THE HEAVENS IN JANUARY.

BY HENRY NORRIS RUSSELL, PH.D.

THE finest group of constellations in the whole heavens is that which now occupies the southeastern skies.

Its central figure is Orion, which is about half way up to the zenith. The principal stars of this noble constellation can easily be identified with the aid of our map; while the initial letter at the head of this article shows how these stars are related to the traditional figure of the classic giant. The bright stars Betelgeuse and Rigel are in his shoulder and at his foot, while it is easy to trace his belt, his sword, the uplifted club in his right hand, and the lion's skin which he holds as a shield in his left.

Above Orion is Taurus, with the small but conspicuous cluster of the Pleiades. The V-shaped group below them, of which the bright red star Aldebaran is one, bears the name of the Hyades. The star between Aldebaran and the point of the V is a fine naked-eye double.

Below Orion is Canis Major, whose brightest star, Sirius, so far outshines all its neighbors (and indeed all others in the sky) that it is hard to realize that several of them are fully as bright as the stars of Orion's belt. To the left of these constellations are three almost equally fine ones—Auriga, Gemini, and Canis Minor—which contain four more stars of the first magnitude.

Due east is Cancer, marked only by the small star cluster Praesepe, and on the horizon are part of Leo, and the head of Hydra. Jupiter is in the former constellation, and will rise within an hour.

Below Orion are the small groups of Lepus and Columba, and west of these is the long faint star-stream of Eridanus, beyond which is Cetus, in the southwest. The variable Mira is now fading, and barely if at all visible to the naked eye.

The great square of Pegasus stands on one corner, low down and almost due west. Above it Andromeda extends toward Perseus, which is directly overhead. Aries and Pisces lie south of these.

Cygnus is setting in the northwest, Draco and Ursa Minor are below the pole, Ursa Major rising in the northeast and Cassiopeia and Cepheus high up in the north-northwest.

When we look at such clusters of stars as the Pleiades or the more widely scattered Hyades, the question naturally arises: Are these stars really near one another (as compared with their distance from us); or do they simply look near, because they lie nearly in line with us, though some are really more remote than others?

We cannot answer this question by direct measurement of their distances, for these are so great that it is not yet possible to measure them accurately enough for our purpose. But we can get an answer in another way.

How it is done can perhaps best be explained by an illustration. Suppose the air was full of birds of all sizes at all sorts of distances, flying in every direction at various rates. Two or more birds that at a given instant seemed near together would do so only because they were in line and their flights, being in different directions, would soon carry them far apart. But suppose that among them there was a flock of wild geese. We could tell at once that these birds were really near one another, because they kept together, flying in parallel lines. If we watched them longer, the flock as it came nearer would appear to spread out and grow larger, until it passed overhead, and then to dwindle again in the distance; but all the while any chance bird that passed before or behind it could be identified by its different direction of flight.

Now each of these groups of stars—the Pleiades and Hyades—behaves exactly like such a flock of birds. The stars in general move over the sky, some faster, some slower, but in directions that vary almost at random from star to star; but the stars of each of these groups keep together, in a way which proves their real connection.

And this is not all. Prof. Boss, who has recently supervised the preparation of a great catalogue of stars for the Carnegie Institution, in which their motions are very accurately determined, has identified nearly forty stars (most of which are visible to the naked eye) belonging to the Hyades group, and has shown that their motions are not exactly parallel, but converge toward a point in the constellation Monoceros between Betelgeuse and Procyon. That is, this group of stars, if we could watch them long enough, would seem to shrink together. It follows that these stars are receding from us, having already long passed their closest approach—about 700,000 years ago, as the present rate of motion shows.

Confirmation of this remarkable result is furnished by observations with the spectroscope, which show that three of the brightest stars of this group are actually receding from us, all at the same rate—25 miles per second.

That not only agrees with Prof. Boss's theory, but enables him to calculate the distances of the stars of the group from us, which average about 120 light-years, with a range of about 10 per cent on each side of the mean.

At this distance our sun would appear as a telescopic star of the eighth magnitude, and therefore the brightest stars of the Hyades must be much brighter than the sun—probably between 50 and 100 times as bright.

The brightest of all the cluster (as we see it), Aldebaran, is however an intruder, moving in quite a different direction. Its distance has been directly measured and appears to be about 30 light years—only one-quarter that of the great cluster. If removed to their distance it would seem three magnitudes fainter than it does now and be no brighter than several other stars of the cluster.

THE PLANETS.

Mercury is evening star all through the month, and is well visible during the latter part of it. On the 26th he reaches his greatest elongation (or apparent distance from the sun). At this time he sets about 6:35 P. M. and can easily be seen, low in the southwest, when it begins to grow dark. Venus is morning star and rises about 5:40 A. M. in the middle of the month. Mars is likewise morning star, rising about two hours before Venus. On the 13th he is quite close to the bright star β Scorpii.

Jupiter is in Leo and rises about 9 P. M. in the middle of the month. Saturn is evening star in Pisces, setting about 11:30 P. M. on the 1st, and 9:45 on the 31st.

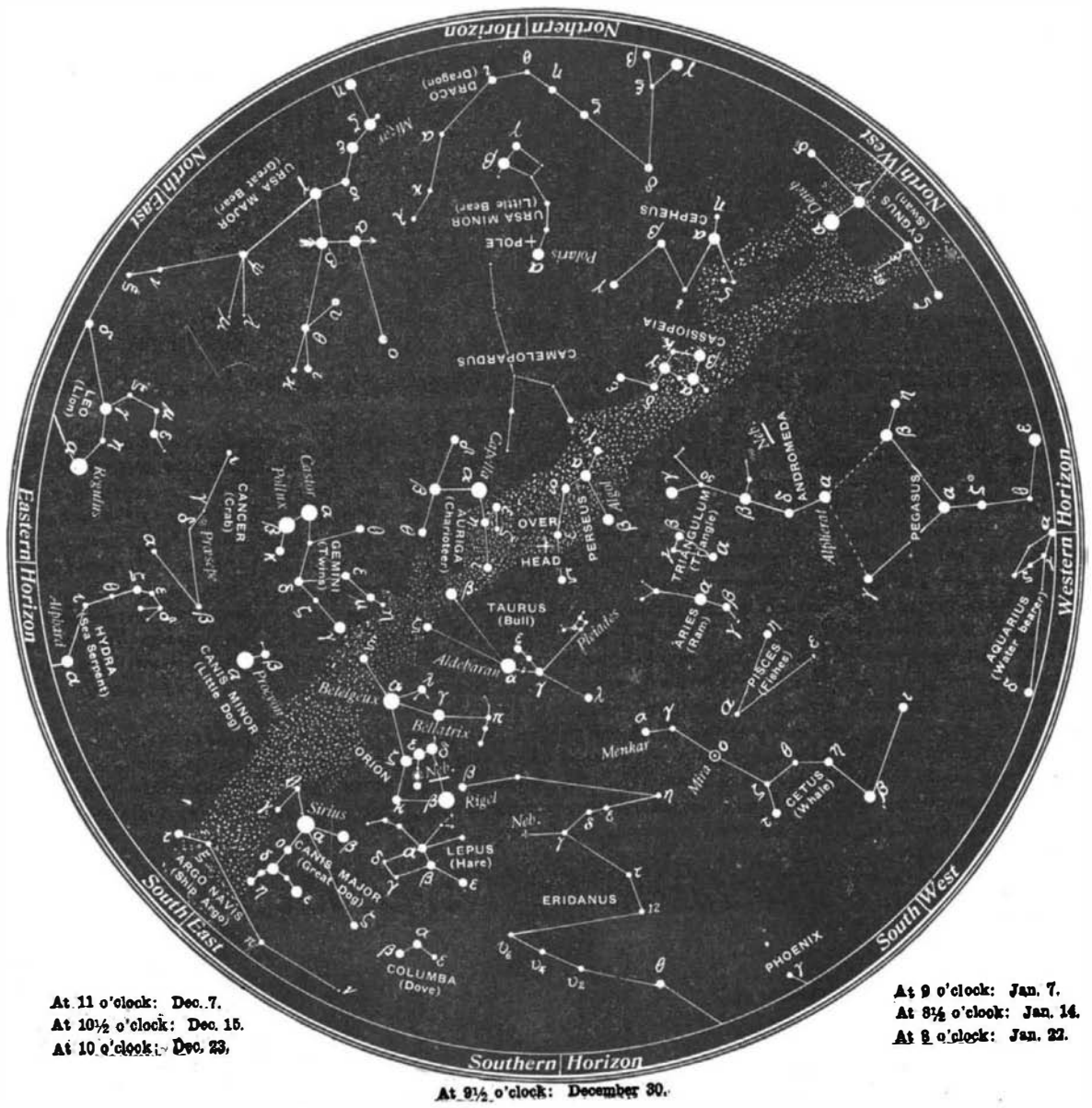
Uranus is in conjunction with the sun on the 7th and is invisible throughout the month.

Neptune is in opposition on the 5th. At this time he is in R. A. 7h. 8m. 58s. Declination 21 deg. 45 min. north, and is moving 7s. eastward and 12s. northward per day. To see his disk requires a good-sized telescope.

THE MOON.

Full moon occurs at 9 A. M. on the 6th, last quarter at 1 P. M. on the 14th, new moon at 7 P. M. on the 21st, and first quarter at 10 A. M. on the 28th. The moon is nearest us on the 23d and most remote on the 11th. She is in conjunction with Neptune on the 6th, Jupiter on the 11th, Mars on the 17th, Venus on the 19th, Uranus on the 20th, Mercury on the 22d, and Saturn on the 25th.

Princeton University Observatory.



At 11 o'clock: Dec. 7.
At 10½ o'clock: Dec. 15.
At 10 o'clock: Dec. 23.
At 9½ o'clock: December 30.
At 9 o'clock: Jan. 7.
At 8½ o'clock: Jan. 14.
At 8 o'clock: Jan. 22.

NIGHT SKY: DECEMBER AND JANUARY

Origin of Gold Deposits.

The current theory of the formation of gold-bearing alluvial deposits assumes that the gold existed originally in the central nucleus of the earth in the forms of sulphide and telluride, which subsequently became dissolved in the waters of hot springs and were deposited together with gelatinous silica. Thus were formed veins of auriferous quartz which, in consequence of erosion, gave rise to alluvial strata containing particles of metallic gold.

M. Fieux, however, asserts that the erosion of outcropping auriferous veins of quartz does not account for all deposits of metallic gold. He finds that some gold-bearing strata show no trace of quartz, but consist wholly of clay with fragments of diorite or diabase, and moreover are so situated as to preclude the existence of quartz veins. He has seen beds of streams become richer in gold after every rain, though they showed no trace of quartz. Finally, in certain auriferous strata which contain much quartz, not a particle of gold is found in the quartz, though some gold occurs in the diabase which accompanies it.

Hence Fieux concludes that the erosion of quartz veins cannot be the sole source of auriferous alluvial strata and, furthermore, that the almost constant presence, in those strata, of heavy basic rocks, containing diorite, amphibolic schist, and diabase, indicates that native gold is one of the subsidiary ingredients of those rocks.

According to this new theory, therefore, certain of the heavy eruptive rocks have carried with them in their eruption some of the gold existing in the metallic state in the central nucleus of the earth. After reaching the surface these rocks were oxidized by contact with the air and eroded by water, which washed away the lighter materials and left the heavier, including the gold.

This M. Fieux regards as the true theory of the formation of gold-bearing alluvial strata, in general, the erosion of quartz veins being only an occasional cause of the enrichment of those strata.

Handy Man's Workshop.

Next week's issue of the SCIENTIFIC AMERICAN will contain a special Handy Man's Workshop Department devoted to winter sports. There will be complete directions for making an iceboat, also a thoroughly practical article on the building of a "scooter" or ice-and-water sailboat. Hand-motor sleds and coasting skates will be other features of the department. The constructions described will be simple and calculated not to overtax the ability or purse of the average amateur.