

## POSITION OF THE PLANETS IN APRIL.

## SATURN

is evening star. He takes the highest rank on the planetary annals for April, and is in better position for observation than he was during March. He rises now before sunset, and, when it is dark enough for the stars to come out, will soon be high enough above the horizon to make it easy and convenient to observe him with the telescope or the unaided eye. When the month closes, Saturn will be on the meridian about 10 o'clock, and half way between the horizon and the zenith about 7 o'clock. He continues to retrograde or move westward, approaching the beautiful double star Gamma Virginis. He is in conjunction with the star on the 8th, being 6' south. As 6' of arc is a very tiny piece of sky, the telescope at that time will bring to view two celestial marvels of wondrous beauty, the ring-girdled planet and the star separated into its two silvery white components hanging side by side in the sky. It is a spectacle that amateurs who have access to telescopes should not fail to see.

The moon is in conjunction with Saturn, two days before the full, on the 28th, at 0 h. 30 m. A. M., being 50' south. The conjunction will be visible as an eclipse, and there will be an occultation of the planet in the southern hemisphere for observers who are in the right conditions to see it.

The right ascension of Saturn on the 1st is 12 h. 38 m., his declination is 1° 11' south, his diameter is 18'.2, and he is in the constellation Virgo.

Saturn sets on the 1st at 5 h. 51 m. A. M. On the 30th, he sets at 3 h. 53 m. A. M.

## URANUS

is morning star until the 28th, and then evening star. He is in opposition to the sun on the 28th, at 7 h. 28 m. P. M., being at his nearest point to the earth, and reaching the meridian about midnight. These are the most favorable conditions under which he is ever seen, and the opportunity should be improved by observers who wish to follow his course, for he is barely visible to the naked eye in his best estate. It is easy to keep track of the distant wanderer, his movement is so slow, for it takes him seven years to pass through a zodiacal constellation. The bright star 18° northwest of Uranus is Spica, the third magnitude star on the east is Alpha Librae, the fifth magnitude star on the west is Lambda Virginis. The last time the planet traversed the portion of sky he occupies at present was in 1809, and he will not return to it again till 1977. The best period of observation for Uranus is from March till August.

The moon, two days after the full, is in conjunction with Uranus on the 3d, at 10 h. 34 m. A. M., being 1° 36' south. The conjunction is invisible, occurring in the daytime.

The right ascension of Uranus on the 1st is 14 h. 30 m., his declination is 14° 19' south, his diameter is 3'.8, and he is in the constellation Libra.

Uranus rises on the 1st at 8 h. 34 m. P. M. On the 30th, he sets at 4 h. 59 m. A. M.

## JUPITER

is evening star until the 27th, and then morning star. The planet will be conspicuous by his absence from the sky. His reign has been long and brilliant, and his bright presence as evening star will be greatly missed, not only for his superb appearance, but for the record he has made, the jewel added to his starry crown. Very few observers will see the mythical fifth satellite, but every one interested in astronomy knows and feels its presence close beside the grand primary.

Jupiter is in conjunction with the sun on the 27th, at 7 h. 8 m. P. M. He then passes to the sun's western side, commencing his career as morning star, being for the present too near the sun to be visible. An interesting incident marks his course. He is in conjunction with Venus on the 28th, at 11 h. 39 P. M., being 3' south. Jupiter, the day after conjunction, a one-day-old morning star, moving westward from the sun, encounters Venus moving eastward toward the sun, only four days before her superior conjunction with the sun. The planets are close together, and close to the sun. They have their meeting, make their appulse, and go on their way, the phenomenon as totally invisible to terrestrial observers as if the two brightest planets had dropped from the sky. Imagination has power, however, to pierce the solar veil and behold the picture securely hidden within the royal vestibule.

The moon, the day after her change, is in conjunction with Jupiter on the 17th, at 0 h. 13 m. A. M., being 1° 44' north. The conjunction is invisible for two reasons. Moon and planet are below the horizon, and are too near the sun to be seen.

The right ascension of Jupiter on the 1st is 1 h. 59 m., his declination is 11° 8' north, his diameter is 32'.0, and he is in the constellation Aries.

Jupiter sets on the 1st at 7 h. 53 m. P. M. On the 30th, he rises at 5 h. 0 m. A. M.

## VENUS

is morning star. The only interesting event in her April course is her close conjunction with Jupiter, already described. She is of no account for nearly three months to come, after which she will emerge from her retreat and shine brightly as evening star.

The moon, on the day of her change, is in conjunction with Venus on the 16th, at 2 h. 44 m. A. M., being 42' north. The conjunction is invisible.

The right ascension of Venus on the 1st is 0 h. 18 m., her declination is 0° 21' north, her diameter is 10'.0 and she is in the constellation Pisces.

Venus rises on the 1st at 5 h. 32 m. A. M. On the 30th, she rises at 5 h. 2 m. A. M.

## MERCURY

is morning star. On the 28th, at 9 h. 8 m. P. M., he reaches his greatest western elongation, when he is 26° 56' west of the sun. He may then be looked for in the east before sunrise as morning star visible to the unaided eye. The success of the observer is uncertain, as the planet is 12° farther south than the sun.

The moon, two days before her change, is in conjunction with Mercury on the 14th at 8 h. P. M., being 1° 39' south.

The right ascension of Mercury on the 1st is 0 h. 36 m., his declination is 6° 50' north, his diameter is 11'.4, and he is in the constellation Pisces.

Mercury rises on the 1st at 5 h. 27 m. A. M. On the 30th, he rises at 4 h. 7 m. A. M.

## MARS

is evening star. He has dwindled to a ruddy point, and will soon be lost to sight. The planet is so small that he is only seen to advantage at opposition and during the month before and after. He is not in opposition in 1893, and observers must turn their attention to more interesting members of the sun's family. His synodic period, or time from one opposition to the next, is 780 days, or 2 y. 1½ m., the longest in the planetary system. The earth, therefore, revolves twice around the sun, and it then makes 1½ m. of a third revolution before she comes into line between the sun and Mars.

The moon, three days after her change, is in conjunction with Mars on the 19th, at 2 h. 31 m. P. M., being 2° 45' north.

The right ascension of Mars on the 1st is 4 h. 1 m., his declination is 21° 39' north, his diameter is 5'.0, and he is in the constellation Taurus.

Mars sets on the 1st at 10 h. 36 m. P. M. On the 30th, he sets at 10 h. 15 m. P. M.

## NEPTUNE

is evening star. His right ascension on the 1st is 4 h. 30 m., his declination is 20° 19' north, his diameter is 2'.6, and he is in the constellation Taurus.

Neptune sets on the 1st at 11 h. 0 m. P. M. On the 30th, he sets at 9 h. 9 m. P. M.

Mars, Saturn, Neptune and Uranus are evening stars at the close of the month. Mercury, Venus and Jupiter are morning stars.

## TOTAL ECLIPSE OF THE SUN.

There will be a total eclipse of the sun on the 16th, invisible in North America, but visible as a partial eclipse in nearly the whole of South America, nearly the whole of Africa, and portions of Europe and Asia. The path of totality commences in the Pacific Ocean, traverses the central part of South America, crosses the Atlantic Ocean, and ends in the center of Africa. The central eclipse begins in Greenwich mean time, on the 16th, at 0 h. 54 m. P. M. The middle of the eclipse occurs at 2 h. 27 m. P. M. The central eclipse ends at 4 h. 19 m. P. M. Observers on the line of totality will behold the most magnificent phenomenon ever visible from this planet, when for a few moments the sun's face is hidden from view.

The conditions required for a total eclipse are that the moon shall be at her nodes or crossing points when at new moon. She must be near perigee when her diameter is greatest, and the sun near apogee when his diameter is least. These conditions are fulfilled in the present eclipse. The moon is near her node, and near perigee, and the sun is approaching apogee. The moon's diameter is 33' 7".0. The sun's diameter is 31' 55".4. The moon's diameter exceeds the sun's 1' 11".6. The result is that the eclipse will occur under very favorable circumstances, the totality lasting at some points of observation 4 m. 42 s., making the eclipse one of the finest of the nineteenth century, for its comparative accessibility and the length of its continuance.

The eclipse will call out more observers than were ever assembled before. American and European astronomers are already making preparation for the great event at the stations they have chosen. Some are located at Ceara, on the northeast coast of Brazil, many are in the region of the Senegal in West Africa. The path of totality has been carefully mapped for observers to choose the localities best adapted to their special work. The whole astronomical world is greatly exercised with the hope of making discoveries within the solar precincts.

Much is expected from the condition of the sun, now at the maximum of sun spots. The sun's circumference will be aflame with rosy protuberances, and the silvery corona show signs, by its greater extent and more radiant glow, of the disturbances that agitate the sun and are reflected on the earth in magnetic storms and vivid displays of auroral light. If only the weather be propitious and the wearisome travel and great expenditure be not in vain!

## Agricultural Notes.

The relative merits of sweet cream and sour cream for making butter were tested last year in a series of elaborate experiments at the Iowa Agricultural College. Sweet cream, fresh from the separator, was thoroughly mixed and then accurately divided in two equal parts by weight; one of these parts was churned immediately at 52° F., the other was ripened at 60°, and then churned at 59°. The butter-milk was tested for fat, and the butter was analyzed. In the nine tests the yield of butter from sour cream was 3 per cent larger than from sweet cream. The sour cream usually churned quicker than the sweet, and the butter contained 2-100 of 1 per cent more casein. The losses of fat in churning, washing, and working were less with sour than with sweet cream. In nine trials the average difference was nearly ½ lb. per 100 lb. of butter made. After being kept five months the sweet cream butter acquired somewhat of the flavor and aroma of ripened cream butter, and was in better condition.

A very interesting series of tests have been made at the Wyoming experimental station to determine the quantity of water necessary to irrigate an acre of land. A continuous flow of one cubic foot per second during May, June, July, and August was found sufficient, with a rainfall of about six inches, for over 95 acres of land which had never been irrigated; but the next year, with a rainfall of nearly seven inches, it would have sufficed for over 216 acres of such previously irrigated land. The need of water varied with the kind of crop. Thus one second foot through the four months would have supplied 167 acres of oats, 295 acres of sugar beets, 336 acres of sorghum, 588 acres of peas, and 735 acres of corn, all growing on land close to the irrigation canal. The previously estimated duty of water for Wyoming was about 100 acres to the second foot through four months.

Some very interesting experiments have been conducted at the Texas experimental station, the object having been originally to see whether the belief of many farmers that cottonseed would kill pigs under certain conditions was well founded. The two years' successive tests in feeding cottonseed and cottonseed meal to pigs, and practical attempts to feed these products during the last ten years, show that there is no profit in feeding cottonseed in any form, or cottonseed meal, to pigs of any age, and a good deal of danger.

## The Acids of Fruits.

Mr. George W. Johnson, in his *Chemistry of the World*, says in describing the "vegetable food of the world:"

"The grateful acid of the rhubarb leaf arises from the malic acid and binoxalate of potash which it contains; the acidity of the lemon, orange, and other species of the genus *Citrus* is caused by the abundance of citric acid which their juice contains; that of the cherry, plum, apple, and pear, from the malic acid in their pulp; that of gooseberries and currants, black, red and white, from a mixture of malic and citric acids; that of the grape from a mixture of malic and tartaric acids; that of the mango from citric acid and a very fugitive essential oil; that of the tamarind from a mixture of citric, malic, and tartaric acids; the flavor of asparagus from aspartic acid, found also in the root of the marshmallow; and that of the cucumber from a peculiar poisonous ingredient called fungin, which is found in all fungi, and is the cause of the cucumber being offensive to some stomachs. It will be observed that rhubarb is the only fruit which contains binoxalate of potash in conjunction with an acid. It is this ingredient which renders this fruit so wholesome at the early commencement of the summer, and this is one of the wise provisions of nature for supplying a blood purifier at a time when it is likely to be most needed. Beet root owes its nutritious quality to about nine per cent of sugar which it contains, and its flavor to a peculiar substance containing nitrogen mixed with pectic acid. The carrot owes its fattening powers also to sugar, and its flavor to a peculiar fatty oil, the horse radish derives its flavor and blistering power from a volatile acrid oil. The Jerusalem artichoke contains fourteen and a half per cent of sugar and three per cent of inulin (a variety of starch), besides gum and a peculiar substance to which its flavor is owing; and lastly garlic and the rest of the onion family derive their peculiar odor from a yellowish, volatile acrid oil, but they are nutritious from containing nearly half their weight of gummy and glutinous substances not yet clearly defined."

O. D. M.—In answer to the question, "How would a hot water boiler work connected with two ranges, one in basement and one on first story, with boiler on second story?" the *Plumbers' Trade Journal* answers:

It will work all right if properly connected. Run your cold water pipe first to lower range, then with hot pipe to upper range—this will act as a super-heater. If a large quantity of hot water is required, it will be a good way to supply the demand; otherwise you will create steam. If run any distance, put in a return pipe to system.