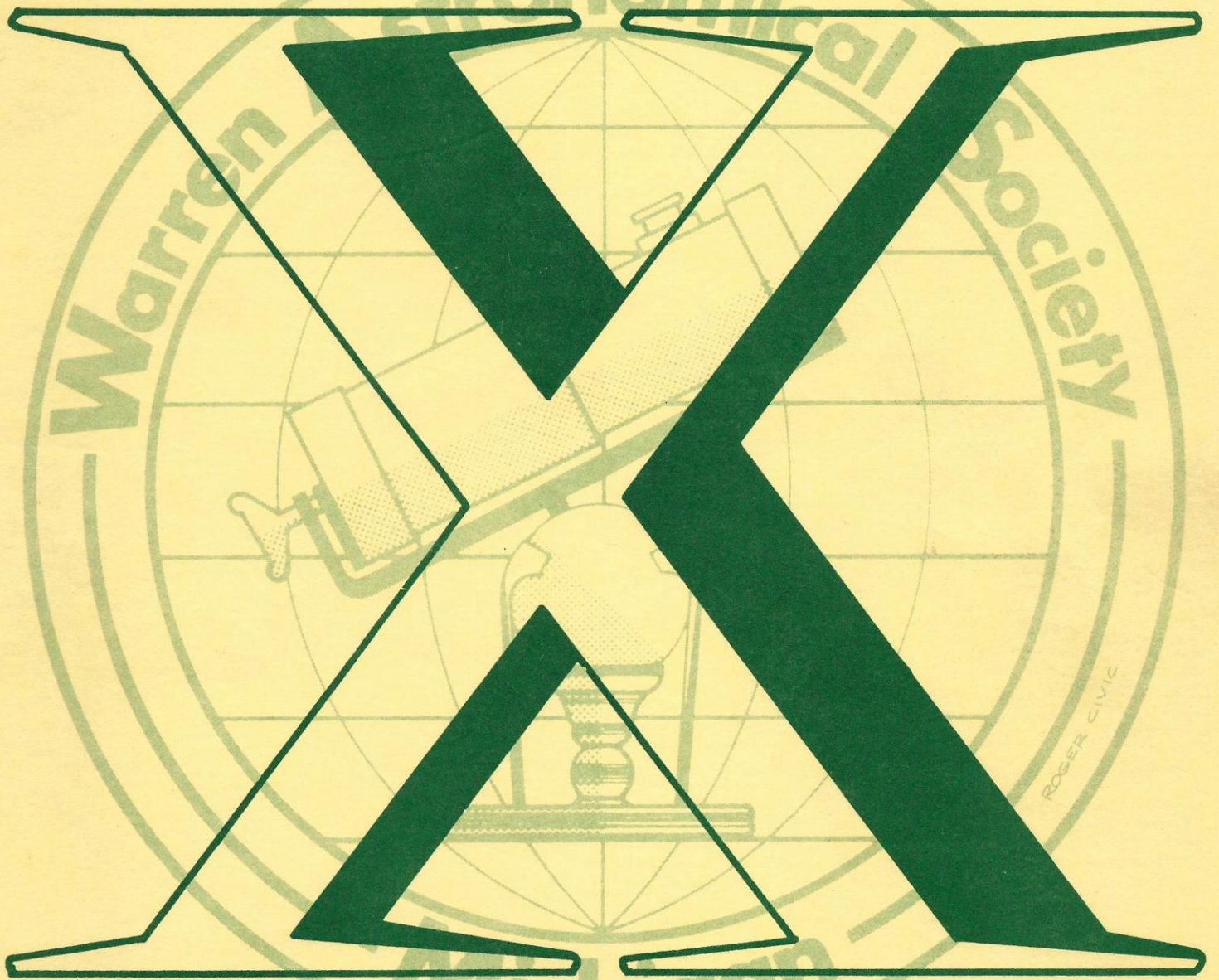


WASP



ANNIVERSARY

MARCH 1969-1979

Introduction

Welcome to the tenth anniversary issue of the Warren Astronomical Society Paper (W.A.S.P. for short). This month's WASP will have a small sampling, of the literary talent that has been the WASP the last ten years. The way we picked the articles for this month's issue are as follows: the year it was printed, the subject matter, how it was written, and various other things. We tried to pick a variety of articles as you will see. Also, as a special bonus', we have reprinted the first WASP in its original form.

Now for the history of the WASP: The first WASP was printed in 1969 as a mimeographed paper for the few dozen members in the club at that time. Frank McCullough, the first editor, was the one who printed and produced the paper a decade ago. For you history buffs out there, the editors from past to present are: Frank McCullough, Ken Wilson, Carl Noble, Ray Bullock, Gary Boyd, Roger Civic, myself, and my assistant editor Brad Vincent. Not only should you give thanks to these people, but you should also give thanks to the people who have helped the paper out for these past ten years.

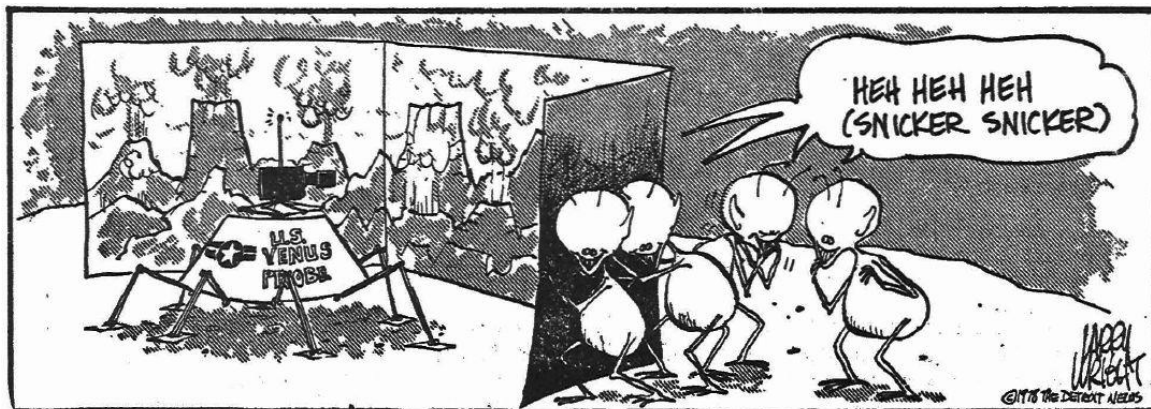
The WASP has had a good ten years compared to other societies' papers, but the paper needs new blood. That is the main reason why I took over as the new editor of the WASP. We also need new people writing articles for the paper. Only through this process can the paper keep on going strong as it is now.

When you look through and read this issue, take a minute and think of how much work some people have done in the last ten years. It is for the past editors and all the people who have helped the paper out these past ten years that I dedicate this issue to.

Jeff Stanek
Editor-WASP

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The Wasp

March, 1969

Vol. 1 No. 1

The Warren Astronomical Society Paper

March 1969

CLUB NEWS

Meetings:

March 11th -- NOTE, the meeting of March 12th has been rescheduled to Tuesday the 11th. This meeting will feature Mt. Barkley, a guest speaker from Bell Telephone. The program discusses the most ambitious, complex, and potentially rewarding peacetime project ever undertaken by men -- sending astronauts to the moon and returning them safely. Please be ready to start at 7:30. All guests are welcome.

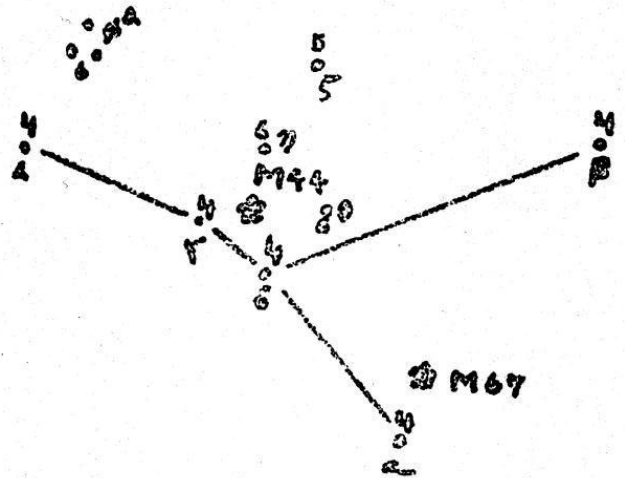
March 26th-- The central attraction of this meeting will be Mr. Leonard Draving, head of the science department at Cousino High School. Mr. Draving's topic will be "The Biological Effects of Supernovae." This daring new line of thought traces major evolutionary changes to exploding stars far out in space.

Field Trips: For those interested in solar astronomy the W.A.S. is planning an excursion to the McMath-Hulbert Observatory on March 8, 1969. Only 15 interested adults and high school students are permitted to attend. For further information contact Martin Butley at 758-6755.

Projects:

Spectroheliograph-- The people involved met Feb. 19th to determine their course of action. Diane Bargiel was elected treasurer to handle the group's \$27. Frank McCullough and Dave Atnip volunteered to build the coelo-

cont. page 3 col. 1



CONSTELLATION OF THE MONTH:
CANCER

Location

This zodiacal constellation lies between Gemini and Leo in the Spring sky. The notable star cluster in Cancer, the Praesepe, can be located by drawing an imaginary line from B Tauri to Pollux in Gemini and prolonging it approximately 15°. A line from Capella in Auriga through Pollux points toward Alpha Cancrī, which bears the Arab name "Acubens."

Description

Cancer is the most inconspicuous of the zodiacal constellations yet it makes up for its obscurity by containing two Messier objects, #67 and #44 and a notable number of double stars. By far the most outstanding object is the above-mentioned Praesepe or Beehive cluster. It lies within an irregular square of stars formed by Delta, Gamma, Eta, and Theta Cancrī and has, on

cont. page 3, col. 2

A FRESH LOOK AT TELESCOPING

As we look ahead to warm spring nights when it will be possible to do some viewing without freezing to death, we should begin thinking about the condition of our mirrors.

Most of us, after working diligently to make a telescope mirror, have it aluminized, assemble the parts and then proceed to use it occasionally tend to forget the fact that the mirror's surface is prone to deterioration. Generally, the telescope has been sitting in a basement, garage, or some other out of the way place where it has been collecting dust particles all winter. These particles, when present on the mirror's surface, tend to misdirect the light that hits the mirror, thus destroying the good images that we worked so hard to get during the polishing process. This misguided light will be picked up by a dirty eyepiece and will, in turn, become visible to the eye as scattered light and blurry images. This often accounts for the halos sometimes seen around bright stars and planets.

This condition can be easily corrected in one of two ways: having the mirror re-aluminized, or by cleaning its surface. Those of us who cannot spend the money for a fresh aluminizing job can easily clean our own mirrors by immersing them in a pan containing a mild solution of detergent and distilled water. While the mirror is immersed, take small cotton balls and very lightly pass them over the mirror's surface. Remove the mirror from the solution, then rinse by immersing it in clear distilled water. Be sure to remember to tilt the mirror up from one edge as you remove it from the water. When done this way, most of this water will run off the mirror. The few remaining drops can then be removed by swabbing with dry cotton balls.

This, then, is the only successful way to clean a plain aluminized mirror that has no overcoating. Be sure to be careful while handling your mirror when wet, as you may slip and your fingers will smudge the mirror.

A dirty mirror is a situation which is easy to correct, but other problems may arise which are not so readily solved. The actual mirror coating itself is known to deteriorate.

The atmosphere itself, over periods of a year or so, can act as an acid, etching the surface of a mirror and thus bringing out the grain and/or crystalline structure of the metal. (Similar to a galvanized pail.) This is especially true if the mirror is stored in a basement where a faulty

furnace may release gas containing sulfur compounds, such as sulfuric acid. It has been stated by R. Sumner (Mr. Optics) that an aluminized surface will deteriorate quite rapidly even in Arizona where there is practically no dew to speed the erosion of the surface of the mirror.

Mr. L. A. Sampson (the person who has probably coated your mirror) says that the Alloy Tin coating is especially resistant to this deterioration, but my mirror, Alloy Tin only two years old, has a definite grain structure which becomes especially prominent when one breathes lightly across the face of the mirror. A noted metallurgist, H. Davis, states that being an alloy, different parts of the coating will be attacked at different rates, thus producing a grain like structure. I am taking my mirror to Mr. Sampson later this week, and will record his findings in a future article. If you are interested in this problem, examine the surface of your mirror and report your findings to either Mr. Alyea at 754-2134 or Martin Butley at 758-6755.

**G. Alyea
M. Butley**

Club News, cont.
stat, Gene Francis is in charge of the optical work, and Timothy LaBrecque, along with Martin Butley will take care of the vibrating slit mechanism. The completion date for the project is set at May 31, 1969.

Camp Rotary-- Mr. Polus has submitted a written report to the Grounds Committee, which meets Feb. 26th. He is confident that he will be able to obtain for the club, free of charge, a 10x12 portable wooden building in which to house the telescope. He is also looking into the possibility of bringing electrical power into the structure.

Chelsea-- The star party which the club was planning for the elementary students at Chelsea has been cancelled. Another party has offered their services during the March 11-13 period, thus saving us the 150 mile round trip.

TYCHO BRAHE

LAST OF THE GREAT NAKED EYE ASTRONOMERS

The advancement of the Copernican planetary system into the scientific arena in the late 15th century raised a great deal of controversy as to what the solar system was actually like. Many theories had been developed and later discarded because of their inabilities to explain the observed motions of the planets and stars. To make accurate observations of star and planet positions for which to test the various astronomical models became the work of the 16th century Danish astronomer, Tycho Brahe.

Born in 1546, he also developed a planetary system which, though erroneous, retains its value today in revealing the thinking of the scientists of this age. Tycho measured the positions of 777 "fixed stars" with many different types of instruments, including large sextants and compasses. Since the telescope had not yet been invented all his observations were made with his naked eye yet they were accurate enough to be in error by no more than 1/15 of a degree. His observations, made at his private observatory on the island of Hven, were the

cont. page 5

Constellation, cont.
occasion, been mistaken for a comet. This cluster was one of the first objects which Galileo viewed and it filled him with delight and amazement. It has been viewed by this author on a number of occasions, at Bald Mt. as well as at home, and If has always appeared bright and easy to see. In a dark sky a large number of faint, outlying members appear.

M67 is composed of stars from mag. 9 to 12.5 surrounded by brighter stars in the form of a semicircle.
To observe Cancer to advantage requires a dark clear sky, although it can be made out in part from the Warren area.

Double Stars

Iota 1	Mag. 4.2-6.6	Sep 31"	
Yellow-Blue			
Zeta	Mag. 5.7-6.0	Sep 0.9"	Fine Contrast
	Mag. 6.3-7.8	Sep 0.2"	Quadruple
Phi 2	Mag. 6.3-6.3	Sep. 8.0"	

Notable Facts

Cancer is due south at 8:00 pm on April 1st.
In June of 1895 all the planets except Neptune were in this region.
Halley's comet appeared here in 1531.
The Beehive contains approximately 358 stars down to the 18th mag.
The cluster is 500 light years from earth.

Information taken in part from Olcott's Field Book of the Skies.

end.
Gene Francis

THE WASP SALUTES

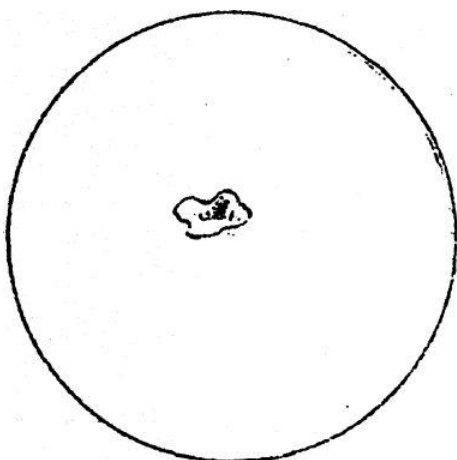
Mrs. Jean Baldwin, who has offered her services as club treasurer for almost five years. She is a quiet unobtrusive member, but she's always there, whether it be a meeting, or at a camp-out passing out hot dogs. People like her provide the foundation upon which a great club must be built. We give our thanks and appreciation.

OBSERVATIONAL ASTRONOMY

I viewed the Crab Nebula on three occasions during February while it was high in the early evening skies. I found the object just northwest of the third-magnitude star Zeta Tauri in Taurus the Bull. The Crab is an 8.4 magnitude object and is quite faint. The approximate coordinates of the Crab are 5 hours 35 minutes and 22°.

I used a four and a half-inch reflector with a focal length of 900 mm. The magnification used was only 45X in order to obtain sufficient light gathering power for the small telescope.

The Crab Nebula is a tricky object if you do not know what you are looking for. When I viewed it for details I found it looked like a small piece of cotton.



CRAB NEBULA
(M1)

I found no streamers or spray from the explosion but the white faint cloud of helium and hydrogen was there like a puff of smoke. It played hide and seek on me many times while it was still in my eyepiece. After using averted vision on the nebula I was able to keep track of it and make out the dark and light parts of the nebula. The location of the Crab to the star Zeta makes it an easy object compared to others. I must stress the importance of using low power while searching for the object. The drawing is close to what I saw, the circle representing the field of view.

Frank McCullough

NOTES FROM THE GRAPHIC TIME TABLE

PLANETS:

Mercury

Poorly placed in the morning sky, the planet's position deteriorates as the month progresses. On the first, Mercury rises an hour before the sun; on the 31st, 5 min. before the sun.

Venus

Reaching greatest brilliancy on the third of this month, the planet does not set until 9:50 pm. Moving closer to the sun by the end of the month the planet will set at 8:00 pm.

Mars

Improving in position throughout the month, the planet rises at 12:35 am on the 13th and transits at 5:25 on the same date.

Jupiter

Visible almost all night this month, Jupiter rises at 7:15 pm, transits at 1:15 am, and sets at 7:20 on March 13th.

Saturn

Becoming more poorly placed as the month progresses, Saturn will set at 9:05 pm March 13th.

Sun

March 1st sets at 6:20, end twilight at 7:55, morning twilight 5:35, rises at 7:05.

March 31st sets at 6:55, end twilight at 8:25, morning twilight 4:45, rises at 6:15.

Moon

FM 4th, 7:15 pm

LQ 12th, 3:25 am

NM 17th, 6:20 pm

FQ 26th, 2:45 am

perigee

13th 4:20 am

apogee

25th 1:50 am

STARS, March 13th:

4:55 Pleiades transit

6:40 M42 transit

7:50 Sirius transit

8:40 Castor transit

11:10 Regulus transit

12:00 sidereal time 11:25

3:05 Polaris lower culmination

Tycho Brahe, cont.

most accurate ever to be recorded in this era of visual astronomy.

As a result of these observations, it was soon discovered that the Copernican system was basically correct and a stand was soon stated for a more accurate description of planetary orbits.

This search was to end with the mathematical work done by Johann Kepler near the end of the 16th century. His three famous laws governing planetary motion and the concepts behind them will be the subject of next month's column, "Physics in Astronomy."

Gene Francis

QUESTION OF THE MONTH

Does the sunlight that falls on the Earth have any weight?

ANSWER OF THE MONTH

The light pressure on the surface of the Earth is given as two pounds per square mile.

taken from

1001 Questions Answered About Astronomy

This copy of the first issue of the WASP was prepared by Jeff Stanek and Brad Vincent from the last known remaining copy. The original spelling and grammatical errors were left in to be original. Since almost 30% of each page was either partially or totally blank due to dampness in storage, some of the astronomical data and interpretations may be incorrect. Even though, we believe you will enjoy this re-issue of WASP #1 on its tenth anniversary.

A Day Missing In Time

by Jim Trombly

Well, how about some more weird ideas? What about the idea that the earth's sun and Moon stood still for 24 hours total- Ha! More superstition you say. Well, here's the story and it's true.

NASA technicians and professors are working on plotting satellite courses in the future. Some were 100 years and 1000 years in the future. The purpose of this was to avoid having some satellites collide with the earth in the future. Now, while the computer was processing the data, the red light came on. A repairman said the computer was O.K., but she couldn't work because A DAY WAS MISSING IN TIME. The NASA officials couldn't account for this. Nothing could, except for that "symbolic, mythological book called the Bible."

Well, some dude there was a Bible "nut". NASA laughed, but they listened. They had nothing else to go on. Well, he said, "In Joshua 10-12,13:

12 Sun, stand thou still upon Gideon and thou, moon, in the valley of Ajalon.

13 And the sun stood still, and the moon stayed, until the people had avenged themselves upon their enemies. Is not this "written in the book of Joshua? So the sun stood still in the midst of heaven, and hasted not to go down about a whole day!"

The "about a whole day" was found to be 23 hours and 40 minutes. There was still 20 minutes missing. No, this "holy nut" referred to the other part by turning to II Kings 20:9,11.

"And Isaih said, *'This sign shalt thou have of the Lord that the Lord will do the thing that he hath spoken: shall the shadow go forward ten degrees or go backward ten degrees?'*"

"And Isaih the prophet said unto the Lord; and he brought the shadow ten degrees backward, by which it had gone down in the dial of Ahaz."

Well 10 degrees on the sundial is 20 minutes, here the sun's shadow went back 20 minutes. That's 24 hours total, 23 hrs, 40 minutes, and 20 minutes = 24 hours. Well, take it or leave it. Accept it, and then it explains itself. Reject it, and then you have no other source except theory.

Date: October-November, 1970

REFLECTOR vs. REFRACTOR

by Richard Hollifield

A refractor is a telescope which has a lens for its objective, while a reflector has a mirror, often called a primary, as there are usually one or more secondary mirrors. The lens in a refractor bends the light rays to form an image, whereas in the reflector they are formed by the curved surface of the mirror for the same purpose. My intention here is not to explain how the images are formed, since this has no bearing on the relative merits, but to consider the advantages and disadvantages of the two types.

Some of the features of a good astronomical telescope are (not in order):

- | | |
|--------------------------|--|
| 1. Definition | 6. Size of image (usable field) |
| 2. Achromatism | 7. Flatness of field |
| 3. Magnifying power | 8. Versatility |
| 4. Light-gathering power | 9. Economy and ease of construction |
| 5. Resolving power | 10. Convenience of handling and upkeep |

This list is not complete, nor does it apply in every case, since for some particular purpose, many of these features may not be important. However, let us compare the average reflector and refractor according to these requirements.

1. Definition. The refractor is definitely superior in this aspect. A lens can be corrected to almost any desired degree (theoretically) for all the six primary (chromatic and spherical aberration, coma, distortion, astigmatism, and flatness of field) and many of the higher aberrations. The usual astronomical refractor has a lens of two components, comprising four surfaces, and we must accept the aberrations as they come. Each of the reflector types, Newtonian, Cassegrainian, and so forth, has its own degree of corrections for the various aberrations, beyond which no further correction can be made. In certain cases, correcting lenses are placed in the optical system to correct for some aberrations, particularly coma, with which the reflector is especially afflicted.

Generally, refractors are more thoroughly corrected for aberrations than reflectors, with two exceptions: first the reflector is completely free from chromatic aberration, because the law of reflection is independent of the wavelength of light (but the law of refraction is not). Second the parabolic mirror is completely free of all aberration on the optical axis. But this second point can be true for only a single geometric point that is for one star.

Obviously, any aberration reduces the quality of the image. Further, the reflector is subject to loss in definition because the blocking of light by the secondary, and because of diffraction from the legs of the secondary support. Therefore, if excellent definition is the essential quality of a telescope, the choice of the refractor is indicated.

2. Achromatism is freedom from chromatic aberration, and here, as stated above, the reflector is superior, being completely free of this because of its operating principle. For spectroscopy, and any work involving the quantitative or qualitative analysis of light, the reflector is definitely superior.

3, 4, 5. Magnifying power depends upon the focal length, light gathering power, upon the area of the objective, and resolving power, upon the diameter of the objective. Theoretically, there is no choice between the two types for any of these factors. But in practice certain restrictions are present. Lenses can be only so big (forty inches is the largest considered practicable) because too large disks cannot be

supported around the edges and still retain their shape. Therefore, telescopes of large size must be reflectors.

Magnifying power is the ratio of the focal lengths of objective and eyepiece. But the highest practicable magnifying power for a given telescope is dependent upon the resolving power of the telescope and the quality of the image (definition). The quality of the refractor image is slightly better, so it's usually possible to use a greater magnifying power than in a reflector of comparable optical dimensions.

6. Size of image. Except for certain special types of work, it is usually desirable to have a large field of good definition. This is especially true in mapping the sky and star counting. Here the refractor is immeasurably superior. The usable field of a reflector is limited both by the oblique aberrations and by the necessarily small size of the secondary mirror.

7. Flatness of field. Since much of modern astronomical work is photographic, flatness of field (that is of image surface) is imperative. Only the refractor can have a flat field over any relatively large area.

8. Versatility. Here the reflector comes into its own. Nearly all large telescopes can be converted to one form of reflector or another if provided for in the original design of the telescope. This cannot be done with a refractor.

9. Economy and ease of construction. Cost is usually not a prohibitive problem for an observatory instrument, but it is definitely a problem for us amateurs. Although the tube and mounting for a very small refractor would probably cost less than for a reflector of the same size, diameter for diameter the refractor is a much longer instrument, as refractors are usually made with a focal ratio of $f/15$, whereas reflectors are $f/8$ or shorter. And the cost of the optical glass alone would make the refractor more expensive.

10. Convenience of handling and upkeep. Because of its shorter focal length, and because, in such forms as Cassegrainian, the tube is shorter than the focal length, the reflector is much easier to handle than a refractor of the same aperture. A twelve inch reflector may be carried in an automobile, but a twelve inch refractor is an enormous instrument requiring a twenty-foot dome to house it.

A mirror, being unprotected, requires more upkeep than a lens. It must be resurfaced from time to time, and frequently cleaned, when care must be taken to see that it is not scratched or damaged.

Certain types of telescopes have been designed that are neither refractors nor reflectors, but is a combination of the two, such as the Schmidt camera and Maksutov telescope. But the limitation on size of plate still holds true for these scopes. The field of the Schmidt is so curved that the photographic plate must be curved to make up of this.

Evidently, there is no answer to the question, which is better, refractor or reflector? Unless it be, well, that depends on whether ...

HOLES IN SPACE

By

Kenneth Wilson

One of the objects on the list of new discoveries in astronomy are black holes. As opposites to these objects, white holes have been recently proposed. Some of the theories proposed concerning these objects sound more like science fiction than scientific astronomy.

Black holes were first proposed by J. Robert Oppenheimer and one of his graduate students, Hartland Snyder, in 1939. Black holes are the burnt out cinders left over from the deaths of massive stars. When the star has used up its atomic fuel, it begins to collapse rapidly. If the star is of sufficient mass, when it collapses, the gases of the star gather such momentum that they virtually crush themselves out of existence. According to Einstein's general theory of relativity, as the gases crush each other toward oblivion, the usual laws of physics may not apply. The star's mass becomes infinitely dense, yet occupies virtually no space. For example, a star twice as large as our sun's 864,000 mile diameter would shrink to less than the size of the state of Rhode Island, in a fraction of a second. The gravity of this black hole or "collapsar" (as cosmologist Alastair G.W. Cameron calls it) is so intense that no light or any other radiation can escape from it. Anything passing near a black hole would be drawn into it, never to be seen again. As it emits no radiation, about the only way to detect the presence of a black hole is to observe its effects on a binary companion. Cameron and Richard Stothers, both of NASA's Goddard Institute for Space Studies, believe they have found a black hole as the binary companion to Epsilon Aurigae. This "star", which eclipses its bright companion every 27 years was previously thought to be a young star in its early stages of development. Cameron and Stothers believe another possible black hole is the companion of 89 Hercules.

If, in these black holes, matter vanishes, where does it go? British theorist Roger Penrose suggests that the missing matter may pop out elsewhere in the universe. Taking up where Penrose leaves off, astrophysicist Robert M. Hjellming suggests an object the complete opposite of the black hole: the white hole. Hjellming suggests that the white hole would be the point where matter and energy would re-emerge into a universe. The flows between universes would be two-way, thus keeping equilibrium.

One of the major problems of modern astrophysics is the large amounts of energy, in the form of cosmic radiation, x-rays, and infrared radiation, coming from quasars and the centers of galaxies (including the Milky Way). The output of these energies seems to be greater than can be accounted for by any known physical process, including thermonuclear ones. If white holes could be shown to be the origin of these radiations, a major problem of astrophysics would be solved.

If any conclusion can be drawn from the above, it is: that the more we learn about the universe, the more uncertain we are of our theories, and the more new questions there are that go unanswered. One thing is certain – astronomy is not a dead science, as has been often said.

Date: July-August, 1971.

Precise Telescope Alignment

Lou Faix

For the observer who wants to use setting circles to find sky objects or do guided astrophotography, precise alignment of the telescope with the earth's axis is essential. There are several methods of aligning a telescope, but I have found this method to be reliable and much more precise than just sighting on Polaris which isn't really at the pole at all.

The first step is to properly collimate the mirror to be sure the optical or sighting axis is straight through the middle of the tube. The easiest method is described in Sam Brown's book "All About Telescopes" on page 150.

The second important step is to check the squareness of the telescope axis to the declination shaft. An easy way to do this is shown in Figure 1 on the next page. Set the telescope so that the tube is directly over the polar shaft and lock the polar axis. Put the tube parallel to the polar shaft and measure the distance between the tube and polar shaft. Swing the telescope tube 180° around the declination shaft and measure again. The dimensions must be the same. If they're not, shim the declination flange or the tube on the end which is the closest. An inside measuring tape measure is useful. This adjustment is critical for using setting circles.

Now set the telescope up in the field and get the polar axis pointing close to Polaris, the almost north star. You'll need an inexpensive 12" carpenter's level and adjustable angle for the next step. If you travel about (more than ten miles) north or south of home, a state map to determine your local latitude is also useful. Adjust the angle to match the latitude of your position. (Stargate is 42°41') With the tube straight above the polar axis, set the angle on the tube as shown in Figure 1 and lay the carpenter's level on top. Adjust the mount pivot or the legs until the bubble is in the middle of the glass tube.

Finally, put a cross hair eyepiece in and locate a star near the celestial equator and near the meridian. Rotate the eyepiece until the cross hairs are set north to south and east to west. This is accomplished when the star moves parallel to a hair while moving the telescope around only one axis. Now figure out which side of the eyepiece is north. Put the star at the cross hair and move the telescope toward the North Star (up) using only the declination axis. The star will move toward the south edge of the eyepiece. Remember which side is north and which side is south.

Put the star back on the cross hair and lock the declination shaft. Wait five minutes and look again. If the star has moved to the south, the polar axis is pointed too far to the east and must be adjusted a little to the west. If the star has moved to the north, the polar axis is too far to the west and must be aimed a little to the east. Usually only minor adjustments are necessary, and after some practice you can be right on after only two tries. Figure 2 illustrates the star motion.

The whole procedure can usually be done in fifteen to twenty minutes. You can start even before darkness is complete and lose no valuable observing time.

Date: January 1975

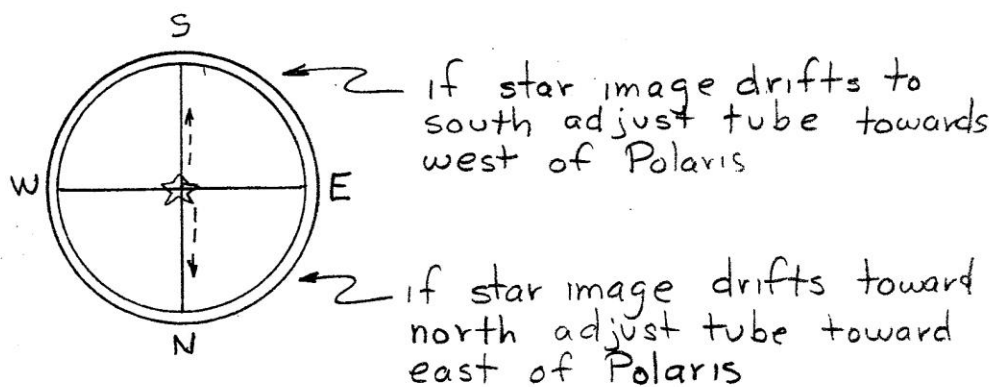
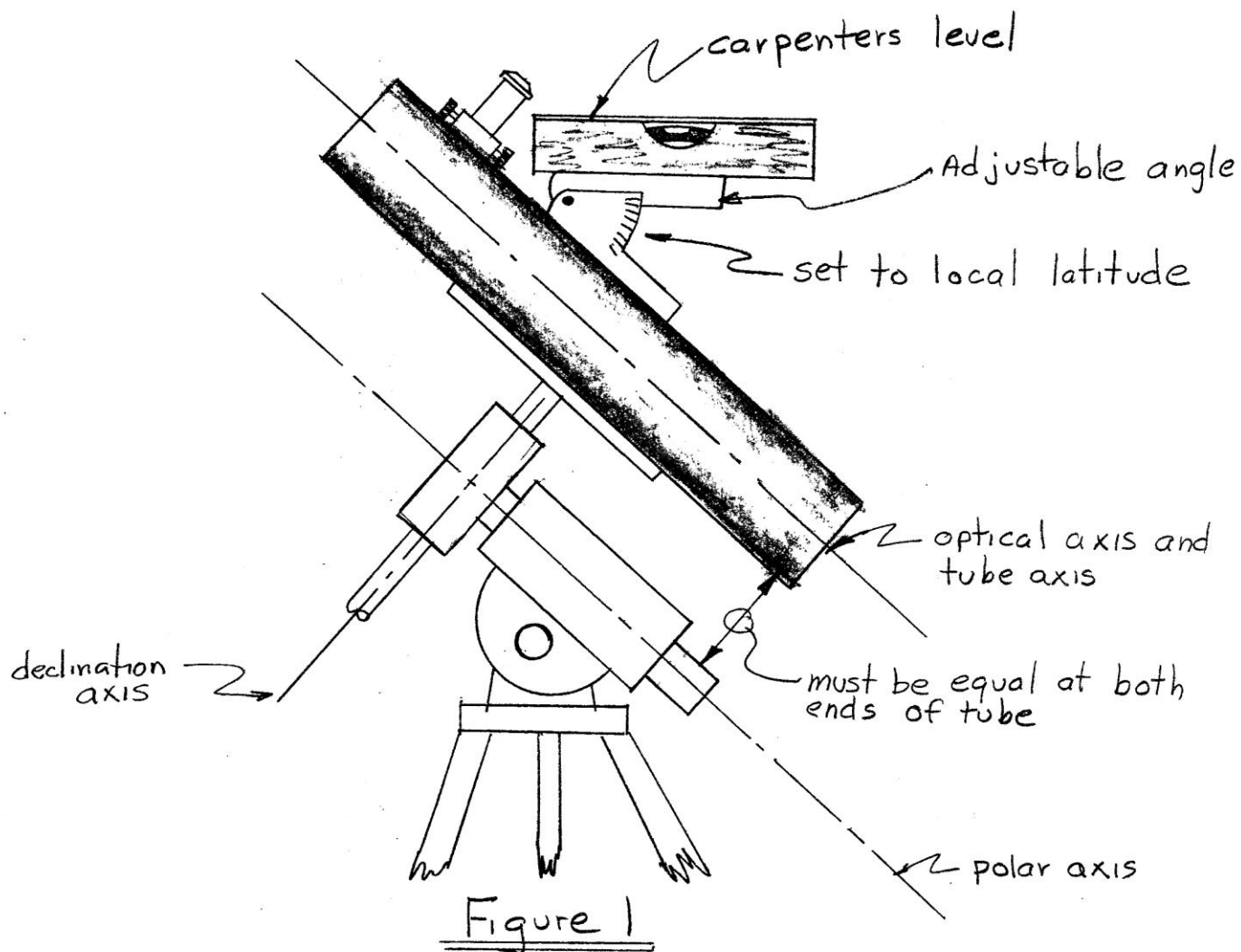


Figure 2

Can You Spot One?

by

Kenneth Wilson

The hobby of amateur astronomy is not the most popular pastime in America, According to the most optimistic estimate, there are only about a million amateurs in the whole country. And, since he comes in all sizes, shapes and colors, location and identification of the amateur astronomer is difficult for another amateur and almost impossible for a non-amateur. The following guidelines should be of use to these people.

The amateur astronomer (or celestus fanaticus) is commonly a nocturnal creature. As a result, he is frequently found singly or in groups, in the middle of a country field, on a dark moonless night, peering through his telescope. If there is a flock of five or six present, strange noises may be heard, such as: "I think my nose is frozen to the eyepiece!"; "I found M91!"; "Did you see that -27 bolide?"; "Yeah, in the fourteen inch with what used to be my right eye!"; "Where's my Skelnate-Pleso?"; "You're standing on it!"; "Hey, Let's go spin Dave's setting circles!" and , " *% !# it, here come the \$%&*! Clouds!" But, such fields are likely to be remote and the amateur is easily spooked by a careless flashlight. So it might be easier to find an amateur during the daylight hours.

During the day, the amateur is usually well camouflaged as a normal human being. But, there are a few characteristics that may help. First, an amateur astronomer is prone to tripping over curbs, chuckholes and other objects as he stares into the sky looking for solar halos and daytime novae. If the amateur drives a car, this often results in frequent minor accidents.

If you happen to spot a likely amateur, follow him to his habitat to confirm your identification. His neighborhood is likely to be marked by numerous smashed streetlights. His garage will have two occupants; his dented car and his telescope. Inside, you will find on the coffee table, along with a copy of "Reader's Digest" or "Playboy", the current issue of "Sky and Telescope". If this habitat belongs to a Michigan amateur, the closet will be full of heavy winter clothing.

The personality of the amateur astronomer is usually a bit eccentric. For example, a married amateur is often heard telling his wife "Wait for a cloudy night, or one near the full moon!" If he has any children, they will find their father is often tired and grouchy after a long clear night. His neighbors will find that the amateur reacts violently when any new street lights are erected nearby (often giving the impression that he is a sex fiend or some other kind of criminal).

New that you know how to identify the general amateur astronomer, here are some sub-species to look for:

The Amateur Telescope Maker or ATM (pyrexus grindus)- distinguished by the red rouge stains under his fingernails.

The Astrophotographer (camerus fanaticus)- usually found with a copy of the LFK exposure guides glued to one arm. Often found lurking in camera stores. Their homes are usually filled with the odors of fixer and Glacial acetic. Deep Sky Astrophotographers (Guidus Longus) are distinguished by the neurotic mumblings of "reciprocity, reciprocity, reciprocity,..." and "grain, grain, grain...".

The W.A.S.P. writer (journalisticus amateurus)- Perhaps the most unusual sub-species, he writes articles like this one.

Date: January 1975

THE
ASTROPHOTOGRAPHERS CORNER
by
Larry F. Kalinowski

PART II - THE AFOCAL METHOD

The afocal method is by far the quickest and easiest method of through-the-telescope photography to set up. With fast film and a bright subject like the Moon, you don't even have to fasten your camera to the telescope. It can be hand held and some excellent pictures can result, provided the photographer has a steady hand. However, there are some precautions that must be taken.

First, the telescope eyepiece must be focused on the subject to be photographed. Second, the camera lens must be focused for infinity or the farthest distance possible. Some low cost cameras have a picture showing a group of people near the focusing portion of the camera. Instamatic users won't have to worry about focusing, the lens is fixed.

Instamatic type camera users will also find that their pictures will have to be limited to bright objects like the Moon, Sun or daytime subjects on the Earth. There are only two shutter speeds on these low cost cameras. When flashcubes are used, the camera shutter is 1/45 of a second, without flashcubes, 1/90 of a second. A used flashcube can be inserted in the camera to make use of the slower shutter speed when taking Moon photos.

The more advanced camera bugs will better appreciate the afocal method because more expensive cameras have a large range of shutter speeds to choose-from making the camera capable of photographing a greater range of subjects, like eclipses and planets. This writer doesn't recommend hand holding the camera at the telescope if the exposure time must be longer than 1/30 of a second. The camera must be fixed to a tripod, or better yet, to the telescope and a motor drive used to keep the telescope pointed at that heavenly body. You'll find that the Earth's rotation, as imperceptible as it seems to be, will be greatly magnified by the telescope, easily ruining the image recorded on the film. Some sort of drive motor becomes a must when exposures become longer than 1/30 of a second.

In order to determine how long your exposure must be, some simple calculations must be made. Start with your telescope magnification. (Sometimes called telescope power)

$$TM = \frac{FL_m}{FL_e}$$

Where: TM is the telescope magnification, FL_m is the focal length of the mirror and FL_e is the focal length of the eyepiece. It is suggested that all measurements be made in inches.

THE ASTROPHOTOGRAPHERS CORNER (cont'd)

With the magnification now known, the effective focal length can now be determined.

$$EFL = TM \times FL_{cl}$$

Where: EFL is the effective focal length, and FL_{cl} is the focal length of the camera lens.

On most thirty-five millimeter type cameras, the focal length of the lens is usually around two inches. Instamatic cameras (not the pocket type) have a focal length of about one and a half inches. If you're not sure what the focal length of your standard lens is, it can be approximated by measuring the distance across the negative of one of your past pictures. The measurement must be made diagonally, from one corner to the opposite corner.

Finally the f-ratio of your system can be calculated.

$$f \text{ ratio} = \frac{EFL}{D_m}$$

Where: D_m is the diameter of your mirror.

With the f ratio finally calculated, all that remains is to look up the proper shutter speed needed in your copy of THE L.F.K. ASTRONOMICAL EXPOSURE GUIDES.

One more thing, after you've taken a few pictures, you'll probably notice that some or all of your pictures will have a noticeable darkening around the outer edge of your prints or slides. This is a common problem called vignetting. All the light coming out of the eyepiece isn't getting to the film. The problem can be solved or greatly eliminated by using the proper camera distance from the eyepiece. With the telescope pointed and focused at the Moon, hold a piece of white paper about an inch from the eyepiece. You'll see a spot of light on the paper. Move the paper backwards or forwards until that spot of light is sharp all the way around its edge. That point is where the camera diaphragm must be positioned. Notice I said diaphragm, not camera lens. The diaphragm is usually located in the center of the camera lens on the more expensive cameras and behind the lens on the low cost cameras. All the light will get to the film if the diaphragm is positioned properly, assuring more professional results. Other factors contribute to vignetting, however, there isn't enough space to go into a detailed account. The reader is advised to consult one or more of the many advanced astrophotography journals for further information.

CELESTIAL SHOWPIECES - Something to work for!

by Carl L. Noble

My interest in getting more beginners into the area of Astronomy again finds me at the typewriter to provide a piece of sheer superb literary work!

In the world of the Amateur Astronomer there is one sect that I would like to belong to - that being the members of the "Celestial Showpiece Club", better known as those Astronomers who have cataloged over 100+ of the Messier Objects. The different Objects have always interested me but never did I ever dream that I could have been able to see anyone of them. I always thought that only the 200 incher could only see these beautiful galactic clusters, globular clusters, Nebulae, or Galaxies. I have, at present 2 Messier Objects under my belt! I hope to have more than 70 of them by this time next year. It can be done, it is one of the many things that makes Amateur Astronomy so exciting.

Rule no. 1 is "Don't get upset and quit!" Anything worth something must be worked at. Finding these inconspicuous or prominent celestial showpieces is quite a task.

Rule no. 2 is "Ask the experts", meaning quite simply, the members of the Warren Astronomical Society. If you have any problems, someone in this group should be able to help.

Try to get a good atlas or star map, the information contained is helpful. It is also helpful to get the terms sorted out, so you will know exactly what you are looking for. Here are a few "definitions":

1. OPEN CLUSTERS': The open clusters are concentrations of stars which appear as loosely arranged groups. They have no particular pattern, but are a distinct unit within the surrounding stars. Because they all appear within our own galaxy they are known as GALACTIC CLUSTERS. (Pleiades and Hyades are two examples.)
2. GLOBULAR CLUSTERS: The globular clusters are closely packed, ball-shaped groups of stars. Unlike the open clusters, this group is made up of scores or hundreds of thousands of stars. (M13; M5, are two examples)
3. NEBULAE: There are two main groups here: 1.) Planetary Nebulae and 2.) Diffuse Nebulae. Both are basically large clouds of glowing gas. The Planetary Nebula seems to have come from an exploding star, thus it has a "ring" like effect. The Diffuse Nebula is characterized by a large "cloud" like effect, brightly glowing in the darkness of space. (M1, M27, M42, etc. are some examples.)

4. EXTRAGALACTIC SHOWPIECES – THE GALAXIES - What can be said when one views another island of stars, a galaxy? It really is a strange feeling you get inside when M51 comes into view of your eyepiece! Even a 3 inch to an 8 inch will give you a fairly good view. Don't let a lack of equipment stop you from finding' some of these most beautiful objects in Creation. (Examples of these are, M51, M31, M101, etc.)

To the beginner I say, "Don't give up!" Even the dim Messier Objects can be seen with good seeing conditions. (The middle of Warren is not so hot even for the bright ones!) Don't get a feeling of hopelessness if you only have even a 2.25 Inch 'Scope; you can still see some of these 'objects. The most important thing to remember is to try.

See how many of these objects you can get in a period of only one year. Then you may start to see that there are many more things to see in the night skies than just the moon, and the planets!

HAPPY HUNTING!

Date: May 1975



"I may not be wealthy or goodlooking, but I do know where M1 through M101 is!"

"One Lousy Night"

or

Another Page From The Apprentice Astronomers Notebook

By
Louis J. Faix

What a lousy night! Thin highly scattered clouds; fairly heavy high altitude haze puts a large halo around the moon. Scattered moonlight is so bright I can't see more than second magnitude. And I wanted to test the CdS cell on starlight again and finish that roll of Fuji on M51. (Expletive deleted) moon! Well, I'll get the scope out anyway and fix that clutch. Nothing else to do.

Hmm; Venus is pretty tonight -- just about a half illumination. Take a few pics at $f/32$, $1/250$, $1/125$ and $1/60$. What the (deleted!). Finished the roll on the moon since the cameras all set away. $f/22$, $1/400$, $1/200$, $1/100$.

Gee that's odd! For the three quarter moon, the glare on the ground glass isn't too bad and craters seem quite sharp. I'll stick in an eyepiece. Now that is strange -- the whole surface is well defined and it isn't hurting my eyes at $f/5.6$ -- haze must really be obscuring. Sky is unusually steady, moon is sitting there steady as a rock (bad pun). Terminator must be about -62° east longitude. Never really looked at that terminator before. Sure is a lot of detail in the south. I'll take a closer look (12mm eyepiece).

Son-of-a-gun! There's a neat pair of craters. Book says the big one is "Gassendi" (-41°E , -17°S). Wonder who he was? I know he can't be an Arab they'd have named a star for him -- yuk. The little crater isn't named. They form a miniature figure eight with the rims just tangent. Gassendi seems odd -- perfect -- too perfect -- too perfectly round. Also looks shallow but floor is too coarse to be lava filled. Central peak seems strange too; Try the Barlow and 12mm eyepiece. Hey, it's a double peak. The little crater must be younger. It's torn down the north edge of Gassendi's wall. It's cleaner, fresher looking. Seems deeper and more bowl shaped.

Well, let's shove it up to the south pole and then do a slow declination traverse down the terminator.

Man that is tough looking real estate up there. Craters everywhere. You sure get a feeling that they're just stacked on top of each other. Area between -40° to -60°E latitude and -40° to -80°S longitude is really battered. Judging from the overlaps, I can see at least four generations of craters. All very jagged and very rough rims. No mare at all up here. Not many central cones. There's another odd pair overlapped. Let's see -- the name is "Hainzel". Looks like a big footprint! That's the one the kids were giggling about at Stargate last night. One of these days I'm going to get that Peter Kwentus! He skips town and leaves me with "just a few scouts -- a special group", 247 wild brownie scouts! "A few-- some day, Peter -- some day."

There's something neat -- a long ridge line just at the terminator -- or is it a mountain chain? Neither; the chart says it's a biig crater. "Schickard" a walled plain, 134 miles across. That is a big hole. I just can't conceive what the devastation would be like when those things were formed. Can you imagine a blast that would produce a crater from here to Cleveland? The western wall looks extremely irregular and very high in spots judging from spotty brightness.

Date: August 1975

Boy, here is a whole mess of little craters. Sort of looks like salt and pepper right around -30°S - -60°E. Wonder how small they are? I'll try to measure them. Get out the 12mm eyepiece with the graduated reticule. Hmm, .010" division is too large. Put an extension behind the reticule. That's better --I'd say about .002" is the smallest crater I can resolve. Now the slip stick and ruler. Focal plane extension is 5.59". Wow: That's 485 power! And the image is still good. Quickly computing: assume lunar distance is 238,000 miles, resolution equals 1.76 arc seconds. That "little" crater is 2.14 mile across. I'd hate to try to do it on my hands and knees. Wonder how much power this thing will take tonight. The air is very steady. Pop in the old 6mm eyepiece. That figures to 1050 power. I got an image -- not too bad either. Colors are odd and contrast is soft. Bright areas appear a yellow grey and just blend into the dark zones which are murky brown-grey. Can still make the crater profiles though. Ken Wilson's going to tell me it can't be done. You can't get 1000X on a 10" objective.

What's that? It wasn't there before. A dull glow just east of that Schickard rim. I wonder if that's the floor just starting to catch the sun. Keep an eye on that.

Sure ain't much going on down here in Oceanus Procellarum. There's something different here. It's not the same as the other seas. It's too smooth; no ripples or flow marks in the lava floor. Over in Mare Imbrium you can see lots of graduations in the lava floor and even hints of crater rims buried beneath it. Procellarum is much smoother and almost no little craters. Wonder if that means if this lava was hotter and less vicious when it flowed? Maybe it's deeper. The absence of craters suggests it could be younger too. Have to look into that!

Just take a side trip and swing over to Copernicus (-20°E, +10°N). Not too impressive at this sun angle. Secondary cratering is obvious -- more so to the east. Tiers in the inner rim are obscure. Stuff in the middle doesn't really look like a cone, just a bunch of rubble. It's broken into five groupings that I can see. Let's get back to the terminator where there's better resolution.

So that's the crater Herodatus. Well, whoopee. I'm surprised it made the chart.

Sinus Roris -- anyone for pool? That's smoother than Procellarum. I wonder if this sun angle conceals irregularities in the lava flows?

The Jura mountains look soft, not as jagged as the Appenines. Seem to be formed like folds -- three of them irregular but parallel. Heraclides Prominence. Seen that lots of times. Some folks think they see a woman's face profiled there. Some people are lunny too.

A quick peek back up at Schickard. Hey, that was the floor starting to light up. It's much clearer now. In fact, I can see two long shadows reaching across it. The tips along the east rim are just starting to catch the light. Those shadows are right behind where I thought the high spots on the west rim were. The darkness is like a tide that slowly recedes to give up the land.

We'll finish up down in the north now. The moon's libration must have the North Pole tipped towards earth tonight. I can see structure at the pole that's not on the map. The poles look much alike, heavy multilayered craters.

What's happening? It's getting dark and there's no clouds! Whoops, the moon's going behind the tree. My gosh, it's 2:30 in the morning already.

For a lousy night this wasn't too bad. Ya know, for an old hunk of rock, you ain't too bad.

THE
ASTROPHOTOGRAPHERS CORNER

by
Larry F. Kalinowski

EXPOSURE VALUES FOR ANY FILM SPEED AND ANY "F" RATIO

Occasionally the instrumentation we've just finished building doesn't turn out exactly the way we planned it. Some modification might be required to make it suitable for an upcoming eclipse or in order to get the required image size, some additional lenses in the system might be required. In any event, the f ratio of your system doesn't always turn out to be the neat f8 or f11 that writers like me are always quoting. What do you do when your system is something like f7.2 or f5.1? As far as I can tell, there isn't any list of exposure values that include f7.2 or 5.1.

How about the other side of the coin? I've got an extremely slow, contrasty film that's marked .05 ASA. Who publishes exposure values for that kind of stuff? Chances are, no one does.

If you're one of those guys who aren't satisfied with published information because it doesn't fit your instrumentation, then I've got a formula that you'll find a bit interesting. It's been around for awhile in one form or another in the Grand Rapids publication, one Canadian publication and a well known West coast mag. I'm surprised that it hasn't been used more often around this area. Maybe it will be now that I'm bringing it out into the open again.

Here it is.

$$T = \frac{EFR^2}{ASA \times b}$$

Where:

T is the time required for exposure in seconds,

EFR is the effective f ratio,

ASA is the film speed rating and

b is the brightness factor of the subject to be photographed.

The beauty of using the above formula for exposure determination is the brightness factor b. That value is directly proportional to the subject's actual brightness. The brighter the image, the larger the value b becomes. Suppose you wanted to use a yellow filter to photograph Jupiter. If the filter is rated 2x (usually written on the side of the filter) then divide the brightness factor by two before you use it in the formula. Divide by three for a 3x filter, etc.

Neutral density filter users will find it just as easy. Each neutral density absorbs light by a factor of ten. A number two ND filter has a 100x factor, ND3 a 1000x factor. Simply determine your filter factor and divide that value into the brightness factor. In fact, if you can determine just how many times your subject has been dimmed, by a filter or a cloud, this formula will give you the new exposure value.

Date: August 1975

ASTROPHOTOGRAPHERS CORNER (cont'd)

The following is a list of values for b. If you wish to determine what the value of b should be for yourself, simply thumb through some old issues of Sky And Telescope and write down the exposure values given in the caption of the picture of the subject you are interested in. Then use this formula:

$$b = \frac{EFR^2}{ASA \times T}$$

First Quarter Moon	15.36
Full Moon	64
Totally Eclipsed Moon	0.016
Earthshine	0.032
Sun (with ND4 filter)	1024
Venus (during greatest brilliancy)	1024
Mars (during closest approach)	15.36
Jupiter	128
The Jovian Satellites	0.128
Saturn	7.68
Titan	0.064
Uranus	0.032
Diamond Ring (just before or after totality)	256
Prominences (during eclipse)	512
Corona (inner-during eclipse)	32

NOTE: The following values of b are valid only for variable f ratio cameras with a maximum clear aperture of approximately one inch...i.e. the thirty-five millimeter type. To find the proper exposure for lenses or mirrors of larger aperture, determine the exposure for an f2 camera lens. Then calculate how much larger in area your mirror or objective lens is compared to a one inch diameter lens. Divide your exposure time for a one inch lens by how many times larger your objective is.

1st magnitude star.....	0.122
2nd "	0.048
3rd "	0.019
4th "	0.007
5th "	0.003
6th "	0.001
7th "	0.0005
8th "	0.0002
9th "	0.00008
10th "	0.00003
11th "	0.00001
12th "	0.000005
13th "	0.000002
14th "	0.0000008
15th "	0.0000003
16th "	0.0000001

“HOUSEKEEPING FOR A.T.M.s”

Anyone with a telescope can tell you that if the optics are not working properly, the telescope is worthless. This is especially true with a reflector type telescope. The mirror is the largest optical surface to keep clean, and it is the light-gatherer of the unit. The eyepieces are just as important, but this article will deal with the mirror and the diagonal.

Of course, the aluminized and overcoated coating is the most delicate part of the mirror, and with care it should last up to ten years. The atmosphere, etc. however, can affect the life span of the coating. Following are some general hints in care of the mirror itself:

- a.) Don't touch the mirror with hands or any other object except for cleaning (a safe way of cleaning).
- b.) If the mirror is dusty try to remove by gently brushing with a camelhair brush (Make sure the hair ends are not cut, but are of a natural taper. Use of the cut hair produces fine streaks on coating).
- c.) Keep your telescope capped when not in use, and store the tube in a horizontal position to prevent settling of particles on the surface of the mirror.
- d.) When the mirror becomes excessively dirty, try the cleaning method as follows: (Note: don't use laundered towels or cloths for wiping: do not use lens cleaners. Both of these methods will produce residual spots that is impossible to remove without recoating.)

Materials Needed:

- 1 pound of surgical or engravers cotton. (Engravers cotton is cheaper!)
- 1 quart Isopropyl alcohol, Tide or Basic H detergent.

PROCEDURE:

With the mirror resting face up on a towel in the sink, turn on the cold water and play a stream of water on its face. This will loosen some of the particles and wash off unattached dust. Dip a wad of cotton in a mild solution of detergent. (1/2 teaspoon to 1 pint of water) Then gently swab the entire surface. Keep the water going while doing this so all the detergent solution gets washed off.

Date: August 1975

VERY IMPORTANT: Do not let the surface dry or bead up, two things happen, water marks will form and you will lose your mind! Therefore, keep the stream of water going.

After swabbing the surface with detergent solution the mirror is now covered with a stream of water. Make ready three wads of cotton for the following steps:

- a.) Dip one half of the cotton swab into Isopropyl Alcohol.
- b.) At the time you place the swab on the surface of the mirror, turn off the water.
- c.) Now swab the entire surface with this swab (CAUTION: do not turn the swab over or dissolved skin oils will deposit on the mirror).
- d.) Right away, take a dry swab and wipe gently. Keep changing cotton swabs until the surface is totally dry.

This method when used over a period of many years has shown itself to be the best. This method was tried and tested by the COULTER OPTICAL COMPANY.

There are many different methods available, but I have found this to be rather easy and safe. The mirror is too important of an investment, and of the instrument to become ruined by improper cleaning.

CARL L. NOBLE
14 July , 1975

Soviets step up space activity

2nd ship sent to Venus

MOSCOW — (UPI) — The Soviet Union launched an unmanned spacecraft Saturday to follow a sister ship blasted into space last Sunday in the first twin probe of cloud-shrouded Venus, earth's nearest planetary neighbor.

The spaceships are scheduled to complete the journey of 30 million miles and reach Venus next October.

"The flight will make it possible to obtain more complete data about Venus as well as about physical processes occurring in space," said Tass, the official Soviet news agency.

The ships are Venus 9, launched last Sunday, and Venus 10, which began its flight to Venus

from an intermediate earth orbit Saturday morning.

Tass said equipment on both probes is functioning normally and Venus 10's flight path is close to predetermined calculations.

The launch comes at a time of heightened Soviet space activity. Two Russian cosmonauts Saturday completed three weeks aboard the earth-orbiting Salyut 4 and scientists have recently launched a barrage of weather and communications satellites.

Tass also said Saturday that cosmonauts are beginning "comprehensive training sessions" for the scheduled July link-up of a Soviet Soyuz spacecraft and an American Apollo.

THE TELESCOPE AND THE BICENTENNIAL

-Raymond Bullock

Since the entire country is getting prepared for our bicentennial I thought it was only right and proper that I bring up a little known story about George Washington and the telescope. I have never told this story before because I was afraid of being stoned by my audience. I have decided to take that risk for the sake of history, besides I hope to be out of range by the time you finish reading this.

The story begins two hundred years ago this very month. As hostilities between England and the Colonies grew the situation became very touchy for people living on this side of 'the Atlantic. Everyone was accusing everyone else of being a British sympathizer.

Let me briefly describe the two main political factions. In England there were the Whigs, who were sympathetic to the Colonists, and the Tories, who backed King George III. Likewise in the Colonies, those who favored breaking with England were referred to as Whigs, while anyone supporting the King was a Tory. (Some coincidence!)

What has all this to do with telescopes? Well, George Washington was aware that Tories in the Colonies had been passing information along to the British, so he decided to try spying on them. He procured a telescope (I believe it was a Celestron 5) and tried watching one house in particular from his Mount Vernon Estate. He assumed the people in that house might be aiding the enemy ever since a steady stream of tired, hungry Red Coats began flowing into the house, and a steady stream of well-fed, armed Red Coats, carrying maps left it.

Washington set his telescope up and discovered, to his dismay, that a large cherry tree blocked the view. He had no alternative but to cut it down with his Black and Decker chain saw. (Now, dear readers, be serious. Obviously Washington didn't have an electric saw since there was no electricity at the time. Ben Franklin had talked of electricity, but everyone thought it was the ravings of a mad man, besides Franklin was always out flying kites in the rain, he was obviously unbalanced. Washington's saw was gas powered.)

With the tree out of the way Washington had an unobstructed view of the house, but saw to his horror that the house had an unobstructed view of him! Worse yet, the enemy had a Celestron 8!! What to do? ---

Washington realized that he must build some sort of shelter from which he could spy without letting the enemy know he was watching them. Soon a great deal of activity was going on at Mount Vernon. Workmen would come and go. Since Washington was a surveyor he laid out the floor plans himself, saving a bundle of money in the process. A round tower began to take shape, rising higher and higher until it was the tallest structure on Mount Vernon.

Everyone thought it was to be a new silo, except it was too narrow to hold much. Besides, everyone knew Washington had too many silos already, and was using most of them for storing I.C.B.M.s.

Finally the curiosity became too much for the people. A group of Whigs went to Washington and demanded to know what was going on. He refused to tell them, citing "Colonial security" as the reason. It was only after they threatened to sue him for violating the zoning ordinances that he recanted and took them over to the structure. He paused, looked at them and swore them all to secrecy. Then he produced a large iron key and unlocked the door.

To the amazement of everyone, the silo was not hollow. Inside was a spiral staircase circling up into darkness. They all followed Washington in and began the long, slow climb, starting each time the stairs creaked in protest of the weight.

Higher and higher they climbed until they began to believe they must surely be above the clouds. Suddenly Washington stopped. They had reached the top, another door had to be unlocked. As the group entered a large room, and their eyes became adjusted to the feeble light, they saw Washington's telescope mounted equatorially on a pitch fork. ("You want a fork mount, and this is the only kind of fork I have." the dealer had told him when it was installed.)

Washington opened a door in the roof and invited everyone to look over the countryside. They all "ooh'd" and "ah'd" at the view. Then Washington pointed out the enemy's house, and everyone appreciated his genius. He was able to look directly into the house with his telescope, where the lady of the house was in the process of ...-but that's irrelevant to this story.

Everyone cheered, for now they had a secret weapon. They could read the enemy's maps right under his nose, and he would never know it. But what to call this new structure?

"Well," said Washington, thoughtfully, "you know what this building is for. Let's call it OBSERVE A TORY."

*

(ED. NOTE: It seems that the W.A.S.P. has finally found a suitable competitor for Frank McCullough in the art of punmanship! Please direct your groans to Ray. And, in case you didn't get the answer to Ray's puzzle last month: The question was "How did Russell get out of prison?" and the answer was "Hertz Sprung Russell". So, it was all a big H-R plot.)

ANIMAL CRACKERS by Rog Bollen



SOME INTERESTING ASPECTS OF OBSERVING DEEP-SKY OBJECTS FROM URBAN AREAS

by

David L. Harrington

Most deep sky objects are best observed from locations where skies are dark, and the Milky Way clearly seen. However, there are some objects which, as a consequence of their spectral emissivities, are best observed from urban areas. A little known fact is that certain of these objects are in spectral classes Y-IC and Y-LOCK and can be best seen and photographed from the downtown area! Since many members of the Warren Astronomical Society live in close proximity to Detroit, this article should provide valuable information and help to expand the members' observing programs.

The first of these objects that will be discussed is M-97 the famous Groesbeck Nebula. This nebula was discovered by L. Kalinowski in 1964 using a 6" reflector. In an article in "Popular Spectroscopy", Mr. Kalinowski points out that the spectrum of this object was found, in 1966, to contain the distinct line of doubly-ionized neon. This marked the first time that this forbidden spectral line had been observed in nature, other than in the Clock Restaurant sign. Another interesting object is M-53, the Van-Dyke Nebula. This bright nebula was first observed by K. Wilson in 1969, and is described by him as "... an elongated patch of light oriented in the north-south direction, with the southernmost end of the nebula being noticeably brighter, unless you are looking through an inverting telescope, in which case the northernmost end is brighter." The spectrum of this object is quite interesting, containing the forbidden lined of double and triple-ionized mercury, as well as traces of ionized neon.

One object that urban observers should definitely search for is the elusive "Moon" Nebula (M-OON). This object, which is thought to be in our own galaxy, was discovered by R. Snodgrass at Times Square, New York on New Year's Eve, 1957. In his log, Snodgrass wrote "... it appeared as a large dim object, approximately 30' of arc across, and nearly round. It is very diffuse, and appeared to have a large proper motion." Unfortunately, Snodgrass passed away before he could accurately determine the object's position, and it was not observed again until 1966. At that time, P. Kwentus rediscovered this faint nebula and obtained its spectrum. Amazingly, this object was found to have a spectrum almost identical to that of the sun, a fact that still puzzles astronomers today. Kwentus reported in the October, 1966 issue of the "Warren Journal of Theoretical Nebulosity" that the nebula was crescent shaped instead of round, but that it indeed has a large proper motion at nearly 0.5 degrees per hour, exceeding that of even Barnard's star! As a result of this excellent research work, a resolution was introduced at the 1967 annual meeting of the International Astronomical Union that this object be designated as the "Kwentus Nebula", but Mr. Kwentus respectfully declined, saying "To _____ with it."

The brightest of all these objects, and the easiest for the novice to locate, is I-94, the "Chicago Nebula". This is one of the finest in the urban sky, and extends from horizon to horizon in an east-west direction. Its brightness has even led observers to refer to it as "the second Milky Way". This object was known even to the ancients, and Julius Caesar is reported to have said of this object, "... Il Certainus Quo Carborundum." Loosely translated, this means "It really grinds me." The I-94 Nebula

("I" designating inter-galactic), is actually a large nearby galaxy, and contains many hues of red, yellow and green. It is best seen in binoculars or with an RFT, and on good evenings can even be seen with the eyes closed. The spectrum contains many bright lines, including six-times-ionized sodium, mercury, and tungsten. The spectrum of the western edge contains forbidden lines of iron, sulphur dioxide and hydrogen sulfide. Very little oxygen seems to be present. It was stated by R. Civic in the "Roseville Journal of Neutrino Science" that I-94 is actually a variable nebula, with a peak-to-peak magnitude variation of 2.3. Mr. Civic reported that, after painstaking research, he has determined the period as 7.000 days. Amazingly, a sharp brightness maximum for this nebula seems to occur on Sunday Evenings.

Another fine object for urban observing is the famous double nebula in Scorpius. This object is comprised of two nebulae: M-24, the Telegraph Nebula, and its companion, M-10, the Woodward Nebula. The double nebula was first observed in 1943 by two draft-dodgers Simon Telegraph and Carl Woodward, through a chink in the attic roof where they were hiding. Due to obvious circumstances, they were unable to publish their findings immediately. However, when their paper was finally presented at the 1946 meeting of the Flat-Earth Society, it was instantly acclaimed as a landmark discovery. The notoriety they received brought the FBI and they were promptly arrested.

In this same area of the sky is I-96, an unnamed object which is one of the fainter inter-galactic nebulae. This object was discovered photographically in 1972 by L. Faix, while searching for M-59, the "Pontiac" Nebula. After developing a two-hour guided exposure of M-59, and finding that it was out of the field of view, Mr. Faix was about to discard the negative when he noticed something very strange. He had forgotten to use any stop bath! However, even after soaking the negative in a stop-bath solution. A faint streak remained in the upper left hand corner of the negative. After spending weeks inspecting all available sky atlases, and noting that nothing was shown in that position, not even in the Comprehensive Flamsteed Catalogue, (which includes nebulae down to the 4th magnitude), Mr. Faix became convinced that he had discovered a dark nebulae. When W.A.S. astronomers at Mount Stargate passed the light from this nebula through their infra-red spectro-photometric analyzer, they were astounded to find that the red-shift indicated a recession velocity of 1.5 times the speed of light. It was then theorized by F. McCullough that this would account for the darkness of the nebula. Then D. Mission pointed out that the red light in the observatory had been left on. When the light was shut off, a residual red-shift remained, indicating that I-96 is indeed receding from us. There is some evidence that the absolute luminosity of I-96 has been increasing; however, it is still a faint object, requiring at least a 3" telescope.

An intergalactic nebula with a photographic magnitude between those of I-96 and I-94 is I-75, the "Flint Nebula". This object, which is actually a galaxy, was discovered by T Skonieczny, using radio astronomy. On September 7, 1974, Mr. Skonieczny was routinely listening to radio emissions at 800 KHz (CKLW) when he noticed an abnormal amount of interference (which is not an easy thing to detect at that wavelength). By changing the orientation of his transistor radio, he narrowed the source to a region near the bright galaxy, I-94. He sensed a great discovery, and immediately returned from Michigan State University, even though he was involved in

an important astronomical research project: "Is the volume of the Big Dipper changing?" He had already established that the Big Dipper currently holds 8.2 billion cubic parsecs, but, due to proper motion of its stars, will hold only 6.7 billion cubic parsecs by the year 2100. Mr. Skonieczny stated upon his return to Warren, "What will happen to the other 1.5 billion cubic parsecs as it overflows is anyone's guess. It may pose a grave danger to the Earth." He then utilized sophisticated radio equipment (Radio Shack 5-Band) to determine that the radio emissions were being generated by an unseen galaxy colliding with the I-94 galaxy. The fainter galaxy was later detected visually (using a Tuthill Star-Trap) by C. Noble, who named it the "Flint Nebula". He was going to name it the "Skonieczny Nebula", but decided not to.

There are other fine objects observable from urban locations such as M-25, the Gratiot Nebula, and M-14, the Plymouth Nebula, but those already discussed should serve to kindle the interest of the membership. You may not make a monumental discovery such as those mentioned above, but the number of urban-observing projects is endless.

Date: January 1976

What Makes a Successful Astronomical Society?
by
Kenneth Wilson

In my several years as an active amateur astronomer, I have been a part of and observed several local amateur organizations. It is my opinion that the success of these organizations had nothing whatsoever to do with money, size of membership, number of observatories, number of large telescopes, fancy meeting places, or any of the other superficial trappings aspired to by most organizations. Instead, it is the dedicated effort put forth by a few individual members that has meant success.

Examine your own society. Usually it is two or three (maybe more as with the W.A.S.) who do all the work while the rest of the membership does little more than attend the meetings. They arrange meetings, set up star parties, get speakers, publish the society's papers and in general kindle the fire of life that keeps an amateur society going.

See if you can spot these people. They are the most valuable commodity a club can have. Don't do anything to alienate them because I have seen too many clubs die when they leave. And if you aren't one of them, make yourself one. You can't expect to just pay your few dollars each year and have a great organization laid at your feet. You must be part of it. Don't just suggest that something be done in your society, do it! Otherwise, it probably won't get done at all.

In closing let me repeat these magic words: "Success in any organization rests on the individual people that comprise it."

Date: September 1973

A.T.M. *for the Frantic Fringe!*

"A Simple 6" Telescope for Beginners"

By: Garry Boyd

Although its design does not strive optical perfection, this instrument will show such phenomena as the rings of Saturn, the mountains on the moon, and Jupiter's satellites. Total cost: about \$65.00

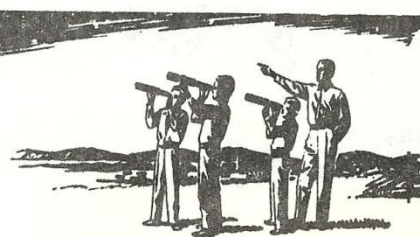
In 1926 an article appeared in Scientific American magazine which described how a group of amateurs in Springfield, Vt., had mastered the formidable art of constructing an astronomical telescope. The details of construction had been worked out by Russel W. Porter, engineer and explorer, and were described in collaboration with the late Albert G. Ingalls, an editor of Scientific American. Within a year some 500 laymen had completed similar telescopes and were well on their way to becoming amateur astronomers.

Ever since those years many amateurs have constructed their own telescopes, with enough ambition to grind and polish their own mirrors. Today it's much less complicating for beginners, for they can purchase pre-finished mirrors for about the same cost of a mirror kit and its aluminum coating.

The simplest reflecting telescope consist of four major subassemblies: an objective mirror which collects light and reflects it to a focus, a flat diagonal mirror which bends the focused rays at a right angle so that 'the image can be observed without obstructing the incoming light, a magnifying lens or eyepiece through which the image is examined, and a movable framework or mounting which supports the optical elements in alignment and trains them on the sky. About half the cost of the finished telescope is represented by the objective mirror (Coulter Optical Co.- has a 1/25 wave parabolic 6" F/10 mirror available for \$29.95).

The mounting of this telescope may be constructed while the mirrors are on order. In designing the mounting never permit appearance to compromise sturdiness. This telescope will have a maximum magnifying power of about 250 diameters and any jiggle arising in the mounting will be magnified proportionately. The mounting can be made from almost any combination of materials that chances to be handy: Wood, pipe, sheet metal, discarded machine parts and so on, depending upon the resourcefulness and fancy of the builder, The mounting designed on the next page is representative. The dimensions may be varied according to the requirements of construction.

Date: February 1976



FEB. 1976

After assembly the optical elements must be aligned. You must look through the tube in which it slides and adjust the diagonal mirror until the objective mirror is centered in the field of view. Then adjust the tilt of the objective mirror until the reflected image of the diagonal mirror is centered. Replace the eyepiece in its tube and you are in business.

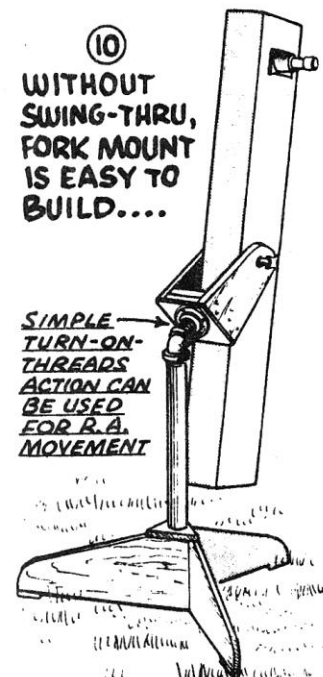
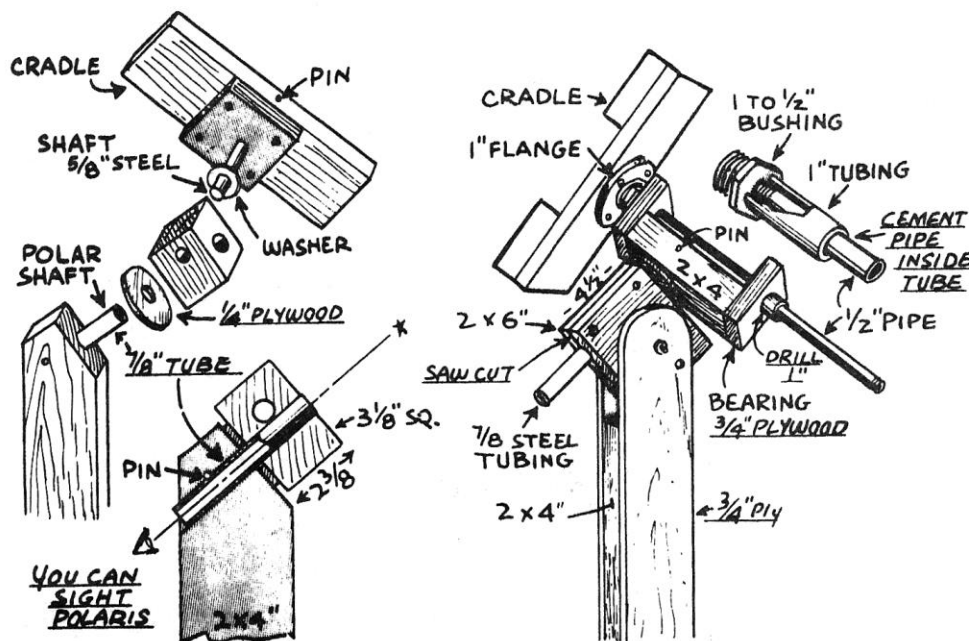
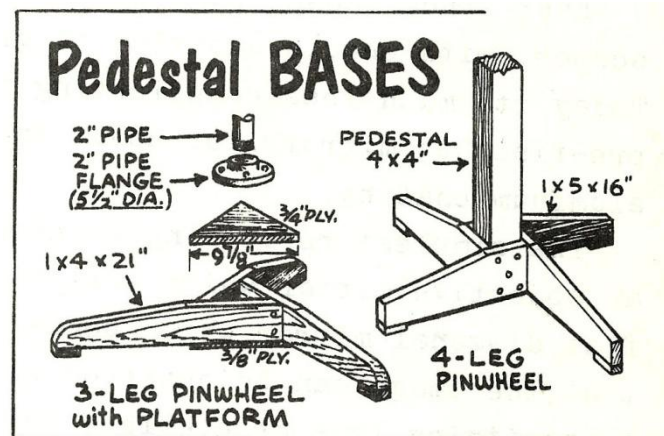
Those who construct this telescope will ultimately discover that it is not the best that can be built. To improve it consult the books recommended below and tackle the fine art of engineering a better mount.

All About Telescopes
by: Sam Brown
available: Edmund Scientific Co.

*Below some concepts for the
\$65.00 Telescope, from Sam
Brown's, All About Telescopes

Amateur Telescope Making
By: Albert G. Ingalls
Books, 1,2,and 3(3 vol. set)
Available: Scientific American,
also Edmund Scientific Co.

The 6" F/10 Telescope mirror
can be purchased from Coulter
Optical Co. P.O. Box K, 54121
Pinecrest Road, Idyllwild, Ca.
92349
(See Sky&Scope, Jan. '76)



THE FIRST TIME I SAW

-R. Bullock



I shall never forget the night I first saw— Θ —, It was many a year ago, long, before I knew what I was doing (Not that I know what I'm doing now, I just don't admit my stupidity any more). At least five years ago, maybe more.

I had been taking the astronomy course at Oakland University, and from time to time I would get up enough excitement (and energy) to haul out the 2½" terrestrial refractor my uncle had given me. The terrestrial telescope does not invert images. This didn't bother me in the least, for on cloudy nights it was very useful for looking through our neighbors' windows and, -but I digress, never mind that.

My favorite project had been looking at all the bright things up in the sky. Sometimes I stumbled upon a planet or two, and congratulated myself when I was able to discern the subtle difference between Mars and Jupiter. I spent many hours looking at the bright stars, noting the many colors in the sky.

On this particular night I found I had a slight problem. It was my custom to focus on the Moon, because it was relatively easy to find in the telescope (no finder scope). Unfortunately the Moon was not to be found, so I pointed the 'scope at a likely object, namely a bright star, and tried to focus.

What I was looking at didn't want to focus. I cursed and fumed at the crude instrument (no knobs on this model, the fixed eyepiece pulled in and out to focus). Suddenly, realization hit me! I hadn't used the 'scope for many months: the lens had come loose, making the star look like a hyphen.

HORRORS!!

By this time the object had drifted out of view (no clock drive either). I sighted on another star and found the telescope needed just a slight tap to focus properly.

So what in #@*&\$%! was that other thing? I tried to find it again.

Suddenly it swung into view---a RINGED PLANET!! Some thirty seconds elapsed before I realized my mouth was agape.

Words on paper cannot describe my utter amazement. I had found a new planet! I had never seen \ominus before, and, using primitive equipment slightly better (?) than that used by Galileo, I had made this incredible discovery. I congratulated myself and modestly named the new planet after myself.

Regrettably, most of the scientific community insists in referring to \ominus by a pagan name, something dreamed up thousands of years ago by superstitious, besotted barbarians.

How can anyone make significant gains while the rest of the world lives in darkness?

Now I know how Copernicus felt.



Date: February 1976

THE APPRENTICE ASTRONOMERS NOTEBOOK

Lou Faix

With warmer nights rapidly approaching from the south and the Summer Milky Way approaching from east, amateurs are once again into an ideal observing season. Just as diffuse and planetary nebula dominate winter viewing, galaxies prevail in spring. Likewise, the summer skies are embellished by star groupings; doubles and triples, galactic and globular clusters. Summer is the time for precision viewing - separating those very close binaries and resolving the individual stars in the majestic globulars. It is a time to be sure that our telescopes are performing right up to their limit. Just like an auto engine must be periodically "tuned up" to achieve its best performance, telescopes have to have occasional maintenance to achieve their best performance. Three factors should be examined:

- 1) Cleanliness
- 2) Lens and mirror supports
- 3) Collimation (optical alignment)

While there are several good commercial lens cleaning solutions on the market, I've had success with homemade solutions. Before washing a mirror or lens, use a soft camel hair brush to gently sweep off any large (visible) dirt particles. For a first solution, use a mild, non-fatty acid, liquid hand soap. A few drops in a pint of water are enough. Pre-wet the glass for 15 minutes and then swab the surface with surgical cotton balls dipped in the soapy water. Rinse thoroughly in clear water and then swab again in a diluted solution (1:4) of alcohol and distilled water. Finally, rinse the surface with distilled water. Drain the excess water by standing the mirror vertically. If a mirror still has a dull, whitish case, it is probably in need of recoating.

Reassemble the mirror into its cell and check for any lateral free movement. Replace any cork or other compressible material which may have lost its resilience and would allow the mirror to move about. Also replace pads which isolate the mirror from the cell hold-down arms. Adjust the hold-downs to be sure that the mirror is securely, but gently, retained in the cell. Any clamping pressure on the mirror may cause distortion and seriously reduce the image quality. Before reassembling the mirror cell into the tube, check the centering adjustments to be sure there is no radial free play and that the mirror is centered in the tube. Keeping the mirror exactly centered while the telescope is in any position is critical to good performance.

Collimation, or alignment of the optics, is the final and most critical operation. To speed the process up, place a small black spot at the exact center of the main mirror. Then cut a wood or cardboard disc to a size that just fits snugly into the open end of the tube. Drill four $\frac{1}{4}$ " dia. holes in disc exactly one inch in from the edge and equally spaced around the periphery (i.e. 90° apart). Put the disc in the tube and look in through one hole. When mirror optical axis is centered in the tube the black spot will appear centered in the opposite hole.

Date: June 1978

Be sure you see the same thing through all four holes. The black spot also aids in aligning the secondary diagonal mirror in a Newtonian telescope. Replace the eyepiece with a wood, metal or cardboard disc having a 1/8" hole exactly centered. Look through the disc at the black spot. The secondary mirror is properly aligned when the mirror spot is seen to be centered in the hole which can be seen on the back side of the disc. This completes course alignment of the optics. To aid in visibility, I suggest painting the backside of the eyepiece disc white. For best resolution, final alignment must be done at night, using a first or second magnitude star. Wait for a night when the seeing is very good and the stars are not twinkling. Allow the telescope to sit outdoors for at least one hour for all the optics to become temperature stabilized.

Pick a star near the zenith point in the sky and center it in a low power (50x) eyepiece. Increase the magnification to about 200x with a shorter focal length eyepiece or Barlow lens. Slowly back the eyepiece out from the focus position. A series of bright rings should be seen. If the rings are circular and concentric, the telescope optics are perfectly aligned. If the rings are eccentric ellipses, the main mirror alignment must be adjusted. These rings are formed as a result of the wave nature of light. In addition to indicating how well the telescope optics are aligned, these rings can tell you a great deal about the quality of the mirrors or lenses in the telescope.

The following article, reprinted with the kind permission of the Edmund Scientific Company, provides additional valuable information about the light rings and what they can tell you about your telescope.

AMATEUR BRIEFS

ANNUAL ASTRONOMY AWARDS FOR 1978

Robert Cox Harrington

The "Don Quixote" award for perseverance goes to Doug Bock for his untiring vigil in watching for aurora displays during the last two sunspot minimums. Now taking a well deserved break, Doug will no doubt be back at his post during 1984-85 for the next minimum. When queried about the importance of this project to the scientific community, Doug chased this reporter down the hall, shouting, "Someone has to do it, there is no shortage of thankless jobs in science!"

The "Divide-By-Zero" award for applied mathematics goes to Doug Smith, who has finally put his computational method for determining orbits to the test. On the evening of May 2), he made three closely-spaced observations of an objects position. Next, he spent four hours at the calculator in order to obtain the five orbital elements of the object. To his surprise, the results showed that the descending node was at Detroit's Metro Airport. It seems that Doug had observed a 747 on a landing approach. "I thought the proper motion looked a little large", he said with a puzzled look.

The "Flat-Earth Society" research award for the year goes to Jeff Stanek for his discovery of "ozone holes" in the Earth's atmosphere. After studying numerous photographs of meteor trails, Jeff noticed that they all pass through a single point in the sky. He then postulated that the ozone layer must repel all meteors except where an "ozone hole" exists. It is at this point that all of the Meteors enter. When asked by this reporter why meteor counts have been on the increase, Jeff replied, "It must be due to all those deodorant cans creating more ozone holes".

The: "Giordano Bruno" award for being in the wrong place at the wrong time goes to Frank McCullough, who was recently released from the hospital following an automobile accident on 23 Mile Road. It seems that Frank had a special, neutral-density #5 windshield installed in his car so that he could observe the sun on his way to work. However, this made it rather difficult to see oncoming traffic. "I now realize that I should have compromised at neutral-density #4", said Frank, waving his crutch for emphasis; "That would have been better for photography anyway".

The "Rube Goldberg" award for innovation goes to Dave Harrington, who recently acquired contact lenses. After several sessions of telescope viewing with these lenses in place, Dave hit upon the brilliant idea of eliminating the eyepiece by wearing orthoscopic contacts. This has worked amazingly well according to Dave, who told this reporter, "Why introduce another optical element if you don't need it"? He is now scheduled for plastic surgery in order to have a 1,*" adapter installed in his eye socket.

The "Cerro Tololo" award for deep-sky observing goes to Tim Skonieczny. Tim recently viewed the final two objects needed to complete the Kwentus Catalog of 1st Magnitude Objects. By viewing K-8 and K-14 (Arcturus and Polaris), Tim becomes eligible for the coveted Urban Observers Certificate. Commenting on the many months spent searching for these objects, Tim said, "Thanks to good seeing, K-1 and K-2 (the sun and moon) were fairly easy, and I got them both on the same day from Six Mile and Woodward. After that they got pretty tough". Tim informed this reporter that he spent many an hour at higher elevations (the bar on top of the Renaissance Center) searching for K-6 and K-7 (Sirius and Vega). "It doesn't become astronomically dark until about last call" he said, popping an alka seltzer into his mouth. After a futile search from Eight Mile and Gratiot for that difficult double, Mizar and Alcor, Tim

launched an expedition to the more favorable skies of downtown Lansing. It was here that he was first able to split this double star, in between flashes of a Kentucky Fried Chicken sign.

-2-

The "George Pierrot" award for the club member who has logged the most consecutive days without moving from his armchair goes to Gary Morin. Gary holds the current club record of 284 days and 6 hours without observing a single astronomical object. "I almost got caught by the rising last-quarter moon when I was driving home from my girl friend's house last week", said Gary, "But I ducked down behind the dashboard and drove home with averted vision". According to Gary, maintaining the status of Armchair Astronomer is not as easy as it sounds. "You must spend hours every day watching the weather maps, in order to know when it's going to be overcast, so you can sneak out of the house to get needed groceries. The weather fronts are the most dangerous", stated Gary, "because a sudden clearing could form while you are making a quick dash for toothpaste, and you might inadvertently catch a glimpse of the Big Dipper". When questioned as to his current projects in amateur astronomy, Gary informed this reporter that he does a lot of reading and thinking about the universe. "I'm also getting ready for the next transit of Venus in 2008", he said. "A person should learn to restrict himself to a reasonable number of observing projects, and not spread himself too thin",

Date: July 1978

NEWS NOTES

EX-PRESIDENT JAILED

It is with deep regret that we announce “the untimely departure of David Harrington from the ranks of the Warren Astronomical Society. Dr. Harrington, accomplished amateur astronomer and chemical engineer, began serving his 20 year sentence for defamation of character in the Jackson State Prison last week.

Dave is best remembered for his fight to construct an amateur astronomical observatory in the Detroit suburb of Troy. After a lengthy court battle, he was allowed to complete his observatory even though he was found guilty of interfering with his neighbor’s television reception. Applying his professional talents to the project, the observatory was outfitted with a lunar energy collector to provide energy for his clock drive. “After all,” said Dave, “lunar energy is the coming thing and I do use the observatory primarily at night.” Although functional, the collectors also serve as a moon dial and coffee maker.

During his career as an amateur, Dave acquired the nickname “Hard-luck Harrington” for his eclipse expedition disasters. Although he spent a considerable amount of time and money studying satellite cloud photos prior to each eclipse, he always managed to find the cloudiest viewing sites. His luck changed after the 1972 eclipse when someone pointed out that he was mistaken in his analysis of cloud patterns. It seems Dave studied infrared photographs which indicated cloudy areas as dark instead of white as normally shown. “They really fooled me on that one,” he commented later.

Dave’s career as a chemical engineer spanned both the aerospace and automotive industries. After 10 diligent years, he received his Ph.D. from the Michigan State University Extension Service in Ann Arbor. Soon he began work for General Motors at the Technical Center in Warren. His work in fluid dynamics led to many awards and recognitions. Unfortunately, his career took a sudden turn for the worse the first year he was elected president of the Warren Astronomical Society. After driving in a fellow club member’s Toyota Celica, he sold his newly acquired Delta 88 and purchased one for himself. The next day, he stormed into a design meeting and demanded an explanation why General Motors couldn’t design a car that had as much quality and efficiency as the Celica. Soon after receiving his pink slip, he quipped “I asked for it, and I got it!” When asked about his future, he replied “Plumbing and air conditioner-repair are highly related fields. You can’t complain about the wages either.”

Ironically, it was the same court that granted his lifelong dream of owning his own observatory that also put an end to his freedom. In the landmark case “The Defamed of the Warren Astronomical Society vs. Dave Harrington”, 11 members of the club who had been subjects of one of Dave’s numerous satires successfully sued him for his observatory and had him put away. The “Defamed 11” as they became known received much legal advice from lawyers representing Fatus Enterprises, the now billion-dollar corporation once satirized by Dave. At the end of the trial, Dave shouted “I was only joking!” So were they.

SKY CALENDAR MARCH 1979

Information for helping teachers and students observe the sky

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
<p>EVENING PLANETS: JUPITER is brightest "star" visible as dusk falls. High in ESE to SSE at its highest point, in S, at 9:32 pm local time on Mar 1, and 7:30 pm on Mar 31. Jupiter sets in WNW about 7 hrs later. With binoculars, look 7°-8° E of Jupiter for Beehive cluster (shown on map). SATURN in early March is up all night; it rises just N of E around sunset, is high in S in middle of night, and sets just N of W around sunrise. By Mar 31 it is high in ESE at dusk and sets 1 hr before sunrise. In evening, look about 10° lower left of Regulus as shown on Mar 1, 10-12. MERCURY's best evening appearance of 1979 occurs early this month (see Mar 7, 14). MORNING: Brilliant VENUS rises in ESE 2 hrs before sunup Mar 1, less than 1½ hrs before on 3/31.</p> <p>Evening: SW Aldebaran * Pleiades * Hyades * Moon</p> <p>Moon passes through Hyades tonight---pretty in binoculars! Watch leading dark edge of moon cover up several stars. See March 2.</p> <p>Evening: East 11 Regulus * Moon * Saturn</p>	<p>Evening: High in S 5 Moon at First Quarter * Aldebaran * Betelgeuse</p> <p>Evening: East. * 12 Note Saturn & Regulus are higher than on Mar 1. Saturn * Moon</p> <p>Sun enters Pisces today, just S of Circlet. If you were born on this date, you will never see the Circlet on your birthday. Nevertheless, HAPPY BIRTHDAY!</p> <p>Morning: S to SSW 19 Moon O * Antares</p>	<p>Evening: SSE to S 6 Moon O * Antares</p> <p>Full Moon. 13 As moon rises at sunset in Maine and Cape Cod, extreme upper right part of moon is in umbra, or dark central core of earth's shadow. From rest of New England, NJ, and eastern NY, slight penumbral darkening may be seen.</p> <p>Morning: South 20 Moon O * Antares</p>	<p>Evening: West. 7 Mercury at greatest elongation, 18° east (upper left) of setting sun. In mid-twilight, look 9° up in west. * Mercury</p> <p>Evening: 14 Mercury is 1.2 mags fainter and 3° lower than on March 7. Can you still see it? Inferior conjunction will occur March 24. * Mercury</p> <p>Last Quarter. 21 Equinox. Spring begins. As sun rises due east today, moon is nearly due south and is close to point in sky where midday sun was Dec 22. Note how Low moon is at sunrise, compared to how high sun is at midday.</p> <p>Evening: Even 29 though we are looking nearly 25 min later than last night, moon is higher because it is farther from sun. Look for <i>earthshine</i>.</p>	<p>Evening: East 11 * Regulus Saturn at opposition, 180° from sun (see notes at left). * Saturn</p> <p>Evening: 8 * Castor Evening: * Pollux ESE * Moon * Jupiter Procyon * Moon</p> <p>3 hours after sunset: ESE 15 Moon O * Spica</p> <p>3 hours after sunset: ESE 16 Rising Moon * Spica</p> <p>Also around the date 22 of an equinox, the sun rises due east and sets due west. During the next 3 months until the solstice, watch the sun's rising and setting points shift more than 30°. Which way will they shift? Find out by observation.</p>	<p>Tonight Aldebaran is 30° east (upper left) of crescent moon. Watch moon get 13° closer to Aldebaran each night. See Mar 3, 4. Around midnight PST Sunday night, moon will cover Aldebaran as seen from southern 2/3 of California coast.</p> <p>* Castor 9 Evening: * Pollux ESE * Jupiter * Procyon * Moon</p> <p>3 hours after sunset: ESE 16 Rising Moon * Spica</p> <p>Also around the date 22 of an equinox, the sun rises due east and sets due west. During the next 3 months until the solstice, watch the sun's rising and setting points shift more than 30°. Which way will they shift? Find out by observation.</p> <p>Evening: WSW to W 31 Aldebaran * Hyades * Pleiades</p>	<p>Evening: SW Aldebaran * Pleiades Hyades</p> <p>Evening: East 10 Moon * Regulus * Saturn</p> <p>Moon now rises about one hour later each night, allowing dark evening skies for good Milky Way viewing. Look for moon in morning sky, before and after sunrise, each day through March 26. Why does its phase change?</p> <p>Morning: ESE 24 Moon</p> <p>Venus * Moon</p> <p>Evening: WSW to W 31 Aldebaran * Hyades * Pleiades</p>

Magnitudes of the Planets: Venus -3.7 to -3.5; Jupiter -2.1 to -1.9; Saturn +0.5 to +0.6; Mercury: Mar 2 -0.7; Mar 7 -0.1; Mar 12 +0.7; then 0.2 magnitude fainter each day. **Motions during March:** Venus enters Capricornus Mar 3 and Aquarius Mar 26, and goes 37° eastward in 31 days. As it goes 1.2° per day, watch Venus pass 3.8° S of 3rd mag Beta Capricorni on Mar 6, 0.8° N of 4th mag Theta on Mar 15, and 2.3° N of 3rd mag Delta on Mar 23. Jupiter goes 1.0° west in Cancer March 1-25, ending retrograde 8° W of the Beehive and 8° SE of Pollux. Saturn goes 2.3° west in Leo, approaching to within 2.9° NE of 4th mag Rho and 9° E of Regulus.