

ization, occurring without any intimate change in the chemical constitution of the body. Though representing the same chemical element, carbon assumes in the solid state a multitude of different conditions, exhibiting rather different physical and chemical properties. There seems to be a series of progressive condensations, the limits of which would correspond with the different modifications of carbon.

According to ordinary analogies, the physical properties of composite bodies, capable of being formed directly, are a consequence of those of their components, except that they are more or less modified on account of the loss in energy resulting by reason of this combination. The combination of hydrogen, boiling at  $-252$  deg., and that of oxygen, boiling at  $-182$  deg. C., will thus give water, which boils at  $+100$  deg. C. The energy which maintains at the gaseous state the free molecules of hydrogen and oxygen, has thus decreased to an enormous extent, as corresponding with the 59,000 calories lost at the instant of their combination, with the formation of a molecule of gaseous water. The same seems to be true of carbon in its combinations with hydrogen. The real existence of this element in an identical gaseous state, no matter what may be the origin, is shown by spectrum analysis, both in the electric arc and in the sparks through its oxides, hydrides, etc., as well as in the flames produced by the combustion of these different compounds.

Taking into account the boiling points of acetylene and the gaseous carbides of hydrogen, as well as of the gaseous oxides, etc., of carbon and the analogy above stated, the normal condition of carbon at the ordinary temperature should be that of a permanent gas, the boiling point of which would be comprised between those of hydrogen and oxygen. A similar gas, however, would nearly instantaneously be transformed into polymerics by the reciprocal combination of its molecules, this change occurring with considerable amounts of heat given off.

#### THE HEAVENS IN JULY.

BY HENRY NORRIS RUSSELL, PH.D.

Nothing of much general interest has occurred in the astronomical world during the past month. The journals of the science have been full of the ordinary routine observations of planets, comets, variable stars, and the like, with occasional bits of mathematical theory; but there has been little or nothing of interest to those who are not specialists.

All that need be recorded here is that further observations of Brooks' comet show that its orbit is nearly parabolic, and that its period of revolution must be long, if, indeed, it ever returns at all. The calculated orbit of short period to which we referred last month, turns out to have been affected by a rather large error in one of the observations on which it was based, in the way which was explained at the time. There remains nothing remarkable about the comet except its great perihelion distance—over 250,000,000 miles. It is rarely that a comet is observed at such a distance from the sun, and this one, though telescopically inconspicuous, must really be a pretty big comet to be seen at all so far away.

A question has recently been raised by a correspondent whose answer may be of enough interest to warrant our spending a few moments on it. He asks: "Why do you refer to the Great Bear as feminine?"

We must go back into the age of classical mythology for the reason. Even then we do not reach the first historic recognition of this noble constellation. It was known to the Egyptians, who called it the Hippopotamus! We need hardly regret that this designation has become obsolete. The people of southern Europe saw in the same stars the more familiar figure of a bear, and the legends which grew up around it were finally given a permanent shape by Ovid in his "Metamorphoses." As he tells the story, Callisto, an Arcadian nymph, was beloved by Jupiter. Juno, in fierce anger, turned her into a bear, depriving her of speech that she might not appeal to Jupiter. Her son, Arcas, while hunting, came upon her, and failing to recognize her in her metamorphosed form, raised his bow to shoot her. Jupiter, moved by pity, prevented the matricide by transforming the son also into a bear, and took them both up to the heavens, where they were placed among the constellations, and Neptune granted them the special favor that they should not be obliged to set and pass into his domain, as the sun and planets did. The constellation has had still other names, and been represented by other figures, notably the very ancient one of the Plough or the Wain, in which the four stars of the quadrilateral are the wheels of a wagon, and the other three are the horses. Our own common name—the Dipper—appears to be an American invention—at least it is so regarded in England. It is certainly realistic, but it does show some evidence of modern date—certainly later than the invention of tinware. But Ovid has undoubtedly fixed the permanent designation of this group of stars, and from his story there can be no doubt that Ursa

Major is really a she-bear, while Ursa Minor is masculine. Both the Bears have very long tails, as anyone may see for himself.

Admiral Smyth, in his "Cycle of Celestial Objects," quotes an explanation given by a Cambridge astronomer in 1590, which deserves to be given *verbatim*.

"Scholar.—I marvel why (seeing she hath the forme of a beare) her taile should be so long.

"Master.—I imagine that Jupiter, fearing to come too nigh unto her teeth, layde holde on her taile, and thereby drewe her up into the heaven; so that shee of herself being very weightie, and the distance from the earth to the heavens very great, there was great likelihood that her taile must stretch. Other reason know I none."

#### THE HEAVENS.

If we go out at nine o'clock on a clear evening in the middle of July, and look due south, the most prominent constellation will be Scorpio. Its brightest star, Antares, is fiery red—one of the reddest stars in the sky. A smaller star flanks it on each side, and three fairly bright ones form a vertical line on the right. These are in the Scorpion's claws, while his tail may be followed below Antares down to the southern horizon, where it curves back, and ends in a conspicuous group of stars which mark the sting. To the left is Sagittarius with the little Milk Dipper, and beyond is Capricornus, into which Saturn is just rising.

The bright star in the Milky Way above Scorpio is Altair, and the one of almost equal brilliance, much farther north, is Alpha Cygni; while Vega, which lies just to the west of the galaxy, surpasses them both.

The great square of Pegasus is the only prominent group in the east. On the meridian are Draco (above the pole), then Hercules, and next Ophiuchus, above Scorpio. West of Hercules are Corona and Boötes. The latter constellation contains Arcturus, the brightest star now visible. Virgo lies south and west of Boötes, and Leo west of it, close to the horizon. Ursa Major is high in the northwest, and Cassiopeia and Cepheus are lower down in the northeast.

#### THE PLANETS.

Mercury, Venus, and Mars are invisible during the month, being too near the sun. The first two are evening stars in the early part of July, but soon pass through inferior conjunction—Venus on the 8th and Mercury on the 9th—and become morning stars. Mars is morning star, but is still too near the sun to be seen, though he may perhaps be picked up at the end of the month, when he rises an hour before sunrise.

Jupiter is morning star in Pisces, and is the most conspicuous object in the morning sky. On the 21st he is in quadrature with the sun, and comes to the meridian at 6 A. M.

Saturn is in Capricornus and will soon be prominent in the evening sky. He is due south at 2 A. M. in the middle of the month and more than an hour earlier at its close.

Uranus is in Sagittarius, and is well placed for evening observation. On the 15th he is in R. A. 17h. 46m., dec. 23 deg. 37 min. south, and comes to the meridian at 10.15 P. M. He is not near any conspicuous star, but he can easily be identified if one has a good star map.

Neptune is in Gemini, too near the sun to be observed.

#### THE MOON.

Last quarter occurs at 6 P. M. on the 5th, new moon at midnight on the 12th, first quarter at 3 P. M. on the 19th, and full moon at 4 A. M. on the 27th. The moon is nearest us on the 14th, and farthest away on the 2d, and again on the 30th. She is in conjunction with Saturn on the 1st, Jupiter on the 6th, Neptune on the 11th, Mars on the 12th, Mercury and Venus on the 13th, Uranus on the 26th, and Saturn again on the 28th.

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#### THE PURCHASE OF A RESERVOIR SITE.

Another step has been taken toward the transformation of the arid West. The Secretary of the Interior has authorized the purchase of the Hondo reservoir site in New Mexico for the sum of \$20,000. It is in Chaves County, about 12 miles west of Roswell.

The site of this proposed reservoir is a natural depression, which, with a small amount of embankment, can be given a capacity of 40,000 acre-feet. This will hold practically all the water that the Hondo will furnish during low-water years. It is proposed to store here the flood waters of this stream and draw on them through lateral canals for irrigating the lands below the reservoir.

The lands that will be benefited by the reservoir waters are naturally fertile and may be easily irrigated at slight expense. They are free from alkali and will be ultimately worth at least \$100 an acre when planted to alfalfa and corn. If used for fruit growing, to which they are specially adapted, they may have a far greater value.

No engineering difficulties are expected in the work. The natural reservoir will have to be enlarged and

canals built for the inlet and outlet of the waters. It is estimated that the cost of constructing the reservoir and bringing the water to the arid lands will approximate \$240,000, or \$20 an acre for a minimum acreage of 12,000. It is believed, however, that nearly 15,000 acres will be served.

#### SCIENCE NOTES.

The oldest working clock in Great Britain is that of Peterborough Cathedral, which dates from 1320, and is conceded to have been made by a monastic clock-maker. It is the only one now known that is wound up over an old wooden wheel. This is some 12 feet in circumference, carrying a galvanized cable about 300 feet in length, with a leaden weight of 3 hundredweight. The cable has to be wound up daily. The gong is the great tenor bell of the cathedral, which weighs 32 hundredweight, and it is struck hourly by an 80-pound hammer. The going and the striking parts of the clock are some yards apart, communication being by a slender wire. The clock is not fitted with a dial, but the time is indicated on the main wheel of the escapement, which goes round once in two hours. This clock is of most primitive design, more so than the famous one made for Charles V. of France by Henry de Nick.

According to the report of M. R. Gallerand, a French scientist, the Sakalaves of Madagascar use the pith of a certain palm tree as an article of food. The tree is found in the Ambongo region and is known as the *satranabe*. According to Pernir, it is the *Mademba nobilis*, nearly related to the *Hyphane*. In that region the *satranabe* covers vast spaces either along the sea-coast or bordering the rivers. After cutting down the tree, the natives take out the pith, which runs from 4 to 10 pounds per tree, then dry, powder and sift it, thus forming a kind of flour. Some of this flour was sent to Marseilles to be analyzed at the Industrial Laboratory. It is a fine yellow powder and when fresh has a somewhat sweetish taste, which it had lost, however, upon arriving, and its solution did not act upon a beam of polarized light. When shaken up with water, the flour swells up and a light yellow liquid is obtained which has the odor of beer. About 17 per cent of the matter is dissolved. When fresh the product contains 13.3 per cent of water. After drying to expel all the water, it analyzes as follows: Starch, 66.833 per cent; cellulose, 12.939; albuminoid matter, 10.538; fatty matter, 1.037; mineral salts, 8.2 per cent. Among the salts are sulphate of potash, chloride of sodium, phosphate of lime, magnesia, oxide of iron; silica is also found. What is to be remarked principally about this product is the relatively large proportion of albuminoid matter it contains. In this respect it ranks ahead of the potato, manioc, and sweet potato, seeing that the latter contain 6.23, 3.30, and 3.38 per cent of nitrogen substances.

Some highly interesting and valuable archeological discoveries have been made on the site of the ancient Greek city Olbia. The site is situated on the southern bank of the Boug, about midway between Otchakoff and Nicolaieff, and not far distant from the estuary of the Dnieper. This ancient city was a colony of Miletus 655 B. C., and was a great center for Greek trade with the interior. It is generally maintained among archeological authorities that a trade route extended from Olbia across country to the northern sea, and when a find of ancient Greek coins was made, it was contended to be substantial proof of the fact. Recently, however, it was proved that these coins were spurious. Olbia was destroyed by the Getæ about 70 to 60 B. C., but it revived, and when it was visited by Dion Chrysostom about 100 A. D., it was again a flourishing city. The excavations that are now in progress upon the site of this city are being carried out by M. Formakovski under the auspices of the Russian Archeological Society. Mr. Formakovski has succeeded in unearthing extensive portions of the walls and foundations of the original city, which date back from the seventh century B. C. The masonry is identical with that of the ruins of ancient cities excavated in various parts of Greece. Before this depth was reached, two different strata of walls and basements bearing descriptions of the fourth and first centuries B. C. were encountered. The stone blocks composing the ruins of houses, temples, etc., in these upper strata are of remarkably exact area, square proportions, and excellently dressed. The more solid constructive work is, however, found in the remains of the original city. At this depth there was unearched a perfectly preserved wine cellar. Some fifty huge jars or vases had evidently contained red wine, now turned to a light powdery substance. A large collection of valuable antiques in gold, marble, and ancient pottery has also been found in these newly-uncovered ruins. These have been dispatched to the Hermitage at St. Petersburg. M. Formakovski, however, is carefully examining every antique unearched, to establish its genuine character, as it was on this site that the spurious tiara of Saitapharnes, now in the Louvre, was alleged to have been discovered.