Jupiter's aphelion; what is more—one of the two points where each of them intersects the plane of Jupiter's orbit is generally very near to the trajectory of this planet. The theory which best explains such distribution is that which regards the comets of which the groups are composed as having come under the perturbing influence of the major planet to which they are respectively related. If a comet arrives from interstellar space into the solar system with a sensible parabolic velocity, and passes near a major planet, the velocity will be either diminished or increased. In the former case, the parabolic orbit would be transformed into an elliptical one, and the comet would be, as it were, incorporated into our system—captured by the planet. If, on the other hand, the velocity is accelerated, the orbit becomes hyperbolic, and the comet moves away from our system, never to return. The results of a research on this subject were given by M. Tisserand a few months ago (*Bulletin Astronomique*, July 1889, and NATURE, vol. xlii. p. 31).

M. Callandreau has at present only investigated the strong perturbations which a comet experiences when passing in the neighbourhood of a major planet—that is, a particular case of the problem of three bodies. He has considered the perturbations when a comet approaches very near to the disturbing body, and examined the difficulties connected with the capture theory. The theory that periodic comets are "ejects" from the major planets is mathematically discussed, and shown to be an improbable one. But it is not sufficient to show that periodic comets may be produced by capture; it is necessary to explain why the hyperbolic comets which the capture operation ought to engender escape observation. M. Callandreau proves that such comets are not seen either because their perihelion distance is very great, or because they only pass perihelion once, and then move to infinity on the hyperbolic orbit. Many other conditions are treated, and similarly interesting results obtained. An accurate knowledge of the formation of comets is of great importance in cosmogony. Such a discussion as the one before us is a decided advance in the matter, the demonstrations being in accordance with M. Callandreau's established reputation.

ANNUAIRE DE L'OBSERVATOIRE DE BRUXELLES.—This interesting *Annuaire* for 1891 has just been received. It is composed of ephemerides containing astronomical data for the ensuing year, statistical, geographical, and meteorological information, and articles on various scientific subjects. The mean positions of the principal stars, with the right ascension for every tenth day, occultations of stars by the moon, and eclipses of Jupiter's satellites are tabulated, as in previous years. Tables are also given of physical units and constants, and a detailed note on absolute measures, on the definition of different electrical units, and on their expression in absolute units. Another section contains a large amount of physiographical information. Dr. Folie contributes an article on diurnal variations in the height of the Pole; M. Spée, one on solar activity in 1890; and M. Lancaster gives an extended account of the climate of Belgium in the same year. An important article on the similarity between maps of the earth and other planets is from the pen of M. W. Prinz. Elements of the planets, and of some of the asteroids discovered in 1890, are also given. The obituary notices refer to the late MM. Montigny, Fievez, and Pirmez.

NEW ASTEROIDS.—Prof. Millosevich discovered the 307th asteroid on March 1, and M. Charlois the 308th on March 5.

THE LONDON-PARIS TELEPHONE.

LONDON and Paris are now connected by means of a telephone, and the completion of so great an enterprise deserves to be specially noted. The scheme was originally proposed by the French Government. It was at once taken into favourable consideration in England, and, when Mr. W. H. Preece had proved that it was practicable, it was adopted by the Postmaster-General.

The following details are taken from the *Times*, which printed on Tuesday a full account of what had been done in the matter. The scheme involved the construction of a trunk telephone line between the two cities, with a telephone cable across the Straits of Dover, the first ever made for the open sea. It was decided to have two separate circuits, so that if one should fail at any time, the other might be in use. The route for the English land line was chosen by Mr. Edward Graves, the Engineer-in-Chief to the Post Office, who has taken a keen personal interest in the whole work. It runs along the South-Eastern Railway to a point near Sidcup, and thence by road and rail through Swanley, Maidstone, and Ashford to the cable-house on the beach at St. Margaret's Bay, between Dover and Deal. The building, which began in September last, was continued throughout the severe frost, except when it snowed too hard to see, and the work was completed by the first week in March. The wire is of copper, the best material for the purpose, and weighs 400 pounds to the mile. The connection between the last pole on the chalk cliff at St. Margaret's Bay and the cable hut on the beach is effected by lengths of the cable core inclosed in an iron pipe and buried in a trench down the face of the cliff. The whole line is 85 miles long, and its excellence is proved not only by the electrical tests, but by the wonderfully clear and loud speaking through it between the cable-hut and the General Post Office. The voice of the speaker in London can be recognized at the hut, and the ticking of a watch distinctly heard.

The French land line follows the direct route of the Chemin de Fer du Nord, through Montdidier and Calais to the cable-house at Sangatte, between Calais and Boulogne. It is similar in construction to the English line, except that only one circuit is run at present, and the copper wire weighs about 600 pounds a mile. Its length is about 204 miles, and the speaking with the D'Arsonval apparatus employed in France is also excellent.

The connecting cable, which is the joint property of the two Governments, was designed by Mr. Preece, and contains four separate conductors, two for each circuit. It was taken on board Her Majesty's telegraph ship *Monarch*, on Monday, March 2, and the following day, in order to be laid when the weather was favourable. On Tuesday evening, March 3, the *Monarch* left her moorings near the *Warspite* and put to sea. Next morning she arrived off St. Margaret's Bay, and afterwards she steamed across to Sangatte; but for several days there was a nasty swell on the sea and a disagreeable haze. After waiting nearly a week in hopes of better weather, the morning of Monday, March 9, broke fine and clear. The long-expected opportunity seemed to have come, and preparations were made for landing the shore end of the cable into the hut at Sangatte. The two lifeboats were lowered, and a strong platform placed across them to form a raft, on which a length of cable sufficient to reach the shore was quickly coiled by the cable hands. The steam launch took the boat raft with the black coil of the cable in tow, the men paying it by hand as she went along to ground. She cast off and gave place to the men, who, in their white overalls and sea-boots, dragged the cable up the sand, along the trench, and into the cable hut. It was half-past 9 when the lifeboats were launched, and 12 minutes to 11 when the end was landed. No time was lost in returning to the ship, which immediately started paying out towards St. Margaret's Bay. The cable ran smoothly out of the tank, through the iron "crino-line," which keeps it from lashing about with the rolling of the ship, it glided along the guides, took three turns round the huge revolving iron drum, with its friction brake which controls the speed of egress, and passed over the starboard sheave or pulley projecting from the bows, then dived into the sea, just grazing the hull about the water line. Mile after mile was traversed in this way, and all was going on well. As yet there were no signs of an approaching storm. A drizzling rain began to fall, and the breeze freshened, but it was not until towards 3 o'clock, when 10 miles of cable had been paid out, and the *Monarch* was half seas over, that the gale came on, and the water became rough. At length it was decided to anchor until a lull in the storm should reveal the land, if only for a little while. The cable was fastened, and the anchor rattled out soon after 4 o'clock. The snow cleared about 5 o'clock, and it was then discovered that the *Monarch* was lying off St. Margaret's Bay, about a mile from the shore, and eastward of the cable hut. An attempt was made to lift the anchor and pay out all the cable, but the strong tide, aided by the furious wind, had driven the cable foul of the anchor, and after a fruitless attempt to clear, the anchor was slipped with 14 fathoms of chain. It was now a quarter past 8 at night, and very dark, but the *Monarch* paid out the rest of the cable to avoid cutting it, and buoyed the end well off the shore to the east of St. Margaret's Bay, about 20 minutes past 9, then ran for the Downs, where she anchored soon after 10 o'clock. Next morning the weather made further operations impossible. Wednesday was not much better, for, although it brightened up, the glass was still unsettled. The

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Monarch was now lying at Dover, where she went to land a visitor and take in stores. Thursday was fine, and after picking up the cable from the buoy, she proceeded to clear it from the lost anchor. The line was coiled four times round the anchor, and could only be released by cutting out the damaged part. This was done, the anchor and chain being recovered, and the end of the cable buoyed. She returned to Dover. On Friday nothing could be done owing to the high wind and sea; but Saturday morning was as quiet as a lamb, the blue sky smiling through fleecy clouds. The *Monarch* was early astir, and although the sea was a little hazy, and a strong easterly breeze blowing, the glass was very steady. The ship had spliced the cable by 20 minutes past 11, and then picked up some 5 miles of cable from the buoy, towards Sangatte, relaying it so as to clear a bight in the Calais-Dover line, arriving off St. Margaret's Bay about 20 minutes past 3 in the afternoon, where she anchored 1000 yards away from the landing-place. A raft was speedily formed with the lifeboats, and the shore end landed in the same way as at Sangatte. It was now getting dusk, but groups of spectators had collected on the beach to watch the operations, and a local photographer, deputed by a London illustrated paper, took a picture of the scene. The end was hauled ashore by the sailors at 10 minutes past 6, and 12 minutes later brought into the cable hut. Lieutenant O'Meara called up St. Martin's-le-Grand and announced the good news. Three cheers were given at the Post Office and in the hut through the land line, and those from London sounded so lustily that the lieutenant declared they had split the drum of his telephone. The end of the cable was then stripped and the sheathing filed off, the rasping of the file being plainly heard in London. The cores were then pared, and the cable connected to a Morse apparatus, by which the hut was put in communication with Sangatte. The French electricians there telegraphed a "hurrah for the telephone," and the work was done.

COCO-NUT BEETLES.

THE destruction of coco-nuts in the Straits Settlements by insects has been so great that of late much attention has been given to the question. Perhaps the most important contribution that has yet been made to our knowledge of these pests is a recent report by Mr. H. N. Ridley, Director of Forests and Gardens at Singapore, on the destruction of coco-nut palms by beetles, which has been printed by the Government and issued from the Colonial Secretary's Office. There are, Mr. Ridley says, two species of beetles which are especially destructive to coco-nut palms. The first is the *Oryctes rhinoceros*, commonly known as the rhinoceros, elephant, or black beetle, and the other the *Rhynchophorus ferrugineus*, known as the red beetle. Two other larger species of Calandra attack some palms at Singapore, but Mr. Ridley has not received any notice of their attacking coco-nuts.

The *Oryctes rhinoceros* belongs to the group of Lamellicornia. The parent beetle usually deposits its eggs in decaying coco-nut trees. The identification of the larvæ is very difficult, for the grubs of all the larger Lamellicorn beetles are very much alike. The larva is white and fleshy, and when full grown is about three inches long; the head is round and hard, and is of a dark chestnut colour. It is covered with short bristles; the legs are about half an inch long; the antennæ are short and hairless, and the jaws thick and strong. The chrysalis has the form of the perfect insect; but the insect is very rarely found in this state. The beetle itself is sometimes two and a half inches long; it is very broad, and is of a dark-brown or black colour, and its chitinous coat is very hard. The head of the male is small, and has a horn, about half an inch long, curved towards the back. The wing-cases do not quite cover the body; they are broad and oblong, and covered over with minute punctures. The legs are strong, and the second joint is armed with teeth, by means of which the beetle cuts its way into the tree. The female is usually much smaller, and is readily distinguishable from the male. The grub is quite harmless, but the perfect insect is most destructive. It always works at night, attacking the base of a leaf-stalk, burrowing into the heart of the cabbage, where, as a rule, it remains all the next day. The attack is generally renewed till the rain finds its way in and rots the palm. The destruction of the tree is hastened by the fact that when once a tree has been attacked it appears to become popular. Besides the coco-nut palm, very many other palms, a list of which is given by Mr. Ridley, are destroyed by this insect, but, so far as is known, it does not attack other trees. The present methods adopted for destroying the *Oryctes rhinoceros* are described and criticized in the report. The usual mode is to search for the beetles in the palms, and spear them with a flexible iron wire. Large fires are also made in the plantations at night, and the beetles, flying towards the light, are beaten into the flames by men and boys with branches of trees. Mr. Ridley does not hope to exterminate the pest, but he thinks that its numbers can be greatly reduced by destroying in all the plantations rubbish and vegetable refuse of all kinds. Dead trees should be burnt, and the law should prevent any planter from allowing any heap of vegetable matter, in which the insects always breed, accumulating, and also from keeping any dead trees on his land. By this simple measure the ravages of the beetle can be minimized, if not quite abolished.

The second species of beetle spoken of in this report is the *Rhynchophorus ferrugineus*, the red beetle, which is, perhaps, even more destructive than the other. In the case of *Oryctes rhinoceros*, it is the perfect insect which is destructive; in the present instance, it is the grub. It attacks the trees at night, and having perforated the base of the leaf-stalk, it pushes the egg deeply into the body of the tree. The grub is white and footless, and tunnels through the soft portion of the palm. Unfortunately the presence of this insect in the tree is not so easily detected as in the former case. The grub is a thick, cylindrical, white larva, without feet or antennæ. The head and jaws are small, and the body curved and wrinkled. The perfect insect is usually about two inches in length. The head is small and usually red; the wing-cases are black, sometimes ornamented with red, and a good deal shorter than the body. The legs are black and long, and have a strong claw at the end of the second joint, and two small ones on the feet. The methods of destruction used by the planters are very similar to those used in the case of the rhinoceros beetle, but on account of the difficulty of tracing the red weevil they are not so efficacious. If the black beetle is much reduced in numbers, the effect will be to reduce the red beetle also very much, for the latter will not then be able to take advantage of the holes which have already been made by the former. In dealing with this beetle also, the report urges the necessity of making the destruction of all vegetable refuse compulsory, particularly in the neighbourhood of the palm plantations.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The General Board of Studies have reappointed Mr. J. E. Marr, Sec.G.S., Fellow of St. John's College, to the Lectureship in Geology, for five years from Lady Day.

The subject of the Adams Prize Essay of 1893 is "The Methods of Determining the Absolute and Relative Value of Gravitation and the Mean Density of the Earth." Candidates must be graduates of the University. The value of the prize is about £170.

Mr. S. F. Harmer, Fellow of King's College, has been nominated to the use of the University table at the Naples Zoological Station.

The Mechanical Workshops Enquiry Syndicate have issued an important memorandum, setting forth a scheme of practical and theoretical instruction in engineering within the University; and state that a sum of £20,000 will be needed for the establishment and equipment of the necessary laboratories. As the funds are not to be had in Cambridge, they propose to make an appeal for benefactions outside the University.

The Agricultural Education Syndicate have issued a voluminous report, containing a complete plan of education and examination in agricultural science and practice, leading either to the B.A. degree or to a diploma in agriculture. It involves the formation of a Board of Agricultural Studies, and the foundation of readerships or lectureships in agricultural botany, chemistry, physiology, &c. Without the amplest pecuniary assistance, the plan is likely to fall by its own weight, but the Syndicate plainly indicate their expectation that adequate subsidies will be forthcoming from the County Councils and from the Government. The report is signed by the fourteen members of the Syndicate, including the Vice-Chancellor, Lord Hartington, Lord Walsingham, Canon Browne, Profs. Liveing and Foster, and Mr. Albert Pell.

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