THE HEAVENS IN AUGUST.

BY HENRY NORRIS RUSSELL, PH.D.

The warm clear summer evenings give us a very good opportunity to make ourselves familiar with the constellations. We may well begin with the Lyre (Lyra) which is right overhead at 9 o'clock in the evening early in August. Our map shows that it contains one very bright star Vega, of the first magnitude. This star is remarkable for its strong bluish color. Though appearing so bright, it is not one of our nearest neighbors, for the best determinations of its distance show it to be about two million times as far off as the sun, and there are probably more than a hundred stars nearer us than this. Still, as compared with the thousands of stars visible even to the unaided eye, Vega must be called nearer than the average. The sun, removed to the same distance, would appear to us a faint point of light, just visible to the unaided eye (very much like the two small stars close to Vega, which form a triangle with it). It appears, in fact, that in actual brightness Vega surpasses our sun a hundred fold.

Great as this brightness is, there are many stars, apparently fainter, whose distance from us is so great that Vega itself, if placed alongside them, would be inconspicuous. An example of a star which we have good reason to believe to be of this class is β Lyræ, which is shown on the map a short distance southeast of Vega. This star is worth watching, as it is variable. At its brightest it is about equal to its near neighbor γ Lyræ, but when faintest it is less than half as bright. These minima of light repeat themselves regularly at intervals of twelve days, with less conspicuous minima midway between.

To the east of Lyra is Cygnus, the Swan, a figure in which it is easy to see a great cross (much the best cross in all the heavens) or the flying swan itself, the brightest star α being in its head, the star β in the tail, and the transverse line δ γ ϵ marking the extended wings.

The stars α (Alpha) and β (Beta) deserve special notice, the former because it seems, from the best determination, to be so very far off, at least ten times as far as Vega, and the latter (which is also very remote) as a very fine double star, well seen with a small telescope.

South of the Swan is the Eagle (Aquila) with the bright star Altair, which is a near neighbor of ours, about half as far away as Vega.

The little group of the Dolphin is below this, and farther to the right is the Sea Goat (Capricornus). Its brightest star is a fine naked-eye double. The Water Bearer (Aquarius) has just risen, but contains no bright stars. The planet Saturn is in this vicinity, but at the hour for which our map is made it has barely risen.

The great square of Pegasus stands on one corner, low in the east. Andromeda and Perseus are dimly seen in the haze of the horizon. The zigzag line of Cassiopeia, whose brightest stars form an irregular letter W, is above these, and higher up is her husband Cepheus, who is by no means as brilliant as his wife.

The Little Bear stands on its tail above the Pole Star, surrounded by the coils of the Dragon, whose two eyes (β and γ) are close to the zenith.

The Great Bear is sinking in the northwest, the Dipper hanging by its handle. The Herdsman (Boötes) is due west, his brightest star Arcturus leading the others toward the horizon. Below this is the Virgin, whose principal star Spica will soon set.

The southern constellations can be studied better with the aid of the map than by verbal description. Hercules and the Northern Crown lie between Lyra and Boötes. South of them is the tangled mass of the Serpent and the Serpent Holder (Ophiuchus). Below these we find the Scorpion, a splendid constellation which we do not see to advantage, as it is always low in the south. On a clear night, however, the long tail, streaming down from the red Antares to the horizon and bending back to the stinging tip, can all be seen. It is worth remarking that the star μ is another fine naked-eye double.

The Archer (Sagittarius) is not as bright as the Scorpion. Its principal configuration, the Milk Dipper, is a little hard to trace just now, because Mars, who is right in the midst of it, draws the eye to himself by his overpowering brilliance.

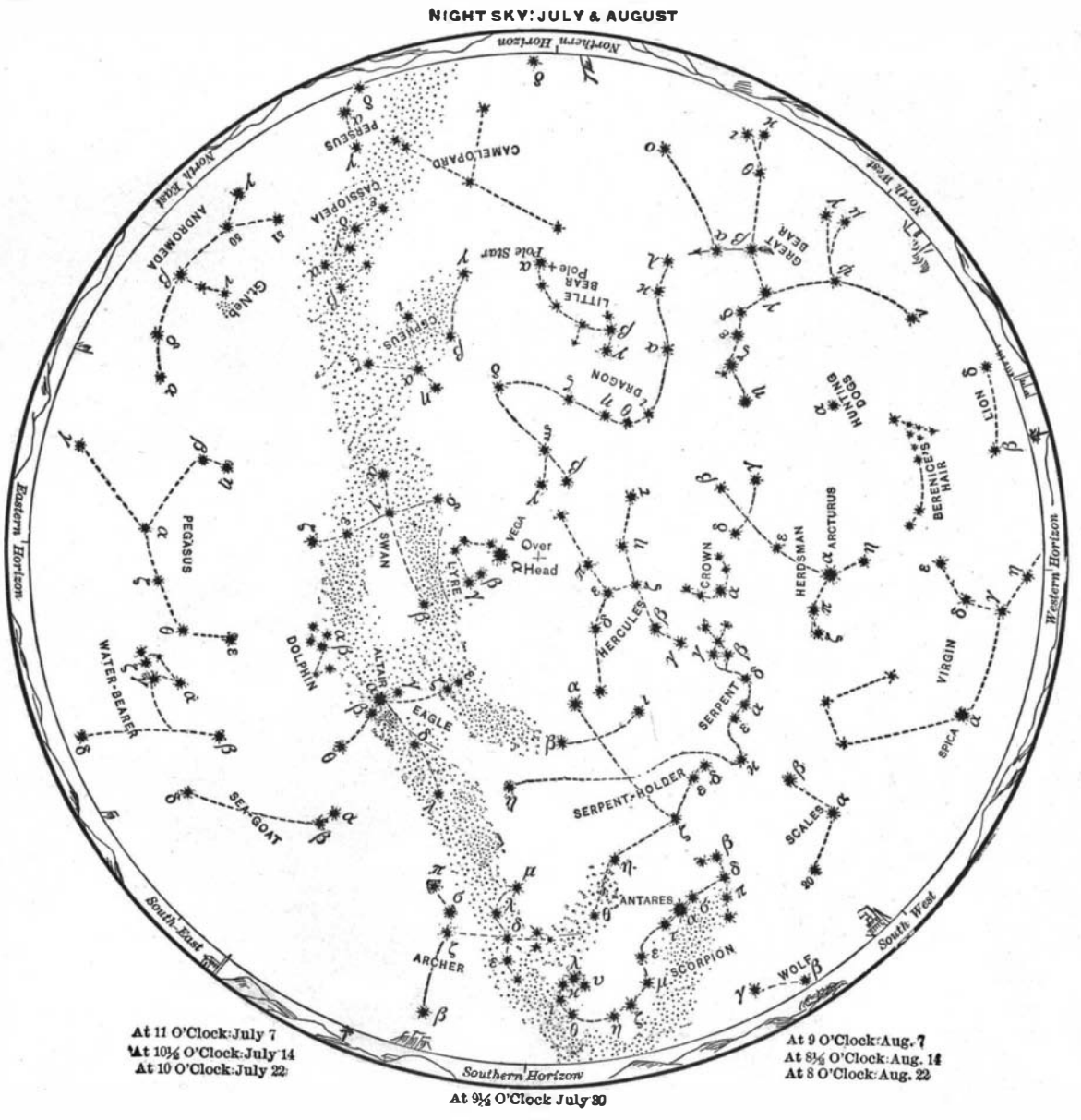
THE PLANETS.

Mercury is morning star all through the month. He is at his greatest elongation on the 12th, when he rises before 4 A. M., and, as he is unusually bright, should be well seen in the dawn.

Venus is also a morning star, but is so near the sun that she can be seen with difficulty if at all.

Mars is in Sagittarius, just past opposition, and visible almost all night. Under the present very favorable conditions he is almost as bright as Jupiter, and by far the most prominent object in the evening sky.

Jupiter is morning star in Gemini and Cancer. On the 10th he is in conjunction with Mercury, being two degrees north of him. The two planets can be seen almost due east a little before sunrise. Saturn is in Aquarius, and rises about 8:30 P. M. in the middle of the month. Uranus is in Sagittarius, about 5 deg. north of Mars. At the beginning of the month he is almost exactly on a line carried from the southernmost of the stars of the Milk Dipper diagonally across the bowl, and southward not quite as far again. He moves slowly westward all through the month, but does not cover as much as one degree. Neptune is a morning star in Gemini, not easily observable.



In the map, stars of the first magnitude are eight-pointed; second magnitude, six-pointed; third magnitude, five-pointed; fourth magnitude (a few), four-pointed; fifth magnitude (very few), three-pointed, counting the points only as shown in the solid outline, without the intermediate lines signifying star rays.

THE MOON.

New moon occurs at 1 A. M. on the 9th, first quarter at 4 P. M. on the 16th, full moon at 7 A. M. on the 23d, and last quarter at noon on the 30th. The moon is nearest us on the 21st and farthest away on the 5th. She is in conjunction with Neptune on the 6th, Mercury and Jupiter on the 7th, Venus on the 8th, Mars and Uranus on the 19th, and Saturn on the 24th.

Daniel's comet, discovered in June, was then rapidly approaching both earth and sun. According to the earliest calculation of its orbit, its nearest approach to the earth comes about the end of July, at a distance of some sixty million miles, and to the sun on September 4 at a distance of forty-six million miles. In the middle of August it should be more than twenty times as bright as at discovery, and be situated somewhere on Gemini, rising before 3 A. M. Later and more accurate calculations may modify these statements somewhat; but it seems certain that the comet, which shortly after discovery was visible in a field glass, will not be hard to see.

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THE HEATING OF COPPER WIRES BY ELECTRIC CURRENTS.

Perhaps the simplest and most familiar fact connected with the flow of electric current through a wire is that the watt rate of generation of heat within any length of it is equal to the square of the amperes multiplied by the resistance of that length. This is a consequence of Ohm's law. When, however, we try to deduce from this fact the temperature elevation attained by the wire under the conditions of heat liberation, we encounter numerous difficulties, and the problem of either measuring or computing the increase of temperature becomes difficult. It is known that the temperature elevation of a concealed wire, cooled by conduction, follows a law similar to Ohm's law; that is, the temperature elevation of the wire corresponds to e. m. f., the flow of heat corresponds to the flow of electric current, and the electric resistance is represented by a thermal resistance, depending upon the dimensions of the insulating cover or covers, as well as on the thermal resistivity of the materials.

An interesting paper on the subject of concealed wires heated by electric currents, was presented by Dr. A. E. Kennelly and Mr. E. R. Shepard before the recent convention of the American Institute of Electrical Engineers. It was shown that the final temperature elevation of the wires increased faster than the square of the current in all cases. The measurements showed, in fact, that the temperature elevation for very small currents increased as the square of the current; but that at elevations near 50 deg. C. they increased at an exponent of about 2.2, or faster than the square, while at elevations near 100 deg. C. they increased at an exponent of about 2.3. The reason for this is that the hotter the wire becomes, the greater its resistance, and the greater the heat produced by a given current in that resistance. If the resistivity of copper did not increase with temperature, the final temperature elevation of the wire might be expected to increase in direct proportion to the square of the current strength. Within the range of 100 deg. C. temperature elevation, the plotting of final temperature against steady current followed nearly straight lines on logarithm paper. A large number of measurements were made on the heating of wires in sand, soil and gravel, from which a number of data on thermal resistivity of such substances have been tabulated for reference.—Electrical World.

BUILDING RAILWAY COACHES WITH SIDE DOORS.

President Harriman of the Southern Pacific a short time ago gave orders to have a number of new fine passenger coaches built at the company's car shops at Sacramento with side doors instead of end doors.

Harriman believes that cars thus constructed will be much stronger and more durable than the style now used; and also that in case of wreck, there will be little danger of the coaches telescoping each other. These new cars will have a small passageway by which passengers may go from one coach to another, but this will be so arranged that it will not weaken the end walls of the cars.

Another feature of these coaches is the use of round instead of square windows. New patent ventilators, now being used by the Union Pacific on its motor cars, will be placed on the new coaches, and the cars will present an appearance so little in common with the ordinary coach, that they will at first hardly be recognized as a passenger vehicle. Some of these cars will soon be completed and placed in commission on the Southern Pacific western roads.