

THE HEAVENS IN JUNE.

BY HENRY NORRIS RUSSELL, PH.D.

IN the month of June the most interesting events for the amateur astronomer are two eclipses, both of which are visible in the eastern United States.

The first is a total eclipse of the moon, which occurs on the evening of the 3rd. The earlier phases of the eclipse take place before the moon rises; which, since she is exactly opposite the sun, happens as the latter sets. By this time she will be fully half immersed in the earth's shadow, and at 7:58 P. M. eastern standard time the last ray of direct sunlight will leave her disk, and she will be totally eclipsed.

In the strong twilight that will still be present she will be invisible; but as the darkness increases, her full disk may be faintly seen, shining with a dull and reddish light, which is due to sunlight refracted through the earth's atmosphere (as through a lens). How bright this will be depends on the weather in the part of the earth where the light must pass (in this case above Norway, Greenland, and Hudson's Bay). If the air is full of clouds there, the moon will be very faint; if it is clear, she will look brighter.

Totality lasts a little more than an hour. At 9 P. M. the moon's edge begins to come out of the shadow. The illuminated portion rapidly grows, and at 10:14 the whole moon is visible, though the western edge will still be darker than the rest, because it is still partly shaded by the earth.

It is not very often that a lunar eclipse happens at such a convenient hour in the evening, and in so genial a season, so that this is a very good chance to see one, especially for the youthful amateur.

It may be remarked in passing that an intelligent interest in eclipses need by no means be confined to adults; with no more apparatus than a tennis ball, a golf ball, and any sort of lamp the affair can be explained and illustrated by the aid of a working model to anybody.

At the new moon following this eclipse there is another—this time of the sun, of course—on the 17th.

As seen from the Eastern States this is a rather small partial eclipse, just before sunset, the sun setting before the greatest phase is reached. It will be somewhat better visible in the northwestern part of the country, where the lunar eclipse can hardly be seen at all.

This eclipse is total, with very short duration, along a track which passes from Siberia to Greenland, and is practically inaccessible; passing right across the unexplored polar region and within a hundred miles of the North Pole itself.

THE HEAVENS.

Turning from these passing shadows to the unchanging stars, we find due south and very high up, at our accustomed hour in the evening, a great red star that must attract even the most careless eye. This is Arcturus, the brightest star in the northern hemisphere of the sky, and also one of the most remarkable.

Though to the naked eye it seems quite fixed—among its neighbor stars—modern telescopic observations would show within a few months that it was moving southward. Since the days of Ptolemy, it has moved over a distance equal to fully twice the moon's apparent diameter, and, even to the naked eye, it no longer fits the alignments with other stars which Ptolemy described.

Its real motion is very rapid—about 100 miles per second, according to the latest measures of its distance, which put it rather nearer than the previous determinations, and show that its light takes forty or fifty years to reach us. On the same data, it is about 150 times as bright as our sun; so that it is altogether a very imposing luminary.

The other stars of Boötes are shown on the map, and also in our initial, which shows the figure of the Herdsman, who, with the Hunting Dogs before him, is carelessly pursuing the Great Bear round and round the Pole. The stars ϵ and π (shown on the map) are fine doubles, separable with a three-inch telescope. Below these is Virgo, with the bright star Spica; and lower still, to the right, are Corvus and Crater, resting on the back of Hydra.

Due south, very low down, is the upper part of Centaurus. The two brightest stars of this constellation, which lie to the eastward of the Southern Cross, and whose line points toward it, are only well visible from points south of 25 deg. north latitude.

Scorpio is well up in the southeast, and the tangled mass of Ophiuchus and Serpens is above and to the left.

Altair has just risen, almost due east, and Cygnus is low in the northeast. Higher up is Lyra, with the great blue star Vega. Between this and Arcturus are Hercules and the semicircle of the Northern Crown.

The Great Bear is almost overhead, northwest of the zenith. Draco and Ursa Minor are above the Pole, and Cassiopeia and Cepheus below it.

Auriga and Gemini are setting in the northwest, and Leo is due west, still pretty well up.

new during the solar eclipse of the 17th, and in the first quarter at 2 A. M. on the 25th. She is nearest us on the 12th, and remotest on the 25th.

She passes near Uranus on the 6th, Mars on the 10th, Saturn on the 13th, Mercury on the 17th, Venus on the 18th, Neptune on the 19th, and Jupiter on the 23rd. The conjunction with Venus is close, but moon and planet are too near the sun to be easily seen.

At 9 A. M. on June 21st the sun reaches his greatest northern declination. This will therefore be the longest day of the year—how long depends on the observer's latitude.

At New York the day, from sunrise to sunset, is almost exactly fifteen hours long.

Princeton University Observatory.

Effect of Silicon in Iron.

The effects of silicon upon the physical and chemical properties of iron include the following:

1. **Magnetic Properties.**—The magnetic permeability decreases as the proportion of silicon increases. In addition to the gradual diminution sudden falls of permeability decrease when the weight of silicon amounts to 1/5, 1/3, and 1/2 of the mixture. These proportions correspond to the formulæ Fe₅Si, FeSi, and FeSi₂, and the peculiar phenomena observed indicate that these

three are the only possible definite compounds of iron and silicon. These results were obtained with iron free from carbon. The combined effect of carbon and silicon on the magnetic properties remains to be studied.

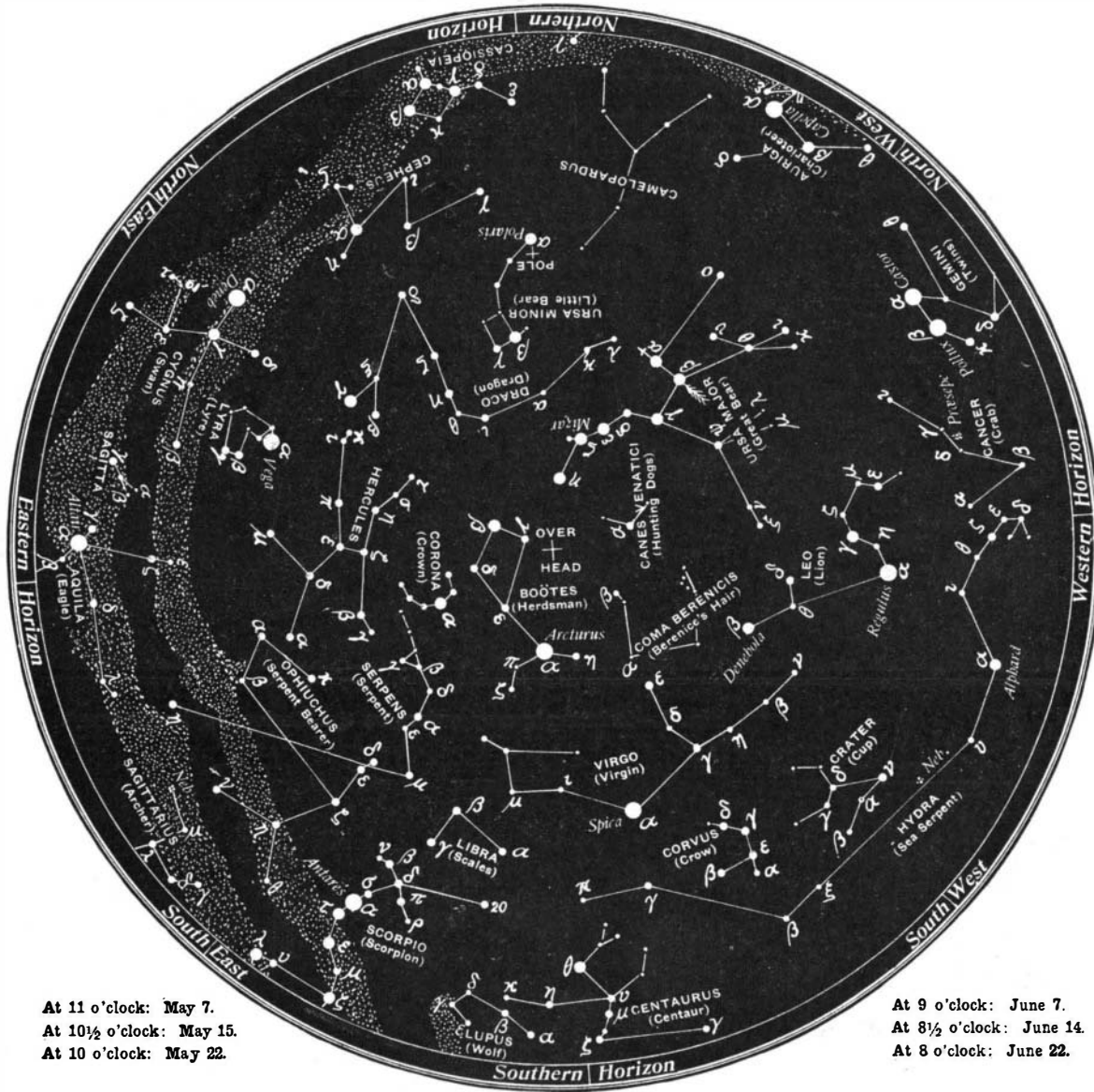
2. **Chemical Properties.**—The more silicon the iron contains, the smaller is the proportion of carbon which the metal can combine with or dissolve. In presence of silicon, the carbon separates as graphite in the act of solidification.

The characteristic chemical effect of silicon is a greatly diminished susceptibility to attack by acids. The alloys which are best attacked are those which contain more than 1 part of silicon to 2 parts of iron, and which are produced in the electric furnace.

Sulphuric acid can be concentrated to 66 deg. Baumé in vessels made of such an alloy without producing the slightest corrosion. An alloy containing 21 per cent of silicon, immersed for two months in hot sulphuric acid of 22 deg. Baumé, lost less than 1/16 per cent in weight, while ordinary cast iron lost 46 per cent in two hours. A larger proportion of silicon is required to resist nitric acid, which can be concentrated, in vessels of a suitable alloy, to 48½ deg. Baumé.

Less satisfactory results were obtained with hydrochloric acid. Ferro-silicon is less affected by acetic acid than any common metal alloy, except tin.

The perfection which has been reached in the manufacture and adjustment of automobiles is well shown by the exhaustive examination of all the working and other parts, in the laboratory of the Massachusetts Institute of Technology, of the Maxwell car, which has recently completed a 10,000-mile non-stop run. After the engine had been officially stopped at the end of twenty-five days' continuous running the car was driven for ten miles for the observation of its general running condition, starting and stopping on the steepest grades in the neighborhood, and showing perfect control by both brake and clutch. The engine was then taken apart, all bolts and nuts with one minor exception were found set up tight, as well as the radiator and water connections; piston rings and cylinders were bright and smooth, and inlet valves and seats clean; the main crankshaft bearings, connecting-rod boxes, and wristpins were measured with micrometer calipers and no wear detected; the push rods, valve stems, and guides were round and smooth, showing no sign of wear, and even on the gear teeth wear was hardly noticeable.



NIGHT SKY: MAY AND JUNE

THE PLANETS.

Mercury is evening star until the 14th, and after that morning star. He may be seen just after sunset during the first few days of the month and just before sunrise at its end, but for the most of the time he is invisible.

Venus is evening star, best visible at the end of the month (when she sets at about 8:40 P. M.) but not yet conspicuous.

Mars is in Aquarius, and rises about midnight in the middle of the month. He is steadily growing brighter, but is twice as far away as he will be in September, and only one-quarter as bright.

Jupiter is evening star in Leo, and sets at 11:30 P. M. on the 15th. He is by far the brightest object in the western sky.

Saturn is morning star in Pisces, rising about 1 A. M. toward the end of the month.

Uranus is in Sagittarius, and comes to the meridian at 2 A. M. on the 12th. He will be more conveniently observable after opposition next month.

Neptune is unobservable, setting but two hours after sunset.

THE MOON.

The moon is full on the 3d at the middle of the eclipse, in her last quarter at 10 P. M. on the 10th,