

she is heeled to her best sailing lines. The boat will be comfortable in a seaway, and she will do her best work over the windward and leeward course. Her deep midship section will be a drawback to the boat in reaching, especially when the higher speeds are attained and wave-making begins, and on this point of sailing "Reliance" will probably have no difficulty in leaving her. To windward, judged purely by their models, "Shamrock III." should be the better boat; but "Reliance" has shown such unexpectedly good windward qualities that it is likely that she will be able to hold her on this point of sailing and possibly pull away from her. Before the wind, under spinnaker, "Shamrock III.," because of her smaller wetted surface, should be the more slippery boat; but, on the other hand, the enormous sail plan of "Reliance" will probably outweigh her greater wetted surface, and pull her down to the leeward mark some minutes ahead of her more handsome sister.

The sail plan of "Shamrock II." was found to be so pre-eminently satisfactory that it has been adopted with very little change in "Shamrock III.," the later boat carrying about a couple of hundred more square feet of sail. The mast is 158 feet in length, and the boom 104 feet, with a base line of 78 feet for the forward triangle. The rig is thus, relatively to "Reliance," narrow for its height and favorable for windward work. The question now is whether the deeper-bodied, rounder, and sweeter boat, with her generous sail plan of 14,400 square feet, can hold her own with a flat-floored, shoal, full-bowed boat carrying full 1,500 square feet more canvas. It is a clear case of a gamble on the weather, with the odds largely in favor of the overgrown boat. In winds that will allow "Reliance" to carry her sails spread, we think there is not a doubt as to the outcome; but should the wind pipe up to a strength of 20 to 25 knots, we prophesy dire trouble for the scow and a good fighting chance for the smaller boat.

THE HEAVENS IN JULY.

BY HENRY NORRIS RUSSELL, PH.D.

The brightest and most interesting regions in the evening skies of July lie to the eastward of the meridian. The Milky Way, rising obliquely from the north point of the horizon, sweeps round in a vast curve to the eastward of the zenith, and descends toward the south. Along it we find a series of brilliant constellations. Beginning low in the north, we first find Cassiopeia—familiar at all seasons, for in our latitude it never sets. Next above, on a level with the pole star, a few rather inconspicuous stars mark the place of Cepheus.

Though this group hardly adds much to the brightness of the sky, the next one makes up for its deficiency, for it is the splendid constellation Cygnus. This is one of the few groups of stars that bear any resemblance to the objects for which they are named. It takes but little imagination to see the head and body of a flying swan in the line of stars that lies almost centrally in the Milky Way, and its outstretched wings in the equally conspicuous line that crosses it.

The southernmost of the principal stars of the constellation—Beta Cygni—which marks the tail of the swan, is well worth looking at with any telescope, however small. It is one of the finest double stars in the heavens, though a very wide pair, and is an admirable example of contrasted colors, the principal star being orange, and its companion blue. The two stars have a common proper motion in space, and it is not unlikely that they are also in revolution around one another, though the period must be many thousands of years, as the stars have shown very little relative motion in the last century. Their distance from the earth is very great—too great for accurate measurement—so that we can only say that the system must be one of enormous magnitude, so great that the sun, or even Sirius, if set alongside it, would seem small in comparison.

Close to Cygnus, and on the western edge of the Milky Way, is Lyra. The brilliant Vega marks this constellation so conspicuously that it is one of the easiest of all to recognize.

Below Cygnus the Milky Way divides into two branches, which pursue a roughly parallel course as far as the southern horizon. The western branch is comparatively faint, but the eastern one contains the brightest part of the galaxy that we ever see, and is full of intricate patches and knots of brightness, and also of dark holes and pockets, some of a most extraordinary character. One of the most conspicuous is in Cygnus, and looks almost as if a dark streak of cloud obscured the stars.

Not far below Cygnus, in this branch of the Milky Way, lies Altair, a first-magnitude star, and one of our nearer neighbors. There are no very bright stars lower down, though the little inverted "milk dipper" in Sagittarius is a characteristic configuration, but the galaxy itself is here fine enough to reward observation abundantly.

West of Sagittarius, and right on the meridian,

Scorpio is in full view, from the three stars which mark his claws and the red Antares in his body down to the recurving end of his upturned tail. It is a pity that we never see this constellation at a greater altitude, clear of the mists of the horizon, for it is one of the finest in the heavens.

There is little of interest east of the Milky Way. Pegasus is just rising below Cygnus, and Capricornus is partly visible below Altair.

The planet Saturn, which is about an hour high in the southeast, is the brightest object in that part of the sky.

On the meridian are Draco, above the pole, Hercules, almost overhead, and Ophiuchus, stretching southward toward Scorpio. Virgo and Boötes are farther west, and their principal stars, Spica and Arcturus, are the chief adornments of the western sky. Mars is near the former, but is not very conspicuous.

Leo, which is just setting, and Ursa Major, which fills the space to the left of the pole, complete the list of the constellations now prominent.

THE PLANETS.

Mercury is morning star until the 25th, when he passes through superior conjunction, behind the sun, and becomes an evening star.

He is rather higher than usual and easily seen during the first ten days of the month. On the 1st he is in Taurus, not far from Aldebaran, and rises at about 3:30 A. M., an hour before the sun.

Venus is evening star and is very conspicuous. On the 9th she reaches her greatest eastern elongation, being 45½ deg. from the sun. As she is moving southward, however, she does not remain in sight quite as late as she did in June. On the 1st she sets at 10 P. M., but on the 31st at about 9 P. M. She is moving eastward through Leo and Virgo during the month, and passes close to Regulus on the 16th—within a degree of him. Her phase changes from a half moon to a pronounced crescent during the month, but her decreasing distance, and increasing apparent diameter, more than make good the deficiency, so that she is growing brighter.

Mars is evening star in Virgo. On the 6th he is in quadrature with the sun, and comes to the meridian at 6 o'clock. He is rapidly receding from the earth, and is only one-quarter as bright as he was at opposition in March. As he moves eastward through Virgo he passes quite near Spica, their least distance, 1½ deg., being reached on the 23d.

Jupiter is in Aquarius and rises about 10 P. M. on the 15th. He is the most conspicuous object in the morning sky, but it is still too early to observe him comfortably in the evening.

Those who can command good telescopic aid, and who are interested in watching his satellites, will be repaid for the trouble of looking at him on the nights of the 22d and 29th, for on both these occasions the planet appears for some time with only one visible satellite—the fourth. On both nights the first satellite is in transit in front of the planet, and the second and third are behind it, or eclipsed in its shadow. The succession of phenomena—ingress of one satellite, egress of another, occultation of a third, etc., occupies the whole night, but the most interesting hours of observation are from 11 to 1 in both cases.

Saturn is in Capricornus, and comes to opposition on the 30th. He is still very far south, but is a little better placed than last year. In spite of his low altitude he is a most interesting telescopic object. The smallest instrument will show his rings, and his brightest satellite, Titan, whose motion round the planet, completed in a period of 16 days, is interesting to watch. A larger instrument brings out the smaller satellites nearer the planet, as well as the outer one, Iapetus, which is about three times as far away as Titan, and takes 80 days to complete its circuit.

Uranus is in Ophiuchus, and comes to the meridian at 10 P. M. on the 15th. Neptune is morning star in Gemini—too near the sun to be observed.

THE MOON.

First quarter occurs at 4 P. M. on the 1st, full moon at 1 P. M. on the 9th, last quarter at 2 P. M. on the 17th, new moon at 8 A. M. on the 24th, and first quarter once more at 2 A. M. on the 31st. The moon is nearest us on the 24th, and most remote on the 10th.

She is in conjunction with Mars on the evening of the 1st, Uranus on the 7th, Saturn on the 11th, Jupiter on the morning of the 15th, Neptune on the 22d, Mercury on the 24th, Venus on the 27th, and Mars again on the morning of the 30th.

The most noteworthy of these conjunctions are those with Jupiter and Mars, which are quite close, especially the first conjunction with Mars. In fact, an occultation of the planet is visible from the southern parts of the United States on July 1, the hour verging from 8 to 9 P. M. Eastern Standard time, according to the location of the observer. As seen from New York, Mars will only make a close approach to the northern limb of the moon.

Cambridge, England.

SCIENCE NOTES.

The Great Salt Lake of Utah is gradually drying up. Readings taken by United States Section Director Hyatt show that the lake level, despite heavy rains, is 2 feet, 6 inches below the normal.

Before the Chemical Congress at Berlin, on June 7, Prof. W. Markwald exhibited specimens of polonium. A bit of the metal was shown weighing 0.15 of a grain, which was produced from two tons of uranium at a cost of \$75.

Andrew Carnegie has purchased the famous zoological collection of Baron de Beyet, of Brussels. The collection is especially rich in specimens of extinct birds of central Europe and northern Asia. The collection is to go to Harvard University.

The temperatures of the stars are given as follows in the Report of the International Congress of Physicists of 1900:

Star.	W.L.	T°	t°
The Sun	0.54	5450	4850
Sirius	0.46	6400	5700
Vega	0.46	6400	5700
Arcturus	1.08	2700	2450
Aldebaran	1.03	2850	2550
Betelgeux	0.94	3150	2800
Electric Light	0.84	3500	3150

W. L. is the known wave length of the wave of maximum energy; T, t are the limits between which the absolute temperature must lie.

In the early history of Virginia and Maryland tobacco was by all odds the most important crop, and it was even possible at times to secure a wife in exchange for a moderate amount of tobacco, as in later days in the West a squaw could be obtained in exchange for a small amount of whisky. In 1732, at Jamestown, tobacco was made a legal tender for all debts, including customs. In about a dozen years after the founding of Jamestown by Capt. John Smith, an English nobleman, Sir Edwin Sandys brought over with a shipload of supplies ninety young English maids, who, immediately upon their arrival, were wooed and married by the colonists, each being paid for at the rate of "120 pounds of good tobacco." As late as 1777 the annual poll-tax of Baltimore city and county was fixed at 172 pounds of tobacco. Tobacco, it is well known, was a native Indian crop in America before the advent of Columbus.

With their little red wrappers decorated with black polka-dots, the various members of the lady-bug family are gay and attractive members of the insect world. They are always man's friend, and get most of their living by preying on the destructive soft-bodied plant lice, the most common of which is the green aphid, which can commonly be found on house plants and rose bushes. The most striking example of the usefulness of the lady-bug to the horticulturists is seen in the case of *Vealia cardinalis*, the bug which was imported from Australia and which saved the citrus trees of California by destroying the cottony-cushioned scale which was devastating the orange and lemon groves. In the study of the grain aphid it was found that a species of lady-bug preyed upon this pest. The former were observed to go down among the roots of the grain in the field in search of the aphides, and to pass the winter along with them in that situation. The larvæ of the lady-bug also live principally upon insects which are destructive to garden and field crops. The dainty lady-bug should never be destroyed.

In a note in Science Dr. Sidney Reeve presents in a brief form the views respecting the dissipation of energy set forth in his book, "The Thermodynamics of Heat Engines." In discussing the second law of thermodynamics he says: While any given quantity of energy tends, so long as it exists without transformation, to fall in intensity and never the reverse, yet the secondary form of energy into which that quantity may at any time find itself transformed possesses a degree of intensity that is entirely independent of that of the original quantity, and which is the maximum permitted by circumstances. In other words, energy tends downward in intensity during untransformed existence and upward during transformation. This necessarily denies in toto the doctrine of the dissipation of energy and affirms, on the contrary, that as much exaltation of energy as depression is constantly going on. In short, the total fund of intensity or availability of the energy of the universe is as constant as is the universe's total fund of mass, or as is its total fund of the product of the two, energy itself. The availability of the energy of the solar system is, of course, being steadily dissipated. But astronomy has long since passed the point where observations confined to the solar system suffice for the establishment of fundamental principles of this sort. The old doctrine of the dissipation of energy necessarily excluded any possibility either of the universe being infinite or eternal in its extent, or of its being one with the solar system. The new statement is not only consistent with such views, but it implies them.