THE HEAVENS IN JULY.

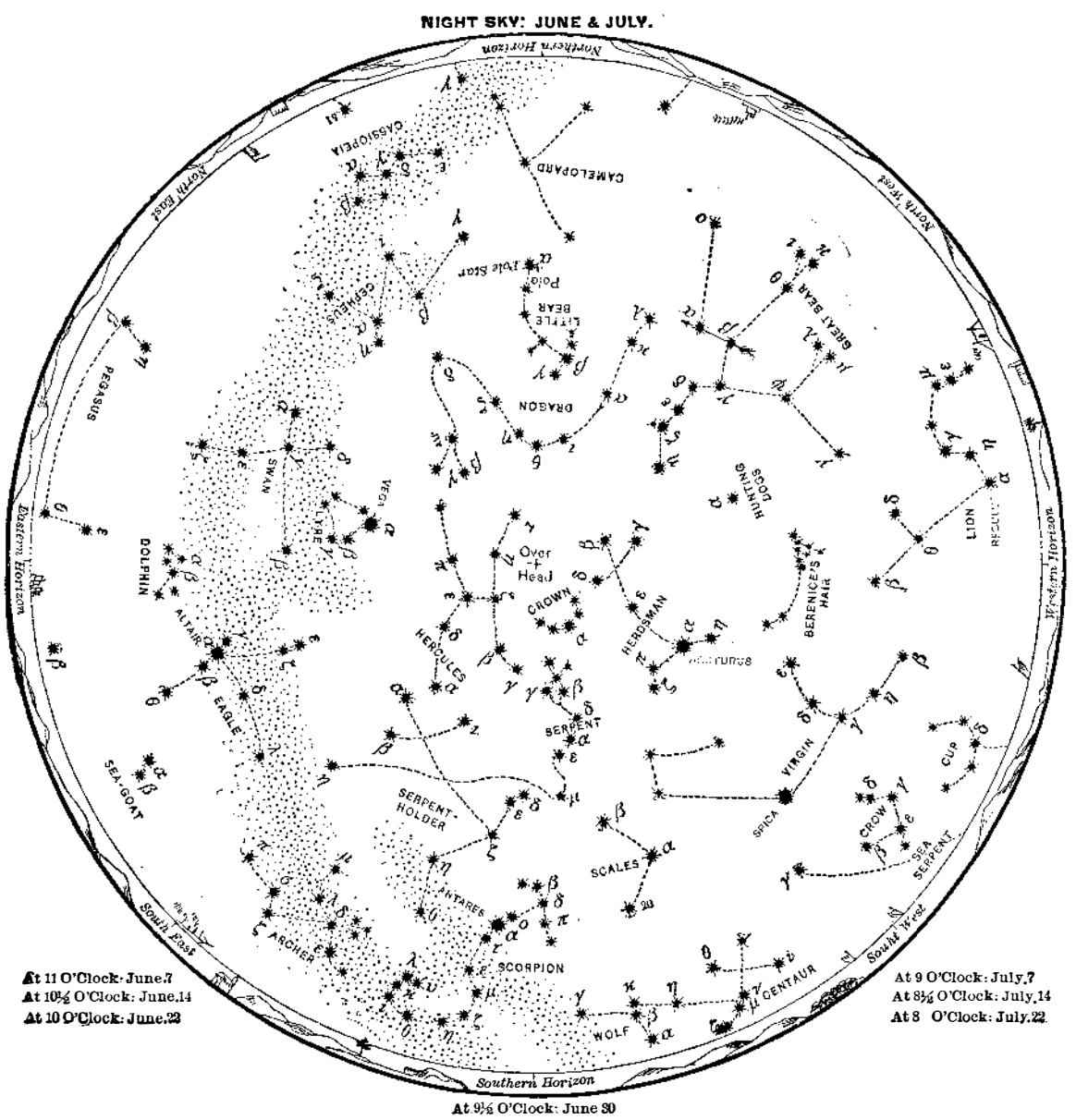
BY HENRY NORRIS RUSSELL, PH.D.

Two eclipses, and the opposition of Mars, make the month of July this year a notable one from the astronomer's standpoint. The first of these eclipses, which occurs on the 10th, will not be visible in this country, and can only be observed from South America. Observers in the northern or southern part of this continent will see only a small part of the sun's disk obscured by the moon, but along a wide track, which passes somewhat north of Rio de Janeiro, the moon will be seen projected upon the sun's face, giving rise to an annular eclipse.

A fortnight later, on the evening of the 24th, there is a partial eclipse of the moon, visible throughout the United States. The moon enters the penumbra at 8:59 P. M. Eastern Standard time, but first touches the dark shadow of the earth at 10:04. When the eclipse is at its largest, at 11:22 P. M., about five-eighths of the moon's diameter is hidden. Then the obscuration decreases and at 12:41 the moon leaves the shadow and gets clear of the penumbra at 1:46 A.M.

This eclipse will be very conveniently visible in this country. It is one of the few astronomical phenomena which can be seen almost as well with the naked eye as with the telescope. The edge of the earth's shadow, which looks sharp enough to the unaided vision, is really very diffuse on account of the refraction of sunlight into the shadow by the outer layers of our atmosphere. It is impossible to fix its exact position on the moon or to determine with any accuracy the time at which it reaches any definite point. This deprives a lunar eclipse of most of the scientific value that it would otherwise have, for we cannot find from it, as we can from a solar eclipse, the exact time when the moon was in a known position, and so cannot use it to correct our tables of the moon's motion.

Of much greater importance to astronomers is the very favorable opposition of Mars, which occurs on the 6th. Although Mars comes to opposition every other year (roughly speaking), he can be much better seen at some of these times than at others. At every opposition the earth is (approximately) in line between the sun and Mars, so that the planet's distance from us is equal to the difference of the distances of the earth and Mars from the sun. The earth's orbit is nearly circular, but that of Mars is considerably eccentric, so that his distance from the sun varies from about 129 to 155 million miles, while the earth's distance varies from 92 to 94 million.



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.

At present Mars is almost at his nearest to the sun—132 million miles distant—and the earth is about at its farthest, so that the distance between the two is reduced to 38 million miles, as against 49 million at the average opposition, and 62 million at the least favorable.

Being so near us, Mars looks correspondingly large in the telescope, and bright to the naked eye. He is, however, very low down in our skies, his declination being 28 deg. south, so that he is at most 22 deg. above our horizon and only 10 deg. high at Greenwich. He can hardly be observed at all in northern Europe, and only with difficulty in this country, so far as the finer details go. But the southern observers will doubtless be busy, and Mr. Lowell, who has always made Mars a special study, has sent an expedition to South America for the express purpose.

Meanwhile the news comes from his observatory in Arizona that some of the "canals" on the planet's disk have again been photographed there, and we may hope that this summer's work will give us important and perhaps conclusive evidence of the nature of these singular markings.

THE HEAVENS.

Turning to our map, we may begin by identifying the very bright star Arcturus, which is due southwest very high up, and to which the curve of the dipper-handle points. Below this, in the southwest, the less brilliant but whiter star is Spica, in the constellation of the Virgin. Another equally white star, a shade fainter than the last, is Regulus, in the Lion, which is just setting.

The Dragon and the Little Bear are above the Pole, and the Great Bear lies to the westward, while Cassiopeia and Cepheus are toward the east.

In the east are Cygnus, the Swan, and above it Lyra, with the great blue star Vega. Farther south is Altair, in the constellation of the Eagle, and lower down, on the left and right, the Dolphin and the Sea-Goat (Capricornus). Hercules and the Northern Crown lie between Vega and Arcturus, and south of them the Serpent-Holder (Ophiuchus) and the Serpent fill a great area of sky.

West of south is a part of the Centaur, whose brightest stars we never see, and farther east is the Scorpion, with the red star Antares. Mars, which is in Sagittarius, is well up in the southeast, and is much brighter than anything else in sight.

THE PLANETS.

Mercury is evening star until the 24th, when he passes through inferior conjunction, and becomes a morning star. He can be seen in the twilight during the first few days of the month, when he sets at about 8:30 P. M. Venus is morning star in Taurus and Gemini and rises at about 3:30 A. M. in the middle of the month.

Mars is in Sagittarius, coming to opposition on the 6th, and is visible all night long, as already described.

Jupiter is in conjunction with the sun on the 16th, and is invisible throughout the month.

Saturn is in Aquarius and rises about 10:30 P. M. in the middle of the month. Uranus is in Sagittarius, close to Mars, and comes to opposition on the 3d. The two are in conjunction on the 19th. At this time Uranus is 5 deg. 18 min. north of Mars, and it will not be difficult to pick him up, even with a field glass, and make sure of the identification by watching his slow westward motion among the stars.

Neptune is in conjunction with the sun on the 5th, and is invisible throughout the month.

THE MOON.

Last quarter occurs at 9 A. M. on the 2d, new moon at 10 A. M. on the 10th, first quarter at 8 A. M. on the 18th, full moon at 11 P. M. on the 24th, and last quarter once more at 9 P. M. on the 31st. The moon is nearest us on the 23d, and farthest away on the 9th. She is in conjunction with Venus on the 8th, Neptune and Jupiter on the 10th, Mercury on the 12th, Mars and Uranus on the 23d, and Saturn on the 28th.

COMETS C AND D, 1907.

A faint comet was discovered by Giacobini at Nice on June 1. It is in Leo, and is now receding from us and growing very faint. A much brighter comet was discovered on the morning of June 10 (civil reckoning) by Mr. Zaccheus Daniel, a student in Princeton University, and assistant at this observatory. It is in Pisces, very near the equinoctial point, and is moving slowly eastward, almost in the ecliptic. Elements of its orbit have not yet come to hand.

Princeton University Observatory.

CONVERTING MUSIC INTO ELECTRICITY.

A successful attempt, as is well known, has recently been made to produce music immediately from electricity by means of the telharmonium of Dr. Cahill, without the aid of any musical instrument. In this connection it will be interesting to learn that a French scientist, Dr. M. Dupont, a short time ago succeeded in converting music into electricity, by reproducing in the shape of an alternating current the series of vibrations corresponding with a series of musical sounds. This alternating current affords a picture of the sound vibrations that constitute a musical performance, and is able to produce physiological effects similar to the hearing of music. The alternating current in question is made up of periods, the frequency of which corresponds with the number of vibrations of the sound, that is, with the pitch, a high sound yielding a rapidly vibrating current and a low one a current with long periods. The ratios between the various phases of the current periods are identical with the ratios between the sound intervals. The alternating current corresponding with a scale thus comprises a series of periods, the number and ratios of which are equivalent to the frequency and ratios of the sounds of the scale.

In reproducing these musical currents, Dr. Dupont uses a phonograph to which a microphone is fitted. After recording a musical scale on the phonograph cylinder, the apparatus is made to work, when the microphone will yield an alternating current as above described. The microphone circuit comprises the primary of an induction coil without its interrupter. By means of this transformer the alternating currents obtained are controlled at will before being applied to the organism.

If in the place of a scale a piece of music be chosen, the alternating current, on passing through the human body, will produce the physiological effects of that piece.

After some practice it will doubtless be possible to tell a piece of music by the corresponding currents traversing the tissues of the body, in the same way as by hearing it. This process might prove especially valuable in the case of deaf mutes.

Dr. Dupont has undertaken extensive researches on the physiological effects produced by these rhythmical currents on the nervous system. It is hoped to ascertain the kind of current corresponding with each given condition of the mind, so as to be able at will to exert an exciting or calming action.

In this connection it should be remembered that Dr. Leduc some years ago investigated the calming and anesthetizing effects of rapidly intermittent direct currents of low intensity.

Death of Prof. Alexander Herschel.

Prof. Alexander Stewart Herschel, M. A., the distinguished astronomer, died on June 18, 1907, at the Observatory House, Slough, Bucks, where his grandfather, Sir William Herschel, and Sir John Herschel made most of their world-famous discoveries.

Prof. Herschel was a fellow of the Royal Society and was a doctor of civil law. He was professor of physics and experimental philosophy at the Durham College of Science at Newcastle-on-Tyne.