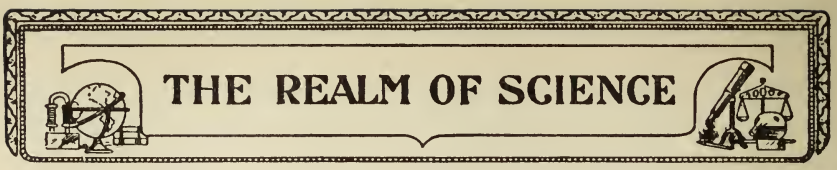

HOW TO FIND OUR WAY BY THE STARS

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IN a recent number, *l'Astronomie,* the official journal of the Societe Astronomique de France, mentions the case of a French soldier who though captured by the Germans, contrived to escape from his prison. As he was in the enemy's territory he had to hide during the day, and as he was in a region unknown to him, he wandered about more or less aimlessly during the night. One night, however, when the sky was clear, he happened to look up at the stars. Knowing just enough of astronomy to identify the north star, he was at once sure of his bearings, and could thereafter direct his way towards his own country, which, thanks to the faithful guidance of the stars, he at last reached in safety.

This romantic little incident shows that even a most elementary knowledge of astronomy may be of enormous practical use. This elementary knowledge is so small and is so easily acquired that there is hardly any excuse for not possessing it. A careful perusal of this or similar articles and a little study of the night sky are all the necessary requirements.

If the reader will look at the engraving, in which the black dots are intended to represent stars according to their relative positions and brilliancies, he will have a sure guide to lead him to the north star. No marks and no letterings of any kind have been drawn on the map and no directions have been given to the engraver as to which side should be up. This was done on purpose.

If now we take the map, hold it up vertically before us,

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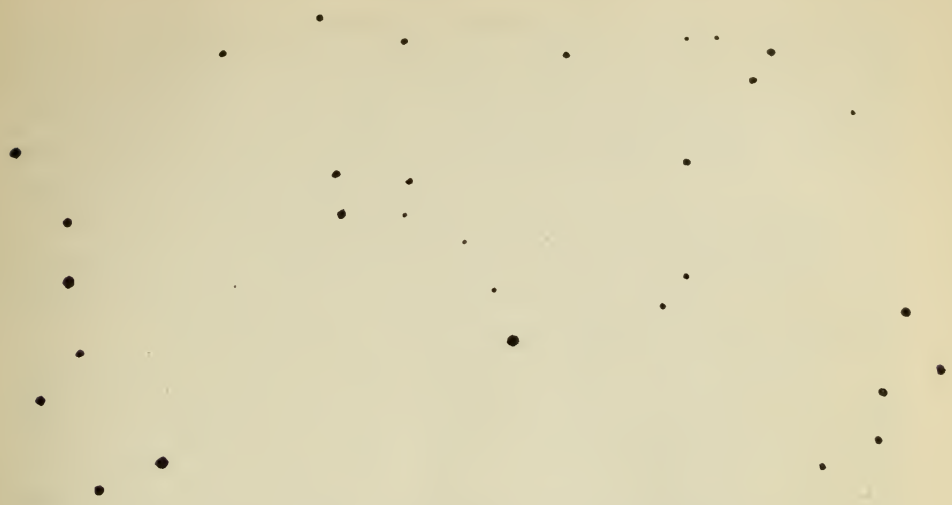

and compare it with the northern sky on a clear night, when there are no glaring electric lights and no moon to blind us, we shall soon be able to recognize many of the stars on our map and do that so well that possibly even after our first lesson we will no longer need the map. About half way up from the ground to the point directly overhead, we will see a bright star which has only one to equal it in brilliancy for a considerable space. This is the pole star, or the north star, or Polaris, the most important star in the heavens. It is placed near the middle of our map. Once we know this star, we can pick it up on any clear night, because it is always so near the same spot that our eyes will not detect its little motion. All the other stars in the heavens move in circles of various sizes, so that even a few hours, sometimes even a few minutes when the stars are very low, will suffice to make us realize their motion. But the pole star seems, as far as our eyes can see, to be immovably fixed in its place, so that all the other stars move about it as a center.

It is because all the other stars move about the pole star as a center that I cannot give the reader more explicit directions as to what side of the map here printed he is to place on top, because I cannot know on what night or at what hour he may compare the map with the sky. It is on account of this ceaseless revolution which carries the stars in circles about the north

star in the course of one sidereal day (which is about four minutes shorter than our solar day of twenty-four hours as shown by our time pieces,) that, in order to keep pace with this motion, our map should swing around the north star in a direction opposite to that of the hands of a clock, so that all sides of our map will in turn come on top. It is advisable therefore to know a few other stars so that this diurnal revolution may not confuse us, the more so as it will be difficult for a beginner to identify the pole star alone without reference to his entourage.

Looking at our map somewhat more closely, we will notice near one end of it the Big Dipper, a configuration of seven stars, all except the fourth of about the same brightness as the pole star. The Big Dipper is easily identified. It is the finest grouping of bright stars to be seen in the north. It has been known from antiquity, and has received special names in various countries. We call it the Big Dipper, because it looks like one. The handle is elegantly curved and the bowl is wider at the top than at the bottom, and the faintest star of the seven is at the juncture of the handle with the bowl. Everybody should know the Big Dipper. It swings round the north star exactly as its drawing on our map would swing round its north star when the paper is turned anti-clockwise.

Now, remembering that we said that the bowl was wider at its top than at its bottom, using the terms top and bottom with respect to the Big Dipper itself and not to its position in the sky, we draw a line through the two end stars of the bowl from its bottom to its top, and produce this line about five times as far as the distance between these two end stars, and we will always come to the pole star, no matter where the Big Dipper may be, whether it be above or below to the right or left of the north star. As the Big Dipper is so easily identified at all times, this method gives us an easy and a very sure way of finding the north star. And as the north star is of course to the north, we have our bearings correctly.

Now that we know the pole star, let us make the acquaintance of the Little Dipper. It is not as conspicuous nor as large

as the Big Dipper, nor is it so well formed. It has the north star at the outer end of its handle. This handle is curved in the opposite direction, so that it is more of a ladle than a dipper, and the bowl is narrower on top than at the bottom. If once known, it is easily found again.

We may become acquainted with one more grouping of stars in this our first lesson. This is the irregular W on the side of the pole star opposite that of the Big Dipper. It is called the Lady in Her Chair, or more scientifically Cassiopeia. As the Big Dipper is part of Ursa Major, the Big Bear, so the Little Dipper is part of Ursa Minor, the Little Bear. These groupings of stars are called constellations, and however fanciful we may think some of them to be, the names have come down to us from our ancestors and are really of the greatest service in naming the brighter stars, so that even professional astronomers use the names of the constellations.

Everybody, young and old, should be able to find the north star on any clear night wherever he may be in the northern hemisphere. If we travel far away, some very notable changes may come upon the north sky, so that it is very necessary to be well acquainted with our north star. If we travel directly east or west without changing our latitude much, there will be no observable difference in the position of the pole star. In southern Europe in the war zone, as well as in China, we will see pretty nearly the same stars that we see in the United States. The only difference will be the one of absolute time, England and France being exactly six hours ahead of us. But because we set our watches a full hour head or back whenever we change from one standard time to another in going respectively east or west, we may say with great truth that there will be practically no change whatever in our starry skies.

When, however, we travel north or south the case is different. For every degree, that is, for every sixty nautical miles or for about every seventy statute miles, that we go north, the pole star will be one degree higher in the sky, so that if we should ever reach the north pole, this star would be directly overhead,

On the other hand for every degree we go south the pole star sinks a degree in elevation, until when we come to the equator, it is on the horizon, and in the southern hemisphere we cannot see the north star at all. We must then learn how to find our way by the south celestial pole. This is not so conspicuously marked by a bright star as our north pole is, and is therefore not so easily located in the sky. To find it we must consult the proper star map. This can be done easily enough should we ever need it.

As the pole stars, both north and south, change their altitudes according as we travel north or south, it follows that all the other stars in the sky must change their altitudes accordingly. The consequence is that we may use almost any star and notably the day star, the sun, to help us find our whereabouts on the earth. Latitude, we see, would be found by measuring especially meridian altitudes, and longitude by what we might call east or west altitudes. These would give us our local time, and when compared with that of any other and known place, by wireless telegraphy for example, or the older method of lunar distances, would give us our longitude.

This is the basal principle by which navigators and travelers can find their positions. It is practically an absolute method, so that after drifting about helplessly on a wreck for a long time and finally effecting a landing on an unknown island, a sailor, possessed of a sextant and a chronometer and two or three necessary books, could in a few hours or less know where in the world he was. A second method is the one known as dead reckoning or plane sailing. It is a differential one and consists in noting the miles traveled and the direction. This, of course, is inferior in accuracy to the first, but it is the only possible one under certain circumstances, such as in a continued spell of cloudy weather or in a submerged submarine.