

in his scientific tour may write to M. de Mortillet at the Château de Saint Germain. The banquet hall was decorated with a life-size picture of an early Gaul. The picture was executed according to the last discoveries of M. de Mortillet. The man is represented as having no hair on his body; his arms are very long and muscles very powerful, but the toes of his feet are not opposable, although they could be used for climbing the trees of the primitive forest. His jaw is strongly prognathous, but not at all equal to that of an anthropoid ape. His breadth is strongly compressed laterally and his abdomen prominent. The skin is not negroid, but of our present colour. The expression of the face is in intelligence on a level with that of an Australian.

ANTHROPOLOGY plays a great part in the Paris *salon* this year. One of the largest pictures, attracting the attention of crowds, represents a primæval tribe preparing in their cave to feed upon an *Ursus spelæus* which has been killed by the warriors with their stone implements.

THE spring meeting of the Institution of Mechanical Engineers was held at the Institution of Civil Engineers on May 1 and 2. The most interesting paper read was on the Consumption of Fuel in Locomotives, by M. Georges Marié, Engineer to the Paris and Lyons Railways. This paper is of considerable importance as bearing on the actual economy of the locomotive considered as a heat engine. The chief conclusion is that the locomotive is a better engine, as regards economy of fuel, than is usually believed, and cannot be very much improved unless the pressure in the boiler can be increased at one end or a condenser applied at the other. The author looks forward confidently to both these improvements, but when achieved they will, he considers, necessitate an improvement in the valve gear, and probably the use of compound engines on the scheme now brought forward by Mr. Webb. With these and with some other improvements, such as a better clothing of the boiler and the heating of the feed-water by the exhaust-steam, M. Marié looks forward to the locomotive attaining a position, as regards economy of fuel, much beyond even that which it possesses at present. The other papers read were entirely of a practical character, with the exception of one by Mr. Robert Gordon, of Burmah, describing the apparatus used at Mr. Froude's works at Torquay, for testing current meters. The arrangement of the tank, dynamometer, governor, &c., is clearly described, but would hardly be intelligible without the aid of drawings.

WE are glad to direct the attention of our readers to the *Health Journal*, published by Heywood of Manchester, and which, with the May number, has concluded its first volume. The *Journal* is a monthly review "of sanitary science and of voluntary effort for the public good." It seems to us to be admirably calculated to serve the purpose for which it has been established, and we hope it will receive all the encouragement it deserves.

THE recent threat of certain French journals that their troops would occupy the island of Hainan until China had paid an indemnity has directed attention to that little-known appendage of the Chinese Empire. In a late number of that valuable periodical, the *China Review*, we find an account of a journey through Hainan by Mr. Henry. As in other outlying possessions of China, the native tribes have succeeded in a measure in holding their own against the ubiquitous Chinese. The northern part of the island is described as a large plain, while the central and southern portions are mountainous. Here the aboriginal tribes, the Les, take refuge. They are cordial and hospitable to strangers, and are probably of Malay origin. There are fifteen or sixteen different tribes, known under distinct names, varying more or less in dress, language, and customs, but all evidently belonging to one homogeneous race, bound together by common

ties, and, as a rule, living on friendly terms with each other. The flora and fauna appear singularly rich, and but little investigated. In a visit of a few weeks the late Mr. Swinhoe noted 172 species of birds, nineteen of which were new to science, and were first described by him. The leeches are an especial plague to the traveller. They are described as of a grayish-brown and earthen hue, and vary from half an inch to an inch and a half in length, and swarm from the ground on all sides. Along the path, on the ends of grass blades and branches of shrubs, they may be seen holding by one end, while they reach out their whole length feeling on every side for their prey. The instant they touch foot or hand, or any part of the body, they take fast hold, and can only be detached by the application of fire, or when they are sated with blood. The natives carry bamboo sticks, with which by a quick motion they can sometimes detach them. Although the people appear in a state of rural prosperity, as there is very little foreign trade, while the climate is bad, it is difficult to see what France would gain by the occupation of the island.

REPORTS from Mount Hamilton, California, *Science* states, say that this has been the most stormy winter known since observations were begun at the Lick Observatory. The bad weather did not begin till so late in January that a drought in California was feared; but there have been 40 inches of rain and melted snow up to April 4, and at that date the mountain was covered with 2 feet of snow. The anemometer cups were blown away, with the wind-gauge indicating 65 miles per hour. The lowest temperature has been +12°; and at this temperature outside water did not freeze within the uncompleted buildings.

THE additions to the Zoological Society's Gardens during the past week include a Rhesus Monkey (*Macacus rhesus* ♀) from India, presented by Miss Harbord; a Pig-tailed Monkey (*Macacus nemestrinus*) from Java, presented by Miss Ethel Fenwick; a Macaque Monkey (*Macacus cynomolgus* ♂) from India, presented by Mr. F. Harrison; a Garnett's Galago (*Galago garnetti* ♂) from Eastern Africa, presented by Lieut. James Knowles, R.N.; a Dow's Tapir (*Tapirus dowii* ♂) from Venezuela, presented by Mr. Reginald Pringle; a Spotted Ichneumon (*Herpestes nepalensis*) from Nepal, presented by Mr. John Walker; two Clapperton's Francolins (*Francolinus clappertoni*) from West Africa, presented by Major H. Wade Dalton; two Chukar Partridges (*Caccabis chukar*) from North-West India, presented by Lieut.-Col. C. Swinhoe; a Herring Gull (*Larus argentatus*), European, presented by Miss Laura Dunnage; two Barn Owls (*Strix flammea*), British, presented by Mr. R. Church; two Hoary Snakes (*Coronella cana*) from South Africa, presented by Mr. E. Watson; two Wattled Cranes (*Grus carunculata*) from South Africa, two Spur-winged Geese (*Plectropterus gambensis*), four Vinaceous Turtle Doves (*Turtur vinaceus*), three Harlequin Quails (*Coturnix histrionica* ♂ ♂ ♀) from West Africa, deposited; a Grey-cheeked Mangabey (*Cercocebus albigena* ♂) from West Africa, two White Cranes (*Grus leucogeranus*) from India, a Cabot's Horned Tragopan (*Cerorhinus caboti* ♂) from China, a Banded Gymnogene (*Polyboroides typicus*) from Africa, two Yucatan Blue Jays (*Cyanocitta yucatanica*) from Yucatan, two Axolotls (*Sirendon mexicanus*) from Mexico, purchased; a Moustache Monkey (*Cercopithecus cephus*) from West Africa, received in exchange; a Maholi Galago (*Galago maholi*), seven Coypus (*Myopotamus coypus*), born in the Gardens.

OUR ASTRONOMICAL COLUMN

WHITE SPOTS UPON VENUS.—Four years since M. Trouvelot drew attention to two remarkable white spots which he had observed on opposite limbs of Venus, near the extremity of the cusps, from November 13, 1877, to February 7, 1878. The

southern spot was the brighter of the two, and "appeared then to be composed of a multitude of bright peaks, forming on its northern border a row of brilliant, star-like dots of light." The white spots disappeared after the inferior conjunction, which occurred on February 21.

At the sitting of the Academy of Sciences of Paris on March 24, M. Trouvelot mentioned that on two hundred and forty-two occasions since February 1878 he had observed one or other of the luminous spots, and occasionally both, and had made upwards of one hundred and twenty drawings. Since April 5 in the present year he had not lost sight of the northern spot, which alone was visible at that date. He did not find the spots affected by the diurnal rotation of the planet, and hence infers that the axis passes either through or very close to their centre. In this view it will be interesting to compare the position of the axis of the spots determined by his observations with the results obtained by De Vico and others. An attempt in this direction, founded upon some of the more satisfactory drawings, did not promise a near agreement. M. Trouvelot adds that the spots appear almost permanent, and thinks they are the summits of high mountains projecting beyond the cloudy envelope, generally opaque, which covers the planet.

The observations in 1877-78 were made at Cambridge, U.S., those of the present year at the Observatory of Meudon. De Vico's investigation on the position of the axis of Venus appeared in the *Memoirs* of the Observatory of the Collegio Romano for 1840-1841 : it can hardly be said that his results, founded upon data necessarily vague, have inspired much confidence amongst astronomers. He made the inclination of the equator of Venus to the ecliptic $53^{\circ} 11'$, and the longitude of the ascending node $57^{\circ} 19'$ for 1841 ; the rotation of Venus in sidereal time, $23h. 21m. 21.93s.$: these are the figures quoted in Secchi's "Life of De Vico."

THE GREAT COMET OF 1882.—Prof. Howe notifies that he has undertaken a definite determination of the orbit of this comet, which will doubtless be a work of some labour. Thus far calculation appears to indicate that the comet was moving in an ellipse, with a period not differing much from eight centuries : Kreutz gave 843, Fabritius 823, Frisby 794, and Morrison 712 years ; the orbit of Fabritius depends upon the widest extent of observation. Between the earliest and latest accurate positions the comet described an orbital arc of 340° : a similar arc was traversed by the comet of 1680 between its discovery by Kirch on the morning of November 14 and the last observation by Sir Isaac Newton on March 19 following.

Those who may have unpublished observations of position of the great comet of 1882 will do well to communicate them to Prof. Howe forthwith.

BRORSEN'S COMET OF SHORT PERIOD.—We have not yet met with any intimation that an ephemeris of this comet for the approaching reappearance is being prepared : that for the last return in 1879 was furnished by Prof. L. R. Schulze of Dobeln ; the time of perihelion passage was about eleven hours later than his calculation gave it. Disregarding perturbation, the comet would be again due at perihelion in the middle of September next, in which case it would be observable in the two hours before sunrise, in August and September, under somewhat similar conditions to those in 1873. Supposing the perihelion passage to occur September 14.5 , the comet's position at that time would be in about R.A. $154^{\circ} 5$ and N.P.D. $76^{\circ} 2$, the distance from the earth 1.41 .

Since the discovery of this comet within one day of perihelion passage in 1846 it has been observed at four returns, viz. in 1857, 1868, 1873, and 1879.

THE IRON AND STEEL INSTITUTE

THE annual meeting of the Iron and Steel Institute took place at the Institution of Civil Engineers on April 30 and May 1 and 2. The proceedings commenced with the reading of the Council's Report and the Accountant's statement, and with the presentation of the Bessemer Medal jointly to Mr. E. B. Martin of Dowlais and Mr. E. Windsor Richards of Middlesbrough, in recognition of the part taken by them in introducing the basic process for the manufacture of steel. In returning thanks, Mr. E. Windsor Richards mentioned that his firm, that of Messrs. Bolckow, Vaughan, and Co., were now making no less than 3000 tons per week by this process from Cleveland pig-iron, such

as would have been thought, until recently, wholly unsuitable for steel-making. Sir H. Bessemer, who was present, congratulated the recipients and the steel trade generally upon the brilliant success of Messrs. Thomas and Gilchrist's invention.

The first paper read was by Mr. I. L. Bell, F.R.S., and dealt with the use of Raw Coal in the Blast Furnace. It pointed out that this question, as being more complicated than that of coke, had never been treated before the Institute, although raw coal was largely used in the United States in the form of anthracite, and in Scotland in the form of the splint coal of the Lanarkshire coal-field. It is with the latter that the paper was chiefly concerned. Taking the Brockwell seam as a good specimen of Durham coking coal, analyses were given of it first in its raw state, and secondly when converted into coke, together with the number of heat units developed from one weight-unit of each. It appears that this number is 7437 in the case of the coal, and 7395 in the case of the coke, so that the heat developed in the two kinds of fuel is practically the same. This theoretical result was checked by experiments on a large scale made upon the North-Eastern Railway, using the same engines and the same weight of trains. The trials were continued for one week with each kind of fuel, full loads being taken to the place of shipment and the waggons returned empty to the collieries. The result in one trial in pounds consumed per train mile was 40.5 of coal and 41.6 of coke. In another experiment the difference was larger, but still it was not serious, and the theoretical deduction just given is thus fully confirmed. This equality of value between coal and coke is not, however, found to exist in the blast furnace, for the simple reason that the volatile constituents of the coal are scarcely oxidised at all, and therefore give but very little useful effect. They might, however, be utilised in another way, namely, as a means of reducing the oxide of iron to the metallic state. The gas from the coal would thus do part of the work now done by CO, and might enable a larger quantity of CO₂ to be evolved in the escaping gases. At present, however, this effect does not seem to be realised in practice. Analyses were given of the Lanarkshire splint coal, which show that, as a source of heat, it is inferior by about 30 per cent. to the South Durham coal. Analyses were also given of the escaping gases where this coal is used for smelting, and from this the quantity of heat evolved and appropriated was calculated, and compared with furnaces using coke. It thus appears that the raw coal occasions a much less perfect oxidation of the carbon, and in consequence a much smaller evolution of heat. On the other hand, the hydrogen contained in the coal affords a large supply of heat, but this and far more is absorbed in the expulsion of the volatile constituents, which is sufficiently proved by the very low temperature of the escaping gases, $190^{\circ}\text{C}.$ as compared with $332^{\circ}\text{C}.$ in the case of coke.

As regards the proportion of CO₂ and CO in the escaping gases, it appears that with coal it is much below the limit which Mr. Bell has fixed as the maximum compatible with reduction, viz. 1 of CO₂ to 2 of CO. Hence it follows that a considerable quantity of CO₂ must have dissolved carbon and so returned to CO. Calculating this quantity, it appears that the total carbon which reaches the hearth and gives up its heat for the fusion of iron, &c., is not very different in the two cases. Why then is there so large a disappearance of CO₂ in the Scotch furnace as compared with the English? Mr. Bell attributes it to the fact that the latter is 80 feet high, whilst the former, though 74 feet high, was only filled to 85 per cent. of its real capacity. The effect of the lower furnace is to diminish the time during which the ore is exposed to the reducing agency of CO, whilst still too cool for the fuel to decompose CO₂. In addition it is suggested that the presence of hydrogen in the coal might cause the formation of steam, which would subsequently react on the fuel and tend to lower the percentage of CO₂. On the whole it appears that when using raw coal in the blast furnace there is a waste of carbon to the extent of 3.72 units ; but before recommending that the coal should be coked in order to avoid this loss, the commercial aspect of the question must be considered, and it appears that the cost of coking even where possible would in many cases exceed the saving attained. A further point, however, which needs consideration is the possibility of condensing the tar and ammonia given off by the coal and so saving the valuable products. Here we have a difficulty in the Scotch furnaces from the enormous quantity of gas which would have to be dealt with ; nevertheless the results attained by Messrs. Baird in the Gartsherrie furnaces (given below) seem to show that the yield of ammonia is about the same as in the Simon-Carvès process for coking, as used