

not be overestimated. The nitrate beds of Chile, representing the accumulated wealth of geological ages, are being rapidly depleted to supply nitrogen to the crops of Europe. The distillation of coal in our gas works gives a small amount of ammonia as a by-product, which is saved and utilized also as a fertilizer. Slaughter house refuse and ground fish from which oil has been extracted are other sources of nitrogen which are used in fertilizers. To all this there must be an end, for it is all essentially destructive. But if we can cultivate microbes which will draw upon the exhaustless air for nitrogen, and will then feed plants therewith, the nitrogen problem of the future, one destined to be as serious as the coal problem will be, may eventually be disposed of.

While nitrogen in fertilizers is very often supplied in combination with hydrogen as some compound of ammoniacal type, the plant cannot absorb it until it has become oxidized into nitric acid. This process is termed nitrification. It has recently been found that nitrification is dependent on bacterial agency, and that to produce nitric acid from ammonia compounds two distinct bacteria are required. One performs the first and most difficult step, and combines the nitrogen with enough oxygen to form nitrous acid. The next microbe takes up the incomplete work and adds enough oxygen to the molecule of nitrous acid to form nitric acid. In this form it is quickly absorbed by the plant. The absorption is so rapid that only traces of it can be found in soil in which vegetation is growing.

The nitrification process is one of destruction as well as of building up. The ammonia type molecules are destroyed and in their place the nitric acid ones are built up. The offensive products of sewage, the products which nourish disease germs, and which with every probability we may recognize as the supporters of typhoid fever and other infections, are of the ammonia type. In the nitrifying organisms we have the agents for destroying the injurious products of sewage. If proper conditions are supplied, the army of microscopic beings will attack and destroy the disease germs, or at least their nutriment, and will transform the noxious sewage into a valuable fertilizing agent.

Some of the advanced processes of sewage treatment are based on these facts. The sewage is delivered over the surface of the land and allowed to percolate through it. If supplied in proper quantity, the nitrifying organisms are supplied with nutriment and dispose effectually of the sewage. The great point is believed to consist in a proper rate of supply of material. Too little sewage will starve the microbes, while too much must not be supplied for them to dispose of.

Potassium nitrate, or saltpeter, is made in nitrification beds. Animal refuse of all kinds is mixed with mortar and lime, and the heap is watered with liquid manure, and eventually the saltpeter formed is washed out of it, and is recovered by crystallization. The agents that produce the salt are the bacteria, whose part in settling the destinies of nations by making saltpeter may now be recognized. The great storehouse of nitrates, the South American nitrate beds, were probably produced in a similar way in the past, and wars are being fought, and sulphuric acid is being made, through the agency of the products of the work of the bacteria of the past.

The quick succession of generations, which are sometimes less than half an hour in duration, seems to offer the biologist a field for studying changes in life due to environment. But little has been done here. To a limited extent a change can be produced in the constitution of some microbes, but the degree of development is very small.

THE FORTY-FIRST ANNUAL MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The annual meeting of the A. A. A. S. for the present year will be held in the city of Rochester, N. Y. The University of Rochester will be the place of meeting, by the courtesy of the trustees of that institution. The meeting will begin on Tuesday, August 16, and daily sessions are recommended by the council for the 17th, 18th, 19th, 22d, and 23d of August, from 10 to 12 A. M. and 2 to 5 P. M. The meeting will be called to order by the retiring president, Prof. Albert B. Prescott, of Ann Arbor, Mich., who will introduce the president-elect, Prof. Joseph Le Conte, of Berkeley, Cal. The usual addresses of welcome, announcements of committees, etc., will be followed by organization of the sections under the vice-presidents as follows: Section A, astronomy and mathematics, J. R. Eastman; Section B, physics, B. F. Thomas; Section C, chemistry, Alfred Springer; Section D, mechanical science and engineering, John B. Johnson; Section E, geology and geography, H. S. Williams; Section F, biology, S. H. Gage; Section H, anthropology, W. H. Holmes; Section I, economic science and statistics, S. Dana Horton. Public addresses and excursions will be included in the programme, which is not yet fully formulated. Before the meeting, the American Microscopical Society will hold its annual meeting, August 9, 10, 11, and 12, under the presidency of Prof. M. E. Elwell, of Chicago, Ill., and the Geological Society of America,

on August 15 and 16, will hold its annual meeting under the presidency of Mr. G. K. Gilbert, of Washington, D. C. On the two last named days the Society for the Promotion of Agricultural Science, under the presidency of Prof. I. P. Roberts, of Ithaca, N. Y., and the Association of Economic Entomologists, under the presidency of Dr. J. A. Lintner, of Albany, will hold their annual meetings. Further particulars may be obtained by addressing Secretary F. W. Putnam, Salem, Mass.

POSITION OF THE PLANETS IN JULY.

MARS

is morning star. He is by far the most important member of the solar family in July, for, at its close, he is within four days of the opposition so long anticipated. The reason why he comes so near the earth at the present opposition may be simply stated, and, as these conditions occur only at intervals of fifteen or seventeen years, great importance is attached to them. The earth is in aphelion on July 1, when she is 3,000,000 miles farther from the sun than she was when in perihelion on January 1. Her eccentricity, or the distance between these two points, is comparatively small, and is of little account, her orbit being almost a circle. Such is not the case with Mars, whose eccentricity is the largest of any planet in the system excepting Mercury. Mars is in perihelion on September 7, when he is 13,000,000 miles nearer the sun than when in aphelion. If the earth is nearly at her greatest distance from the sun and Mars is nearly at his least distance from the sun when an opposition occurs, the two planets must approach each other. This is the situation of affairs in the coming opposition when Mars, the earth, and the sun are in line, with the earth in the middle, Mars being about 35,000,000 miles from the earth. Although near at this time, it is possible for him to approach nearer, as he would if his opposition and perihelion were coincident. The opposition of 1877 took place nine days after perihelion, and was made illustrious by the discovery of two Martian moons. The opposition of 1892 will take place thirty-four days before perihelion, the conditions not being quite as favorable.

Our nearest outside celestial neighbor will, however, make a majestic appearance as he comes into view above the southeastern horizon on July evenings, marvelous in size, glowing with ruddy light, and brilliant in the martial colors that denote his imperial rank. Observers with the unaided eye cannot fail to be impressed with his unusual size and luster. The chief interest of the occasion will, however, center around the telescopic Mars, and the most powerful instruments in the world will be directed toward his ruddy face. Much will be expected from the Lick Observatory, although the astronomers there have failed thus far to see the double canals on the Martian disk, which have been perceptible to four European observers, Schiaparelli, Perrotin, Terby, and Stanley Williams. It must be remembered that the Martian supremacy of 1892, which culminates at opposition, August 4, continues only about two months, through July and August, the months preceding and following the greatest event of the year. The planet is small and traveling rapidly away from the earth, soon becomes dwarfed by distance, and returns to his ordinary mediocrity. Many observers will remember the opposition of 1877, a few will remember that of 1862, the attention of the whole civilized world will be drawn to that of 1892; but when the next grand opposition of 1909 comes round, half of the present inhabitants of the earth will have looked their last upon the glory of the heavens as seen from this planet; half a generation will have passed on.

THE OCCULTATION OF MARS.

The moon increases the interest aroused by the near approach of Mars in occulting the planet, the phenomenon being visible in this vicinity, and the time favorable for observation. The occultation occurs on the 11th, when the moon, two days after the full, with her bright edge foremost, hides the planet from view. The immersion takes place on the 11th at 11 h. 5 m. P. M. The emersion takes place on the 12th at 0 h. 7 m. A. M., the occultation continuing 1 h. 2 m. We give the data in Washington mean time, as at other places the time will vary on account of the moon's parallax, or her difference in direction when seen from different points. Our satellite, in almost full-orbed radiance, will approach the ruddy planet, almost, if not quite, putting out his light when she is in near vicinity, as observers will note, unless the visual power is exceptionally good. An opera glass will be an effective aid in observing the phenomenon, but a telescope will be far better.

The right ascension of Mars on the 1st is 21 h. 25 m., his declination is 20° 32' south, his diameter is 21".8, and he is in the constellation Capricornus.

Mars rises on the 1st at 9 h. 53 m. P. M. On the 31st he rises at 7 h. 52 m. P. M.

JUPITER

is morning star. If Mars take the precedence, Jupiter ranks next, for an important event occurs in his July course. He is in perihelion on the 24th at 7 h. P. M. The giant planet then reaches that point in his vast orbit when he is nearest the sun, being 42,000,000 miles

nearer to him than when he is in aphelion. This event can occur only once in about twelve years, the time of Jupiter's revolution. His last perihelion passage was in 1880. If his perihelion and opposition occurred at the same time, the planet would be at his best and brightest, but as his opposition takes place in October, he will be more than two months past perihelion when he comes into line with the earth and the sun. In 1880, there were but eleven days between the two events, and Jupiter adorned the sky with a majestic grace that Venus at her brightest could scarcely surpass. He is in quadrature on the 15th, being 90° west of the sun. He then rises about midnight, and will be a superb object to those who watch for his advent.

The moon, on the day of her last quarter, is in close conjunction with Jupiter on the 16th, at 6 h. 26 m. P. M., being 29' south. The conjunction is invisible, but when the planet rises about 11 o'clock on that evening, the moon will not be far away from the brilliant star.

The right ascension of Jupiter on the 1st is 1 h. 24 m., his declination is 7° 26' north, his diameter is 37".4, and he is in the constellation Pisces.

Jupiter rises on the 1st at 0 h. 14 m. A. M. On the 31st he rises at 10 h. 19 m. P. M.

MERCURY

is evening star. He is in conjunction with Venus on the 1st at 2 h. 50 m. A. M., being 4° 36' north. He is at his greatest eastern elongation on the 29th, at 3 h. A. M., being 27° 14' east of the sun, and is visible to the naked eye in the west as evening star. As his northern declination is small and he will be above the horizon only an hour after sunset, it will be difficult to find him unless observers are enthusiastic and possess unusually good eyesight.

The right ascension of Mercury on the 1st is 7 h. 40 m., his declination is 23° 22' north, his diameter is 5".2, and he is in the constellation Gemini.

Mercury sets on the 1st at 8 h. 23 m. P. M. On the 31st he sets at 8 h. 11 m. P. M.

SATURN

is evening star. There is nothing of special interest in his July course, and when the month closes he sets two hours later than the sun. The moon is in conjunction with Saturn on the 28th, at 0 h. 1 m. A. M., being 1° 39' north.

The right ascension of Saturn on the 1st is 11 h. 43 m., his declination is 4° 15' north, his diameter is 16".0, and he is in the constellation Virgo.

Saturn sets on the first at 11 h. 12 m. P. M. On the 30th he sets at 9 h. 19 m. P. M.

VENUS

is evening star until the 9th, and then morning star. She is in inferior conjunction with the sun on the 9th, at 1 h. 24 m. P. M., closing her brilliant career as evening star and commencing an equally brilliant course as morning star. She takes a low rank on the July annals, but will not remain long in retreat. She rises at the close of the month two hours before the sun, as observers who are early risers may see for themselves.

The right ascension of Venus on the 1st is 7 h. 36 m., her declination is 18° 50' north, her diameter is 57".0, and she is in the constellation Gemini.

Venus sets on the 1st at 7 h. 59 m. P. M. On the 31st she rises at 2 h. 58 m. A. M.

URANUS

is evening star. He is in quadrature on the 24th at noon, being 90° east of the sun. The moon makes a close conjunction with Uranus on the 3d, at 4 h. 3 m. P. M., being 47' north. She makes a second conjunction with the same planet on the 31st, at 0 h. 33 m. A. M., being 31' north. The moon occults Uranus on the same dates for observers who see her in her geocentric position.

The right ascension of Uranus on the first is 14 h. 0 m., his declination is 11° 43' south, his diameter is 3".6, and he is in the constellation Virgo.

Uranus sets on the first at 0 h. 37 m. A. M. On the 31st he sets at 10 h. 36 m. P. M.

NEPTUNE

is morning star. His right ascension on the 1st is 4 h. 34 m., his declination is 20° 27', his diameter is 2".6, and he is in the constellation Taurus.

Neptune rises on the 1st at 2 h. 35 m. A. M. On the 31st he rises at 0 h. 40 m. A. M.

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

Ovid's Recipe for Wrinkles.

Take equal parts of bean and barley meal and mix with raw egg. When the mass is thoroughly hard and dry, it should be ground to a fine powder and made into an ointment with melted tallow and honey. A thick layer of this applied to the face every night was warranted to smooth out all wrinkles and make the skin as soft as a baby's.