ASPECTS OF THE PLANETS FOR JULY.

VENUS

is evening star until the 11th, when, to the regret of every lover of the stars, she deserts the western sky, where she has reigned with queenly majesty and grace for nearly ten months, and is seen there no more. She is not lost, however, for when she disappears from the sun's eastern side as evening star, she reappears on his western side as morning star. This event is called her inferior conjunction. It takes place on the 11th, at 9 o'clock in the evening. She then passes between us and the sun, with her dark side turned toward the earth, like the moon at new moon. In like manner she made the passage on the never to be forgotten 6th of December, 1882, but with this difference:

At the present inferior conjunction, she passes above the sun, and is invisible. At the previous inferior conjunction, she was near one of her nodes, and was projected on the sun's surface as a round black orb, while the grand phenomenon of her transit made the event memorable to every observer. The like will not be seen again until the year 2004, for, at every intervening inferior conjunction, she will pass above or below the sun, and no mortal eye will detect her presence as she passes.

The reason is plain. The orbit of Venus is inclined about three and a half degrees to the ecliptic, so that she is half the time above the sun's path, and half the time below it. She must be at or near one of her nodes or crossing points to bring her directly between the earth and sun, and make her passage or transit visible to terrestrial view.

The interval between an inferior conjunction and the one next succeeding is 584 days. This is called the synodic period of Venus, although she completes her revolution around the sun in 224 days. As the earth and Venus are both moving, nearly three revolutions of Venus are required to bring the sun, Venus, and the earth into line.

Our brilliant celestial neighbor moves very rapidly in this portion of her orbit, and soon becomes visible as the brightest star that shines in the morning sky. She will be worth getting up early to behold at the end of the month, rising then a few minutes after 3 o'clock, nearly two hours before the sun. The waning crescent has become the waxing crescent. Hesperus, the evening star, is transformed into Lucifer, the light bearer. Beautiful as she will be when, a month or two hence, she anticipates the dawn, her morning charm never quite equals the lovely appearance she puts on amid the glowing splendor of the twilight sky or the grand proportions she assumes as she slowly sinks below the western hills.

The fair star is being watched by a trained observer, who seems to be on the eve of making important discoveries. She is so closely veiled by an atmosphere of clouds, that it is almost impossible to obtain a glimpse of anything upon the body of the planet. M. Trouvelot has not been deterred by the difficulties in the way, but has made diligent studies of Venus since 1877. During that year, he found two remarkable white spots on opposite limbs of the planet near the extremity of the cusps or horns of the crescent. The southern spot was the brighter of the two, and appeared to be composed of many bright points, forming on the northern border a row of brilliant, star-like dots of light. The spots disappeared in about three months. Since that time—February, 1878—M. Trouvelot has observed on 242 occasions, either one or the other of the luminous spots and occasionally both of them, and has made 120 drawings. Since April of the present year, he has not lost sight of the northern spot, which alone was visible at that date. The spots are not affected by the planet's diurnal rotation, and he therefore infers that the axis passes either through or very close to their center. The spots appear almost permanent, and Trouvelot thinks they are the summits of high mountains projected beyond the cloudy envelope that hides the planet.

The observations of 1877–78 were made in Cambridge, Mass. Those during the present year were made at the Observatory of Meudon, near Paris. M. Trouvelot is one of the most skillful observers in astronomical ranks, as well as one who holds a place among the highest for his drawings of the sun and the different members of his family of worlds. His observations and drawings are as reliable as any that human skill has yet attained. We trust his practiced eye will detect something more than two bright spots on the face of our interesting neighbor. If only he could bring to life and light her long lost satellite, astronomy would bestow upon him distinguished and immortal fame.

The right ascension of Venus on the 1st is 7 h. 50 m.; her declination is 18° 33′ north; and her diameter is 55·8″.

Venus sets on the 1st about a quarter after 8 o'clock in the evening; on the 31st, she rises soon after 3 o'clock in the morning.

MERCURY

is morning star until the 12th, and then becomes evening star. We give Venus the first place on the monthly record, for being the most brilliant and interesting of the planets, and place Mercury second on the list on account of the contrast in the movements of the two planets. On the 12th, at midnight, Mercury is in superior conjunction with the sun, thus reversing the conditions described for Venus. For he passes to the sun's eastern side, instead of his western, beyond the sun, instead of between him and the earth, and is at his greatest distance from the earth, instead of the least. The course of the two planets clearly illustrates the difference between inferior and superior conjunction, as indeed the words plainly indicate. In the former case, the planet is joined to the sun on his inferior or inner side. In the latter case, on the superior or outer side.

Although, in reality, Mercury and Venus are as far apart as they can be, viewed from the earth they appear to be near together, and are in conjunction on the 12th at 1 o'clock in the morning. Venus, four hours after inferior conjunction, encounters Mercury eleven hours before superior conjunction. The planets meet and pass on the celestial road, as we see them, both morning stars at the time, the one moving eastward toward the sun, and the other westward from the sun. Though both planets take on similar aspects as they revolve around the sun, swift-footed Mercury will complete more than five synodic periods while the more stately Venus completes one.

Mercury is in conjunction with Jupiter on the 23d, at 3 o'clock in the morning, being 1° 10′ north. Both planets are too near the sun to make the conjunction worthy of observation, even if the time were favorable.

The right ascension of Mercury on the 1st is 5 h. 55 m.; his declination is 23° 24′ north; and his diameter is 5·6″.

Mercury rises on the 1st about a quarter before 4 o'clock in the morning; on the 31st he sets a few minutes after 8 o'clock in the evening.

JUPITER

is evening star throughout the month, but will soon be too near the sun to be detected in the glare of twilight. He reigns alone. Venus, his great rival, is out of the way. He will enjoy the supremacy but a short time, for he is rapidly approaching his far greater rival, the sun, in whose overpowering beams his feeble light will be eclipsed. Even the giant Jupiter has to succumb to the mighty power of the central orb, and is, as it were, blotted from the sky when he dares to encroach on the solar domain.

Jupiter hastening toward the sun is met on the way by Mercury, the smallest of his brother planets, hastening from the sun. They are in conjunction on the 23d, an event already referred to.

The right ascension of Jupiter on the 1st is 8 h. 40 m.; his declination is 19° north; and his diameter is 30·2″.

Jupiter sets on the 1st soon after 9 o'clock in the evening; on the 31st he sets at half past 7 o'clock.

MARS

is evening star. He is near Uranus during the whole month, setting about half an hour earlier on the 1st, and about a quarter of an hour later on the 31st. Meantime, they meet and pass each other. For they are in conjunction on the 19th, at 2 o'clock in the afternoon, when Mars is 11′ south of Uranus. There are difficulties in the way of observing this event. It occurs in daylight, and even if the time were favorable, it would require a powerful telescope to pick up Uranus, he is now so far away from the earth. The sea green tint of Uranus, in contrast with ruddy tint of Mars, would make a telescopic picture fair to see.

The right ascension of Mars on the 1st is 11 h. 4 m.; his declination is 6° 54′ north; and his diameter is 5 8″.

Mars sets on the 1st about a quarter before 11 o'clock in the evening; on the 31st he sets at half past 9 o'clock.

URANUS

is evening star; besides being in conjunction with Mars, his path lies very near to Beta Virginis, a star of the third magnitude in the constellation Virgo. The conjunction takes place on the 30th, at noon-day, the planet being 2′ north of the star. The approach is so close as almost to become an appulse.

There has been recent news from Uranus. M. Perrotin and Mr. Lockyer, studying the planet through the 15-inch equatorial in the Observatory at Nice, found a bright spot near the equator. It was a very difficult object, and much doubt was felt as to its real existence. But repeated observations confirmed the first impression, and made the observers conclude that they saw a luminous belt instead of a single spot. From observations of its movements, they deduced a rotation period for Uranus of about ten hours. Thus these eagle-eyed observers actually saw this huge sphere rotating on its axis as they watched the progress of the luminous spot over the disk, though they were nearly 2,000,000,000 miles away. If these observations are confirmed, a most welcome discovery will enrich astronomical annals, and "unknown" will no longer find place in the tables for the axial rotation of Uranus.

The right ascension of Uranus is 11 h. 40 m.; his declination is 2° 53′ north; and his diameter is 3·5″.

Uranus sets on the 1st about a quarter after 11 o'clock in the evening; on the 31st he sets a quarter after 9 o'clock.

NEPTUNE

is morning star. There is nothing noteworthy in his course. He is approaching the earth, rising before midnight at the end of the month, and would be an interesting object in the morning sky, if we were near enough to see him.

The right ascension of Neptune on the 1st is 3 h. 22 m.; his declination is 16° 45′ north; and his diameter is 2·5″.

Neptune rises on the 1st not far from half past 1 o'clock in the morning; on the 31st he rises soon after half past 11 o'clock in the evening.

SATURN

is morning star. He is far enough from the sun to be visible to early risers, and will soon give promise of the bright aspect he will assume a few months hence, for great events occur in his history in the years to come. He has perceptibly advanced in his eastward course, and is leaving behind Aldebaran and the Pleiades, his close companions of the last year. Observers will find him nearly south of Capella, rising on the 1st an hour and a half before the sun, and on the 31st more than three hours before the sun.

The right ascension of Saturn on the 1st is 5 h. 4 m.; his declination is 21° 26′ north; and his diameter is 16″.

Saturn rises on the 1st at 3 o'clock in the morning; on the 31st about half past 1 o'clock.

THE MOON.

The July moon fulls on the 8th, at 11 minutes after 5 o'clock in the morning, standard time. On the 17th, two days after the last quarter, she is near Neptune, and on the 19th near Saturn. On the 21st, the day before new moon, she is in conjunction with Venus. On the 23d, the one-day old moon is near Jupiter and Mercury. On the 26th, she is in conjunction with Uranus and Mars. The moon thus passes each planet in turn, and shows the order of their position in regard to the sun, the old moon drawing near Neptune, Saturn, and Venus, on the sun's western side, and the new moon approaching Jupiter, Mercury, Uranus, and Mars on the sun's eastern side.

The moon occults in her path only three small stars visible in this belt of the world's territory. Observers from other lookouts are more fortunate. For our satellite occults Neptune to observers in some localities between 44° and 74° south latitude, and occults Venus, that most charming sight, to some favored mortals whose lookout lies between the limiting parallels of 90° and 54° north.

HOW PILE BUTTONS ARE MADE.

The commonest articles of daily use sometimes awaken curiosity as to the method of their production; one of these is the buttons used on coach cushions and for similar purposes. They appear to be balls of pile or plush, like those ball ornaments used sometimes on ladies' and little girls' dresses. But these ornaments are usually made by hand, by being wound or threaded on a paper or pasteboard disk around a central string, the yarn being cut around the center with a sharp knife, the paper or pasteboard torn out, and the pile or yarn being beaten into fluffy form and shaped with scissors. In the manufacture of coach trimming buttons the principle is the same, but the method is different.

The woolen yarn of which the buttons are composed is slightly twisted into a rope of the proper diameter, and is then circumferentially sewed at distances of about half an inch. At these sewings the rope is cut into sections, making a slightly convexed disk on the side of the free ends of the yarn, the sewed portion remaining compact. This portion is then placed on an eyed base of thin metal, such as forms the under side of cloth buttons, and the base and worsted are forced into a tube by a press, the sides of the tube turning up the edges of the metal base to form a cup, thus holding securely the tightly sewed edges of the woolen fluff. As the button comes from the press it is almost flat, instead of being nearly globular, the pile top being slightly convex and the bottom of metal standing out from the mass.

Now comes the most interesting portion of the manufacture, and its last stage. The flat buttons are placed in a rotating perforated cylinder, and turned over a steaming caldron of hot water. Only a few minutes' exposure suffices to puff out the buttons into almost perfect spheres, a shape that they will retain until after long compression.

The around and around sewing is done by an ingenious attachment to a sewing machine which rotates the rope of yarn and feeds it along by intermittent adjustable feed to accommodate the different sizes of buttons. This attachment is the invention of an ingenious mechanic in Bridgeport, Conn. It is used also for staying the ends of ropes for the running rigging of ships, reefing points, clothes lines, and other cordage, to prevent untwisting, and to produce a solid end for passing through blocks, eyebolts, etc.

Defective Castings.

It is stated in the English papers that an examination of the broken girders of the fallen railway bridge at Denmark Hill showed that one of them was "honey-combed with air bubbles;" and it is assumed that, as this girder gave way, the extra weight thus thrown upon the others caused the accident. It is almost unnecessary to say, a correspondent in *Iron* says, that the so-called "air bubbles" are really hydrogen cells, and that the only explanation that has been (and probably ever will be) afforded of the source of this hydrogen is that, if not exclusively, it is mainly derived from the moisture of the atmospheric blast, which becomes decomposed on coming in contact with molten iron or steel, its hydrogen being thereupon absorbed by the metal. This occurs not only in the steel converter, but also in the blast furnace and in the remelting cupola. As a consequence, both steel and iron castings are unreliable, and a constant source of danger wherever their soundness is essential to safety; and they are accordingly unfitted for a number of important purposes for which forged metal, at a far higher cost, is considered necessary.

I do not propose, adds Mr. Fryer, to refer to any of the various methods and expedients which have been devised, and which are sometimes employed to cure the evil. It will, however, seem remarkable that no attempt has yet been made to get rid of the defect itself by eliminating the moisture from the blast, and thus removing the cause. One practical trial in that direction would go further to solve the whole question than all the theories that have been advanced, and all the laboratory experiments that have been tried since Dr. Muller's famous discovery of the real nature of the so-called "air bubbles" or "blowholes."