

THE HEAVENS IN JULY.

BY HENRY NORRIS RUSSELL, PH.D.

The progress of discovery often forces us to modify our scientific definitions. For example, a few years ago the asteroids were defined as "a group of small planets circulating in the space between Mars and Jupiter." In 1898 a planet was found—the famous Eros—which comes much nearer the sun than Mars does, and there followed some discussion whether it should be called an asteroid or not. Now the limit has been extended in the opposite direction, for a faint object was discovered early last spring, which turns out to be a minor planet which is more remote from the sun than Jupiter is. This object has not yet been named, but is known as T.G., according to the system of lettering newly-discovered planets which has been in force for a dozen years or so. The next discovery would be called T.H., and so on—and it may give a good idea how fast asteroids are being found, to say that in the last three months enough have been recorded to give the last one the letters U.K.

The planet has now been under observation for more than two months, and its orbit is fairly well determined. Its period appears to be a few days more than twelve years—more than half as long again as that of any previously-known asteroid, and two months longer than that of Jupiter. Its mean distance from the sun is 487 million miles, but as its orbit is decidedly eccentric, the actual distance may vary all the way from 405 to 569 millions. If its orbit lay in the same plane with that of Jupiter, it would run a risk of colliding with its gigantic neighbor (whose average distance from the sun is 483 million miles). But the orbit is inclined in such a way that when the asteroid is at the same distance from the sun as Jupiter is, it is high above or below him, while when the two are in line with the sun, it is either much nearer the sun than Jupiter or a good way outside him. However they may be placed in their orbits, they can never come within about fifty million miles of one another.

At the present time they are four or five hundred million miles apart, and will remain so for a long period. The asteroid is ahead of Jupiter, which is gradually catching up with it, but their rates of motion are so nearly equal that in a whole revolution about the sun Jupiter only gains about one-seventy-fifth of a revolution upon the asteroid. As the latter is now about one-sixth of a revolution ahead, it will take Jupiter more than twelve of his revolutions, or about one hundred and fifty years, to catch it. Similarly, we see that it is some seven or eight hundred years since they were last near together.

With more accurate measurements (of the asteroid, which we shall have in a year or two) it may turn out that the intervals between such approaches are a good deal longer or shorter than the rough numbers given here; but it is certain that this small planet has been revolving in its present orbit for a long time, and will continue to do so for many years. When next it gets close to Jupiter, it will stay near him so long that the shape of its orbit may be very greatly changed, and the astronomers of a century or two hence may find this matter very interesting.

It need hardly be said that the new planet is a very faint object. It is of the fourteenth magnitude, and its real diameter may be estimated at about sixty miles, which makes it rather a large asteroid, so far as actual dimensions go, though it is so far from the sun that it appears to be one of the faintest of the group.

THE HEAVENS.

Our map shows clearly the principal constellations of the evening sky. In the northwest the Great Bear is conspicuous. On the left is the Lion, just ready to set. The Virgin and the Herdsman are the principal groups in the southwest, the latter being very high up.

In the south is the fine group of Scorpion, now seen at its best. The star  $\alpha$  is interesting for its bright red color, and  $\mu$  because it is double, separable on a clear night by the unaided eye. The Centaur and the Archer (Sagittarius) are on each side of the Scorpion, and the Serpent and the Bearer are above.

The Eagle, the Swan, and the Lyre are the brightest groups in the eastern sky, and the smaller group of the Dolphin is not hard to find. Cepheus and Cassiopeia are low in the northeast, and the Little Bear and the Dragon are higher, above the Pole, while Hercules and the Northern Crown are right overhead.

THE PLANETS.

Mercury is evening star all this month, and is best visible about the 15th, when he is farthest from the sun, and sets about 8.40 P. M.

Venus is likewise evening star, some distance above Mercury, and sets between 9 and 9.30 P. M. all through the month.

Mars is in conjunction with the sun on the 15th, and is invisible all through July. Jupiter is morning star in Taurus, rising about 3 A. M. in the middle of the month. Saturn is in Aquarius, and rises about 10 P. M. on the same date.

Uranus is now well placed for observation, and may be easily identified, being about 2 deg. north and 1

ORIENTATION OF CARRIER PIGEONS.

Dr. G. H. Schneider many years ago conducted some very interesting experiments which were concerned mainly with the education of young carrier pigeons and with the short flights of adults. The results of his work are given in the Zeit. f. Psych. u. Phy. d. Sinnes. The question that Dr. Schneider sets out to answer is this: Are pigeons guided by an inborn sense of direction which is unknown to us, or guided by the eye?

Dr. Schneider transported birds in a basket by carriage or by rail to the desired distance, and released them one by one. The time of the release, the condition of the weather, the number and characteristic markings of the bird, were all carefully recorded. The records were kept of the time of the return. The distances were very short, varying from two miles to twenty-five. Certain experiments were made to determine the relative ease of orientation between releases made in valleys and on mountains.

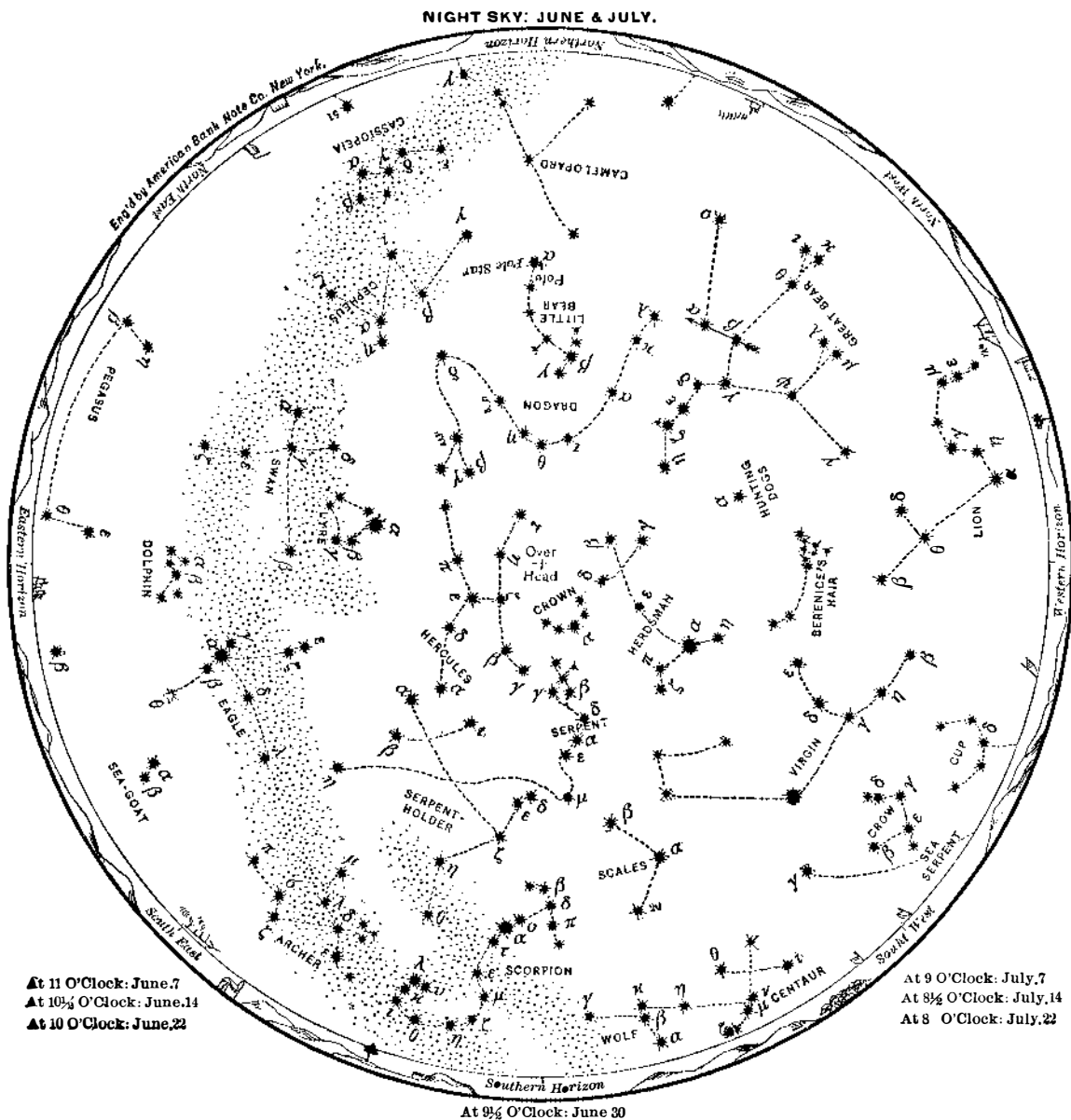
Schneider's conclusions are numerous, the one of chief interest being as follows: "The assumption that the carrier pigeons possess an inborn sense of direction is an error; for if this assumption were true, then the young pigeons ought to find their way equally well. The investigations have shown, especially those

at Könitz, that young pigeons, even at relatively small distances from their home, have the greatest difficulty in finding their way back when the vicinity is at all strange to them, and their home cannot be directly seen." He then concludes that the young birds utilize, in their early flights, the familiar groups of houses, mountains, etc., and that the distances to which a bird may be taken and return may be increased commensurately with the increase in the development of his "topographical memory." The author believes that the pigeon can develop not only "Erinnerungsbilder," but even "Gedächtnisse."

Commenting upon these experiments, a writer in the Psychological Bulletin finds that "Dr. Schneider does not discuss the more difficult feats of the carrier pigeon. He says nothing of their long flights over the ocean. He says nothing of the so-called 'voyaging' pigeons of France. These birds travel over the continent in wagons. A stay of one or two hours in a town enables these pigeons to return to it. He has missed the point in the arguments of those who hold that there are factors in distant orientation which are not explicable by visual sensation or even visual memories. In the first place nobody, we

believe, would deny that the pigeon uses vision where he can. And again, it is a mistaken use of the term 'sense of direction' to assume that it does not have to develop. Consequently we should not expect the young birds to return as well as the adult. The term 'sense of direction' is used by careful writers with the implication that there is a definite psychophysical possibility of its being developed—just as there is a definite psychophysical possibility of visual sensations being developed."

Seldom in the history of chemical industry has any chemical product undergone such marked variation of price within a few years as thorium, the principal constituent of incandescent mantles. Early in 1894 thorium nitrate was sold by the German combination at 2,000 marks per kilogramme, and by January of the next year it had fallen to 900 marks; in July of the same year it stood at 500 marks, and in November at 300 marks. In 1896 it fell in May to 150 marks, and in October to 90 marks, touching the low price of 30 marks, in 1899. After that the price was pushed up to 53 marks, less 7 per cent discount, in May, 1904, a figure which the "Convention" succeeded in maintaining till January of this year, when it dropped to 27 marks, less 3 per cent discount.



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.

deg. east of the bright star  $\lambda$  Sagittarii (Archer), which is marked on our map.

Neptune is in conjunction with the sun on the 2d, and is invisible this month.

THE MOON.

Full moon occurs at 11 P. M. on the 5th, last quarter at 5 A. M. on the 13th, new moon at 8 A. M. on the 21st, and first quarter at 3 A. M. on the 28th. The moon is nearest us on the 4th, and farthest away on the 16th.

She is in conjunction with Uranus on the 5th, Saturn on the 10th, Jupiter on the 18th, Neptune on the 20th, Mars on the 21st, Mercury on the 23d, and Venus at 2 P. M. on the 24th. The last conjunction is quite close.

On the 21st of July there is a partial eclipse of the sun, but as it is only observable from the Antarctic regions, southeast of Cape Horn, it is of no practical account.

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Palladium has about the same degree of hardness as platinum. It may be easily rolled into sheet, and is usually found in commerce in the shape of thin sheet or foil.