

THE HEAVENS IN MAY.

BY HENRY NORRIS RUSSELL, PH.D.



OST of the finer constellations lie in or near the Milky Way; for example, Orion, Canis Major, Lyra, Cygnus, and Scorpio. But there are a few exceptions, and none of these is more conspicuous than Ursa Major.

Probably no group of stars is familiar to so many people as is the Great Dipper, though this name is apparently an Americanism, as it is almost unknown in England. It is at least really descriptive. The group looks like a dipper, with a badly bent handle, to be sure, but still quite serviceable. How the Dipper forms part of the Bear our initial letter shows. The Dipper handle is the Bear's tail; its bowl is in the creature's body, while a group of smaller stars about 20 deg. to the westward marks the Bear's head, and three pairs of nearly equal stars, farther south, represent three of its four paws.

Everyone knows that the "Pointers" at the front of the Dipper bowl are almost exactly in line with the Pole star; and many are familiar with the remarkable system of Mizar, the star at the bend of the handle. It has a distant companion, Alcor, visible with the naked eye; a much closer one, which requires telescopic aid to see it; and recent spectroscopic work shows that all three of these stars are really close pairs, with periods of but a few days or weeks. The stars β and ϵ are also spectroscopic binaries of much the same sort.

It is clear that in the Dipper we have a very remarkable group of stars; and their whole story is not yet told.

Five of the seven stars, those from β to ζ inclusive, are moving together in the sky, all very nearly parallel to the line joining the first to the last. The remaining two, at the ends of the series, are moving in almost the opposite direction, both receding at almost the same rate from a point in the sky not far from Vega.

At the rate at which either of these groups of stars is apparently moving, it would take it about 150,000 years to traverse the distance between the Pointers.

Referring to the map, with these data in mind, it is not hard to figure out what the Dipper looked like 100,000 years ago, or how it will appear as long hence. In neither case does the result bear much resemblance to the present form, though the five central stars are almost unchanged in relationship.

There is little doubt that these stars are really moving together, like the more numerous group in Taurus discussed by Prof. Boss, of which we spoke a few months ago.

Dr. Ludendorff of Potsdam, in a very recent paper (from which many of the above data are taken) finds that these stars are all receding from a common "radiant point," which lies about half way between the stars α Ursæ Majoris and Pollux. (See map.)

Since these stars are apparently opening up—getting farther apart—they must be approaching us. Spectroscopic observations show that this is really the case, the velocity of approach varying from 7 to 10 miles per second. From this rate, combined with the apparent motion of the stars in the sky, it is possible to find the distances of these stars, just as Boss did for the group in Taurus.

It appears that these five stars—or rather, seven for the two companions of Mizar belong to the group—are all at about the same distance from us—between 90 and 100 light years, or about six million times the sun's distance. The distance from one end of the group to the other is about four times the distance of

Sirius from the sun, so that these stars, though evidently belonging together in some fashion, are not very near neighbors, even as the stars go.

The two other stars of the Dipper, though having no relation with the five, are not improbably connected with one another as the five are. Working on this hypothesis, Ludendorff finds that their distance is very nearly the same as that of the other group, so that all seven stars of the Dipper are really about as near one another as they seem to be. But, on account of their very different direction of motion, these two stars will in the lapse of ages separate from the five, so that they are only temporary neighbors—for a little matter of half a million years or so. All these stars are much brighter than the sun—from thirty to one hundred and twenty times as bright according to Ludendorff's data.

The most fascinating feature of such researches is the power they give us to forecast the remote future. One million years hence, the five stars of the Dipper will be nearer us than they are now, and brighter, if they keep on shining the same as ever. Two million years hence they will have begun to recede. By this time the following ones in their motion will have caught up with the leaders, so that all five will be bunched together in a small region, perhaps not larger

sun. At this time he is in Taurus, 25 deg. north of the celestial equator, and does not set till 9 P. M., so that the present elongation affords an exceptionally good opportunity to see this innermost planet of our system.

Venus is just past inferior conjunction, behind the sun, and is practically invisible all through the month, though theoretically an evening star, setting less than half an hour after sunset.

Mars is in quadrature, west of the sun, on the 13th, and at this time rises about 1 A. M., and is due south at six in the morning. He is in Aquarius, a long way from any bright star, and is the brightest object in the southeastern morning sky, though nearly three times as far away, and only one-tenth as bright, as he will be four months hence.

Jupiter is almost opposite Mars in the heavens, and is in quadrature on the 27th, at which time he is due south at 6 P. M., and sets half an hour after midnight.

Saturn is morning star in Pisces, rising about 3:15 A. M. in the middle of the month. Like Mars, he is far from any bright star, and so is easy to identify.

Uranus is in Sagittarius, and is observable in the early morning, best about 3 A. M., when he is near the meridian.

Neptune, which is in Gemini, is so low in the west at dark that he cannot be well observed.

THE MOON.

The moon is full at 7 A. M. on the 5th, in her last quarter at 5 P. M. on the 12th, new at 9 A. M. on the 19th, and in her first quarter at 8 P. M. on the 26th. She is nearest us on the 16th, and farthest away on the 28th; her distance, and therefore her apparent diameter, varying about ten per cent. She is in conjunction with Uranus on the 10th, Mars on the 12th, Saturn on the 16th, Venus on the 19th, Mercury on the 21st, Neptune on the 22d, and Jupiter on the 26th. On the evening of the 20th the young moon and Mercury will be quite close together. This will be a good time for the novice to make sure of the planet.

Princeton University Observatory.

Alloys of Manganese.

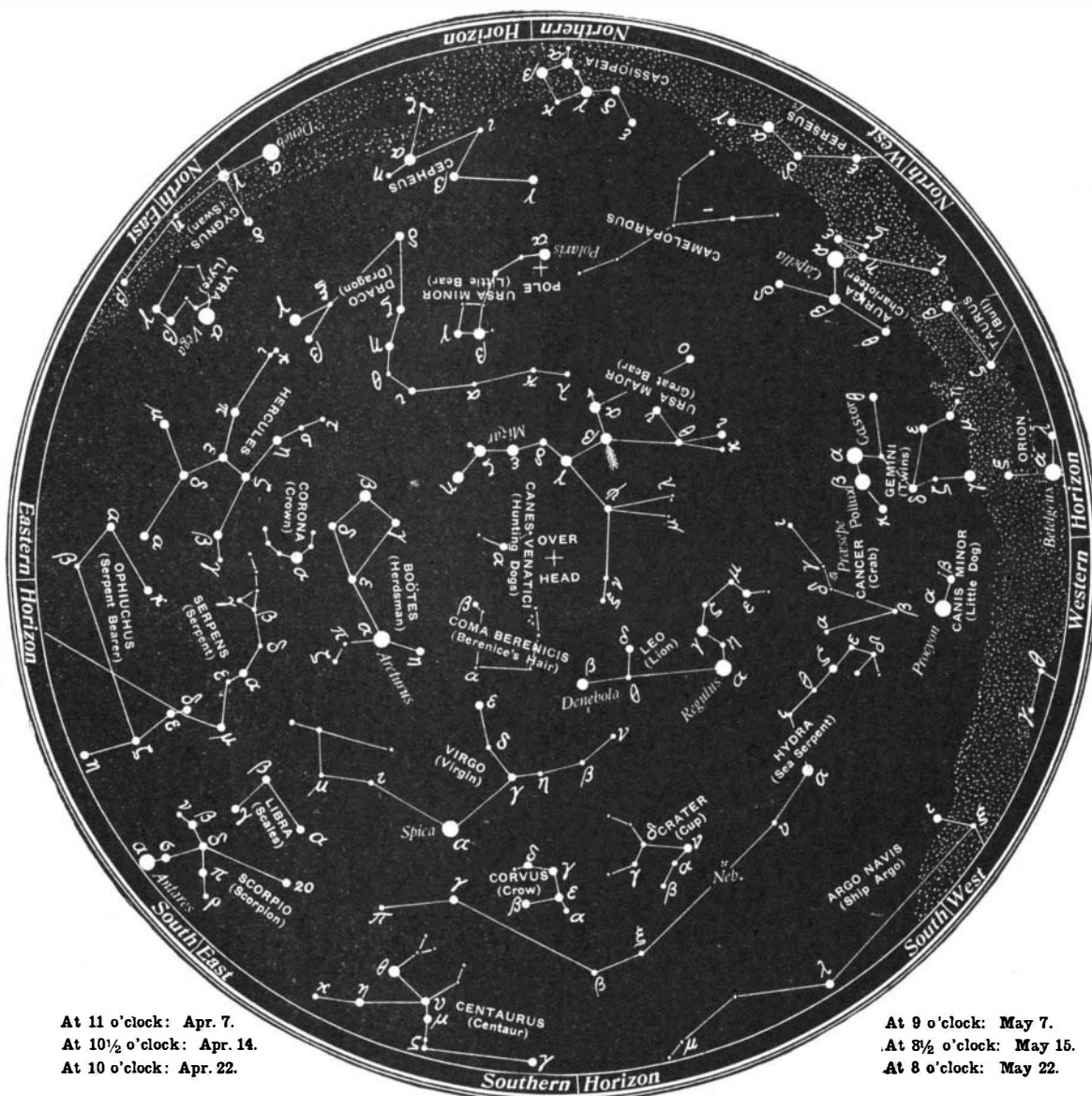
An alloy of manganese and copper, containing 30 per cent of manganese, is obtained by fusing the metals together in a graphite crucible. Alloys of manganese with zinc and with tin are made in the same manner, except that the manganese is not added until the other metals have melted. The manganese used in these processes is reduced by Goldschmidt's thermite process. It contains only 2 per cent of impurities

and no iron or carbon. The addition of manganese to bronze and brass makes the alloy more homogeneous, softer and more malleable and ductile. The maximum effect is given by 6 or 7 per cent of manganese, which is added in the form of the rich alloys with copper and zinc mentioned above.

Manganese added to white metals in proportions of $\frac{1}{4}$ to $\frac{1}{2}$ per cent gives them the color of silver increases their density and makes them easier to work. The grain of nickel castings is made finer and blow holes are eliminated by the addition of 2 per cent of manganese. The copper-manganese alloy containing 30 per cent of manganese and free from iron may be substituted with advantage for zinc and nickel in making aluminium alloys. From 4 to 6 per cent of pure manganese is often added to the copper crossbars of locomotive furnaces, where the presence of iron would diminish the resistance to fire.

Rapid Tanning with Formaldehyde.

Leather can be tanned very quickly with formaldehyde. A few hours' immersion in a 40 per cent solution produces a tough, well-tanned leather, which may be made more flexible by adding 5 or 6 per cent of soda to the bath. Trioxymethylene may be substituted for formaldehyde.



At 11 o'clock: Apr. 7.
At 10 1/2 o'clock: Apr. 14.
At 10 o'clock: Apr. 22.

At 9 1/2 o'clock: April 30.

At 9 o'clock: May 7.
At 8 1/2 o'clock: May 15.
At 8 o'clock: May 22.

than the present Dipper bowl. As they recede farther, they will grow fainter; and five million years hence they will, even if of the same real brightness as now, be hardly visible to unaided eyes like ours. It is almost too bold for speculation to follow them farther.

The other constellations need not detain us long. Below Ursa Major, in the north, are Ursa Minor and Draco, with Cassiopeia low on the horizon. In the northwest, also low, is Auriga. Orion has almost set, but Gemini hangs above his grave, and Procyon can be seen, a little farther to the left. Leo is high in the southwest. Below him, Hydra stretches its enormous length.

Due southward, almost on the horizon, the Southern Cross can be seen, but only from points as far south as Florida.

Virgo is near the meridian, well up in the sky. Scorpio is rising in the southeast.

Arcturus is high in the east. Corona and Hercules are below him on the left, in line toward Vega, which has just risen.

THE PLANETS.

Mercury is evening star all through May, and is well visible in the middle of the month—best about the 20th, when he is apparently farthest from the