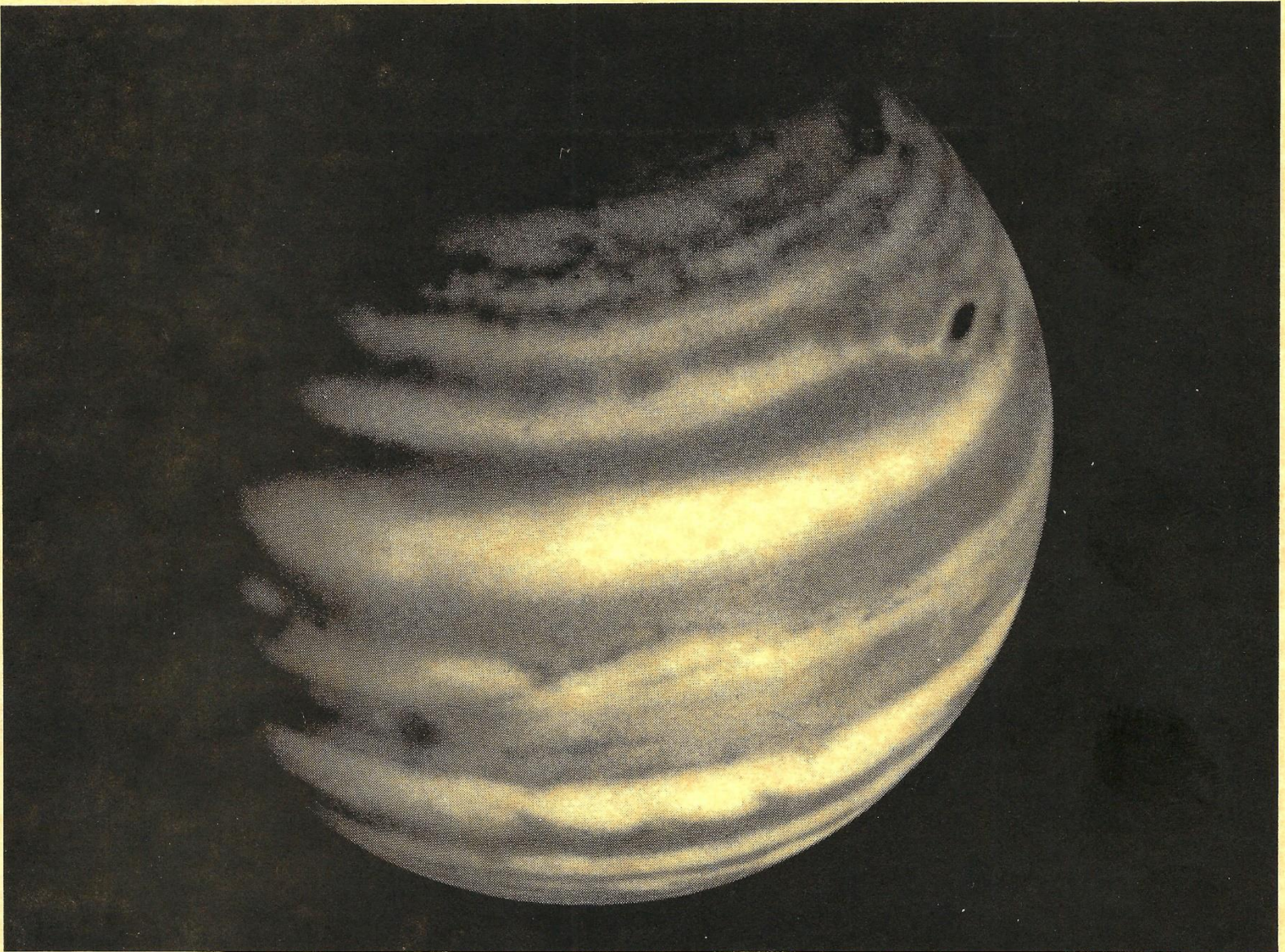


THE WASP

The Warren Astronomical Society
P.O. Box 474
East Detroit, Michigan 48021



Jupiter, showing the little Red Spot.

Model & photo by Roger Civic

Feb. 1979

**THE WARREN ASTRONOMICAL SOCIETY
PUBLICATION**

This Month...

FEB 1979

Editor – Jeff Stanek
751-1673

Assistant Editor – Brad Vincent
751-8506

SOCIETY INFORMATION

The Warren Astronomical Society (W.A.S.) is a local, nonprofit organization of amateur astronomers. The Society holds meetings on the first and third Thursdays of each month. The two meeting locations are listed below:

1 st Thurs.	Cranbrook Institute Of Science 500 Lone Pine Road Bloomfield Hills, MI	3 rd Thurs.	Macomb County Community College – South Campus K Building 14500 Twelve Mile Road Warren, MI
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Membership is open to those interested in astronomy and its related fields. Dues are as follows and includes a year subscription to Sky & Telescope Magazine:

Student - \$11.00	College - \$13.00	Senior Citizen - \$15.50
Individual - \$18.00	Family - \$23.00	

STARGATE LECTURE SCHEDULE

Chairman- Dennis Jozwik- 754-2037

Lectures are given at Stargate Observatory each weekend. The lecture will be either Friday or Saturday night, depending on the weather and the lecturers' personal schedules. If you cannot lecture on your scheduled weekend, please call the Chairman as early as possible so he may arrange for a replacement. Those wishing to use Stargate must call by 9:00 p.m. on the evening they plan to go out. The lecturers for the coming month are as follows:

Feb 3/4	Ray Bullock, 879-9458
Feb 10/11	Bob Dennington, 779-6354
Feb 17/18	Lou Faix, 1-781-3338
Feb 24/25	Dave Harrington, 879-6765

WAS Exchange

FOR SALE...8" f/6 reflector with 2.14" diagonal, mounted in 10" diameter tube – 50" long, no eyepiece focusing mount. Price \$100. Also 4" O.D. - 24" long, black iron stand that is ready to accept 3 legs and equatorial head (Pacific) for \$10; plus, a 22½ lb. counterweight with 1" hole and screw clamp for - \$10. Contact Roger Civic, 776-1673.

FOR SALE...3" refractor in very good condition. Completely equipped with the following: equatorial mounting with setting circles, three eyepieces, star diag., 2X Barlow, 6x30 finder, erecting prism, sun screen projector and accessory tray. Price - \$250. Contact Jeff Stanek. 751-1673.

FOR SALE...6" f/10 telescope. Good condition. Mounted on a lightweight tripod and equipped with clock drive. Price- \$250. Contact Joe Tocco, 573-8547.

FOR SALE...Focal 400 film, fresh (dated July '79). 20 exposure roll including processing, \$4.25 per roll. Limited quantity. Call Dennis Jozwik, 754-2037

WANTED... Complete equatorial mounting for 6 inch reflector. Call Beverly Wicks at 474-7234.

WANTED... 4¼" or 6" reflector in good condition, preferably with mounting. Call Jim Pintkowski, 879-0588

THE FOLLOWING ARE THE MINUTES OF THE NOVEMBER 16, 1978 MEETING OF THE WARREN ASTRONOMICAL SOCIETY:

Our President Dave Harrington opened our meeting at 8:20 p.m., by welcoming new members. Robin Bock, treasurer, reported a \$193.49 bank balance and urged all to bring their dues up to date. It was announced that the January program would feature Doug Bock, Roger Civic and Carl Noble. Bob Shannon took the floor to display a copy of "Telescope News", a publication offering their services in buying and selling telescopes and equipment. Frank McCullough spoke on plans for the annual Christmas Banquet. Antonio's in Harper Hoods is the site and December 14 is the date. He urged everyone to make early reservations.

Volunteers are needed to man the Naval Research Lab at MSU. Students or enthusiasts are needed for 31 observing nights in January. Russ Carroll is taking names.

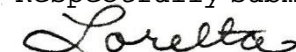
Mention was made that Warren Astro was again mentioned in Sky & Telescope Magazine. Roger Civic announced the forthcoming Venus Probe descent which is scheduled for December 4 to 9 and also on December 21 to 25th. Dennis Jozwik, Observatory Chairman, spoke on plans for the winter season at Camp Rotary. The Rotarians will allow the use of their new building for meetings and slide shows during the months of January, February and March.

Dennis J. was the first program speaker. His topic: A new lens for astrophotography explained the advantages of the 135 mm lens, called F18.. His slide presentation was super crisp, short and informative.

Roger Civic, our second speaker, previewed his January talk on Mars. Use of 20 inch Mars globe will enhance his presentation. Lou Faix then gave an exciting lecture on his portable observatory which he constructed on his home grounds. Slides depicted his project and also fellow members who helped him. Intermission was called at 9:15.

John Searles spoke on his singular study of Variable Stars. He discussed two stars which he had been studying. He described their pulsations and eclipsing. It was estimated that there are 32,00 variable stars in the universe. His research and work, which took him one and half years included Observational data on short term variables, star charts and time conversions. Tim Skonieczny then spoke on "eclipse 1979 and Its Probable Weather." He projected temperature and cloud possibilities plus hints on suitable attire for the north Canadian site. Doug Bock was our last speaker and offered a NASA movie entitled "'Th Moon Old and New". The meeting was closed at 10:50 p.m., and members adjourned to Denny's Restaurant for further, more informal discussion of astronomical subjects.

Respectfully submitted,


Loretta D. Caulley, Secretary

THE APPRENTICE ASTRONOMERS NOTEBOOK

Lou Faix

I would like to be able to tell you that I have made a great discovery---that the sky is made of rubber. I would like to tell you that but it isn't true. I didn't discover that the sky is made of rubber---James Bradley did -- 250 years ago.

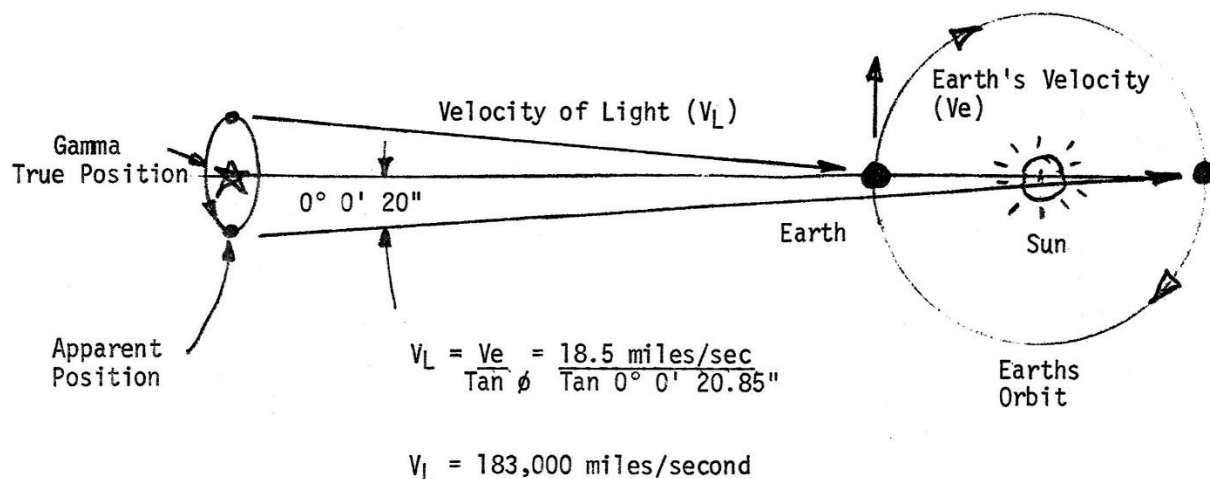
So who is James Bradley? Well, he lived from 1693 to 1762 and was the second man to measure the speed of light (big deal - who was the second man to fly the Atlantic). He was also the Astronomer Royal of England in 1742 and discovered the nutation movement of the Earth's axis.

No doubt you recall vividly how Ole Roemer (1644-1710) first computed the speed of light by observing the eclipses of Jupiter's moon Io. He had noted how the predicted timings could be off by as much as seventeen minutes depending how far apart Earth and Jupiter were. Reasoning that this variation represented the time required for light to travel the diameter of the earth's orbit (He believed in Copernicus's theory), he computed the speed of light as 140,000 miles/second. His 22% error is attributed to a lack of precision in the Sun to Earth distance as it was known in early 18th century.

Bradley computed the speed of light as 183,000 miles/second, very close to the true known velocity. The interesting thing is that he never set out to measure the speed of light; he sort of stumbled over it. Actually, a well to do English amateur astronomer named Samuel Molyneux, played a key role in Bradley's measurement of light. Molyneux was a local politician and allowed Bradley to use his private observatory at Kew which is near London. Mr. Bradley originally set out to measure stellar parallaxes in hopes of being able to determine the distance to other stars. His reason that movement of our planet in its orbit should cause nearby stars to appear to move in the sky relative to further away background stars. Believing that the visual effect would be maximized for a star near the poles of the ecliptic he selected Gamma Draconis as one of his study objects. That star should appear to rotate around a point in space if it wasn't too far away. Just as a check he picked a few other stars near the plane of the ecliptic and reasoned that they should exhibit ~ back and forth motion in a straight line in six months' time. Well, the stars along the path of the ecliptic did move in a straight line but in the wrong direction and at the wrong times. Gamma Draconis did move in a circular path however; only it moved too much and in the wrong direction. (Doesn't anything ever work right?) It was as if the sky was made of rubber. The stars near the ecliptic zigged one way while the stars overhead all zagged another way. Just imagine the stars being attached to a great rubber sheet that could stretch and distort. Perhaps a lesser man would have kicked the telescopes, cursed nature and turned to a life of drink and merriment. But not our hero; no sir! Big Jim hung in there and kept making all kinds of crazy measurements. He determined that Gamma Draconis was gyrating in a circle with a radius of twenty arc seconds.

While trundling home one morning in the rain after an all night session at the telescope, he walked smack into an English Bobby, stuck his umbrella in the constables ear and fell into the gutter. Well, his clumsiness got him thirty days in the Londal Tower (better known as the slammer) on a charge of D and D (drunk and disorderly). Of course, our man hadn't had so much as a taste of the grape that night so his head was clear enough that he could figure out how he got into such a mess. The rain was coming straight down and he was walking quickly. His speed was fast enough that he had to tip his umbrella slightly, forward to keep the rain off his trousers. We're all familiar with how the rain appears to come straight down if we're in a car that is stopped but how the rain then appears to slant as soon as the car is in motion. The faster the car goes the steeper the angle the rain appears to fall at. When he tipped his umbrella enough to allow for his forward motion, couldn't see where he was going and stuck the umbrella tip in the constable's ear and the speed of light is therefore 183,000 miles per second.

Actually, it wasn't quite that simple. Bradley had to figure out that the Earth's orbital velocity was about 18.5 miles per second. He also had to know that just as a duck hunter has to lead his bird with his shot, he had to "lead" Gamma Draconis by 20 arc seconds. How much the hunter must lead his game depends on the speed of bullet, the speed of the bird and the angle between their lines of motion. Since Gamma Draconis is nearly straight above the center of the Earth's orbital plane, Jim knew that the angle of approach was nearly a right angle. All he needed now was a little trigonometry.



No my friends, James Bradley did not discover that the sky was made of rubber. He did discover the Aberration of Star Light, which was the first observational proof that the Earth orbited the Sun and not vice versa. He also made the first accurate determination of the speed of light.

Nice going Jim!
(but watch where you're going)

P.S. My apologizes to true students of history, but the story needs some help.

How to Miss an Occultation Without Really Trying

The holidays this year were a little special for me, Besides the usual gift giving and gatherings with relatives and close friends, a celestial event highlighted the season. The occultation of Venus by the moon around 6:00 am on Dec. 26th. I left my sister's house in Sterling Hts. about 7:00 pm Christmas Day after a 10 Lb. dinner. I nearly walked into my car after gazing upward and noticing a remarkably clear sky, I was screeching onto Schoenher when a thought occurred to me, Why rush home to my 4¼" Astroscan when our editor possesses a Noble 8" telescope?

I sailed on two wheels into his driveway and was shocked to see an empty backyard! Leaping to the door, I entered his humble abode to find him sitting in his room, losing a game of RISK to his brother, Upon informing him of the condition of the heavens, he grabbed a coat and we proceeded to prepare his portable observatory for a 15 degree night of stargazing.

After assuring accurate collimation and polar alignment, we began to pick out several interesting objects. With Orion shining in the East, a visit to M42 was in order. The Pleiades proved to be a bit large for our field of view. Being that the finder scope was under repair, several, objects were a challenge. We decide that 20 minutes was a bit too long to search for M31 and moved on. Actually, our editor decided I had wasted too much time, and let me know with 500 candlepower down the tube.

Once I regained my sight, I gave him a thorough thrashing, from whence he crawled. to the eyepiece to seek Jupiter. He had to wait until it emerged from its occultation (the neighbor's chimney) to get it in sight. Blazing away at 280x, it made the cold night worth it. When 11:30 rolled around, we packed things up.

It was suggested I spend the night in order to see Venus disappear in the 8" scope. I said, "Why not." Due to the other rooms and couch being taken, I had to share our editor's room. The editor slept like a log, tumbling down the Au Sable! I realized it would be a rough night the 3rd time I picked myself up off the floor. If it wasn't waking up shivering (someone else had the covers), it was being talked to or yelled at in the middle of the night. I was called both his brothers and pet dogs names during the evening. Total sleep time was 2-3 hours. When the alarm finally went off at 4:30 am (time flies only when you're having fun), I crawled to the window to see the most beautiful sight.

Horizon to horizon cloud cover!

Never have I seen such a perfect overcast condition. Not a single border in the white was to be seen. I went back to bed to toss and turn until 10:00. Seven hours of sleep lost for what? After thinking about it, I realized I had seen an even better event. A double occultation. Venus covered by the moon, covered by the clouds. It won't make a big dent in the annals of astronomy, but it gives me an excuse for those seven hours of sleep (I think).

Brad Vincent

CONSUMERS CORNER

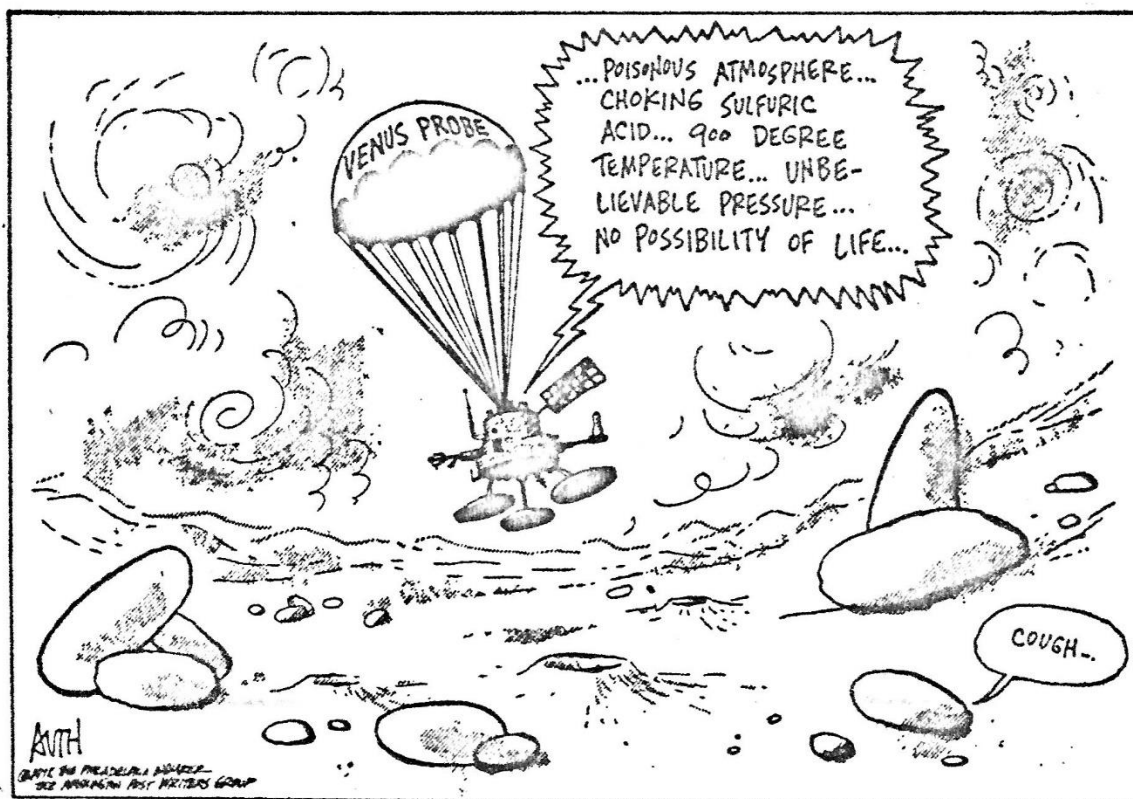
by Jeff Stanek & Carl Noble

8 x 50 mm Finder scope,
Meade Instruments Corporation

A beautiful finder scope that will enhance any telescope. I knew when I purchased this instrument it would yield beautiful views, but I had no idea it would be this nice. On the first clear night after I bought the 8 x 50, I dragged it out and put it on my 8" scope. I was amazed at how nice a view I saw. There were scores of stars in the field of view. The detail it brings out is fantastic. You can see: Jupiter's moons, double stars, open clusters, and most of the Messier objects. A 6 x 30 finder scope does not even compare with 8 x 50 in respect with the views you can see with both.

The Meade 8 x 50 finder scope comes in two versions. Model 516 is a right-angle finder while 520 is straight through. When I describe the finder, the description will do for both.

The 8 x 50 comes with a coated achromatic objective which is a full 50 mm (2") in clear aperture. It produces sharp, brilliant images to the very edge of the field. That might be hard to believe, but it is very true. The finder comes with Meade's newly designed Kellner 30 mm, Extra Wide-Field eyepiece with crosshair reticle. This produces an actual, field in excess of five degrees, with fine field corrections and long eye relief. The right angle finder can be equipped with an eyepiece holder for straight through viewing. The price for the straight finder is \$33.95 while the right-angle is \$39.95. If you want to buy an excellent finder for your telescope, this is the one for you.



Pioneer Venus:

It was a veritable invasion of Venus, complete with strategy, tactics and three coordinated assault waves involving the most concentrated armada of spacecraft ever sent from earth to another planet: six, all of them arriving in less than a single week, five in less than two hours.

The first member of the Pioneer Venus fleet took up station around the planet on December 4, following a critical firing of its engine that had to take place while Venus was blocking radio contact with tense flight controllers at the NASA Ames Research Center in California. Entering an orbit that took it as near as 378 kilometers to the haze-wrapped world's surface (and as far as 66,000 km), the craft began a cautious descent: Its next close encounter, a day later, was lowered to 250 km, a drop of 128 km, but the following day's shift was only 50 km. Then 20 more, then 10, then 5, and 5 again, gingerly dipping a well-instrumented toe ever deeper into the fringes of the much studied but little understood atmosphere. The goal: a plunge to or near the 150-km level on each of the 225 terrestrial days making up a full Venus year.

The atmosphere is unquestionably the star of the show. Largely carbon dioxide with hazes of sulfuric acid and other vitriolic constituents, it had already been probed from earth and *in situ*, but Pioneer Venus (and two Soviet lander-flyby combinations now on their way) have much to add. Though differing sensors have produced initially conflicting reports on the atmosphere's composition (some key analyses have yet to begin), there are intriguing highlights. Prominent is the case of argon, a constituent of interest in part because while its most common present isotope — argon 40 — is produced by the decay of potassium-40, other argon isotopes are believed to be survivors of the original mixture of materials in the cloud from which the solar system condensed. Argon is chemically inert, preventing it from being bound up in compounds such as oxides, and too heavy to escape into space; thus its primordial isotopes are considered one of the keys to deciphering the materials available when and where the planet in question formed.

Another key element on Venus is sulfur, suspected to exist in various forms and believed by some to account for the dark streaks in computer exaggerated versions of ultraviolet images returned by the Mariner 10 spacecraft (since sulfur is an absorber of UV). Although early analyses this week were just beginning to reveal the possibly wide range of sulfur compounds in the atmosphere, even the first of the Pioneer Venus orbiter's UV images added interest by failing to show the dark markings, an indication that they may occur below an overlying haze layer.

Also intriguing, the descending probes

revealed the atmosphere's particles and droplets to be grouped in several discrete size ranges — an odd finding made even stranger when all the particulates seemed to abruptly disappear below about 45 km, the bottom of the main haze layer. The thick yet surprisingly clear atmosphere beneath, says Robert Knollenberg of Particle Measuring Systems, Inc., is "immaculate."

As for the surface of the planet, Pioneer Venus carries the one known eye that can "see" it from orbit: radar. A tiny swath of the surface is covered each day by the instrument, leading — after lengthy and careful processing — to both images (not photos, but representations of radar brightness) and elevations. Both components are necessary if scientists are to reduce the great uncertainty about the surface of Venus — just one of the many long-range goals of the Pioneer Venus mission. □

12-23-78

So many scientists are working on the voluminous data from the various spacecraft of the Pioneer Venus project that it's not surprising that one of them actually said it: "The more we learn, the less we know." Five probes penetrated the atmosphere and an orbiter circles the planet (SN: 12/16/78, p. 420), perhaps providing a greater surfeit of riches in a short time than any other interplanetary mission to date, including Viking. At this early stage of the game, preliminary and conflicting results offer ammunition for almost any side of one's favorite hypothesis, salted with surprises and mysteries — yet through it all, an enriched portrait of Venus is beginning to emerge.

Does the so-called "greenhouse effect," for example, really account for the planet's Hadean temperatures, blocking the re-radiation from the surface of energy initially absorbed at shorter wavelengths from the sun? "The greenhouse looks good," says James Pollack of the NASA Ames Research Center, control site for the mission. If so, a key factor is water vapor in the atmosphere, narrowing the range of wavelengths at which energy can escape. But one set of Pioneer Venus instruments recorded only a few tenths of a percent of H₂O, perhaps too little (by some reckonings) to do the job, while other sensors showed several percent, more than enough for the task — and perhaps too much to be real. Complicating the picture is the planet's variety of hazes, particles and clouds, which the data suggest to be not a dominant factor, but at least relevant in trapping heat generated in the atmosphere's mid-levels.

Important to an understanding of the atmosphere is the turbopause, apparently about 144 km above the surface, atop which gases separate by molecular weight, some of them escaping into space. Instruments aboard the orbiter have begun mapping their behavior, noting the huge hydrogen cloud that surrounds the planet

and fueling studies of whether Venus once had vast quantities of water that have since escaped. The hydrogen has been found to escape rather slowly, but it is still a question whether hydrogen was always rare (not much water to provide it) or is simply depleted. Below the turbopause, in the well-mixed portion of the atmosphere, instruments detected about 60 parts per million of oxygen, surprisingly high compared to the amount observed at loftier altitudes but not enough to account for a vanished "ocean" of water. If abundant water was once present, suggests Thomas Donahue of the University of Michigan, perhaps some oxygen may exist in an oxidized crust, although it would take an improbable amount of geologic thrashing to expose enough crustal material to hold the requisite amount.

Appropriately for the hellishly hot world, a significant factor in its atmosphere is sulfur in a variety of forms. A high haze of sulfuric acid droplets, measured by Pioneer Venus, had already been detected from earth (which has a lesser amount in its own atmosphere). In addition, there is about 240 parts per million of sulfur dioxide, and the project's scientists are now unraveling data that seem to indicate hydrogen sulfide, carbonyl sulfide (COS) and a variety of other versions including elemental sulfur itself. Early analyses suggest that the sulfur in the low levels of the hazes and clouds may be in liquid form, while higher up it is solid. Complex models of the atmospheric chemistry of Venus were around long before this mission, but the details of what compounds exist at what altitudes and in what concentrations are critical to the understanding of a system that is so different from earth's.

Except for the surprisingly "clean" bottom few tens of kilometers of atmosphere, the hazes/mists/clouds are everywhere. Yet according to Robert Knollenberg of Particle Measuring Systems, Inc., many are so diffuse that in places they would permit visibilities of tens to hundreds of kilometers, were it not for the dense gases making up most of the atmosphere. A region about 49 to 52 km above the surface, he says, contains "the only layer that really looks like a cloud."

The invisibility of the surface of Venus to an outsider, in fact, may be misunderstood if it is attributed solely to notions of "the cloudy planet." Even with no such features, says James Hansen of the Goddard Institute for Space Studies, the density of the atmosphere (measured near the surface by two of the probes as 90.5 and 91.5 bars) would bend light so sharply from a straight path that an observer gazing down from orbit might see no planet at all. Looking down on even a haze-free Venus, one infers, might be like looking at empty sky.

Well down in the atmosphere, of course, the planet would be conspicuously visible — along with, perhaps, one of the Pioneer

Venus mission's major surprises. On the two probes that descended over the night-side, says Boris Ragent of NASA Ames, instruments detected "a very faint glow," beginning about 12 to 15 km up and getting slightly stronger near the surface. Problems with the instruments, Ragent believes, are unlikely. Two fascinating alternatives suggest themselves: In the intense heat and other exotic conditions near the surface of Venus, either the surface or the very "air" itself could be aglow. Atmospheric chemoluminescence is certainly a possibility, says Michigan's Donahue, though the molecules and processes that would cause it have yet to be positively identified. If the surface is to blame, still more work remains. The Pioneer Venus probes, after all, were neither instrumented nor even intended as landing craft.

The latest pair of Soviet Venera space vehicles, however, are. On Dec. 21, less than two weeks after the U.S. probes did their work, the first of the Soviet vehicles descended to the surface of Venus, lasting, according to initial reports, for what would be a record-setting time of nearly two hours. Hot on its heels was the second lander, due to touch down on Christmas Day. According to several U.S. Pioneer Venus scientists who have been in touch with their Soviet counterparts, the landers were said to be equipped with instruments considerably improved in sophistication over their predecessors.

Relaying communications for each lander, furthermore, was the "fly-by" craft that had brought it from earth (also reportedly making X-ray, gamma-ray and other astronomical observations on the way). The U.S. and Soviet data on Venus are likely to be shared to a degree, but U.S. scientists were also hoping that coordinated measurements of the solar wind could be made with the Pioneer Venus orbiter and the Venera fly-bys. Their interest was heightened when the sun, relatively quiescent for six days following the orbiter's arrival, abruptly kicked up no fewer than three large flares on successive days. The solar wind could be particularly significant to Venus, which is only poorly protected by its weak magnetic field, and the increased solar wind accompanying the first flare, says Christopher Russell of the University of California at Los Angeles, drove the planet's intervening magnetic "bow shock" to within 250 km of the top of the ionosphere. □

1-6-1979

Soviets Report Lightning on Venus

On Dec. 21, only days after five U.S. probes had plumbed the atmosphere of Venus, the Soviet Venera 12 landing craft settled with a bump onto the haze-

wrapped planet's sunlit side. Out of sight of earth and depending on a passing mothership for communications relay, it provided only 110 minutes of data after landing in the hellish environment, but the brief report was enough to set a new record for survival on Venus, eclipsing by three minutes the 1972 mark of Venera 8. Then, on Dec. 25, came the landing of Venera 11, which touched down about 800 kilometers from its twin and added another 95 minutes of data to the store.

Venus, of course, made its presence known as only it can. The first lander reported a surface pressure of 88 atmospheres and a temperature, "during the last minutes before touchdown," of 460°C (860°F), according to a Tass report. The second craft indicated an identical pressure, although the post-landing temperature, Tass said, was only 446°C (835°F). In addition to these and other measurements, however, the landers made another contribution, described by Soviet Inter-cosmos Council chairman Boris Petrov as "radically new data," and by several U.S. scientists contacted by SCIENCE NEWS as "exciting," "wonderful" and "fantastic": lightning—and, according to Soviet press accounts, a lot of it.

The instruments aboard the descending landers were reportedly activated about 62 km above the surface, a few kilometers lower than those aboard the U.S. Pioneer Venus probes. The action, however, was considerably farther down, beginning, according to the Novosti Press Agency report, when Venera 12 was about 10 km above the surface. "The descent," reported Tass, "took place in 'unclement weather.' The *groza* [thunderstorm] instrument recorded fairly frequent electrical discharges in the atmosphere during the descent. One weighty discharge made the surroundings resound for 15 minutes after the device had landed."

The existence of lightning on Venus is not entirely unexpected, according to several U.S. scientists. The source, however, is likely to raise considerable question. Data from past Veneras have indicated, for example, that the low-altitude winds are very slow, presumably inhibiting friction and similar effects. Dust particles rubbing together could build up charges, but the Pioneer Venus probes found the bottom 35 to 45 km of atmosphere to be almost totally free of particles. The sulfuric acid in the upper atmosphere would be a good candidate as an electrolyte—it is, after all, found in car batteries—but it too seems to be primarily confined to high altitudes.

"These electrical-storm discharges," said Petrov in an interview with a Soviet correspondent, "have been recorded both at very high frequencies and at relatively low ones. This indicates that the atmosphere of Venus is a dynamic and very complex formation, and which is alive and in which processes take place in a far more active way than [in] that of the earth."

Yet it was not precisely clear from early accounts just what the Veneras had found, particularly the reference to making "the surroundings resound for 15 minutes." The landers were said to carry both electric-field detectors and acoustic devices (suggesting something like microphones to listen for thunder), but what kind of electrical or acoustic effect would last that long on Venus? On earth, says James Warwick of Science Applications, Inc., the electromagnetic "whistlers" produced by lightning bolts last perhaps tens of seconds at the longest, as they "mirror" back and forth on the planet's strong magnetic field lines. But the magnetic field of Venus is extremely weak. Thunder, reverberating for 15 minutes is a stunning concept, yet one might expect the dense Venusian atmosphere to dissipate acoustic energy more readily than does earth's. Whatever the answer, says Warwick, the existence of lightning on Venus would indicate that "the range of conditions under which lightning is expected to occur in nature is much greater than we have thought."

Scientists have also speculated on the possibility of lightning on Jupiter, and the U.S. Galileo orbiter-and-probe, to be launched in a few years, is planned to carry a lightning detector down into the Jovian atmosphere. As for Venus, further data will probably depend on Soviet spacecraft. The U.S. Pioneer Venus orbiter still circles the planet, but according to Frederic Scarf of TRW, Inc., symptoms of lightning are probably unable to get above the substantial ionosphere. In the works, however, is a Soviet-French mission in which balloons are to be deployed in the Venusian atmosphere for a few days of constant data-gathering.

Also significant could be the effect of lightning on the planet's bizarre atmospheric chemistry. "If you think of it as a quiescent atmosphere," says one U.S. researcher, "you could get very wrong results."

In addition to the lightning measurements, the landers measured the atmosphere's composition and structure, in many ways similarly to the studies by the Pioneer Venus probes. One significant finding by the Soviet craft supported a Pioneer Venus measurement that has been controversial because it conflicts with data from another sensor (SN: 12/16/78, p. 420): "The ratio of argon 36 to argon 40 on Venus," says a Tass report, "was 200 to 300 times higher than on earth," which could bear on differences in the primordial mixture from which the planets formed.

Were there any photos from the latest landers? They carried cameras, and U.S. scientists this week were still trying to find out.

TAKEN FROM SCIENCE NEWS
BY ROGER CIVIC

SOME COMMENTS REGARDING THE MOST CRITICAL PERIOD IN OBSERVING AN ASTRONOMICAL EVENT

by David L. Harrington

"It's 4:20 in the morning, on a workday in January; I must be out of my mind! This is no time to get up, even for an occultation of Venus." Have you ever had a conversation with yourself that sounded like this? Of course you have! For this is what I have found to be the most critical time in observing an astronomical event, and it has a profound influence on whether or not the event is seen. It is called "getting out of bed in the middle of the night". Have all of us not failed at one time or another to make it through this critical period?

On these occasions, with eyelids heavy, and mouth dry, it is as if we have a split personality, with a devil on one shoulder, and an angel on the other. I have noticed that whether the event is a conjunction of Mars and Saturn, Comet West, an occultation of Venus, or any of a dozen other astronomical occurrences that require the overcoming of human inertia on a cold winter's night, the conversation is always basically the same between the devil and angel. The devil invariably speaks first, usually within a few seconds after the alarm goes off; "This is utterly ridiculous, Dave; only a fool would get up and tromp outside in the middle of the night. My god, it's five below zero out there with twelve miles per hour winds! I'd get back under the warm covers if I were you." Then, just as I start to pull the warm covers back over myself, the angel makes a comment: "Come on, Dave, this is the last time this event occurs until 1983. You'll regret it if you don't get up."

"Don't go for that baloney," replies the devil, "you're probably the only idiot in the entire club who is even thinking about getting up. If you've seen one occultation, you've seen them all. It's probably cloudy anyway!"

"Ignore him," says the angel. "Get up and get dressed. You're wasting valuable time."

"It will all be for nothing," says the devil with a knowing sneer. "It's bitter cold outside and you know that it's always cloudy this time of year. Besides, you've got time for at least another half hour of sleep; why not reset the alarm?"

"Don't let him talk you into that!" says the angel, sensing that the devil is winning. "You've only got 40 minutes as it is, and you have to set up your telescope."

"Listen Dave," says the devil, grabbing my earlobe, "this isn't exactly the big-bang event or a supernovae. It's only a measly occultation. Why not observe with just binoculars for a change? Why bother with all that equipment; you'll just have to tear it all down again when you're done!"

"You should get photographs through the scope" says the angel logically, "...something to send in to the astronomy magazines."

"Now that's a laugh," says the devil, grinning and poking me in the neck for emphasis. "They'll never publish anything that you send in anyway. You would be much better off going back to sleep."

"Remember 1970," says the angel, "When you didn't get up to see Comet Bennett. Don't forget how you have regretted that."

"Oh, there's always another comet and another occultation," says the devil, refusing to give up. "I'm sure there will be 3 or 4 more this year, at least. Besides, you can always tell everyone that you saw it anyway. They'll never know that you slept in!"

Well, in this particular instance I finally took the angel's advice and got out of bed. I saw a nice disappearance of Venus behind the moon before the clouds rolled in, but did not observe through the scope. On that I took the devil's advice and merely observed with binoculars. Thus, this event would have to be rated as a 60/40 success at best.

Comments... (continued)

With the above transcript of a typical event now made public for the first time, what, if anything, can be done to reject the devil's influence during these critical periods? I believe that number one on the list is ... "preparation before going to bed". Find your camera, load your film, spoon out your instant coffee, put water in the teapot, etc. In other words, do everything that can be done ahead of time. The reason for doing this is because you will not be the same person when the alarm goes off. It is the angel of good intentions that sets the alarm, but it is the devil of misguided procrastination that shuts it off and starts to work on you. The more things that have to be done, the more chances for the devil to talk you out of the whole thing. With the devil talking a blue streak to you, it is no wonder that the probability of finding your cable release at 4:00 a.m. is less than 10%.

Another recommendation in fighting the devil is that of group cooperation. Have someone phone you to get you up or, better yet, have them stop by your house. The devil works best when you and he are alone, thus another person on the phone is a great advantage. Just remember that it is the devil who will most likely answer the phone, not you! He has no qualms about saying that you are up and dressed when in fact you are not. Therefore, the person that calls you should know you well enough to be able to tell the difference between you and the devil; otherwise the wake-up call may be wasted.

The final recommendation is to minimize interactions with the devil by choosing your events carefully, taking your particular time schedule and the significance of the event into account. For example, don't get up at 3:02 in the morning to see Pluto cross the orbit of Neptune to become the 8th planet from the sun. And don't roar outside at 2:15 a.m. to watch the moon become full or to observe Saturn's rings at the instant when they are edge-on to Earth. As in the above examples, many of the events listed in astronomy magazines will appear virtually the same hours earlier or later than the listed times. In other words, some events are spectacular, but others provide nothing to observe at the particular times listed. Therefore, in choosing events to observe, one must learn to differentiate among events carefully.

Only you, the reader, know whether you got through the critical period for the occultation of Venus, but there will be many more such critical periods in the future. I wish you good luck in getting through them successfully.

Weather Prospects for the February 26, 1979,
Total Solar Eclipse

Timothy D. Skonieczny
Wyandotte Planetarium

When amateur and professional astronomers began analyzing the weather prospects for February's total solar eclipse, their initial reaction surely must have been disappointing, especially for those living southeast of the Great Lakes. If weather conditions are unfavorable in this region in February, they must be even worse in Manitoba. One too often forgets, however, that our weather is significantly affected by five of the largest Lakes in the world. While both Manitoba and the Great Lakes region are influenced by the same polar air masses, it is generally more cloudy in the Great Lakes region. As a polar air mass, which, is characteristically dry, stable and cold, moves over Canada, it becomes more and more unstable as it picks up moisture. Passing over the Great Lakes, it becomes even more unstable and produces overcast skies over much of the region for long periods of time. So one cannot compare weather over the Great Lakes region to weather in Manitoba.

Two questions often asked are; "What are the chances of clear weather?" and "How cold will it be?" No meteorologist could answer either of these questions with 100% certainty, but several have given probabilities. Jay Anderson of the Atmospheric Environment Service, International Airport, Winnipeg, Manitoba, in the September, 1978 issue of Sky and Telescope wrote that 42% of the time, the sky was 0 to 20% covered with clouds on average on a 10-day interval centered on the eclipse date. Only during 23% of the time was the sky overcast. Careful examination of previous eclipses shows that this eclipse, if viewed from Manitoba, is no less favorable than most others even if they occurred during the summer months. Unfortunately, the mean daily temperature is approximately +10° F. in late February in Winnipeg. A wind-chill chart will show that a 15-m.p.h. wind will produce an equivalent temperature of -18° F. Such winds are common in the region during the winter months. It is, therefore, important to dress properly to maximize viewing comfort during the eclipse.

A successful eclipse expedition will depend on knowledge of local weather conditions and a certain degree of mobility prior to the eclipse. Paul Strong, of the Macomb County Community College, and I have made arrangements with the National Oceanic and Atmospheric Administration in Ann Arbor, Michigan, to obtain last minute information on weather conditions. With this information, the probability of viewing the eclipse in clear skies is greatly enhanced. The information will be based on satellite photographs, taken in both white and infrared light, with a resolution of less than 1/2 mile.

Focal Length and Image Scale of Optical Instruments for Observing and Photographing the Eclipse.

Focal length relationship to image size, in this discussion we will be referring to the 35mm. film format .94 in. x 1.4 in. This is the most popular film in general use. Almost any camera-lens or camera and telescope combination can be used to make Eclipse Partial and Totality photographs. The longer the focal length or effective focal length you make use of the larger the image will be on the film. Some guide lines or recommendations to remember should be noted. You can record three or more solar diameters of the outer corona with a long exposure. Using a 35mm. format any lens from 100mm. to 1600mm. f/8 to f/80 with a diameter of two inches or more is satisfactory. To record inner corona, prominences, and Baily's beads use a focal length of 1000mm. or longer if possible. Also a short exposure time is needed to avoid over exposing and washing out the fine detail. An f/8 to f/15 system is satisfactory.

Your exposures should be varied to show different features appearing as the Eclipse progresses. The sequence of events you will observe, and hopefully, record on film are as follows: Shortly before Totality you will observe the Diamond Ring, next Baily's Beads, then Solar Prominences Inner Corona, and Outer Corona.

The three variables to consider in the system you will be using are shutter speed, f/ratio, and film speed.

An example using 125mm. diameter lens, 1000mm. focal length, and a film with a speed of A.S.A. 64.

From the L. F. K. Astronomical Guides.

Diamond Ring	1/250 second
Baily's Beads	1/500 second
Prominences	1/500 second
Corona Inner	1/30 second
Corona Outer	up to 1 second or longer

Reverse this sequence as totality ends and you will record the 180 degree opposite limb of the sun.

I recommend that you obtain a copy of the L. F. K. Astronomical Guides for complete information on all photographic systems which are too numerous to discuss in this paper. You can obtain the L. F. K. Guide for \$3.00 From:

Larry Kalinowski
15674 Flanagan
Roseville, Mi 48066

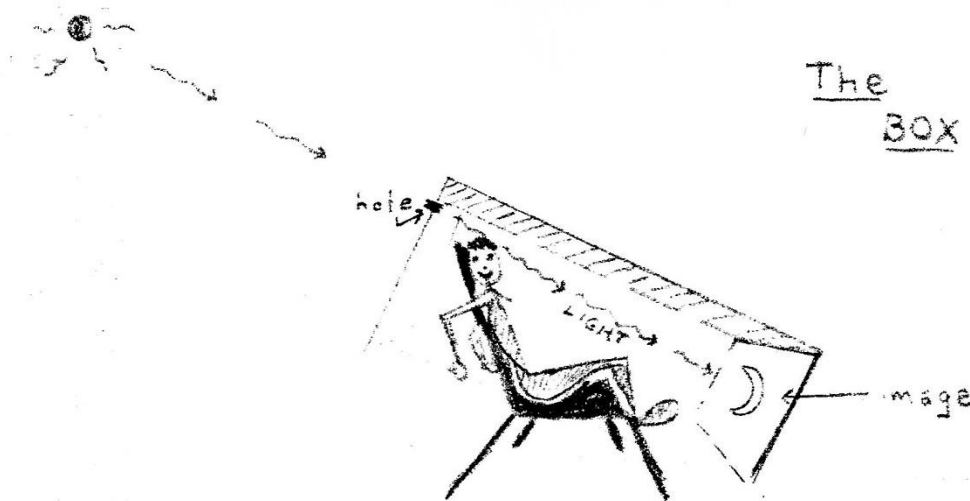
Please read Frank McCullough's article Solar Filters and Safety Observing the Eclipse. Use the same precautions for safe observing to photograph the Eclipse.

Tips:

Use the slowest Film A. S. A. 25 to A. S. A. 100 to show least grain and to record the most of the fine detail of Prominences, Baily's Beads, and the inner Corona. Use the fastest shutter speeds possible.

Take a few seconds of the precious Eclipse Totality time to look at the sky with your naked eye, three Planets will be visible, look at the surrounding horizon. Look for Shadow Bands slightly before Totality. Shadow Bands are best seen on a white background, such as a building wall, or on the snow on the ground. This phenomena may also be seen after Totality.

7X35 Binoculars are satisfactory for visual observing of Totality. Be sure to bring warm clothing, Temperatures have been known to drop to -30 to -40 degrees Fahrenheit for a weeks time during the northern winters. I recommend a Snowmobile Suit, Warm gloves Insulated Boots, and a warm hat or hood.



Now seeing this will be in February, you might call me crazy for suggesting such a method. Who wants to lay on their back on the cold ground in February.

My next suggestion is if you have a window facing the sun, the same methods can be used in the warmth and confinements of your own home. A small crack, hole, or opening in your curtains will cast an image of the sun also.

Trees with many branches act as viewing devices, because if one looks on the ground at the shadows cast he or she may see hundreds of crescent suns.

Filters For Naked Eye Use

Now if one wants to look at the sun directly then filtration must be obtained to cut down the sun's light from 10,000 to 100,000 times and also take out the ultraviolet and infrared rays.

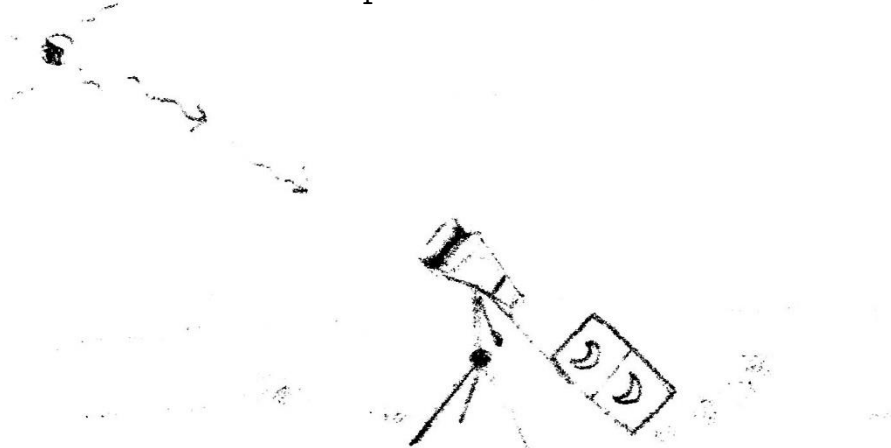
- 1) A number 14 welders filter will work well for eyeballing the partial phases and will give you a greenish yellow sun to look at. This will work extremely well for an unmagnified view of the sun.
- 2) Another one I have tried is black and white negative film fully developed.
- 3) If you have a Tasco, Sears, K-Marts, or any other commercial telescope you will find they supply a sun filter that fits over or screws on your eyepiece. Beware!!! These are not safe at the eyepiece as I will explain later, but for normal visual use they can be used rather nicely. By taking a sturdy piece of cardboard and punch a hole in it not bigger than the glass filter the manufacturer has supplied. Now take electric tape and secure your filter. With one eye closed and one looking through the filter you now can safely observe the sun.
- 4) Silvered Mylar is a good way to observe visually and can be supplied inexpensively. Some astronomy clubs sell it by the yard and when used double and triple thicknesses it is an easy and economical way to observe. Roger Tuthill has touted this material for many years and for \$2.00 one can be supplied a small piece to eyeball the eclipse. (ad in Sky & Telescope)

Observing with Telescope and Binoculars

If one owns a telescope or binoculars he may increase the size of his image along with the types of interesting features found on the sun. This can only add to the excitement in viewing the eclipse. but it also gives a few extra precautions.

The first method of observing the partially eclipsed sun will deal with what is known as the Projection Method. No filters are used so be careful!!

If using binoculars, mount them on a tripod if possible. Aim the binoculars in the general area of the sun, without looking through them!!! Take a piece of cardboard and hold it approximately two feet from eye pieces (plural) of binoculars. Move binoculars till two images appear, focus till sharp. If there are large enough sunspots, they will appear as small black specks on the white disk of the sun and will move with the sun when the binoculars are moved back and forth. If a rod is attached to hold the card in place and taped to the binoculars, it allows you and many other people to observe comfortably and simultaneously. The only thing you will have to do is move the sun back in the field of view to compensate for the earth's rotation.



When using a telescope the same method is applied, except now you are using much more magnification and focal length, which allows you to cover only a smaller portion of sky. The finder scope is important to get the sun close to the field of view of the telescope. If you do not have a filter for your finder then you must be careful.

Point the telescope to the general area of sky the sun is in, without looking through the scope!! Hold a piece of cardboard in back of your finder, move your scope till an image of the sun appears on it. If your finder is aligned with your telescope, you're in the ball park. Most times you will see a bright image concentrated at the eyepiece. Now cover the finder scope so no one will accidentally look through it. Proceed to get a good size piece of cardboard and hold it in back of your telescope. You now should have an image of the sun, move the cardboard away from the eyepiece till you have a desirable image size and focus. True focus is when the edges of the sun are crisp and sharp. (Do not mistake the projected eyepiece field for the edge of the sun.) You now may secure your cardboard to the telescope the same way we did with binoculars. Once the rod has been securely supported, many people can now watch the moon's progress across the disk of the sun. If it is your telescope or binoculars, never leave it unattended while it is pointed at the sun. If you have to leave, make sure you have someone to watch over it while you are gone. If you are by yourself, then turn your instrument away from the sun. If you managed to find the sun once then you're now an old pro at it, finding the sun a second time will not be difficult, plus when you are not using a filter the eyepiece tends to become extremely hot. This may result in the cooking of an eyepiece, causing dirt or dust to bake to the glass or a cheap eyepiece with cemented optics could become uncemented optics with glue trickling down your eyepiece. The moral of the story is give your scope a rest every five or ten minutes if possible.