

sextant, the altitude measuring device, an almanac, and a table of triangle solutions, the navigator may mark on his chart a "line of position" from his sight on a star. The line of position, about 30 miles long, is the tangent to the circle of equal altitude which is nearest the navigator's best known position. Two stars give two lines of position which cross to give a "fix" or exact geographical position. These are generally checked by a third line.

The modern navigator has the roots of his skill buried in the remote past. The heavens must be as much home to him as to the Greek shepherds or the Arab travellers, many of whose names for stars and constellations are still in use. He must accurately identify at least fifty stars and know the movements of the sun, moon, and planets. The skies are not a mystery to him, but like the friendly lights of a city, they point his way.

COURSES IN ASTRONOMY

"Structure of the Stars" under Dr. Gec. A. Gamow is offered by George Washington University in the fall term. The course is advanced work on stellar structure and energy sources, either term on conference basis, admission by special permission.

"Astronomy and Celestial Navigation" with Father Sohon will be given again at Georgetown University in the fall. "Meteorology" is scheduled for the summer session and the January semester.

American University has not completed its schedule so we don't know at this date what astronomical course will be given. Catholic University does not include the subject at all.

THE NEXT BULLETIN WILL APPEAR IN SEPTEMBER.

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PICNIC-OBSERVATION rain or shine, July 7th at Palisades Field House. Our permit is good from 5 to 11 p.m. Bring lunch and telescopes and any influence you have with the weather man.

Take Glen Echo or Cabin John streetcar to Stop 15. The Field House and grounds are on the south side of the car track. Or drive out MacArthur Boulevard from Georgetown, turn left on Dana Place, then right at Sherrier to Edmunds. Entertainment Committee will furnish coffee. Clarence Herreshoff, Chairman, Emerson 0992. The June picnic was rained out.

SOLAR ECLIPSE. Meet on the east side of the Monument July 9th for the partial eclipse which will begin at 7:05 a.m. Bring cameras and whatever equipment you wish to use in time to set them up. Ends at 8:58 a.m. Robert McLellan, Chairman, Hillside 0757.

AUGUST OBSERVATION. Major and Mrs. Ray K. Windham have invited the Association to bring telescopes for an evening of observation and meteor counts at their home, 4885 Edgemoor Lane, Bethesda, Md., August 11th about 8:30. Take Alta Vista or Montrose bus from terminal at Wisconsin Ave. and District Line. Get off at Bank of Bethesda, turn left on Edgemoor Lane between Peoples Drug Store and Elite Laundry. After passing some small shops, it is the third house on the right. Bring camp chairs if you can.

THE ASSOCIATION'S TELESCOPE is now in usable condition, thanks to Mr. McLellan, although the finder needs adjusting and the diagonal prism apparently was left at the Cathedral. A few of the amateurs enjoyed an unpremeditated evening of viewing clear skies with the scope recently.

ABOUT 25 PERSONS arrived to see the stars at the nature outing on June 17th in spite of clouds which cancelled the event. Barnard Hill Park is ideal for observation, being higher than the surrounding area with an unobstructed view of the sky. It is on the District Line at Randolph Street N.E., but well worth the effort to reach it.

#### PUBLICATIONS

"The Home Made Telescope," by Wilbur F. Decker, 1935, is available at the Public Library. 25 page pamphlet. The library has other material in pamphlet form not on the shelves but available upon request.

"Astronomical Information Sheets" are obtainable from G. B. Blair, Astronomical Information Service, 1059 Sierra Street, Reno, Nevada, at a subscription price of \$1 for 20 mailings. A mailing consists of from one to several sheets, depending upon available information.

The copy we have comprises six, full, mimeographed pages with suggestions for finding difficult objects in telescopes, comments on setting circles, conjunction of Venus, and many other items of interest to an observer. It adds: "We find that those who actually use their telescopes are enthusiastic for our service while those who do not are commonly indifferent to it."

"Texas Observers' Bulletin," Oscar E. Monnig, Editor, 1010 Morningside Drive, Ft. Worth 3, Texas, \$1.50 a year. Our copy consists of four mimeographed pages of news items of interest to amateur astronomers.

#### THE STARS AS GUIDES - II Lt. (j.g.) V. Withington, USNR

This primitive but effective method of navigation was made more adaptable and flexible by the discovery that measurement of the angle of altitude of the star will establish distance from its "subpoint," the point on the earth's surface directly below the star. A star on the horizon has zero altitude and its "subpoint" is over 5000 miles away; the star with 90° altitude is directly overhead and the observer stands on its subpoint. Intermediate distances and altitudes are easily figured. If one's destination were 300 miles south of the known path of a star, one could follow the path that is established to be 300 miles south of that of the star by maintaining it at the proper altitude. However, the measurement of a star's altitude will not give exact geographical position, as for any given altitude one might be at any point on a circle whose radius is the distance from the star's subpoint to the observer.

The development of accurate chronometers and, more recently, radio time signals have made it possible to calculate not only north-south position or latitude, but also east-west position, or longitude. Astronomers calculate the exact location of the stars, sun, moon, and planets for each minute and second of time. If the navigator should know the time of his altitude observation and the star were due east or west of him, he could calculate his longitude by simple altitude-distance relationship.

But the stars are not always conveniently arranged to be on one of the four cardinal points of the compass. Various methods have been worked out to solve the spherical triangle formed by the Pole, the stellar subpoint, and the observer's position, and are supplied to navigators in tabular form. With the help of a