University Lowbrow Astronomers
Ann Arbor, Michigan

REFLECTIONS
REFRACTIONS
of the University Lowbrow Astronomers

April, 2000

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 Physics and Astronomy building (Dennison Hall, Room 130 or 807). Meetings begin at 7:30 pm and are open to the public. Public star parties are held twice a month at the University's Peach Mountain Observatory on North Territorial Road (1.1 miles west of Dexter-Pinkney Road; further directions at the end of the newsletter) on Saturdays before and after the new Moon. The party is canceled if it's cloudy or very cold at sunset. For further information call (734)480-4514.

NGC 4535 Galaxy **by Clay Kessler**

I went into this thinking that CCD is supposed to be easy. A few 5 minute exposures and on to another object - no problem. Man, I found out that taking "World Class" images is a different kettle of fish. If memory serves the 4535 shot has about 150 minutes of total exposure counting darks and flats. This does not include the time spend refining the focus, which was done several times during the imaging run and --- (see his article on pg 2)

This Month:

April 1 - Public Star Party at Peach Mountain Observatory
April 8 - Public Star Party at Peach Mountain Observatory (Astronomy Day)
April 14- Computer subgroup Meeting at 807 Dennison, 7:30 pm
April 16- Space Day on North Campus
April 21- Meeting at 130 Dennison , 7:30 pm- Astronomy Hardware
April 29 - Public Star Party at Peach Mountain Observatory
April 1,8,15,22 - Saturday Morning Physics

Next Month & Beyond

May 6 - Public Star Party at Peach Mountain Observatory
May 19 - Meeting at 130 Dennison
May 27 - Public Star Party at Peach Mountain Observatory
June 3 - Public Star Party at Peach Mountain Observatory
June 9 - Lowbrows at Leslie Science Center
June 16 - Meeting at 130 Dennison
June 24 - Public Star Party at Peach Mountain Observatory
July 1 - Public Star Party at Peach Mountain Observatory

The Kitt Peak Advanced Observer Program

By Clay Kessler – March 28, 2000

Have you ever wished you could drive up to a professional observatory and just use their big telescopes whatever way you want? This is not a total fantasy! Jack Kennedy and I did just this when we made our February trip to Tucson and YOU can too!

(The 4.2 Meter Mayhal Telescope on Kitt Peak)

The National Optical Astronomy Observatories (NOAO) have several large Observatories in the US and South America. The Kitt Peak Observatory near Tucson Arizona is one of the largest. The Observatory maintains a very nice visitor's center and offers tours of the various telescopes on the peak. This makes a nice afternoon by itself and I heartily recommend that you make the trip for this reason alone. So – how do you get them to let you use a scope? Well, it doesn't involve hiding in the janitor's closet until everyone goes home.

The Visitor's Center maintains two outreach programs for the public. The first is called the "Night Observers Program". The goal of this program is to have a mini star party with about 20 people. There is a charge ($25.00 each I think) for this program and it is well worth it. The fun starts about 4:30 in the afternoon and consists of a series of lectures that are equivalent to "Astronomy 101". There is even a box lunch to ward off the "hungries". Once it gets dark everyone is equipped with binoculars and the group goes outside to identify constellations. After the group becomes familiar with the evenings' constellations, they move to the telescope dome at the Visitor's Center.

(Jack Kennedy with the Meade 16" LX200 at the Kitt Peak Visitor's Center)

The Visitor's Center is well equipped with a Meade 16" LX200 mounted in polar mode to a solid pier. This is housed in a large dome with benches for seating. They have ALL the goodies there, ST8E, lots of eyepieces, computer control system, "C" clamps..... and it is wheelchair accessible.

The rest of the evening, until about 10:00 or so, is spent in the dome looking at whatever is up. Planets are popular but the great sky at Kitt Peak allows some wonderful views of deep sky objects. At about 10:00 PM everyone is escorted down the mountain, without headlights. (Sounds like an exciting trip!)

This is a great program but you must have reservations. It fills up early and I don't recommend just showing up and hoping to get a spot – that is rare indeed!

OK, so if everyone gets escorted down the mountain how do you get to use the telescope? If you get reservations well in advance you can participate in the "Advanced Observers Program". In this program up to 2 people can stay for the rest of the night and use the 16" for any observing / imaging project that you want. All of the neat goodies are at your disposal as well as a "Telescope Operator" who knows how to make the most efficient use of all of the hardware and software. Yes, there is a cost for all this - $250.00. Yes, I felt that it was a bargain. When Jack and I were there we got the equivalent of a "Masters" course in color CCD imaging using the ST8E, and the SBIG color wheel. We also learned how to use the LRGB color method and DDP processing to bring out the best in our images. We also learned to use the AO7 active optical guiding unit for micro guiding. I have to complement Adam Block, our telescope operator. He was intimately familiar with both the hardware and the advanced computer processing techniques required to make "world class" images.

There are several "Telescope Operators" and they share this duty on a rotating basis. There is also an element of "competition" between these fellows to produce the best images possible. This is wonderful for the guest observer in several ways. It was a lot of fun listening to the exchange of banter in the evening as recent images were compared. The competitive element also adds to everyone's skill level and makes the overall level of professionalism very high among the Telescope Operators.

Our evening started out cloudy. The NOP people even went home early after attempting to look at Jupiter and Saturn through small sucker holes. We nervously watched weather maps on the internet but Adam confidently predicted clear sky by 10:30. As predicted, by 10:30 we were setting up our imaging run and checking the equipment out. Jack had spent a number of hours planning the list of objects that we wanted to image. Jack is the experienced CCD maven and I was happy to be able to rely on his experienced recommendations. After some discussions with Adam, we chose a small galaxy, with a distinct "S" shape as our first target – NGC 4535.

(NGC 4535 Galaxy - see the front page)

I went into this thinking that CCD is supposed to be easy. A few 5 minute exposures and on to another object – no problem. Man, I found out that taking "World Class" images is a different kettle of fish. If memory serves the 4535 shot has about 150 minutes of total exposure counting darks and flats. This does not include the time spend refining the focus, which was done several times during the imaging run and adjusting the balance for good tracking. (this is where the "C" clamps come in) By the time all of the exposures were taken, and our questions answered, it was time for Adam's lunch and our 3:00 AM snack.

After "lunch", the Hercules Galaxy Cluster was well placed for imaging and the work began again. While the imaging was go-

ing on Adam demonstrated the advanced processing techniques necessary to finish these images off. What an interesting night and what a priceless learning experience! Jack and I finally folded about 6:00 AM and we left Adam to clean up the Galaxy Cluster image. After a nap we packed up and collected copies of the night's work. I learned a lot here and I have a much greater respect for the work that goes into successful CCD imaging. I will do this again, perhaps doing film images instead of CCD, or maybe not – the CCD was fun. This is a wonderful program and I felt the cost was well worth while.

Hercules Galaxy Cluster
(see page 7)

Secrets of Deep-Sky Observing

By Alan MacRobert **(Adapted from Sky & Telescope)**
(Permission was obtained to publish the text, but not the photos and illustrations)

Above: M51, better known as the Whirlpool Galaxy, lies in the northern constellation Canes Venatici, along with its diminutive companion NGC 5195. This is how the pair looked to deep-sky aficionado Roger N. Clark, who observed with an 8-inch f/11.5 Cassegrain telescope at magnifications between 117x and 334x. From Visual Astronomy of the Deep Sky, © 1990 Roger N. Clark.

OKAY, YOU'RE PRETTY SURE you've finally got your telescope aimed at the position of the object of your desire. The crosshairs of your finder are on its exact location according to the map in front of you. Now what can you hope to see?

If it's a bright star it will be obvious and beautiful but contain no detail. A star as seen in a telescope is a tiny blaze of brilliant light looking about the same as a star does to the naked eye, only brighter.

More interesting but generally more difficult are "deep-sky objects." This term covers the vast variety of nebulae, star clusters, galaxies, and anything else beyond the solar system that appears extended: having a visible size, rather than just being a starlike point. Many hundreds of these ghostly glows and subtle spatterings are within reach of a modest telescope.

Once you're precisely aimed you may see, with luck, a very dim, shapeless, glowing smudge floating among the stars. While finding it may bring a thrill of accomplishment, many novices are let down by the sight. "Is that all there is...to galaxies? It's nothing like the pictures in the books!"

You've just come up against the fact that the human eye cannot perform as well as a camera does at very low light levels. We are daytime animals that evolved in the skirts of a blazing sun; our eyes are not well designed for the dark of night and space. Your real-life view of a galaxy will never match the spectacular photos so common in books and magazines. But here lies the challenge. Many deep-sky objects do show a surprising wealth of detail when studied long and well even with the eyes nature gave you.

A telescope serves a different function on deep-sky objects than on the Moon, planets, or scenes on Earth. In those cases, its main purpose is to magnify distant detail. With deep-sky objects, on the other hand, a telescope's main purpose is to collect a lot of light for your less-than-sensitive eye. The issue is not that the objects are too small to see without optical aid. It's that they're too dim.

Accordingly, deep-sky observing involves its own techniques. All are aimed at helping the eye to see in near-total darkness. Here are some pointers.

Sky brightness. The single most important factor in deep-sky observing is light pollution. Its worst effect is on dim, extended objects of just the sort we're considering. A dark sky matters even more than telescope size; a small instrument in the country will show faint nebulae and galaxies better than a large telescope in a city. If you live in a badly light-polluted area, take pleasure in what you can see through the skyglow--but don't blame yourself or your telescope for mediocre results. Plan to bring the telescope on getaways to the country.

Dark adaptation. The eye takes time to adjust to the dark. Your eyes' pupils expand to nearly their full nighttime size within seconds of when you step out into the dark, but the most important part of dark adaptation involves chemical changes in the retina that require many minutes.

After the first 15 minutes in total darkness you might think you're night vision is fully developed, but no. Tests show that your eyes gain about another two magnitudes of sensitivity -- in other words, a factor of six in how faint you can see -- during the next 15 minutes. Thereafter, dark adaptation improves very slightly for 90 minutes more. So don't expect to see faint objects at their best until a half hour or more into an observing session.

In practice, complete darkness is unattainable. Light pollution aside, you need some light to see what you're doing. Astronomers have long used a dim red flashlight because red light has less effect on night vision. The reason is that in near-darkness you see with the "rod" cells in your retina, and these are blind to the far red end of the spectrum. When you see red light your "cone" cells are at work; these are the receptors responsible for normal daytime color vision. (You have three types of cones -- red, green, and blue -- but only one type of rod, which is insensitive to red.) The idea is to use the red cones for reading charts and swapping eyepieces, while protecting the rods for the most delicate work at the eyepiece.

Red paper rubber-banded over the front of a flashlight provides a dim, diffuse glow. In a two-battery flashlight, install a bulb

rated for three or four batteries. Its light will be dim and somewhat reddened, and the batteries will last longer.

Much better than the traditional flashlight and red filter, however, is a red LED (light-emitting diode) flashlight. Its red is purer and deeper, so the division between rod and cone vision is more sharply drawn. LEDs also use much less current, so the batteries last for years. Many LED flashlights for astronomers are now available. Or see the article "Make Your Own Red LED Light."

Another trick for preserving dark adaptation is to observe with one eye and read charts with the other. Keep the observing eye closed or covered with an eye patch when not in use.

Averted vision. When you look directly at something, its image falls on the fovea centralis of your retina. This spot is packed with bright-light receptors, the cone cells, and gives sharp resolution under strong illumination. But the fovea is fairly blind in dim light. So to see something faint, you have to look slightly away from it. Doing so moves the image off the fovea and onto parts of the retina that have more rod cells.

To see dramatically how this works, stare right at a star. It will disappear. Look away a little; there it is again.

Practice concentrating your attention on something a little off to one side of where your eye is aimed. This technique is called averted vision. You'll be doing it almost all the time when deep-sky observing.

Your eye is most sensitive to a faint object when it lies 8° to 16° from the center of vision in the direction of your nose. Almost as good a position is 6° to 12° above your center of view. Avoid placing the object very far on the ear side of your center of vision. There it may to fall on the retina's blind spot and vanish altogether.

In practice, finding how far to avert your vision is a matter of trial and error. Not enough and you don't get the full benefit; too much and you lose resolving power, the ability to see details.

Wiggling the scope. Your peripheral vision is highly sensitive to motion. Under certain conditions, wiggling the telescope makes a big, dim ghost of a galaxy or nebula pop into view by averted vision. When the wiggling stops it disappears again into the vague uncertainty of the sky background.

But under other conditions, especially involving faint objects that appear tiny, just the opposite technique may work. According to Colorado astronomer Roger N. Clark in his 1990 book Visual Astronomy of the Deep Sky, some studies indicate that the eye can actually build up an image over time almost like photographic film -- if the image is held perfectly still. In bright light the eye's integration time, or "exposure time," is only about 0.1 second. But in the dark, claims Clark, it's a different story. A faint image may build up toward visibility for as long as six seconds if you can keep it at the same spot on your retina for that long. Doing so is quite contrary to instinct, because in bright light fixating on something tends to make it less visible with time.

Figure 1 (8K JPEG): M1, the Crab Nebula, as viewed through an 8-inch f/11.5 Cassegrain telescope at 188x. From Visual Astronomy of the Deep Sky, © 1990 Roger N. Clark.

Long exposure times might possibly be one reason why an experienced observer sees deep-sky objects that a beginner misses; the veteran has learned, unconsciously, when to keep the eye still. It also may help to explain why bodily comfort is so essential for seeing faint objects. Fatigue and muscle strain increase eye motion.

Using high powers. Conventional wisdom holds that low power works best for deep-sky viewing. After all, low power concentrates an extended object's light into a small area and thus increases its apparent surface brightness (the illumination of a given area on the retina). But as Clark proved after digging through laboratory vision studies, this assumption is usually false. High powers should do better on many faint deep-sky objects. The reason is subtle but key to understanding how low-light vision works, so we'll go into some detail.

The essential point is that the eye, unlike a camera or other purely mechanical lens system, loses resolution in dim light. This is why you can't read a newspaper at night -- even through you can see the newspaper and your eye lens theoretically resolves all the letters just as sharply as in daylight.

Studies show that the eye can resolve detail as fine as 1 arc minute in bright light but can't make out features smaller than about 20 or 30 minutes wide when the illumination is about as dim as the dark-sky background in a telescope. This is almost the size of the Moon as seen with the naked eye. So details in a very faint object can be resolved only if they are magnified to this large an apparent size--which can require using extremely high power!

The explanation lies in how nature has adapted the visual system to cope with night. Photographic film records light passively, but the nerve system in the retina contains a great deal of computing power. In dim light, the retina compares signals from adjacent areas. A faint source covering only a small area -- such as a small galaxy in the eyepiece -- may be completely invisible at the conscious level. But it is being recorded in the retina, as evidenced by the fact that a larger galaxy with the same low surface brightness is visible easily. In effect, when rod cells see a doubtful trace of light they ask other rods nearby if they're seeing it too. If the answer is yes, the signal is passed on up the optic nerve to the brain. If it's no, the signal is disregarded.

When an image is magnified by high power, its surface brightness does grow weaker. But the total number of photons of light entering the eye remains the same. (A photon is the fundamental particle of light. Most people can detect as few as 50 to 150 photons per second entering the eye.) It doesn't really matter that these photons are spread over a wider area; the retinal image-processing system will cope with them. At least within cer

tain limits. A trade-off is needed to reach the optimum power for low-light perception: enough angular size but not too drastic a reduction in surface brightness.

What does all this mean for deep-sky observers? Simply that it's wise to try a wide range of powers on any object. You may be surprised by how much more you'll see with one than another.

Figure 2 (7K JPEG): M74, a galaxy in Pisces, as seen through an 8-inch f/11.5 Cassegrain at 117x to 188x. From Visual Astronomy of the Deep Sky, © 1990 Roger N. Clark.
One more point: There is a folk belief among observers that a telescope of long focal length (high f/ratio) gives a cleaner, higher-contrast view of dim objects than a short focal-length scope. But f/ratio is not the issue. A long-focus telescope is simply more likely to be used at high power! (It's also more likely to have high-quality optics, because they're easier to manufacture.)

Color. Deep-sky objects sometimes disappoint beginners not only by their frequent lack of obvious detail, but also by the absence of the brilliant colors recorded in photographs.

In order to see color, we must view something with a surface brightness great enough to stimulate the retina's cone cells, and the list of deep-sky objects this bright is short. The great Orion Nebula M42 qualifies (some people can make out the pastel yellow or orange in parts of its brightest region), as do some small but high-surface-brightness planetary nebulae. The ability to see color in dim objects varies greatly from person to person, and surprises may occur.

Averted vision is not the way to look for color. The cones are thickest in the fovea, so stare right at your object. In this case, the lowest useful power should work best.

Heavy breathing. When you pour all your concentration into examining a deep-sky object at the very limit of vision, does it get even harder to see after 10 or 15 seconds while the sky background brightens a little into a murky gray? Diagnosis: you're holding your breath without realizing it.

Low oxygen kills night vision fast. An old variable-star observer's trick is to breathe heavily for 15 seconds or so before trying for the very dimmest targets. And keep breathing steadily while you're looking.

Other tips. Night vision is impaired by alcohol, nicotine, and low blood sugar, so don't drink, smoke, or go hungry while deep-sky observing. Bring a snack. A shortage of vitamin A impairs night vision, but if you've already got enough of it, taking more won't do any good. Virtually no one in the developed world manages to get vitamin-A deficiency any more. So don't expect eating carrots to improve your eyesight.

Prolonged exposure to bright sunlight reduces your ability to dark-adapt for a couple of days, so wear dark glasses at the beach. Make sure the label on the dark glasses says they block ultraviolet light (UVA and UVB); some cheap ones don't. Over the years ultraviolet daylight ages both your eye lens and retina, reducing sensitivity and increasing the likelihood of degenerative diseases. So if you wear eyeglasses outdoors, ask your optometrist to have an ultraviolet-filter coating applied to your glasses. This option is so cheap and easy that everyone buying glasses ought to get it regardless of any immediate medical need.

Figure 3 (10K JPEG): A rich complex of nebulae in Orion, including the Flame (upper left) and Horsehead (lower right), viewed through an 8-inch f/11.5 Cassegrain at 82x to 117x. From Visual Astronomy of the Deep Sky, © 1990 Roger N. Clark.

Taking time. Most of all, be patient. If at first you don't see anything at the correct spot, keep looking. Then look some more. You'll be surprised at how much more glimmers into view with prolonged scrutiny -- another faint little star here and there, and just possibly the object of your desire. After you glimpse your quarry once or twice, you'll glimpse it more and more often. After a few minutes you may be able to see it nearly continuously -- what astronomers call "steadily holding" an object. This where you thought at first there was nothing but blank sky.

You can be sure your observing skills will improve with practice. Pushing your vision to its limit is a talent that can only be learned with time. "You must not expect to see at sight," wrote the 18th-century observer William Herschel, often considered the founder of modern astronomy. "Seeing is in some respects an art which must be learned. Many a night have I been practicing to see, and it would be strange if one did not acquire a certain dexterity by such constant practice."

Alan MacRobert is an Associate Editor of Sky & Telescope magazine and an avid backyard astronomer.

A Comet of Y2000

Credit: International Astronomical Union

C/1999 S4 (LINEAR)
This comet, which is currently 13.0-13.5 magnitude, has the potential of becoming a naked-eye comet. The comet will reach a perihelion distance of 0.77 AU on July 26, 2000 (MPC 38308). The Northern Hemisphere is favored during most of the apparition.
The comet has been be picked up visually. As it slowly brightens, the comet will move into solar conjunction in April 2000. It will emerge in the morning sky at the end of May as perhaps a 9th magnitude object. The comet will brighten rapidly as it moves northward. In mid-July 2000, the comet will be at a high Northern declination (~+65 deg. max.). The comet will move under the pole from the morning sky into the evening sky. At peak brightness, the comet might be magnitude 3.0-4.0...This

range value is extremely uncertain. The comet will then rapidly dive to the south in the evening sky and will fade. There will be a period in late July and August 2000 when the comet is visible from both hemispheres. During this same period the comet will become a binocular object. In September the comet will slip into conjunction with the Sun. When the comet emerges in November 2000, it will be a faint telescopic comet for Southern Hemisphere observers.

C/1999 S4 (LINEAR) ---

Credit: International Astronomical Union and Marsden

Orbital Elements -- The following orbital elements are taken from MPC 38308:

C/1999 S4 (LINEAR)
Epoch 2000 Aug. 4.0 TT = JDT 2451760.5
T 2000 July 26.1674 TT Marsden
q 0.765004 (2000.0)
-0.000003 Peri. 151.0672 +0.3096661 -0.8052814
+/-0.000007 Node 83.1907 -0.9405860 -0.1815295
e 1.000002 Incl. 149.3902 -0.1393012 -0.5644191
From 721 observations 1999 Sept. 27-2000 Feb. 19, mean residual 0".6.

Elements are also available for the current standard epoch:
Epoch 2000 Feb. 26.0 TT = JDT 2451600.5
T 2000 July 26.1600 TT Marsden
q 0.765052 (2000.0)
-0.000125 Peri. 151.0535 +0.3097156 -0.8052319
+/-0.000007 Node 83.1828 -0.9405911 -0.1816357
e 1.000096 Incl. 149.3863 -0.1391570 -0.5644556

Ephemeris of S4

Date TT	R. A. (2000)	Decl.	Delta	r	Elong.	Phase	m1	m2
2000 03 17	01 33.43	+25 45.2	3.028	2.315	37.2	15.1	13.1	
2000 05 26	02 02.66	+31 13.1	2.131	1.361	30.7	22.3	10.0	
2000 05 31	02 05.37	+32 07.0	1.999	1.293	34.2	26.2	9.6	
2000 06 05	02 08.25	+33 09.1	1.858	1.225	37.7	30.5	9.2	
2000 06 10	02 11.40	+34 21.8	1.708	1.158	41.3	35.3	8.8	
2000 06 15	02 15.01	+35 48.8	1.550	1.093	44.7	40.8	8.3	
2000 06 20	02 19.46	+37 35.7	1.383	1.031	48.0	47.1	7.8	
2000 06 25	02 25.44	+39 52.0	1.209	0.972	50.9	54.3	7.3	
2000 06 30	02 34.40	+42 53.2	1.028	0.917	53.3	62.7	6.7	
2000 07 05	02 49.67	+47 06.6	0.846	0.869	54.7	72.7	6.0	
2000 07 10	03 20.64	+53 17.0	0.666	0.828	54.2	85.1	5.3	
2000 07 15	04 41.49	+61 44.0	0.503	0.796	50.3	100.5	4.5	
2000 07 20	08 16.04	+63 08.1	0.392	0.775	42.6	117.4	3.9	
2000 07 25	11 01.02	+41 05.5	0.385	0.765	40.6	120.3	3.8	
2000 07 30	11 56.46	+18 36.4	0.488	0.769	46.8	105.5	4.3	
2000 08 04	12 18.83	+05 13.2	0.648	0.784	50.6	89.7	5.0	
2000 08 09	12 29.65	-02 31.3	0.827	0.811	51.1	76.5	5.7	
2000 08 14	12 35.51	-07 22.0	1.009	0.848	49.6	65.4	6.3	
2000 08 19	12 38.96	-10 39.2	1.188	0.894	47.1	56.1	6.9	
2000 08 24	12 41.21	-13 02.6	1.359	0.946	44.0	48.0	7.4	
2000 08 29	12 42.85	-14 53.1	1.522	1.003	40.7	41.0	7.9	
2000 09 03	12 44.18	-16 22.6	1.675	1.063	37.2	35.0	8.4	
2000 09 08	12 45.38	-17 38.3	1.818	1.127	33.6	29.7	8.8	
2000 09 13	12 46.52	-18 44.6	1.951	1.193	30.1	25.0	9.2	
2000 11 12	12 56.15	-28 45.8	2.781	2.018	32.5	15.3	12.3	
2000 11 22	12 54.98	-30 23.6	2.799	2.152	40.9	17.5	12.6	
2000 11 27	12 53.77	-31 12.9	2.798	2.218	45.3	18.4	12.7	
2000 12 02	12 52.06	-32 02.4	2.791	2.284	49.9	19.3	12.8	
2000 12 07	12 49.77	-32 51.7	2.778	2.349	54.6	20.0	12.9	
2000 12 12	12 46.84	-33 40.6	2.761	2.414	59.5	20.6	13.0	
2000 12 17	12 43.21	-34 28.7	2.739	2.479	64.4	21.0	13.1	
2000 12 22	12 38.79	-35 15.5	2.714	2.543	69.5	21.2	13.2	
2000 12 27	12 33.51	-36 00.3	2.686	2.606	74.7	21.3	13.3	
2001 01 01	12 27.30	-36 42.1	2.657	2.669	80.1	21.3	13.4	
2001 01 06	12 20.11	-37 20.1	2.628	2.732	85.5	21.0	13.5	
2001 01 11	12 11.90	-37 52.9	2.599	2.794	91.0	20.6	13.5	
2001 01 16	12 02.69	-38 19.3	2.572	2.856	96.5	20.0	13.6	
2001 01 21	11 52.49	-38 37.8	2.548	2.918	102.1	19.3	13.7	
2001 01 26	11 41.38	-38 47.0	2.528	2.979	107.6	18.4	13.8	
2001 01 31	11 29.51	-38 45.4	2.514	3.039	113.1	17.3	13.8	
2001 02 05	11 17.06	-38 31.9	2.506	3.099	118.4	16.2	13.9	
2001 02 10	11 04.27	-38 06.0	2.506	3.159	123.5	15.1	14.0	
2001 02 15	10 51.39	-37 27.4	2.514	3.218	128.1	14.0	14.1	
2001 02 20	10 38.70	-36 36.5	2.532	3.277	132.1	12.9	14.2	
22001 04 16	09 13.24	-21 43.9	3.358	3.904	116.0	13.4	15.5	
2001 04 21	09 10.79	-20 33.2	3.477	3.959	111.6	13.6	15.7	

Kensington Event --- April 11 UPDATE

Submitted by Paul Walkowski (current Lowbrow rep to GLAAC)

The July 21, 21starparty at Kensington Metropark is still scheduled, although the Friday evening speaker from Abrahms Planetarium fell through. The Saturday program with Jack Lousma, as arranged by Bernard Friberg, is still on schedule. Both programs are rain or shine. the movie "Comet Odessy" will play every 20-30 minutes throughout both evenings.

A. The Friday 7/21 program looks like:
Friday afternoon -Metropark portable stage set up, movie trailer, Craig Barry brings portable LCD projection screen, PA equipment.
5-7 pm sunspot viewing at the telscopes with a colored helium balloon (and appropriate solar filters).
7 pm Comet making demonstration by Metropark volunteers
7:30 Basic Astronomy Equipment talk - (I did not get his name)
8 pm Light pollution -Norb Vance
8:30 Astronomy 101 -Greg Burnett
9pm - Speaker TBA
9:03 sunset -distribute "Skytour Worksheets" to children (Astronomy
9:30 Tour of the constellations on the beach by either Kevin Denny (sp?) or Mark Deprest
9:30 General viewing of the stars & comet.

B. The Saturday 7/22 Program looks like:
5-7 pm Sunspot viewing @ scopes with balloons
6:30 Comet making demonstration by Metropark volunteers
7pm Basic Astronomy Equipment talk - (I did not get his name)
7:30 Astronomy 101 -
8pm Light pollution -
8:30 -9:30 Talk and Q&A by Jack Lousma, NASA Astronaut
9:30 Distribute "Skytour Worksheets" to children (Astronomy
9:30 Tour of the constellations on the beach by either Kevin Denny or Tom Casper
9:30 General viewing of the stars & comet.

Photos by Clay Kessler
Top - Kitt Peak CCD photo -- Hercules Galaxy Cluster
Above- Milky Way to the South
Right - Milky Way to the North

Announcements

(Some of the items are new and some are a repeat of last months -- BF)

1. On clear nights please **check** your e-mail and/or **call** (734) 480-4514 if you are interested in going to Peach Mountain. Someone may be going.

2. If you are a qualified 24" user and you are planning to go to Peach Mountain to observe, please contact me (BF) so that we may extend an **invitation** to others.

3. Volunteers are needed: I am building a list of checked out members that are willing to host some dark sky observing sessions for members and guests.

4. **FAQs-**

Q -- What is this Kensington event.

A -- A very big event is scheduled at Kensington July 21 & 22, sponsored by the GLACC group. Most of the astronomy groups/clubs in Southeastern MI are part of GLAAC. An article is in this months reflections **(see pg 6).**

Q -- I would like to see the complete Lowbrow **Y2000 schedule.**

A -- Open house/Star party at Peach Mountain: **4/1, 4/8, 4/29, 5/6, 5/27, 6/3, 6/24, 7/1, 7/29, 8/5, 8/26, 9/2, 9/23, 9/30, 10/21, 10/28, 11/18, 11/25, 12/23, 12/30**

Meetings at 130 or 807 Dennison: **3/17, 4/21, 5/19, 6/16, 7/??, 8/18, 9/15, 10/20, 11/17, 12/15.** The July meeting may be rescheduled. Leslie Science Center events:--6/9, 8/4

Q -- I would like to plan a dark sky observing outing to Peach Mountain.

A -- Many outings take place throughout the year and many are arranged on short notice when the sky is expected to be very clear. Planning ahead is definitely encouraged in order to include those that cannot respond on short notice. Please pick out your date or dates (preferably a clear night) that is OK with your group and contact me (BF). We usually extend an invitation to everyone, this includes guests. If the numbers become too large at these events, we may limit the invitations, but so far this has not been much of a problem. The excessive numbers only occurs on open house/star party nights and we (the officers and others) are currently dealing with this and other issues.

Do you have a question? Contact B. Friberg, (BF), Bfriberg@aol.com

5. The policy of no food or soft drinks in the observatory seems to be helping (ie-fewer mice).

6. The main observatory gate chain is being modified by the Astronomy Dept so that one lock cannot lock out the other lock. The Lowbrows have not been the problem this time.

8. Request for historical photos -----

Prof. Pat Seitzer and the Lowbrows are desperately seeking photographs of the 15" reflector and 10" refractor in Angell Hall Observatory (before the recent renovation) . Both telescopes have been removed to storage . Copies of the photos will be made and originals returned. Your name will remain with the photos. They will be used by the Astronomy Dept, sent to the Bentley historical collection and displayed on the Lowbrow web site. Please notify Pat Seitzer and/or B. Friberg if you have these photos in your file.

9. Monthly Meeting, April 21, 2000 7:30 pm, Room 130 Dennison Hall, Physics & Astronomy Building, The University of Michigan

John Kirchhoff (of Ryders Hobby Shop (Livonia), an astronomer himself, and a member of both the Ford club (FAAC) and the Great Lakes Association of Astronomy Clubs" (GLAAC)) is bringing hardware and giving a talk on "New Astronomy Hardware" . He will be bringing a van load of demo items including:

(1) The Teleview 38mm Type 5 Nagler! [No words can describe this eyepiece to end all eyepieces! Doug, this has your name on it.]

(2) The Orion "giant" telescope binoculars 25 x125 mm (recently reviewed in Astronomy. Chris, Lorna are you listening?)

(3) Th Celestron Nexstar 5" or 8" computerized SCTs (See the back cover of Sky and Telescope and review in February, 2000)

(4) The Orion Skyqest Dobs with the altitude spring tensioner (Top rated in last summer's Sky and Tel dob shootout. If you're going to get started, why not start at the top?)

(5) Orion Short Tube - Affordable rich field "Cluster Busters" that goes anywhere in a suitcase!

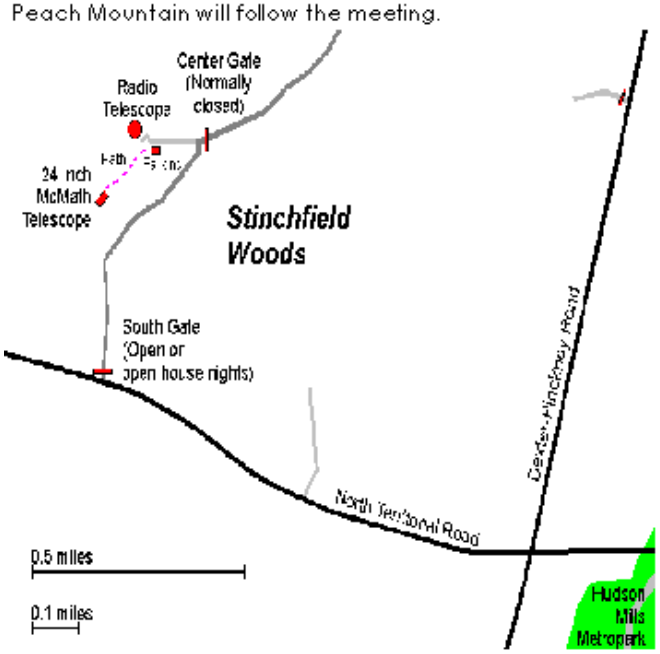
(6) Eyepieces by Kendrich, Orion, Vixen, Teleview Nagler, Celestron.

(7) Digital setting circles for dobs--don't leave home without one!

10. FOR SALE - Meade 8 inch Starfinder Dobsonian telescope. In excellent condition, with all standard equipment and manuals, plus some Orion Telescope extras. Price reduced. For more information and a photograph of the scope, check this URL: http://www-personal.umich.edu/~tgstoner/Dob.html Tom Stoner (734) 663-3232

Places and Times:

Dennison Hall, also known as The University of Michigan's Physics and Astronomy building, is the site of the monthly meeting of the University Lowbrow Astronomers. It is found in Ann Arbor on Church Street about one block north of South University Avenue. The meeting is held in room 807. Monthly meetings of the Lowbrows are held on the 3rd Friday of each month at 7:30 PM. During the summer months, and when weather permits, a club observing session at Peach Mountain will follow the meeting.



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

Public Star Parties:

Public Open House/Star Parties are held on the Saturday before and after each new Moon at the Peach Mountain Observatory. Star Parties are canceled if the sky is cloudy at sunset or the temperature is below 10 degrees F. Call 480-4514 for a recorded message on the afternoon of a scheduled Star Party to check on the status. Many members bring their telescopes and visitors are welcome to do likewise. Peach Mountain is home to millions of hungry mosquitoes - bring insect repellent, and it does get cold at night so dress warmly!

Amateur Telescope Making Group meets monthly, with the location rotating among member's houses. See the calendar on the front cover page for the time and location of next meeting.

Membership:

Membership dues in the University Lowbrow Astronomers are $20 per year for individuals or families, and $12 per year for students and seniors (age 55/+). This entitles you to the monthly REFLECTIONS newsletter and the use of the 24" McMath telescope (after some training). Dues can be paid to the club treasurer Doug Scobel at the monthly meeting or by mail at this address:

1426 Wedgewood Drive
Saline, MI 48176

Magazines:

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

Sky and Telescope: $29.95 / year
Astronomy: $29.00 / year

For more information contact the club Treasurer. Members renewing subscriptions are reminded to send your renewal notice along with your check when applying through the club Treasurer. Make the check payable to "University Lowbrow Astronomers".

Newsletter Contributions:

Members and (non-members) are encouraged to write about any astronomy related topic of interest. Call or E-mail to Newsletter Editors at:

Bernard Friberg (743)761-1875 Bfriberg@aol.com
Chris Sarnecki (734)426-5772 chrisandi@aol.com

to discuss length and format. Announcements and articles are due by the first Friday of each month.

Telephone Numbers:

President: Mark Deprest (734)662-5719
Vice Presidents: Lorna Simmons (734)525-5731
Dave Snyder (734)747-6537
Paul Walkowski (734)662-0145
Treasurer: Doug Scobel (734)429-4954
Observatory Director: Bernard Friberg (734)761-1875
Newsletter Editors: Chris Sarnecki (734)426-5772
Bernard Friberg (734)761-1875
Keyholders: Fred Schebor (734)426-2363
Mark Deprest (734)662-5719

Lowbrow's Home Page:

http://www.astro.lsa.umich.edu/lowbrows.html
Dave Snyder, webmaster
http://www-personal.umich.edu/~dgs/lowbrows/

This months newsletter assembled by BF

Monthly Meeting
April 21, 2000 7:30 pm
Room 130 Dennison Hall
Physics & Astronomy Building
The University of Michigan

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(see Pg 8)

Photo by Mark Deprest
The lineup of the planets; Saturn, Jupiter and Mars with the Moon, taken April 6 ,2000.

UNIVERSITY LOWBROW
ASTRONOMERS
3684 Middleton Drive
Ann Arbor, Michigan 48105