

ASPECTS OF THE PLANETS FOR DECEMBER.

SATURN

is morning star until the 26th, when he becomes evening star. On the 26th, at 6 o'clock in the morning, he is in opposition with the sun, his place in the heavens being then, as the word implies, opposite the sun. He rises in the east at that time as the sun sinks in the west, and adorns the sky from sunset to sunrise. He presents a grand display throughout the month, and thirty years must complete their slow circuit before he will again be visible in his present aspect.

The hour has come that observers have so long desired. The beautiful planet is in opposition, only two months past perihelion, his magnificent rings are open to their widest extent, and he has reached his highest northern declination. He is charming to behold as he makes his way with retrograde steps through the smaller stars of Gemini. He is surpassingly lovely in the telescope as he lies cradled in his rings, and surrounded by the points of gold that reveal the presence of his eight satellites.

These are red-letter days for Saturnian astronomers, who will not fail to improve the precious opportunity for studying his complex system, especially the constitution of the dark spaces between his rings, and the shadowy markings on his disk. The features of this planet's surface are of extreme delicacy. The eye must be practiced, the instrument of the best kind, and the atmosphere clear to give any hope of reaching reliable results. Mr. Denning, of Bristol, a close observer, gives an interesting report in *Nature* of observations that have been made upon the Saturnian belts during the last few oppositions.

A very definite narrow dark belt has bounded the southern side of the equator, remarkable for its compact appearance, though exhibiting no distinct spots. One or two observers have detected proofs of condensation. The belts near the pole are so faint that there is doubt if they have really been seen except by the eye of fancy. It is generally agreed that some of the features of the planet are variable, and this accounts for the difference of opinion among observers. Especially is this the case in regard to the division between the rings and the division in the outer ring. These must fluctuate at short intervals, or the evidence of different observers and different telescopes is strangely at variance. There is not much probability that definite results will be reached at the present opposition, even under such favorable conditions. None the less should the observation be thorough, close, and long-continued, for this is the only method by which terrestrial observers can hold communion with the other planets, or learn even the first lessons of what is going on in their distant domains. It is easy to recognize Saturn as he rises in the northeast about 6 o'clock in the evening on the 1st of the month, for he is almost in line between Pollux and Betelgeuse.

The right ascension of Saturn on the 1st is 6 h. 29 m.; his declination is 22° 23' north; his diameter is 19.2"; and he is in the constellation Taurus.

Saturn rises on the 1st about 6 o'clock in the evening; on the 31st he sets a quarter before 7 o'clock in the morning.

VENUS

is evening star. She reaches one of the great time-marks in her course during the month. On the 8th, at 9 o'clock in the evening, she is at her greatest eastern elongation, being 47° 19' east of the sun. Her progress eastward is then stayed. Remaining stationary for a few days, she commences to turn her steps westward, increasing her pace, apparently approaching the sun, and really approaching the earth.

There is no need to call attention to her lovely aspect as night after night she holds her court in the western sky as queen of the stars, now shining amid the golden glow of the sunset and now rejoicing amid the crimson hues that make the western sky like a dream of beauty. One never tires of admiring this bewitching star. She will be charming as she retraces her steps toward the sun, and afford a fine subject for study in the remaining two months of her course as evening star.

Seen through a telescope at elongation, she takes on the phase of the moon at her last quarter. She will quickly assume that of the waning crescent as she approaches us more nearly, increasing in size through turning less and less of her illumined disk to the earth until only a thread of light is visible as she passes between us and the sun at inferior conjunction.

The right ascension of Venus on the 1st is 19 h. 58 m.; her declination is 23° 25' south; her diameter is 23.6"; and she is in the constellation Sagittarius.

Venus sets on the 1st at half past 7 o'clock in the evening; on the 31st she sets at 8 o'clock.

JUPITER

is morning star. On the 26th, at 5 o'clock in the morning, he is in quadrature with the sun, being 90° west of him. His southern declination will prevent his being seen under the best aspect, but he is now in fine position for observation, notwithstanding this drawback. At the time of the latest observations before the conjunction of Jupiter, the famous red spot, which had nearly disappeared, showed unmistakable evidences of

activity. The ellipse grew darker, the central light cloud disappeared, and the spot had reassumed the appearance it presented in 1878. Interest for Jovian observers will therefore center in the present aspect of the red spot and the changes that have taken place during the time the planet was hidden in the sun's rays. The Prince of Planets is more tangible than his more distant brother Saturn, and his atmospheric features are more firmly established. Observers will therefore find interesting subjects for study in the red spot, the dark belts, the white spots bordering them, while the huge planet is favorably situated, as he is, during the entire month, rising before midnight at its close.

On the 8th, at 6 o'clock in the evening, Jupiter is in close conjunction with Eta Virginis, a star of the third magnitude in Virgo, being 10' south. Planet and star are invisible at the time of conjunction, but will be near each other on the morning of the 9th.

The right ascension of Jupiter on the 1st is 12 h. 12 m.; his declination is 0° 6' north; his diameter is 32.8"; and he is in the constellation Virgo.

Jupiter rises on the 1st a few minutes after 10 o'clock in the morning; on the 31st he rises a few minutes before half past 11 o'clock in the evening.

MARS

is morning star. On the 3d, at 6 o'clock in the evening, he is in quadrature with the sun, and henceforth until he reaches opposition will be of some importance on the planetary record. Mars is the only one of all the planets of the system where we probably see the real surface and distinct markings that indicate land and water. We simply see atmospheric effects in the other planets. The last opposition of Mars brought the planet to view in a most unfavorable light, on account of his great distance at the time. Schiaparelli, however, managed to detect the double markings in the so-called "canals." The next opposition is nearly as unfavorable as the last, but there is always a possibility that something valuable may be added to what is known, or at least that former observations may be verified. On the 3d of December, Mars is in conjunction with Regulus, being 1° 19' north. For several days the star and the planet may be seen in the same field of vision in a marine glass. Mars will be easily found during the month, on account of his vicinity to Regulus.

The right ascension of Mars on the 1st is 10 h. 43 m.; his declination is 9° 21' north; his diameter is 7.6"; and he is in the constellation Leo.

Mars rises on the 1st about a quarter after 11 o'clock in the evening; on the 31st he rises a quarter after 10 o'clock.

URANUS

is morning star. He reaches quadrature on the 28th, at 10 o'clock in the evening, making the third planet in quadrature on the sun's western side during the month, the events occurring in the following order: Mars, Jupiter, Uranus.

The right ascension of Uranus on the 1st is 12 h. 26 m.; his declination is 2° 7' south; his diameter is 3.6"; and he is in the constellation Virgo.

Uranus rises on the 1st at half past 1 o'clock in the morning; on the 31st he rises soon after half past 11 o'clock in the evening.

MERCURY

is evening star until the 18th, and then joins the morning stars. On the 18th, at 11 o'clock in the evening, he is in inferior conjunction with the sun, passing between the earth and the sun, and reappearing on his western side as morning star.

The right ascension of Mercury on the 1st is 18 h. 4 m.; his declination is 25° 37' south; his diameter is 6.6"; and he is in the constellation Sagittarius.

Mercury sets on the 1st at half past 5 o'clock in the evening; on the 31st he sets about half past 5 o'clock in the morning.

NEPTUNE

is evening star.

The right ascension of Neptune on the 1st is 3 h. 15 m.; his declination is 16° north; his diameter is 2.6"; and he is in the constellation Taurus.

Neptune sets on the 1st about half past 5 o'clock in the morning; on the 30th he sets about half past 3 o'clock.

THE MOON.

The December moon falls on the 21st at 3 h. 58 m. P.M. On the 8th, the two days' old moon is in conjunction with Mercury at 1 h. 9 m. A.M., being 6° 3' north. On the 10th he is in conjunction with Venus at 6 h. 19 m. P.M., being 5° 56' north. On the 19th she is near Neptune at 2 h. 24 m. A.M., being 2° 45' south. On the 22d she is at her nearest point to Saturn, 6 m. after midnight, being 3° 58' south. On the 27th, she is in conjunction with Mars at 4 h. 19 m., A.M. being 2° 48' south. On the 28th, she is in conjunction with Uranus at 7 h. 41 m. A.M., being 55' north.

OCCULTATIONS.

The moon occults the planets Jupiter and Uranus, and the bright star Aldebaran, as well as numerous stars of less note on the celestial calendar during the month. The occultation of Jupiter is by far the most

interesting. The phenomenon as seen from the center of the earth will take place on the 28th, at 3 h. 55 m. A.M., Washington mean time. It will be visible to all observers on the earth's surface whose position corresponds to the position of the moon as seen from the earth's center, or her geocentric position. They must, however, be on the dark side of the earth at the time, and between the limiting parallels of 39° north and 29° south. The occultation will be visible for a very short time at Washington, the latitude being 38° 53' north, just below the northern limiting parallel. There will be a close conjunction of the moon and Jupiter in this vicinity that will be worth getting up early to observe, the moon being within a few hours of her last quarter and the bright planet being fair to see, for moon and star will hang side by side before the breaking of the dawn.

The occultation of Uranus occurs on the same morning at 7 h. 41 m., A.M., Washington mean time, and is of course invisible in this vicinity, as it takes place after sunrise.

The occultation of Aldebaran, for the twelfth time during the year, will occur on the 20th, at 4 h. 28 m. A.M., Washington mean time. The phenomenon will be visible at Washington. The immersion of the star occurs at 5 h. 15 m. A.M., Washington mean time. The occultation continues 49 m. The emersion occurs at 6 h. 7 m. A.M., but will not be visible, as moon and star are then below the horizon.

DECEMBER

shows an active condition of the sun's family. The heavens are alive with interesting events among our celestial neighbors, the planets. The moon occults Jupiter and Uranus on the same morning, and hides from view the red star Aldebaran on another occasion. A telescopic view of the occultation of Jupiter presents a scene of wondrous beauty. The Prince of Planets surrounded by his beaming satellites plunges headlong into the moon's domain, and is suddenly blotted from the sky. It is only for a short time. He soon reappears as majestic and stately as ever, pursuing his course among the stars, and soon with his companions to disappear in the coming daylight. The opposition of Saturn is a noteworthy event on the monthly record. There are also to add to the list the quadratures of Mars, Jupiter, and Uranus, the greatest eastern elongation of Venus, and the inferior conjunction of the swift-footed Mercury. Mars holds a conference with Regulus, and Jupiter draws near to Eta Virginis.

December, therefore, presents a prospect of enjoyment and abundant opportunity for steady work for those who follow the planets in their courses, and seek to fathom the mysterious bond that unites planet to planet, and binds the members of the solar family into one harmonious whole. They bear constant and tangible testimony to the resistless sway wielded by the all-powerful sun, whose least disturbance is felt in the system's remotest bounds, and who holds within his fiery orb the issues of life and death for his family of worlds. In his life we live, in his death we die.

The sun crowns the month with two great events. On the 21st, he reaches the winter solstice, when he turns his smiling face northward, and gives promise of the more gentle breezes and warmer sunbeams that will surely follow his approaching steps. On the 30th the sun is in perigee, or at his nearest point to the earth, being 3,000,000 miles nearer than when most distant, thus tempering the severity of winter in our northern clime.

Trial of the Dynamite Air Gun.

Three dynamite projectiles were thrown from Lieut. Zalinski's pneumatic gun, at Fort Lafayette, New York harbor, on the afternoon of Nov. 28. The projectiles were thrown a distance of about two miles, and two of them, one containing 50 and the other 100 lb. of nitroglycerine, exploded in a most satisfactory manner, the other one sinking in the water without exploding. Previous to firing the dynamite-loaded projectiles, experiments were made with those loaded with sand, to obtain the proper range, and Lieut. Zalinski explained the working of the gun to a large number of visitors who had been invited to witness the trial. An illustrated description of the gun and its mode of operation appeared in the *SCIENTIFIC AMERICAN* of Oct. 31. When the projectile containing 100 lb. of dynamite struck the water, it sent up a column of spray 150 feet into the air, accompanying which was a cloud of yellow smoke and a report similar to that made by heavy ordnance. The air pressure employed was 1,000 pounds to the square inch, and this, so admitted as to realize a large part of its expansive force in the long gun, gave the needed velocity to the projectile, without a sudden concussion at starting, as would have been the case with gunpowder, all according to the anticipations of Lieut. Zalinski. The practical demonstration thus afforded that the most powerful of modern explosives can be thus handled, even though the range is as yet comparatively short compared with that of the best modern guns, marks another and most important step in the development of the means afforded for carrying on modern warfare.