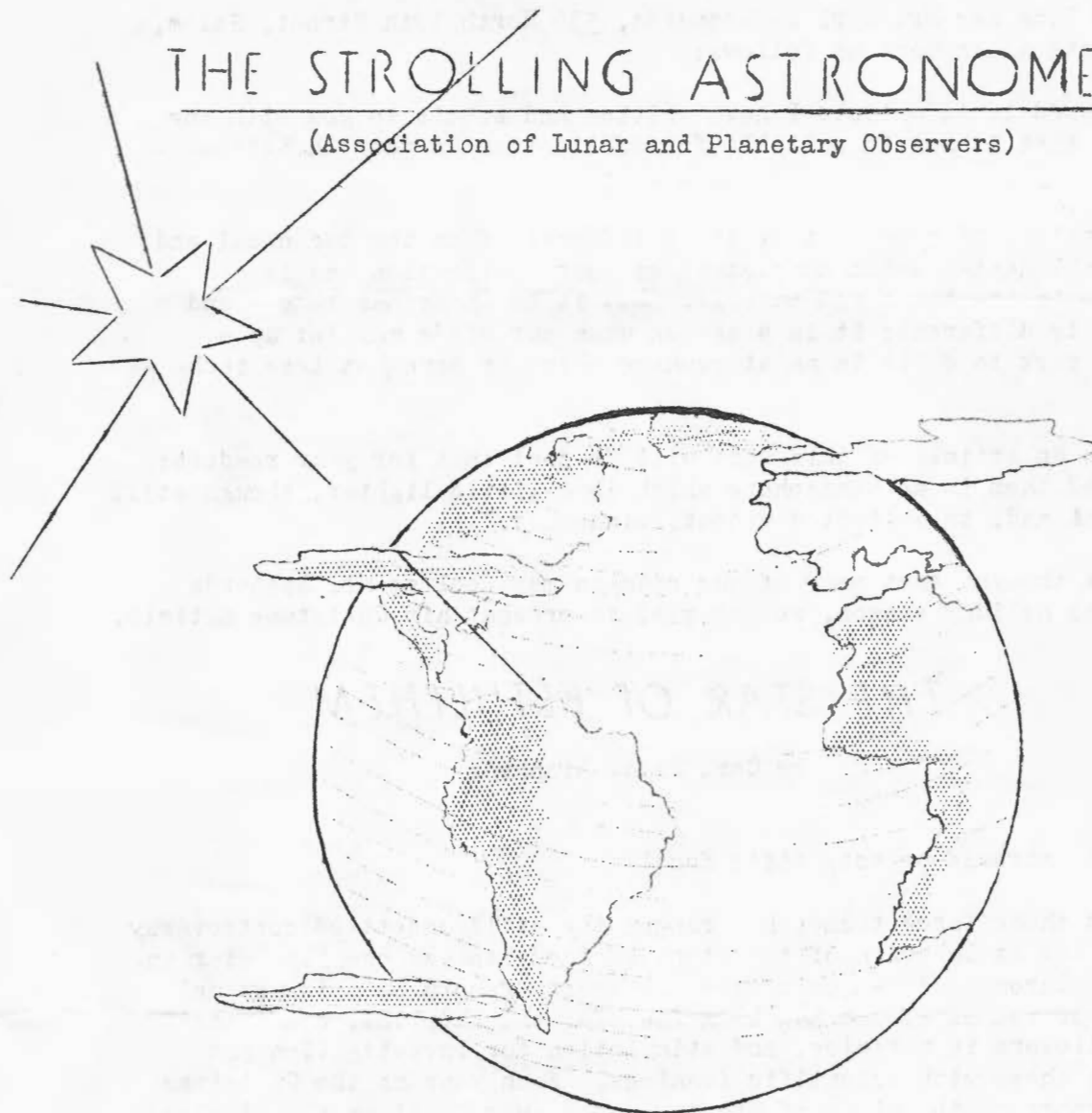


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THE STROLLING ASTRONOMER

(Association of Lunar and Planetary Observers)



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SEASON'S GREETINGS

The Strolling Astronomer wishes all its readers and astronomical friends a very merry Christmas and a prosperous 1948.

No so long ago Mr. Carl P. Richards, 530 North 19th Street, Salem, Oregon, wrote us in part as follows:

"Enclosed is an article I have written and submit to you with the suggestion that it may be suitable for publication in your Christmas... issue...

"I realize, of course, that it is different from the technical and observational matter which characterizes your publication and is so appropriate to its theme and purpose. But it is Christmas time-- and that, too, is different; it is a season when our minds may let up a little and seek to dwell in an atmosphere which is somewhat less technical.

"Maybe an article of this sort will do just that for your readers; it will lead them in an atmosphere which is a little lighter, though still astronomical and, to a limited extent, planetary."

In the thought that many of our readers may feel as Mr. Richards does at this holiday season, we are glad to present his Christmas article.

THE STAR OF BETHLEHEM

by Carl Price Richards

Legend, miracle or scientific fact?

Around these three themes has ranged the still unsettled controversy concerning the explanation of the story of the wise men and "the star in the east." Throughout the centuries the scanty record of this unusual experience of men of wisdom has been food for the skeptics, confirmation for the believers in miracles, and stimulation for investigation and research to those with scientific leanings. Each year as the Christmas season approaches, the minds of men the world over dwell on the timeless stories of the beginnings of the Christian era, interest is renewed in the events of two thousand years ago, and renewed efforts are made to get at the real facts concerning the various episodes.

It is natural for those whose training and mental inclination lead them to believe in the general law and order of the universe to seek reasonable and scientific explanations for phenomena which, at first, seem baffling, or even impossible. That is the attitude of such individuals toward the story of the Star of Bethlehem. Others, having less scientific background, merely toss it aside as the product of a vivid imagination, prompted by religious enthusiasm to endow a cause with the emphasis of the miraculous and mysterious. This is the course pursued by skeptics who pooh-pooh the whole episode as pure fiction.

Another alternative is to relegate such occurrences to the realm of the supernatural. That simply constitutes an easy way out; it is the method of the "medicine man" of primitive races and of the unlearned of the "civilized" peoples. But, to the intelligent, to those who mentally hunger for explanations of things which satisfy in the light of modern learning, any bewildering phenomenon is at once a challenge to seek and to delve until the truth is revealed.

What is the extent of the story of the star which has been handed down through the ages? It is very meager and limited entirely to the first few verses in the second chapter of the gospel according to St. Matthew. The significant passages are as follows:

"Behold there came wise men from the east to Jerusalem, saying, Where is he that is born King of the Jews? for we have seen his star in the east, and are come to worship him.

"Then Herod, when he had privily called the wise men, enquired of them diligently what time the star appeared. And he sent them to Bethlehem - - - - - they departed; and, lo, the star, which they saw in the east, went before them, till it came and stood over where the young child was. When they saw the star, they rejoiced with exceeding great joy."

Brief as the account is, it has had a tremendous impact upon the thought of people down through the years, to the extent that the star has taken its place as the symbol of the advent of Jesus, even as the cross is the symbol of his sacrificial death. For that reason, if for no other, there is justification in seeking to substantiate the story with scientific laws and facts and to correlate it with proven events.

To do this it is necessary to draw upon man's knowledge of astronomy, which is one of the oldest of sciences. The "wise men from the east" themselves were reputedly well versed in knowledge of the heavens and, crude though their knowledge was compared with what the science of astronomy encompasses today, their learning in that direction has much significance in regard to a full appreciation of the story.

Several possibilities have been set forth as affording an explanation of this "star in the east" and a review of them is of interest. These possibilities include such things as the occurrence at the time of the birth of Jesus of certain known periodic astronomical events. In this connection it must be noted that the exact date on which Jesus was born is unknown. But, by correlating the date with contemporary events which are known to have occurred in certain years, it is evident that it must have been during or before 4 B. C. - which was the year Herod the King died - and may have been as early as 11 B. C.

It is natural that the planet Venus should be suggested as being the star which the wise men saw in the east, as it is one of the most prominent objects in the sky, being brighter than any other except the sun and the moon. It would meet the requirements from that standpoint, since the wise men, seeking a sign, would only regard as such something of outstanding beauty and brilliance. Its appearance, too, would occur within the years during which the birth of Jesus is known to have taken place, as it shines very brilliantly for a few weeks as a morning star in the east at regular intervals of just over a year and a half. But

the Magi, being versed in the movements of the heavenly bodies, would not regard so well known and regular a visitant as Venus as being the sign they sought. Something more unusual must be found to meet the condition.

At rare intervals two or three of the planets approach one another in our view of the sky, and some have thought that a "conjunction" of that nature might have been the "star in the east." Such an event occurred in December, 1946, when Venus and Jupiter were brilliant objects close together in the morning sky for about three hours before sunrise; and this spectacle, coming just at Christmas time, recalled to many the story of the wise men and the star.

A similar close approach of the planets Jupiter and Saturn happened in December, 1603, and was observed by Kepler, one of the great astronomers of the years just prior to the invention of the telescope. A few weeks later, these two planets, still close together, were approached by the planet Mars, the three forming a relatively small triangular configuration of striking beauty. Kepler was greatly impressed and wondered whether something similar could have been the wise men's star. So he set to work calculating the movement of those planets backward through the centuries and found that such a "triple conjunction" had indeed taken place in the year 6 B. C. So rare and impressive an event might well meet the requirements of a sign for the Magi, but it should be observed that no mention is made of more than one star. If there had been three, or even two, that fact, surely, would have appeared somewhere in the story.

Other possibilities to explain the star seen by the wise men include comets and even meteors. The latter may be dismissed as scarcely able to fulfill the conditions. A bright meteor, or fireball as it is sometimes called, is too transitory, only lasting for a few seconds. Even the hazards of translation and of handing the account down through the years would not allow it to be said of a meteor that "it came and stood over where the young child was."

The suggestion that it was a comet is much more reasonable. Comets of sufficient brilliance to serve as a "sign" are of rare occurrence and are prominent objects in the sky, usually for a few weeks. Historical records show that a comet has always been regarded as presaging some important event, so it is very likely that, were such an object visible at that time, it would have been fully sufficient to start the wise men off on their quest. One can readily imagine the impression it would make on the Magi to see the bright nucleus of such a comet leading a long, luminous appendage, with the whole impressive spectacle pointing their direction to the King of the Jews whom they sought.

The possibility that such was the case has induced some to investigate any source which might indicate whether there was a celestial apparition of that kind during a year in which Jesus might have been born. A few years ago it was found that records left by early Chinese astronomers indicate that they observed in the year 4 B. C. a comet bright enough to be seen during daylight hours. If it could be seen in the far east, it was also visible in the near east, so this suggestion merits serious attention as the explanation of the nature of the object which led the Magi to their goal.

There is one other astronomical phenomenon which, possibly more than any other, holds promise of being the true explanation of the Star of Bethlehem. At irregular and unpredictable intervals new stars appear in the sky; they flare up in the course of a few hours from being very faint, or even totally invisible, to become stars of great, but varying, brilliancy. Many of them never attain sufficient brightness to be seen without telescopic aid; but every few years there is usually one which can be seen with the unaided eye, becoming as bright, probably, as the stars in the Big Dipper. They retain that brilliancy for only a few days, then gradually fade away, sometimes to disappear entirely from even the largest telescopes. These stars are called "novae," or new stars. Then, very occasionally - once in several centuries - there occurs a gigantic outburst, which astronomers call a "supernova," a new star of a magnitude which has been known to attain a brilliance exceeding that of Venus at its brightest.

Such a supernova appeared in the year 1572 and was thoroughly observed and measured with all the instrumental facilities available in those pre-telescope days by Tycho Brahe, the famous Danish astronomer. The records he left concerning it are precise and, coming from one who was a recognized authority on astronomical matters in his day, may be regarded as thoroughly reliable. This supernova was in the constellation of Cassiopeia; and, strangely, only thirty-two years later, in 1604, another supernova appeared in the constellation of Ophiuchus. The former, which is often referred to as Tycho's star, became so bright that it was clearly visible in the sunlight of noonday. The later one is recorded as nearly equalling in brightness the planet Jupiter. Both must have been striking objects, especially as each was in a part of the sky which is never reached by any of the planets.

No other such supernova has been seen during the subsequent three centuries, but telescopic supernovae have been observed on several occasions. Some of these exceeded Tycho's star in actual brightness, termed absolute magnitude; but, owing to their great distance, their apparent brightness, or magnitude, was much less. Some regions of the sky have produced a considerable number of faint novae and supernovae. The well known Andromeda Nebula, a galaxy similar to ours of the Milky Way, but some 800,000 light-years distant, has shown more than a hundred new stars in recent years. Some of them have been of gigantic proportions, one attaining a brilliancy over 200,000 times that of the sun!

Thus, it would appear that, in the Universe at large, the occurrence of new stars, often vastly greater than our own star - the sun - is relatively common. In these days of systematic scientific observation of the celestial sphere, no event of that nature is allowed to go unrecorded. But conditions were very different a thousand or two thousand years ago. The recording then of scientific happenings was a chance affair; and, with no widespread dissemination of information, such records as were made suffered distortion and loss.

It would, then, seem quite reasonable to claim that the star which the wise men saw in the east was a nova - or even a supernova - and their regard of it as "his star" was, to them, sufficient record. Any scientific explanation of it was inconsequential and entirely overshadowed by their view of it as "a sign." If it was noticed by others, no mention of it seems to have been made in contemporary writings or records of any kind.

So science, left with no authentic information, is merely able to speculate. It can make no definite statement, but merely point out the possible, or even probable, explanation. It is not the only instance of science's being baffled and unable to square its facts with the Gospel records. Incidents relative to the birth of Christ, His miracles, and His resurrection conflict considerably with scientific laws; but, it should be noted, they do not, thereby, lose their moral and spiritual values.

On the contrary, such values are enhanced by the aura of mysticism surrounding that timeless story; and the fact remains that whether the Star of Bethlehem be legend, miracle or scientific fact, the story itself is a great reality and a power for good. It has always been, and will continue to be, an inspiration and a solace to untold millions of people down through the centuries.

Whatever one's attitude may be to the science behind the story, however, there still remains the basic Christmas message - "on earth peace, good will toward men" - and there never was a time when this old world so sorely needed, as it does at present, to follow the teaching which that message forecast.

A PRIVATE OBSERVATORY

by E. L. Forsyth

My 6-inch F:8 reflector was built by John Mellish in an 8-inch galvanized iron tube. The concrete pier goes six feet into the ground. The top is in line with the polar axis of the earth. A 2-inch hardwood block is bolted to the pier's top. The 6-inch declination circle is graduated in whole degrees. There is a brass gear 6 inches in diameter and a worm for a manual drive, with a universal joint and rod to the eye end of the telescope. The mounting is all $1\frac{1}{2}$ -inch pipe fittings with a $1\frac{1}{2}$ -inch pipe plate bolted through the 2-inch by 4-inch wood cradle block holding the telescope. It is possible to unscrew the 4 nuts and to remove the cradle and telescope from the $1\frac{1}{2}$ -inch pipe plate at the end of the declination shaft. All threads were straightened in a lathe, and all fittings were "squared-up" in a lathe to make right angles. This must be done! The $1\frac{1}{2}$ -inch pipe is held on top of the pier block by clamps bolted to the pier block.

The main right ascension shaft is a piece of $1\frac{1}{4}$ -inch pipe turned down in a lathe till it just slid down inside the $1\frac{1}{2}$ -inch pipe shown under the two clamps. This shaft was brought out half an inch past the end of the pier head; then a brass collar half an inch wide was fitted over the $1\frac{1}{4}$ -inch pipe shaft and was screwed into the $1\frac{1}{2}$ -inch pipe tee that holds the telescope and counterweight with a $1\frac{1}{4}$ -to $1\frac{1}{2}$ -inch bushing.

The main 6-inch drive gear was cut out to slide over the $1\frac{1}{2}$ -inch pipe under the clamps on the pier. The gear was brazed half an inch from the upper end, and this braze was covered with a 2-inch coupling and "let down" into the wood block. The whole assembly pulls out of the right ascension clamps.

The worm gear and its mounting and the universal joint with handle near the eye end of the telescope are bolted to the pipe holding the counterweight. This strap-iron mounting for the worm gear is made from $\frac{1}{4}$ - by $\frac{3}{4}$ -inch strap-iron and is brazed. It has an adjusting screw to hold the worm against the main gear and fittings to change the rod to either side of the worm as needed.

When the telescope is swung by hand, the $1\frac{1}{2}$ -inch polar axis pipe on the pier-head turns under the 2 clamps and is a perfect "brake."

There is no vibration in this mounting.

Cost for pipe and fittings	\$6.00
Lathe work in Fallbrook shop	4.00
Wholesale price on 6-inch brass and worm	6.50
To Mr. Mellish for making bearings for worm, brazing and mounting gears, and making universal joint and rod, etc.	<u>15.00</u>
Total	\$31.50

POSTSCRIPT by editor. Through Mr. Forsyth's kind generosity, we are able to illustrate his article with a photograph of his telescope. These are being distributed with this issue.

Our contributor was one of the charter members of the A. A. V. S. O. He was then using a 3-inch Brashear refractor in the clear desert air at Needles, California. For many years he was an engineer on the Santa Fe Railroad. His present observatory is listed in the catalogue of ~~observatories~~ recently compiled by Miss Mabel Stearns of the Washington, D. C., amateurs. Mr. Forsyth belongs to the Los Angeles Astronomical Society, the American Meteor Society, and the Meteoritical Society. His address is R. R. 1, Box 7, Fallbrook, California.

It will be noted on the photograph that the observatory has a roll-off roof.

CURRENT AND COMING OBSERVATIONS

Clyde W. Tombaugh, the discoverer of Pluto, has reported to us his observations of the Crape Ring of Saturn. They were made with an 11-inch diaphragm on a reflector at Las Cruces, New Mexico. On November 11, in rapidly varying seeing, he saw the Ring C (Crape Ring) projection on the ball as a narrow band much wider at the limbs than at the C. M. (It is necessarily really wider at the limbs.) On November 16, in seeing good at times, he did not think either Ring C or its projection unusually narrow. The south edge of the projection coincided at the limbs with the inner edge of C off the ball. Well seen at the ansae, Ring C appeared to fill $6/10$ of the space between the inner edge of Ring B and the globe. On November 28, Ring C was easier and wider at the west ansa than at the east one. Mr. Tombaugh was so surprised by this unsymmetrical appearance that he checked it several times in the best moments. At the west ansa C filled $5/10$ to $6/10$ of the distance from the inner edge of B to the ball; at the east ansa, only $4/10$.

E. E. Hare has continued to study Saturn with his 7-inch reflector. In November he thought the projection of C about as wide as Cassini's at the ansae; at the ansae Ring C extended in $4/10$ of the way to the ball. On November 30, December 1, and December 2, Hare found that Ring C appeared narrower at the west ansa than at the east but suggests that the phase-darkening of the west limb is the true explanation.

In late November and early December W. H. Haas saw Ring C and its projection the same as reported in our December issue. A fairly good view on December 7 showed C wider and lighter at the east ansa than at the west.

The apparent recent lack of symmetry in C may well bear on the explanation of the recent change.

H. M. Johnson and E. E. Hare suggest that Ring C has not really changed at all since May, 1947. They propose that during the last months of 1947 the supposed Ring C projection has really been the shadow of that ring. If so, this shadow will widen with the changing saturnicentric positions of the earth and the sun during the first months of 1948. The editor thinks their explanation improbable. Members of A. L. P. O. have obtained many good views of Saturn during the last decade, and a dozen or so members have accumulated well over a hundred observations of such a delicate feature as Encke's Division; but one looks in vain for reports of the shadow of Ring B south of B, where the C projection lies. (A. F. Alexander writes that Belgian planetarians have made this observation.) Presumably, C and the shadow of B do not contrast enough in darkness for the latter to be seen there. But one easily saw the limb of Saturn through Ring C, and the shadow of C must surely be lighter than the shadow of B. If the shadow of B is here unobservable, that of C must be also. Again, if the Johnson-Hare explanation is valid, large fluctuations in the breadth of the presumed Ring C projection should have been observed at all past apparitions of Saturn as the shadow of the rings shifted. Nevertheless, the editor urges all observers to continue to watch C and its projection very closely in the coming months.

We have already spoken of four belts recently seen on Saturn: the two components of the South Equatorial Belt, the South Polar Belt, and the North Temperate Belt. Other belts have now been reported. Reese and Haas have seen a delicate thin Equatorial Band near the middle of the bright Equatorial Zone. Hare on December 2 perceived "a broad but indistinct belt about 2".0 north of the S. P. B. and a narrow belt near the S. E. B.s." White has drawn a belt between the S. P. B. and the S. E. B.s. Reese on December 1 drew "an extremely faint belt" 7/10 of the way from the shadow of the rings to the north limb.

During January the two Saturnian shadows, that of the ball on the rings and that of the rings on the ball, will be growing smaller. We request our readers to examine these shadows carefully when they are very small; such observations may give important information about the visibility of thin dark bands. The shadow of the ball will be invisible behind the ball on February 9, 1948, the date of opposition; it should be watched for about three weeks both before and after this date. Near opposition a spurious dark band, perhaps a contrast-caused illusion, may border the limb on the unshadowed arm of the rings. The shadow of the rings on the ball should be regularly observed after about January 15. We prefer not to give its expected date of disappearance since foreknowledge can easily bias observations.

In late November and early December Mars continued to exhibit a brilliant north cap and a rather dark bounding north polar band. T. R. Hake at York, Pennsylvania, found this band "striking" in his 4-inch refractor on December 1, the seeing being fairly good. Haas thought the north cap abnormally and extremely brilliant on December 7 and 11. This observer found the south cap to be smaller and dimmer than the north cap in late November and early December. Hake remarked an undistinguished south cap on December 1.

C. W. Tombaugh writes that he saw the southern third of Mare Acidalium severed from the rest of the mare by a light rift. Haas failed to observe this appearance near December first, using a telescope smaller than Tombaugh's; Acidalium was, to Haas, notably dark. Was the separated portion Niliacus? E. E. Hare on November 5 at C. M. 255° remarked two "broad, spotted streaks," which may well be Adamas and Nepenthes canals. Haas drew Adamas on December 8 and saw Nepenthes well on December 7, 8, and 11. The latter canal was light, far less intense than near the 1941, 1943, and 1946 oppositions. Compatibly with Hare's notes on November 5, Haas saw Nepenthes to terminate at Moeris Lacus and not to connect to Syrtis Major, as it formerly had. E. K. White on November 11 drew the Wedge of Casius and Nepenthes emanating from it. Haas found Jamuna canal very strong on November 25, 26, and 27. Tombaugh and Haas independently found the southern maria light and ill-defined with the C. M. near 30°. Is this result due to the present northward tilt of the axis?

We present a table of future values of four physical quantities for Mars: D, the angular diameter; D⊕, the areocentric latitude of the earth; ☉, the areocentric longitude of the sun; and C. M., the meridian of Martian longitude passing through the center of the disc. These values are given for 5 a.m., EST, and corresponding times in other time-zones. Quantity C. M. increases at a rate of 14.6 per hour.

<u>Date</u>	<u>D</u>	<u>D⊕</u>	<u>☉</u>	<u>C. M.</u>
1948, January 1	10".4	+20°.8	39°	41°
January 7	11 .0	+20 .6	42	346
January 13	11 .6	+20 .4	44	291
January 19	12 .1	+20 .1	47	237
January 25	12 .7	+19 .7	50	184
January 31	13 .2	+19 .3	52	131
February 6	13 .5	+18 .9	55	78

The famous Syrtis Major is near longitude 290°.

Jupiter will be visible in the morning sky soon before sunrise during January. It will be interesting to see whether the Red Spot Hollow and other features have changed since last autumn.

MORE THIS AND THAT

Students of the planets will be greatly interested in the fact that Dr. Gerard P. Kuiper, Director of the Yerkes and MacDonald Observatories, has discovered carbon dioxide in the atmosphere of Mars. He made this discovery last autumn with an infrared spectrometer recently developed. The amount of carbon dioxide in the atmosphere of Mars is comparable to that in the atmosphere of the earth. Methane and ammonia, gases prominent in the spectra of the major planets, were not detected. The bulk of the Martian atmosphere may well consist of nitrogen, which does not have bands in the observable part of the spectrum. It is reported that Dr. Kuiper plans to look for water vapor at the edge of the melting north polar cap near the February 17, 1948, opposition.

Mr. S. C. Venter, P. O. Box 451, Pretoria, South Africa, tells us that he has just finished a 6-inch mirror and that he intends to start a 12-inch soon. He is planning to design the latter primarily for planetary work (long focal ratio?). Mr. Venter wonders whether The Strolling Astronomer could give helpful hints to mirror-makers. M. Rosenkotter, R. Schmidt, and several other

readers have also written of their telescope-making problems. The editor hesitates to offer advice about making mirrors; his experience has been limited to observing with them. But a number of members of A. L. P. O. have made optically excellent telescopes - E. J. Reese, F. R. Vaughn, E. K. White, H. E. Dall, L. J. Wilson, and surely many others. Might not some of these submit an article, or even a longer set of instructions, to aid their less experienced colleagues? A. L. P. O. is your Association, and you can do something to further lunar and planetary astronomy.

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S T A F F

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