## THE HEAVENS IN OCTOBER.

I hearis
 pole? ppropriate to give a brief review of the matter here.
An observer standing at the earth's north pole would have the celestial pole (not the pole star, which is $11 / 4$ deg. distant) in his zenith. The stars, during the ong night, would appear to circle round the sky from left to right always at the same altitude ab ve the horizon; the sun to circle similarly, rising slowly from the horizon to its maximum altitude of $231 / 2 \mathrm{deg}$. between March and June, and sinking again until its disappearance in September. The change in the sun's altitude from day to day (which equals that in its declination) is accurately known, and can be taken from a small and easily portable table.
For an observer near but not at the pole, the celestial pole would be displaced from his zenithoward that point of the horizon where the earth's pole lay-by one degre for every 60 nautical miles of distance. The starsor the sun after allowance s made for its change of declination-w ould still appear to circle round the heavens, but would. be owest when due northi. e., toward the pole-and highest when due south The whole change in their altitude would equal twice the observer's distance from the pole. For lati tudes up to 80 For lati more (that is, more than five or six hundred miles from the pole) this change in altitude is very con spicuous, and observations can easily be made when the sun is highest (at local noon) in the manne familiar to mariners But for an observer within a few miles of the pole these changes in altitud would no longer be per ceptible to the eye, and it would not be obvious in which direction the pole really was. To mak quite sure it would quite sure, it would b necessary to observe th sun's altitude at interval during the day, and also its compass bearing. (Th compass, of course, which points toward the earth magnetic pole, 2,000 mile away, would be as good guide there as here, but of no service at all in finding the geographical pole.) It would then be
necessary to march toward that compass bearing in which the sun had the lowest altitude (corrected of course for changes in declination). The distance to the pole in sea miles would be half the difference of the greatest and least altitude in minutes of arc; so that it would then be easy to advance to the right spot-in theory at least!
This discussion tacitly assumes that the observer is on firm land. On the drifting $p$ lar ice, the change in his position during the day would complicate matters. But by making observations for a second day the amount and direction of the drift could be deter mined; for the sun's altitude (still corrected for changes of declination) would be greater in the direc tion of the drift, and less in the opposite direction, than on the previous day, by the amount of the drift The explorer would then have all the information necessary for his purpose
One other point may be mentioned. The sur's alti tude must of course always be corrected for refraction in the usual way. But since the sun's altitude is practically the same all day long, the refraction will be constant (except changes due to weather conditions, which would probably be very small). The observer's position and drift, which are determined from differences of the observed altitudes, will therefore be

HAT astronomical problem has been so much before the pubic during the past month as this: How can a man determine when he is at the north

As many incomplete or misleading answers have come to the writer's notice, it may be
practically independent of the rafraction corrections, and also of any "constant errors" of the instrument. If the conditions of observation were as good to re gards temperature and comfort as lower latitudes, an observer of moderate capacity, with portable instru uents (sextant, artificial horizon, and chronometer) should be able from two days observations to fin ucth his position and rate of drift with an uncer tainty of only a few hundred feet. Under the actua conditions at the north pole, evergthing would depend on the experience and skill of the observer; but in ny case, he could fix his position with an error which would be quite imperceptible on even the largest-scale maps of the polar regions.
the heavens.
Our map shows the aspect of the evening skies; and hows too, at a glance how dull the southern and eastern skies would be, were not Mars and Saturn here to brighten them.
The most prominent constellation there is Pegasus which lies high up, south and east of the zenith. It may be instantly recognized by the Great Squareabout 15 deg. on a side, composed of second-magni tude stars, and standing decidedly alone-which is one of the principal landmarks of the sky for the beginner, as it has no counterpart in the heavens. One of its
 tance. Aldebaran is just rising.
the map. The whole constellation extends 0 ver mor than 40 deg. and is one of the largest, though not the most conspicuous, in the sky. Above these con stellations are the dullest of the zodiacal ones-Capri cornus, Aquarius, and Pisees. The second of these, owever, now contains the splendid Mars, and the last the less brilliant but still conspicuous Saturn which both far outshine any stars within a long dis

The liae of stars running to the left from Pegasus beginning at the northeast corner of the great square contains the principal stars of Andromeda. Above th middle one of the three, near the second of two smal stars, is the Great Nebula, the brightest in the heav ens, concerning whose constellation, and the problems which it still presents, we spoke a few months ago Below this is the inconspicuous but ancient group Triangulum, and the smaller and brighter one of Aries. The Pleiades are visible north'of east, and

Auriga in the northeast is a little higher up. Above it, in the Milky Way, we come in succession to Per seus, Cassiopeia, and Cepheus; then passing the zen th, to Cygnus, Aquila, and Sagittarius (just setting) Ophiuchus and Serpens are also disappearing, due west. A little to the right is the Northern Crown with the "keystone" of Hercules above it, and th steel-blue Vega still high er. The Great Bear swing low on the northern hor zon, and the Little Bear enfolded by the Dragon is higher up.
the planets.
Mercury is evening star until the 12th, when he passes on this side of the sun, and becomes a morn ing star. He reaches hi greatest elongation wes of the sun on the 27 th about which date he rise a little before 5 A . M., and is easily visible before day break; being situated in Virgo, a few degrees above the bright star Spica which however is not a bright as he is.
Venus is evening star and is very bright, but not very conspicuous, be cause she is so far south During the month she passes from Libra through Scorpio into Sagittarius and at its end she is 26 deg. south of the celestia equator. In one latitude she sets a little after P. M.; but for observers in the southern hemisphere she remains in sight three hours longer and is markably prominent
Mars is on the borders of Aquarius and Pisces, rising before sunset, and visible almost the whole night. He moves westward among the stars, ever slower and slower untl the 26th, when he begins the eastward mareh, which will take him over
four corners now belongs to Andromeda; but it was crice grouped with the other three, and evidence of this still remains, for the letter Delta, which it bore as a member of the constellation, is now lacking from the list of the stars of Pegasus. The rest of the constellation, extending westward from the Great Square contains some remarkable double stars (observable only with great telescopes), but nothing to detain us. Our initial letter shows how this constellation, large as it is, is supposed to represent but a part of the winged steed of classic mythology. Any actual resemblance would indeed be difficult to trace.

The western edge of the square, continued far southward, points out the isolated bright star Fomalhaut. The remaining stars of the Southern Fish, though too faint to be shown on the map, are easily vislble on a clear night, forming a horizontal line just below the tright one.

The equally lonely star some distance east of Fomal haut is Beta Ceti. The rest of the constellation follows this to the eastwand. First comes a quadrilat eral, of which the southernmost star $\tau$ is one of our nearest neighbors. Then comes the notable variable Mira-also not far from us in space, and now bright ening up, and visible to the naked eye; and lastly a group, only the brightest two of which appear on
more than a whole round of the zodiac before another cpposition.

Jupiter is morning star in Virgo, rising about 5:15 A. M. on the 1st, and 3:40 on the 31st; that is, about an hour earlier than Mercury at the time the latter is best seen.
Saturn is in opposition on the 13 th, and is well obRervable all through the month. His wings are by this time pretty widely' opened out, and he is a very beautiful telescopic object.
Uranus is in quadrature, east of the sun, on the 10th, and south at 6 P. M. Neptune, in almost the opposite quarter of the skyy, is in quadrature, west of the sun, on the 13th, and crosses the meridian at 6 A. M.

## THE MOON.

The moon is nearest us on the 27 th, atd farthest off on the 13th. She is in conjunction with Neptune on the 6th, Jupiter on the 12th, Mercury on the 13th, Venus on the 17 th, Urasus on the 21st, Mars on the 26th (early in the moriing), and Saturn on the 27 th On the evening of the 20th she occults the brightsetar Sigma Sagittaril (in the Milk Dipper). As seen'from Washington, the star disappears behind the moon's dark limb at 7:01 P. M. and reappears on the bright side eract's at 8 o'clock

