

seem upside down to people from the north, just as it and all other heavenly bodies will seem in the northern hemisphere to people from the south.

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HOW FAR YOU ARE NORTH OR SOUTH

In order to fix a position on the surface of the earth, we need to know two things: latitude and longitude. They may be likened to the way you describe a position in a city, that is, by the intersection of two streets. You may be anywhere along one street, but where this crosses another fixes your location, such as Main Street and Broadway.

Latitude is measured from the Equator, which is an imaginary circle around the earth at equal distances from the North and South Poles. Latitude is measured in degrees north and south from 0 degrees at the Equator to 90 degrees at the Poles. Each degree is 60 nautical miles. From this it can be seen that the distance from the Equator to either pole is 90×60 which equals 5400 miles. Latitude is given as so many degrees and minutes north or south of the Equator. As previously mentioned one minute of angle is a 60th part of a degree and is equal to one nautical mile.

We will describe four methods by which you can find your latitude and all of them, I believe, you will find quite easy.

BY THE POLE STAR

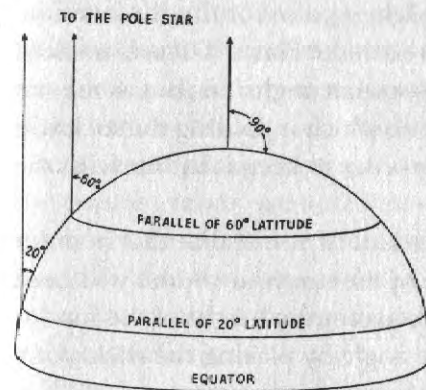
The Pole Star is visible anywhere north of the Equator and provides a very easy means of obtaining latitude.

In the chapter on Measurement of Angles we described the "Harp." If, after sunset or at dawn when the stars and the horizon are visible, or on moonlight nights when the same condition exists, we take the "Harp" and with it measure the angle of the Pole Star above the horizon, this angle will be the approximate latitude north of the Equator.

The Pole Star does not exactly coincide with the true North Pole of the heavens, but describes a small circle around it. When the Pole Star is in the same horizontal position as the true North Pole its height above the horizon will be exactly your latitude. When it is at the top or bottom of this small circle, there will be an error of 1° , or 60 min., equivalent to 60 miles. With the sun and stars a difference of one minute in height is equivalent to one mile in distance on the surface of the earth.

An observer one mile nearer the sun or star than you are will measure an angle one minute greater than you do. An observer one mile farther away from the sun or star will measure an angle one minute less.

The accompanying diagram illustrates that the height of the Pole Star is equivalent to latitude. Navigation tables contain corrections



for the amount that the Pole Star is in error. For our purposes this is hardly necessary, as this error may be approximately determined in the following manner:

Look at the star diagram for the north polar area on page 75. At the end of the handle of the Big Dipper you will see Alkaid (also called Benetnasch). When

this star is directly below the Pole Star, the Pole Star is on the top of its circle, and to obtain your latitude at this time you must subtract 1° from the height you measure.

When Alkaid is in a horizontal line with the Pole Star on either side of it the correction is nil. In between these positions you may allow a proper proportion.

Another method is by the star marked ϵ Cassiopeia and it can be used similarly. When it is above the Pole Star the correct latitude

may be obtained by subtracting 1° from the height you measure; when it is below it is necessary to add 1° .

If you do not have the three-foot length necessary for making the Harp, you can resort to hand measurements as described earlier. The Pole Star is not a particularly bright one and there are many times, due to obscuring clouds, that it will not be visible. Do not be discouraged if circumstances render this or any other one method unusable. There are other ways and you can bide your time until you can use one of them.

BY THE HEIGHT OF THE SUN AT NOON

A simple table has been constructed for your use and is included in Table A, which will be found on the back of the world chart.

To obtain your latitude by this method your watch is not necessary. As the sun is approaching its highest point for the day take continuous measurements of its height with the Harp. There is no need to continually refer to the scale to see what angle it is, but as the sun continues to rise, the tip of the thumb which is holding the stick will be gradually moved up the stick in order to keep it in line with the top edge of the sun and the eye.

Move the thumb tip along the stick until you realize that in order to keep it in line with the top edge of the sun your thumb will need to be moved down. This will be the maximum height of the sun for the day. You can then measure the angle by placing the stick along the "Harp Scale" on the back of the chart.

Entering Table A and looking for the nearest day to your date, go horizontally until you find the nearest noon height to the one that you have measured. The latitude will be found at the top of the column. This may be determined more closely by taking a proportion between the dates shown giving the exact noon height for your date and using the same method of proportion with the noon height in the next column of latitude.

Obtaining latitude from the noon height of the sun will be found

difficult when the sun is between 85° and 90° in height. This is true even with precision navigation instruments because it is hard to determine the direction on the horizon from which to measure. You should also know whether the difference in noon height of the adjoining latitude columns for the same instant is equal to the difference in latitude.

On some occasions between the tropics cases will occur where the difference is not equal to the change in latitude, indicating that the sun has gone over the top. At these times one noon height will be the same for two different latitudes. Apart from these rare occasions the sun's height at noon provides an easy and practical means of determining latitude.

BY THE POLYNESIAN METHOD OF OVERHEAD STARS

The realization and application by the Polynesians of the continued passage of the same stars over the same islands year after year provide a simple means of obtaining latitude at any time of the night without the necessity of having a watch or any mechanical means of measuring height. A watch is necessary for determining our position in an east and west direction, but is not necessary for latitude. In order to use the transparent star chart it will be necessary to be able to recognize the principal groups of stars or constellations. For this reason, star diagrams have been given covering the main constellations.

If the sky is clear about you, look directly overhead and pick the nearest star to your overhead point. Find the next group of stars to it that you are able to recognize from the star diagrams or the transparent star chart.

Knowing a prominent constellation and seeing what direction this particular star is from it, you will be able to tell which one it is on the transparent star chart. Whether or not it is named on the star chart does not matter. It will be easier to find on the chart if you will look along a line on your approximate latitude. If you turn the back