Dr. Pogge reached the Mukenge safely in September last, bringing large collections with him. He had written and sent to Malange for means for his return journey.

A REPORT on the Peter Redpath Museum, Montreal, the foundation of which was laid by the Marquis of Lorne in September, 1880, describes the opening ceremony in August, during the meeting of the American Association. Mr. Redpath in a very few words handed over the Museum to the University, and speeches were made by the Chancellor, Dr. Carpenter, Prof. Hall, and Dr. Dawson. Already collections have been placed in the Museum, which promises to become one of the first rank.

THE current number of the *Agricultural Students' Gazette*, edited by students at the Royal Agricultural College, Cirencester, contains an instructive article on Devonshire Orchards and Cider-making, by C. B. Northcote, a member of the College. Miss Ormerod contributes a paper on the Coffee Grub in Ceylon, embodying our information on this pest up to the present time, from information largely derived from a pamphlet by Mr. Haldane on the subject. Mr. Rutherford gives a concise paper on the Agriculture of the Cotswolds; Prof. Garside one on Glanders, adducing evidence that it is a germ disease due to a bacillus. There is also an interesting and instructive collection of chemical curiosities, answers to examination questions; and in addition reports on the experimental field plots, on the weather, on the amount of chlorine in the rain water of the district, and on many other more purely college matters. This magazine fully keeps up to its advanced standard, and has a value in a circle far wider than its immediate connection with the Agricultural College.

WE have received the *Proceedings of the Medical Society* of the Kazan University, which contains, besides purely medical papers, several valuable papers of general interest. We notice among them a lecture, by Prof. Scherbakoff, on carbonic and azulmic acids in the soil as a measure of the oxidation of its organic constituents. It is known that since more attention has been given to the sanitary conditions of different soils, Herr Peitenkofer has proposed to measure the amount of putrefied organic matter in the soil by the amount of carbonic acid it contains. Prof. Scherbakoff makes a complete analysis of the chemical and putrefactive processes that are going on in the soil, and comes to the conclusion that, unhappily, the carbonic acid does not give a measure either of the oxidating capacity of the soil or of the decomposition of the organic matter. The same conclusion is arrived at with regard to azulmic acid, which is formed only under the action of special ferments, as appears from the classical researches of MM. Schlesing, Müntz, and Pasteur, so that oxidation of the organic elements of the soil may go on on a large scale without azulmic acid appearing as a result of the process. We notice also apaper, by M. Orloff, on the influence of wet and dry chlorine upon different materials when used for disinfection, the author giving the results of a series of experiments on various linen, cotton, silk, and woollen stuffs. The tables of diseases at Kazan and in several districts of the province are also of great interest; they show, for in tance, that the number of cases of malarial fever is really enormous, as it has reached, in the town of Kazan, the figure of 23,000 cases during five years. As to cattle and horse diseases, their number is still more striking, as every year the province loses no less than 4300 to 4600 head of horned cattle, to which must be added sometimes—as in 1877—3250 cattle and horses exterminated by the Siberian plague.

THE additions to the Zoological Society's Gardens during the past week include a Bonnet Monkey (*Macacus radiatus*) from India, presented by Mr. F. J. Wicks; a Ring-tailed Coati (*Nasua rufa*), a Kinkajou (*Cercoleptes caudivolvulus*) from Demerara, presented by Mr. Ernest Francis; a Herring Gull (*Larus argentatus*), British, presented by Mrs. Andrews; a Smooth Snake (*Coronella lævis*), European, presented by Mr. W. A. B. Pain; a Bateleur Eagle (*Helotarsus ecaudatus*) from Africa, two Germain's Peacock Pheasants (*Polyplectron germaini*) from Cochin China, purchased; a Bennett's Wallaby (*Halmaturus bennetti*), four Brown-tailed Gerbillus (*Gerbillus erythrurus*), born in the Gardens.

OUR ASTRONOMICAL COLUMN

D'ARREST'S COMET.—The following approximate positions of this comet are deduced from M. Leveau's elements:—

At Greenwich Midnight

		R.A. h. m. s.	Decl. °	Log. Distance from Earth.	Sun.
May	25	13 13 47	+13 8·9	0·2983	0·4312
	27	— 12 51	13 6·9		
	29	— 12 0	13 4·9	0·3015	0·4267
	31	— 11 15	13 1·9		
June	2	— 10 35	12 58·0	0·3051	0·4221
	4	— 10 1	12 53·2		
	6	— 9 34	12 47·6	0·3090	0·4175
	8	— 9 13	12 41·1		
	10	13 8 57	+12 33·9	0·3132	0·4128

THE OBSERVATORY OF RIO JANEIRO.—We have received the *Bulletin Astronomique et Météorologique de l'Observatoire Impérial de Rio de Janeiro* for January and February. In the first number are observations of the nucleus of the great comet of 1882 made by M. Lacaille. While stationed at Olinda (Pernambuco) for the observation of the transit of Venus, he remarked on November 16 a small nebulosity 6° south of the nucleus of the great comet: it was circular, and had a slight central condensation. On November 20 he saw it again; its aspect was the same as on the previous day, it had the same right ascension, but its declination was 1° further south. On November 22 and 26 it was observed in the same position as on the 20th. M. Lacaille believes that this small nebulosity was no other than a fragment of the nucleus of the great comet. On returning to Rio, he found on January 8, on examining this nucleus with the 10-inch equatorial and power of 500, that it was highly elongated and subdivided into four small nebulosities, the centres of which had the appearance of stars of the twelfth magnitude. The aspect of the fourth as compared with the others, was less condensed, but rather more lengthened out. On the following night he was surprised to find that the first nebulosity was no longer in the position that he had seen it on the 8th, but that it was situate outside the elongated nucleus, and its centre had lost the appearance of a star of the twelfth magnitude. The second nebulosity was precisely in the position of the day preceding. The fourth had sensibly approached the third. On January 10 the four nebulosities retained the same relative positions. Several days of cloudy weather followed, but on January 15 he found that there was a fifth nebulosity in the elongated nucleus. These changes are well shown in a lithograph accompanying M. Lacaille's observations. In the February number of the *Bulletin* are observations of the same comet, made at Athens by Dr. Julius Schmidt, as detailed in a letter addressed by him to the Emperor of Brazil. It relates chiefly to the nebulosities which were remarked by Dr. Schmidt in the vicinity of the nucleus of the great comet on October 9, 10, and 11, his drawings showing the fantastic forms presented by the nebulosities being lithographed.

THE OBSERVATORY OF MOSCOW.—Volume IX. (livraison i.) of *Annales de l'Observatoire de Moscou*, has been issued. Amongst the contents are a short paper by M. Bredichin on the resisting medium; Researches on the first comet of 1882 (Wells), and observations of the minor planet Victoria, taken in connection with others to be made at the Cape and other southern as well as northern observatories, as part of a plan organised by Dr. Gill, for the determination of a new value of the solar parallax. M. Bredichin compares the observed phenomena of the tail of the first comet of 1882 with the indications of theory.

KIELL ON TYCHO BRAHE'S NOVA 1572.—It has often been stated in our astronomical text-books, that John Kiell, Professor of Astronomy at Oxford, considered that the period of the celebrated star in Cassiopeia in 1572, was "about 150 years," or only half that which had been more generally assigned to it.

We suspect that this statement has arisen from a misconception of Kiell's words, while referring to the star in his *Introduction to the true Astronomy or Astronomical Lectures*, &c., the first English edition of which appears to have been published in 1721. In the third edition, 1739 (which is before us), at p. 56, we read, after his reference to the phenomena in 1572, "Leovitius, from the history of those times, tells us that in the time of the Emperor Otho, about the year 945, a new star appeared in Cassiopeia, just such a one as was seen in his time in the year 1572. And he brings us another ancient observation—that there was likewise seen in the *northern* region of the heavens, near the constellation Cassiopeia, in the year 1264, an eminently bright *star*, which kept itself in the same place, and had no proper motion. It is probable that these two stars might have been the same with that which was seen by Tycho, and that in about 150 years the same star may again make its appearance."

It will be remarked that Kiell makes no reference to any star seen midway between 945 and 1264, nor between 1264 and 1556, and it seems his meaning is clear, that Tycho's star, with a period of some 300 years, might make its appearance again "in about 150 years" from the time at which he wrote, as it might do were its changes accomplished in about three centuries. The misinterpretation of Kiell's words has led to his being credited with the opinion that the period is about 150 years, an idea which he probably never intended to express.

ELECTRICITY APPLIED TO EXPLOSIVE PURPOSES[1]

IN introducing the subject the lecturer indicated the principal advantages which it had been early observed would result from a certain mode of firing explosive charges by electric current instead of by the ordinary fuzes, the best of which had inherent defects, greatly limiting their use for any but the simplest operations. He traced the history and development of electric firing from the crude experiments of Benjamin Franklin, about the year 1751, through the various stages in which frictional electricity, volta-induction apparatus, and magnetoelectric machines had supplied the means of generating the current, the tendency of late years being to revert to a modified form of voltaic battery for one class of work, and to employ dynamo-electric machines for another class. The history and development of the low-tension or wire fuze, and of the various fuzes employed with electric currents of high tension, were also discussed, and their relative advantages, defects, and performances were described.

The only sources of electricity which at present thoroughly fulfilled the conditions essential in the exploding-agent for submarine mines were constant voltaic batteries. They were simple of construction, comparatively inexpensive, required but little skill or labour in their production and repair, and very little attention to keep them in constant good working order for long periods, and their action might be made quite independent of any operation to be performed at the last moment.

When first arrangements were devised for the application of electricity in the naval service to the firing of guns and so-called outrigger charges, the voltaic pile recommended itself for its simplicity, the readiness with which it could be put together and kept in order by sailors, and the considerable power presented and maintained by it for a number of hours. Different forms of pile were devised at Woolwich for boat and ship use, the latter being of sufficient power to fire heavy broadsides by branch circuits, and to continue in a serviceable condition for twenty-four hours, when they could be replaced by fresh batteries, which had in the meantime been cleaned and built up by sailors.

The Daniell and sand batteries first used in conjunction with the high-tension fuze for submarine mining service were speedily replaced by a modification of the battery known as Walker's, which was after some time converted into a modified form of the Leclanché battery.

The importance of being able to ascertain by tests that the circuits leading to a mine, as well as the fuzes introduced into that circuit, were in proper order, very soon became manifest; and many instances were on record in the earlier days of submarine mining of the disappointing results attending the accidental disturbance of electric firing arrangements, when proper means had not been known or provided for ascertaining whether the circuit was complete, or for localising any defect when discovered.

The testing of the Abel fuze, in which the bridge, or igniting and conducting composition, was a mixture of the copper phosphide and sulphide with potassium chlorate, was easy of accomplishment (by means of feeble currents of high tension), in proportion as the sulphide of copper predominated over the phosphide. Even the most sensitive might be thus tested with safety; but when the necessity for repeated testing, or even for the passing of a signal through the fuze, arose, as in a permanent system of submarine mines, the case was different, this fuze being susceptible of considerable alterations in conductivity on being frequently submitted to even very feeble test-currents, and its accidental ignition by such comparatively powerful test- or signal-currents as might have to be employed, became so far possible as to create an uncertainty which was most undesirable.

Hence, and also because the priming in these fuzes was liable to some chemical change detrimental to its sensitiveness, unless thoroughly protected from excess of moisture, another form of high-tension fuze, specially adapted for submarine mining service, was devised at Woolwich. This, though much less sensitive than the original Abel fuze, was sufficiently so for service requirements, while it presented great superiority over the latter in stability and uniformity of electric resistance; and, though not altogether unaffected by the long-continued transmission of test-currents through it, the efficiency of the fuze was not affected thereby.

Although high-tension fuzes presented decided advantages in point of convenience and efficiency over the earlier form of platinum wire fuze, the requirements which arose, in elaborating thoroughly efficient permanent systems of defence by submarine mines, and the demand for a battery for use in ships which would remain practically constant for long periods, caused a very careful consideration of the relative advantages of the high- and low-tension systems of firing to result in favour of the employment of wire fuzes for these services. In addition to the disadvantages pointed out there was an element of uncertainty, or possible danger, in the employment of high-tension fuzes, which, though partly eliminated by the adoption of voltaic batteries, in place of generators of high-tension electricity, might still occasionally constitute a source of danger, namely, the possibility of high-tension fuzes being accidentally exploded by currents induced in cables, with which they were connected, during the occurrence of thunderstorms, or of less violent atmospheric electrical disturbances.

Experiment, and the results obtained in military service-operations, had demonstrated that if insulated wires, immersed in water, buried in the earth, or even extended on the ground, were in sufficient proximity to one another, each cable being in circuit with a high-tension fuze and the earth, the explosion of any of the fuzes by a charge from a Leyden jar, or from a dynamo-electric machine of considerable power, might be attended by the simultaneous ignition of fuzes attached to adjacent cables, which were not connected with the source of electricity, but which become sufficiently charged by the inductive action of the transmitted current. It therefore appeared very possible that insulated cables extending to land- or submarine-mines, in which high-tension fuzes were inclosed, might become charged inductively during violent atmospheric electrical disturbances to such an extent as to lead to the accidental explosion of mines with which they were connected. In a Report by von Ebner on the defence of Venice, Pola, and Lissa, by submarine mines, in 1866, he refers to the accidental explosion of one of a group of sixteen mines during a heavy thunderstorm, as well as to the explosion of some mines, by the direct charging of the cables, through the firing station having been struck by lightning. Two instances of the accidental explosion of tension fuzes by the direct charging of overhead wires during lightning discharges occurred in 1873 at Woolwich.

Subsequently an electric cable was laid out at Woolwich along the river bank below low-water mark, and a tension fuze was attached to one extremity, the other being buried. About eleven months afterwards the fuze was exploded by a charge induced in the conductor during a very heavy thunderstorm.

In consequence of such difficulties as these experienced in the special application of the high-tension fuzes to submarine purposes, the production of comparatively sensitive low-tension fuzes, of much greater uniformity of resistance than those employed in former years, was made the subject of an elaborate

[1] The fifth of the series of Six Lectures on the Applications of Electricity, delivered on Thursday evening, April 19, at the Institution of Civil Engineers, by Sir F. A. Abel, F.R.S., Hon.M.Inst.C.E.