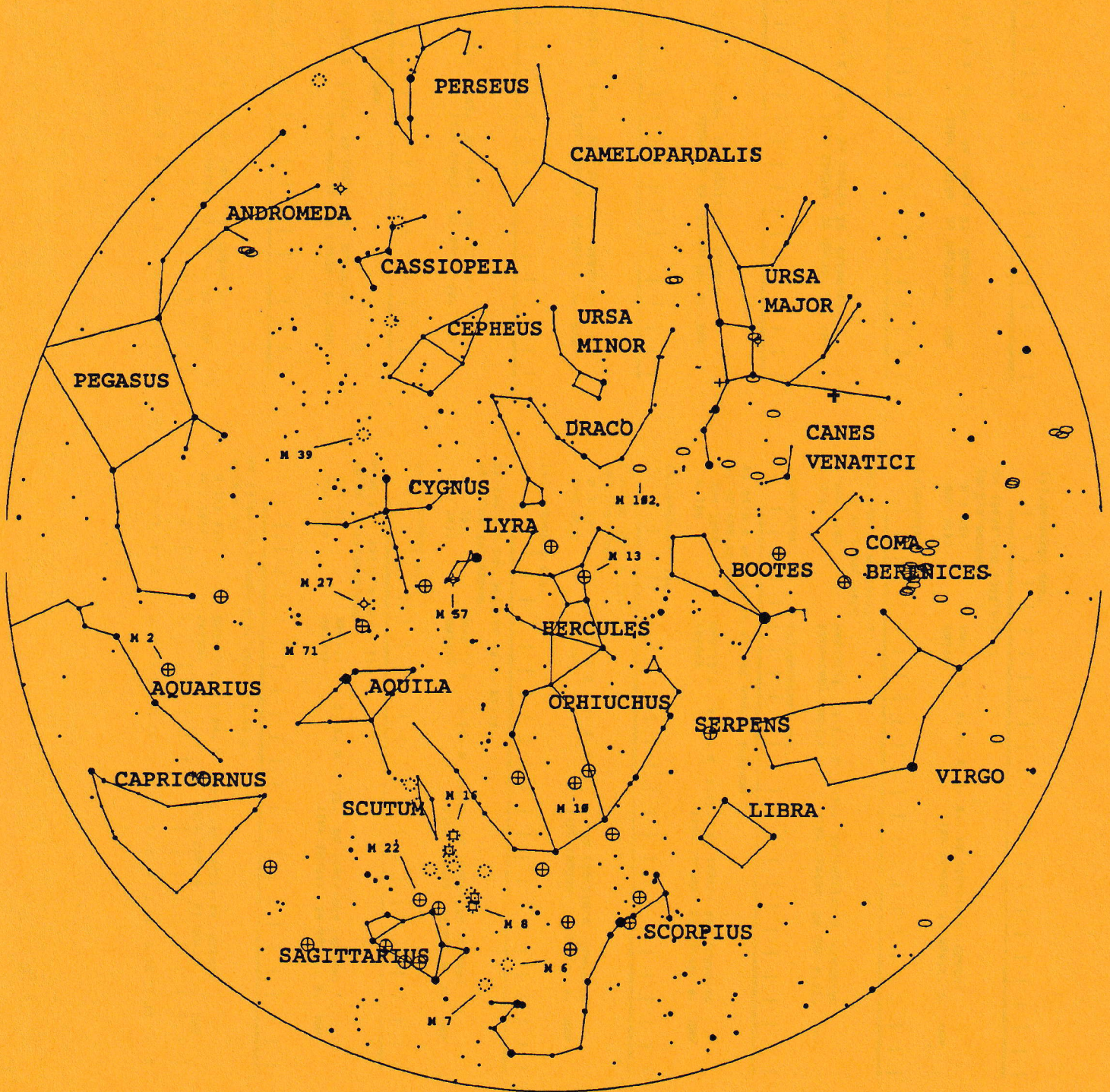
For more information, contact U.S.G.S. Map Sales, Box 25286, Denver, CO 80225. You can also check out the monthly publication "New Publications of the U.S. Geological Survey" at many libraries, or by free subscription from USGS, 582 National Center, Reston VA 22092.

How big is a black hole? One answer is that all black holes have an infinite diameter and a finite circumference! The more conventional measure is either its mass (sidestepping the "size" issue by re-interpreting the question) or the Schwartzchild radius - the distance from the center at which the escape velocity equals the speed of light. If the Earth were compressed to a black hole, it would be about the size of a small marble.





Star Map for 86°56' West, 42°44' North, July 18, 1992, 11:00 PM EDT  
Comet Shoemaker-Levy 1991A1 is marked by the "+" in Ursa Major





2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2

NGC 3726 Galaxy 11hr 33m18s 47 dgr 2' 2" UMA  
 H II 730 MAG:11.2 6' 6" X 4' 6" PA (dgr): 10 CLASS:ISC  
 PB,Vt,LE 0,VAMBH \*15,\*11 n  
 PA 10,well defined spiral pattern

[\*]Herchel 400"

NGC 3877 Galaxy 11hr 46m 5s 47 dgr 30' 3" UMA  
 H I 201 MAG:11.0 6'36" X 1'12" PA (dgr): 35 CLASS:ISC  
 B,L,ME 37  
 PA 35,edge on spiral,16' south from CH1 UMA

[\*]Herchel 400"

NGC 3949 Galaxy 11hr 53m42s 47 dgr 51'58" UMA  
 H I 202 MAG:10.9 3'48" X 2'42" PA (dgr):120 CLASS:ISC  
 CB,PL,PME,VQBM  
 PA 120,comp 4.4',PA273,0.3'X0.1'

[\*]Herchel 400"

NGC 3893 Galaxy 11hr 48m36s 48 dgr 43' 3" UMA  
 H II 738 MAG:10.6 5'36" X 3'30" PA (dgr):165 CLASS:ISC  
 B,PL,R,MBH  
 PA 165,P w NGC 3896 at 3.9',PA125

[\*]Herchel 400"

NGC 3675 Galaxy 11hr 26m 6s 43 dgr 35' 3" UMA  
 H I 194 MAG:10.4 7'48" X 4'30" PA (dgr):178 CLASS:ISC  
 VB,CL,VME 0,VAMBH,many at P  
 PA 178,in field of 56 UMA

[\*]Herchel 400"

NGC 3941 Galaxy 11hr 52m54s 36 dgr 59' 2" UMA  
 H I 173 MAG:11.3 4'36" X 3'30" PA (dgr): 10 CLASS:ISC  
 VB,PL,R,MBH \*9  
 PA 10

[\*]Herchel 400"

NGC 3813 Galaxy 11hr 41m18s 36 dgr 32'60" UMA  
 H I 94 MAG:12.6 2' 6" X 1'12" PA (dgr): 87 CLASS:ISC  
 CB,PL,PME 83,BM  
 PA 87

[\*]Herchel 400"

2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2

NGC 3471 Galaxy 10hr 59m 7s 61 dgr 32' 1" UMA  
 H II 972 MAG:13.0 2'54" X 1'54" PA (dgr): 14 CLASS:ISC  
 VB,R,R,BH  
 PA 14,sp of 2,comp 2.4',PA55,0.8'X0.2'

[\*]Herchel 400"

NGC 3610 Galaxy 11hr 18m24s 58 dgr 47' 3" UMA  
 H I 270 MAG:11.4 3'12" X 3'12" PA (dgr):n/a CLASS:ISC  
 VB,PS,LE 90,VAMBHNSN  
 comp 3.7',PA232,0.25'X0.25'

[\*]Herchel 400"

NGC 3613 Galaxy 11hr 18m35s 58 dgr 0' 5" UMA  
 H I 271 MAG:11.6 3'24" X 2'48" PA (dgr):102 CLASS:ISC  
 VB,CL,ME 305,MBHNSN  
 PA 102,P w NGC 3619 at 15.7',PA158

[\*]Herchel 400"

NGC 3619 Galaxy 11hr 19m25s 57 dgr 46' 4" UMA  
 H I 244 MAG:12.6 4' 0" X 3' 0" PA (dgr):n/a CLASS:ISO  
 CB,CL,R,VAMBH  
 P w NGC 3613 @ 15'

[\*]Herchel 400"

M 108 Galaxy 11hr 11m30s 55 dgr 40' 0" UMA  
 NGC 3556 MAG:10.7 9'48" X 2'12" PA (dgr): 80 CLASS:ISC  
 CB,Vt,VME 79,PBM  
 PA 80,H V 46,N 97 Is 48' SE,nearly edge-on

[\*]Herchel 400"

M 97 Planetary Nebula 11hr 14m48s 55 dgr 0'57" UMA  
 NGC 3587 MAG:11.0 3'22" X 3'16" PA (dgr):n/a CLASS:ISC  
 11 VB,Vt,R,VVQ,VAMBH  
 Owl Nebula,PK148+57.1

[\*]Messier

NGC 3631 Galaxy 11hr 20m60s 53 dgr 10' 2" UMA  
 H I 226 MAG:11.0 6' 0" X 5' 0" PA (dgr):n/a CLASS:ISC  
 PB,L,R,AMBHNSN  
 SN 1964a,UGC 6360,MP 27

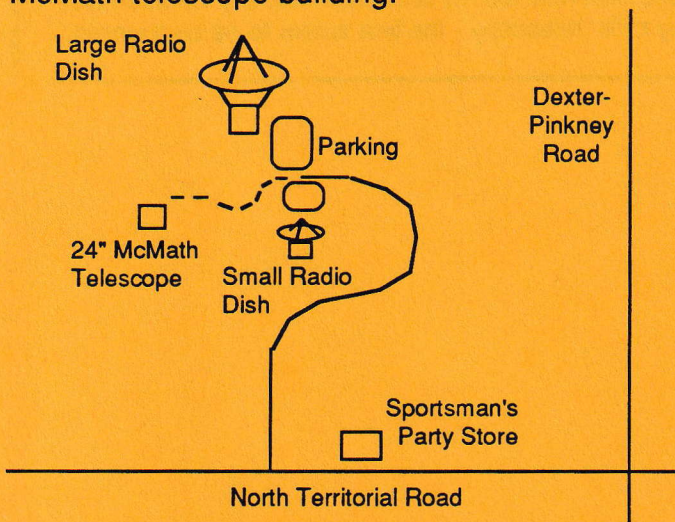
[\*]Herchel 400"



## ☞ Places:

The Detroit Observatory is in Ann Arbor at the corner of Observatory and Ann Streets, across from the old University Hospital main entrance, on the hill between UM's Alice Lloyd and Couzens dormitories. 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 20-meter radio telescope, and the McMath 24-inch telescope 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 southwest (between the two fenced-in areas) about 300 feet to reach the McMath telescope building.



## ☞ Times:

The monthly meetings 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 follows the 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 the status. Many members bring their telescopes; visitors are welcome to do likewise. Peach Mountain is home to millions of hungry mosquitos – bring insect repellent, and wear warm clothes, as it gets cold at night!

## ☞ 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, Ron Avers, at a meeting or by mail at this address:

9394 Anne  
Pinckney, MI 48169-8912

## ☞ Magazines:

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

Sky and Telescope: \$18/yr  
Astronomy: \$16/yr  
Odyssey: \$10/yr

For more information, contact the treasurer.

## ☐ Sky Map:

The sky maps in this issue of *REFLECTIONS* were produced by Doug Nelle using the (DOS) program *Deep Space 3D*.

## ☞ Newsletter Contributions:

Members (and non-members) are encouraged to write about any astronomy-related area in which they are interested. Please call the newsletter editor (Kurt Hillig, 663-8699) 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:

|                     |              |          |
|---------------------|--------------|----------|
| <b>President:</b>   | Stuart Cohen | 665-0131 |
| <b>Vice Pres:</b>   | Doug Nelle   | 996-8784 |
|                     | Paul Etzler  | 426-2244 |
|                     | Fred Schebor | 426-2363 |
|                     | Tom Ryan     | 662-4188 |
| <b>Treasurer:</b>   | Ron Avers    | 426-0375 |
| <b>Observatory:</b> | D. C. Moons  | 254-9439 |
| <b>Newsletter:</b>  | Kurt Hillig  | 663-8699 |
| <b>Membership:</b>  | Steve Musko  | 426-4547 |

## **Peach Mountain Keyholder:**

Fred Schebor 426-2363



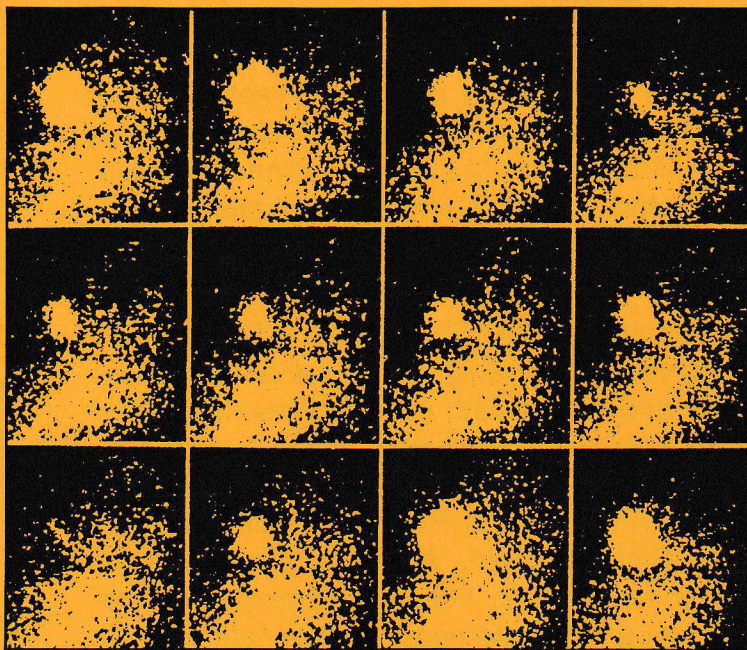
## Monthly Meeting:

Stuart Cohen  
and D.C.Moons:

The Renovation  
of the Peach  
Mountain 24"  
Telescope

July 17, 1992 at 7:30 PM

At the  
Detroit Observatory in  
Ann Arbor



36 milliseconds in the life of the Crab Nebula pulsar, which has a rotational period of 31.04 msec. These X-ray images, taken at 3 msec intervals, clearly show the intensity variation first seen by radio telescope - the first pulsar to be discovered.

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