THE HEAVENS IN AUGUST.

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The chief astronomical events of this month are two eclipses, one of the sun and one of the moon, both of which are visible in the United States.

The lunar eclipse comes first, on the night of the 14th. It is partial, only about one-third of the moon's diameter being immersed in the shadow. The moon enters the penumbra at 8.9 P. M. eastern standard time; that is, at this moment an observer stationed at the proper part of the moon would first see the sun begin to disappear behind the earth. But it will not be till some time later that the darkening of the moon's southern limb will be apparent to the eye. At 9.39 P. M. the moon enters the earth's shadow proper, from which all direct sunlight is excluded, and she continues to press further into it for an hour, and then gradually moves out of it again, leaving it altogether at 11.43, and getting clear of the penumbra at 1.12 A. M.

This eclipse is therefore very conveniently observable in one part of the world, but little information of scientific value can be anticipated from it, thanks to the fact that the earth's atmosphere prevents the edge of its shadow from being sharply defined, so that it is impossible to tell with any degree of accuracy when it reaches any given spot on the moon.

Far more important is the solar eclipse on the 30th, which is one of the most interesting ones for many years. It is a total eclipse, of pretty long duration, and the line of central eclipse passes through several regions which are conveniently accessible for observing parties.

The eclipse is total at sunrise in Manitoba, just north of the United States boundary. Thence the shadow sweeps eastward across Canada, north of the settled districts, and comes out on the Labrador coast. It turns somewhat to the southward as it crosses the Atlantic, and reaches land again on the Spanish coast near Cape Finisterre. Crossing Spain, the shadow traverses the Mediterranean, passes near Tunis, enters the African desert, passes over the Nile near Assouan, and finally bids farewell to the earth somewhere in Arabia, less than three hours after it began in Canada. The duration of the total phase is greatest in Spain, where it is about 3¾ minutes, while it is about 2½ minutes in Labrador, and a little less than three minutes in Egypt.

Several parties of astronomers are going to Labrador, and many more to stations in Spain and Algeria, so that a goodly store of observations may be expected if only the weather behaves as well as it did in 1900, when the track of the shadow on the European side of the ocean was almost the same as at present.

Weather permitting, a great deal of spectroscopic and other information about the sun's surroundings will undoubtedly be obtained. Perhaps the most interesting observations from an amateur's standpoint are those that will be made in the search for a possible small planet nearer the sun than Mercury, by photographing the whole region of the sky near the eclipsed sun. This has been done at several recent eclipses, without result, only known stars being found on the plates; but the brilliant success of photographic methods in finding new satellites makes one feel that the search for an intra-Mercurial planet ought to be continued a little longer.

THE HEAVENS.

The finest constellations visible at this season lie near the Milky Way. We may begin with Lyra, whose brightest star, Vega, is almost overhead at 9 o'clock on an August evening. This splendid white star disputes with Arcturus and Capella the claim to be the brightest in the northern hemisphere of the sky. In fact, the order in which different observers would rank these three stars is different, not because the stars themselves vary in brightness, but because they are of very different colors, and some people have eyes more sensitive to one color than to another. When we come to consider the distances of the three stars, and their actual brightness, it appears that Vega and Capella, which are almost equally distant from us, are each about one hundred times as bright as the sun, while Arcturus, which is much more remote, is ten times as bright as either of the two.

Vega serves as a pointer to several interesting objects. Close to it on the northeast is a faint star, which can be seen to be double with the naked eye by a few people with keen eyesight, or by ordinary mortals with an opera-glass. Each of the two components is a fine telescopic double. Southeast of Vega, at a little greater distance, is a pair of third-magnitude stars, of which the western one is the remarkable variable Beta Lyræ, which changes more than a magnitude in brightness with great regularity in a period of about twelve days. The line of these two stars, carried eastward, points to Beta Cygni, a very fine double star in the Milky Way, well seen with a small telescope.

The rest of Cygnus lies to the northward, and contains several bright stars. The Milky Way in this neighborhood shows singular differences in brightness, with a number of dark patches, some of which look almost like clouds obscuring it. They are probably really gaps between the "star clouds," which send us most of the diffused light of this region, though they consist of very faint stars.

South of Cygnus is Aquila, with the bright star Altair lying between two fainter ones. Below this again is Sagittarius, with the little Milk Dipper, and farther west is Scorpio, now seen at its best.

Arcturus is the most conspicuous object in the western sky. The constellations Corona and Hercules lie between it and Lyra, Ophiucus and Serpens are between it and Scorpio, and Libra and Virgo are below it, the latter setting. Mars, which is in Libra, is the most prominent object in the southwest, and Saturn balances it in a similar situation in the southeast.

The great square of Pegasus is about an hour high in the east. Perseus and Andromeda are on the horizon north of it, and Cassiopeia above them. Draco and Ursa Minor are above the pole, and Ursa Major is to the left of it.

THE PLANETS.

Mercury is evening star until the 29th, when he becomes a morning star. He is best visible during the first week of the month, when he sets about an hour later than the sun, and can be seen in the twilight, almost exactly due west.

Venus is morning star in Gemini, and is unusually prominent, rising about 2 A. M. and being still very bright, though past her maximum. Mars is in Libra, and sets about 11 P. M. in the middle of the month. On the 26th he is in quadrature with the sun, and comes to the meridian at 6 P. M.

Jupiter is morning star in Taurus, almost exactly opposite to Mars, and rises at about the time that the latter sets. He is in quadrature on the 28th, but being west of the sun, he crosses the meridian six hours before him, instead of six hours after, as Mars does.

Saturn is in opposition on the 23d, and is visible all night. He is in Aquarius still pretty far south, but better placed for observation than he has been for several years. His rings are seen more nearly edgewise than has been the case for some time, and the orbits of his satellites are also apparently more elongated.

Titan, the brightest of the satellites, which can be seen with a small telescope, is west of the planet on the 3d, north on the 7th, east on the 11th, and so on, his period being 16 days. When he is north or south of the planet, his apparent distance is about equal to the diameter of the rings; but when east or west of it, it is about five times as great.

Uranus is in Sagittarius, and comes to the meridian at 8:30 P. M. in the middle of the month. Neptune is in Gemini, and crosses the meridian about 3 A. M.

THE MOON.

First quarter occurs at 5 P. M. on the 7th, full moon at 10 P. M. on the 14th (during the eclipse), last quarter at 1 A. M. on the 23d, and new moon at 8 A. M. on the 30th—again during an eclipse. The moon is nearest us on the 4th, farthest off on the 20th, and nearest once more on September 1. She is in conjunction with Mercury on the 2d, Mars on the 8th, Saturn on the 15th, Jupiter on the 23d, Venus on the 27th, and Mercury again on the 30th.

Cambridge, July 10, 1905.

A NEW KIND OF FIREPROOF THEATER.

Mr. Mausshardt, a German inventor, has recently made an attempt, successful it seems, to permit spectators to escape quickly from a theater in the case of fire. In fact, his project aims at emptying the theater within thirty seconds from pit to gallery, no matter whether it contains twenty or two thousand visitors.

When it is considered that the problem of moving bodily whole houses has been solved both in America and more recently in Europe, the task of conveying into the open the whole pit, including all its occupants, should not seem to be impracticable. In fact, Mr. Mausshardt places the whole pit, including the boxes situated on the same floor, and the partition walls of the lateral corridors, on rollers running over rails extending for a suitable distance in front of the theater. In the case of fire, the whole pit, including any rooms on the same floor, is moved into the open quite independently of any individual attempts to gain the open air through the corridors.

As regards the other part of the problem, namely, to convey the spectators in the balconies in the same short interval of time into the open, and to put them down on the street, this has been ingeniously connected with the first part of the rescuing problem. Each balcony has a number of window doors opening toward the street. Although closed during the performance, these doors are opened in case of emergency, either automatically all at a time or else singly by hand in case of a breakdown of the mechanism. Any one of these doors opens on a gallery, the galleries of each balcony being suspended by hinges from heavy outriggers, which act as powerful single-armed levers and which turn round pivots beneath the first balcony. When lowered, all the outriggers and the three suspended galleries will be moved sidewise, coming down outwardly on the street. The outriggers are fixed by their upper ends to wire ropes running over a pulley on the roof through the lateral walls into the ground floor, where they are wound up on rollers, fixed rigidly to the side walls. As the outriggers descend, a transverse shaft is actuated through a conical toothed gearing, and the racks fitted beneath the pit, and along with these the pit itself, which runs on rails, are set rolling. The exceedingly simple gearing is so calculated that at the very moment the outrigger galleries touch the street, the whole pit has been removed from the theater building. The entire apparatus has been so designed as to be operated from an inclosed cabin, after a signal has been received from the fire station of the theater.

There is, however, the possibility of some persons being left in the balconies after the rescuing has been performed. Now, these will be able to escape over stationary running galleries fitted outside to the building, the more easily as by far the majority of spectators have doubtless left the theater, so that there is no possibility of a crowd.

A model theater has been constructed by the inventor according to the plans of the Karlsruhe Court Theater, and a real theater on this ingenious system may soon be constructed.

SCIENCE NOTES.

One century has elapsed since Theodore de Saussure published his remarkable investigations relating to the nutrition of plants and to the influences upon plants of certain well-known physical forces. Although preceded by the publications of Duhamel, Hales, Ingenhouss, and Senebier, as well as by those in a somewhat different line, by Konrad Sprengel and others, we may look upon the work of De Saussure as a wonderful production for his time and as strikingly indicative of the status of plant physiological problems a century ago. His paper may be regarded in a sense as the original charter of plant physiology.

Prof. Albert M. Reese, of the Syracuse University, has gone to Florida, under the auspices of the Smithsonian Institution, to collect eggs of the alligator with which to work out its embryology; subsequently he will spend some time at the biological laboratory of the Carnegie Institution of the Dry Tortugas, developing his find of this crocodilian species. The alligator cannot long escape practical extermination. Already they are becoming scarce and the price of hides has gone up enormously in the last few years. The alligator is characteristic of the austroriparian region, ranging from North Carolina to the Rio Grande of Texas. It has never been seen in the Mississippi River north of Rodney, Miss., which is about latitude 32. Twenty-five years ago this reptile existed in great abundance in its range, but as alligator leather became fashionable about that time the demand thus created has reduced the supply by at least 98 per cent. It is said that a person may travel now from Jacksonville to Miami, Fla., without seeing a single alligator. It is estimated that 2,500,000 alligators were killed in Florida from 1880 to 1894.

In no country in the world do insects impose a heavier tax on farm products than in the United States. The losses resulting from the depredations of insects on all the plant products of the soil, both in their growing and in their stored state, together with those on live stock, exceed the entire expenditures of the national government, including the pension roll and the maintenance of the army and the navy. Enormous as is the total value of all farm products in this country, it would be very much greater were it not for the work of these injurious insects. The statistics of agricultural products for the year 1889, of the Twelfth Census, and for subsequent years, gathered by the Bureau of Statistics of this department, indicate an annual value of all the products of the farm of about $5,000,000,000. To one familiar with the work of the important insect pests of the different agricultural products entering into this total it is comparatively easy to approximate the probable shrinkage due to insects. The detailed consideration of such shrinkages which follow indicates that they will rarely fall below 10 per cent, and in years of excessive insect damage may amount to 50 per cent or even more of the important staple products of the farm. An annual shrinkage of 10 per cent is a low estimate, which is more often exceeded than fallen below, and indicates, at current farm prices, a money loss of $500,000,000—the minimum yearly tax which insects lay on the products of the farm. This total comprises, however, only losses suffered by the growing and maturing crops and annually by live stock, and does not include two very considerable and legitimate items, namely, the loss occasioned by insect pests to farm products, chiefly cereals and forage crops, in storage, and to natural forests and forest products. As shown in the consideration of these two sources of loss presented below, at least $100,000,000 must be assigned to each, making a total annual tax chargeable to insects of $700,000,000.