bases his claims to the existence of the new element. The characteristic properties thus far noted are the following :—When fused with phosphor salt, its compounds yield in the oxidising flame a reddish or brownish yellow bead, and in the reducing flame a green bead. The alkaline vesbiates are soluble in water. The compounds with the other bases are soluble in acids, but insoluble in water—with the solitary exception of the manganese salt. The zinc salt is green, the silver salt is of a reddish yellow. The acid solutions of the iron and aluminium salts are green. Addition of sulphuretted hydrogen causes a flocculent brown precipitate, while the liquid assumes a deep azure blue hue—one of the most distinctive properties of the acid. The yellow vesbiate of potassium when fused, turns black, and if then cooled is insoluble. If on the contrary the temperature is further elevated, the fused mass becomes transparent and is soluble on cooling. The analysis of the silver salt showed it to contain 47·58 per cent. of vesbic acid. This would give 105·29 as the equivalent weight of vesbic acid, and an atomic weight of about 130 or 162, according to the amount of oxygen in combination.

In view of the small quantity of but three grammes of vesbic acid which Prof. Scacchi has thus far succeeded in isolating, he very prudently desists from making any definite claims with regard to the certainty of the existence of vesbium, until he has obtained quantities sufficient to insure purity in the compounds and exactness in the analytical results.

Thus far it appears allied to vanadium or molybdenum, although not responding to the special tests of these metals. A more accurate determination of the atomic weight will also show whether it can fill the gaps in the groups containing these metals according to Mendeleeff's classification. T. H. NORTON

PRIZES OF THE PARIS ACADEMY OF SCIENCES

AT the annual meeting on March 1, the Academy of Sciences distributed a large number of prizes, besides the extraordinary prize awarded to Mr. Crookes for the "Ensemble de ses Expériences." The Poncelet prize has been granted to M. Moutard, Professor at the Polytechnic School, for his works in analysis; the Dalmont prize to M. Collignon, Engineer of the Ponts et Chaussées, for similar services rendered to mechanics. M. Collignon is the author of a treatise on rational mechanics, containing not less than five large 8vo volumes. The Lalande prize was granted to Mr. Peters, the well-known astronomer of Clinton, for the discovery of forty-three small planets, eighteen of them discovered in 1879. M. Trouvelot, the French astronomer who was banished in 1851, and settled in the United States, took the Valz prize for his descriptive designs of Mars, Jupiter, and Saturn, which are exhibited in the large hall of the Paris Observatory. M. Trouvelot's observations on Jupiter's spots were considered as deserving of special mention. The Lacaze prize for physics was awarded to M. Leroux, Professor to the School of Pharmacy for his researches on vapours, on chronographs, magneto-electric machines, and peripolar induction. The Lacaze prize for chemistry was granted to M. Lecoq de Boisbaudran for his discovery of gallium

A large number of the questions proposed for solution by the commissions of the Academy, have been left unsolved and unrewarded, such as the Plumey prize for improvements in steam navigation, the great prize of mechanics for any invention tending to enlarge the efficiency of French men-of-war, the Damoiseau prize for a revision of the theory of Jupiter's satellites, the Vaillant prize for improvements in phonetic telegraphy, the Breant prize (4,000*l.*) for a remedy against choleraic infection, and others.

It is alleged that the failure of these competitions is caused by the too narrow limits imposed on the competitors, and the want of interest felt by the learned public in the proposed subjects. It may be noticed that the practice of rewarding men of science for the whole of their works is gradually gaining ground. Mr. Crookes's prize, an "extraordinary" one, was proclaimed after all the others.

One of the most important functions of the Academy of Sciences is the distribution of these annual prizes, the number of which is considerable—not less than thirty-one, whose aggregate value is about 10,000*l.*, exclusive of the Breant prize for cholera (4,000*l.*). Four of these prizes are paid out of public money, others from sums bequeathed by individuals whose number is yearly increasing. Generally these sums are vested in the funds, and the interest is employed in granting prizes, sometimes yearly, sometimes every two or three or four years. Some of the prizes to be delivered in 1880 are an exception to the rule, and the money is to be given *at once* if any one be found deserving it, according to the verdict of the Academical Commission.

The sitting was opened by an address delivered by M. Daubrée, and after the proclamation of the prizes, M. Bertrand, Perpetual Secretary, read the *éloge* of M. Belgrand, a free Academician, who died recently. He was engineer of the Ponts et Chaussées, and the head of the water service in the city of Paris. It was M. Belgrand who superintended the construction of the aqueduct, which from an immense distance brings within the fortifications of Paris an inexhaustible supply of pure spring water. In prefacing his address M. Bertrand remarked that the number of departed academicians who, from 1666 up to 1880 had not had the advantage of having their *éloge* pronounced by the Perpetual Secretary, amounts to seventy-two, amongst whom are Napoleon I., who was a member of the section of Mechanics, Leon Foucault, and Arago !

ARTIFICIAL DIAMONDS

AN unusually large audience gathered at the Royal Society last Thursday to hear Mr. Hannay's account of his artificial diamonds.

The President, after inviting discussion of the paper by Messrs. Hannay and Hogarth, observed that probably the large audience had assembled more especially in consequence of the general interest attaching to the next paper on the artificial formation of the diamond, and he felt that the valuable investigation just detailed showed Mr. Hannay to be a person worthy of attention when he claimed to have made even so startling a discovery as that on the face of this next communication. With regard to this the President observed that the attitude of science was always sceptical, and the Society would need ample proof that the metamorphosis of carbon into diamond had been really effected. But when once it has been proved, even with regard to the most microscopic particle, the scepticism of scientific men would cease for ever. And he reminded the Society that the present was only a preliminary notice dealing with the statement that headed it, and that a more complete memoir detailing the process would be eagerly expected by the Fellows of the Royal Society.

The following paper by Mr. Hannay was then read by Prof. Stokes :—

While pursuing my researches into the solubility of solids in gases, I noticed that many bodies, such as silica, alumina, and oxide of zinc, which are insoluble in water at ordinary temperatures, dissolve to a very considerable extent when treated with water-gas at a very high pressure. It occurred to me that a solvent might be found for carbon; and as gaseous solution nearly always yields crystalline solid on withdrawing the solvent or lowering its solvent power, it seemed probable that the

carbon might be deposited in the crystalline state. After a large number of experiments, it was found that ordinary carbon, such as charcoal, lampblack, or graphite, were not affected by the most probable solvents I could think of, chemical action taking the place of solution.

A curious reaction, however, was noticed, which seemed likely to yield carbon in the nascent state, and so allow of its being easily dissolved. When a gas containing carbon and hydrogen is heated under pressure in presence of certain metals its hydrogen is attracted by the metal, and its carbon left free. This, as Prof. Stokes has suggested to me, may be explained by the discovery of Professors Liveing and Dewar, that hydrogen has at very high temperatures a very strong affinity for certain metals, notably magnesium, forming extremely stable compounds therewith.

When the carbon is set free from the hydrocarbon in presence of a stable compound containing nitrogen, the whole being near a red heat and under a very high pressure, the carbon is so acted upon by the nitrogen compound that it is obtained in the clear, transparent form of the diamond. The great difficulty lies in the construction of an inclosing vessel strong enough to withstand the enormous pressure and high temperature, tubes constructed on the gun-barrel principle (with a wrought iron coil), of only half an inch bore and four inches external diameter, being torn open in nine cases out of ten.

The carbon obtained in the successful experiments is as hard as natural diamond, scratching all other crystals, and it does not affect polarised light. I have obtained crystals with curved faces belonging to the octahedral form, and diamond is the only substance crystallising in this manner. The crystals burn easily on thin platinum-foil over a good blowpipe, and leave no residue, and after two days' immersion in hydrofluoric acid they show no sign of dissolving, even when boiled. On heating a splinter in the electric arc, it turned black—a very characteristic reaction of diamond.

Lastly, a little apparatus was constructed for effecting a combustion of the crystals and determining their composition. The ordinary organic analysis method was used, but the diamond crystals were laid on a thin piece of platinum-foil, and this was ignited by an electric current, and the combustion conducted in pure oxygen. The result obtained was, that the sample (14 mgrms.) contained 97·85 per cent. of carbon, a very close approximation, considering the small quantity at my disposal. The apparatus and all analyses will be fully described in a future paper.

Extract from a letter from Mr. Hannay, dated February 23.

"I forgot, in the preliminary notice, to mention that the specific gravity of the diamond I have obtained ranges as high as 3·5; this being determined by flotation, using a mixture of bromide and fluoride of arsenic."

The President having called for any observations on the notice by Mr. Hannay, Mr. Maskelyne said that the present differed from the numerous announcements and other communications that have been heretofore made to scientific societies at various times purporting to record the artificial production of the diamond in this, that here the product so claimed to have been manufactured is really diamond. He had himself proved this by the simple tests of the mineralogist. He had deeply abraded topaz and sapphire with a particle of the substance and abraded them with the greatest ease; the angle of the cleavages of a crystalline fragment sent him by Mr. Hannay was the angle between faces of the regular octahedron, and he had burnt a small grain of the substance on a platinum foil with the characteristic glow of the diamond, and without its leaving a residue. And on polarised light it had no action—or rather one particle had a very slight action, just as many diamonds have when turned between crossed tourmalines, and the lustre of the body was truly adamantine. All the particles he had seen as yet were fragments; none were complete crystals. They were characterised by the laminated structure of diamond. One indeed forwarded to him by Prof. Roscoe had exactly the appearance of a chip from a small diamond that might originally have been from $\frac{1}{8}$th to $\frac{1}{32}$nd of a carat in size; it may have been about $\frac{1}{100}$th of a carat in weight itself. Prof. Roscoe had recognised the close similarity of this fragment to one of native diamond, and had declared his scepticism of the reality of the transmutation of carbon until it should be proved to be an established scientific result; and Mr. Maskelyne considered Prof. Roscoe was *primâ facie* justified in this scepticism, and wished, on the part of Prof. Roscoe, to place on record this hesitation on his part to accept the results claimed by Mr. Hannay without further proof, though no one would accept them when proved with greater pleasure than would Prof. Roscoe. And, on the other hand, Mr. Maskelyne, while supporting warmly the observations of the President, and vindicating for the Royal Society its prerogative of holding a sceptical attitude towards new discoveries, and especially towards one so novel and so long desiderated as this, felt confident that the gentleman whose beautiful investigation had led him up to what might so well be the threshold of this discovery, may, until at least his further communication shall have been made, be fairly credited with the moral qualities that would render any approach to falsification of his results impossible. At the same time the rigid scrutiny of science must be called in to establish or refute those results, and the advantage of such a process and of the sceptical attitude that dictates it, is all to the advantage of him whose results are thus accepted. Mr. Maskelyne observed that the employment of a nitrogen compound appeared to be a novel and most important feature in Mr. Hannay's process, though what compound he used was not yet publicly announced. One point of difference he had observed in Mr. Hannay's fragments distinguishing them from ordinary "cleavage" diamond is that they present sometimes a curved lamination, which he would designate as a kind of nacreous lamination, like the rounded and parallel scales of mother-of-pearl. Prof. Stokes subsequently illustrated this by a drawing on the black board. Mr. Maskelyne subsequently explained that his own share in announcing Mr. Hannay's discovery was undertaken with that gentleman's concurrence as asserting his priority of claim.

Mr. Hulke suggested that the fragmentary character of the diamonds might be due to the disruption caused by gaseous inclosures in them on the removal of the enormous pressure under which they were formed.

Prof. Dewar remarked that the somewhat indefinite statements in Mr. Hannay's paper of the presence of a stable compound of nitrogen being necessary for the success of the process bear a strong analogy with known facts regarding the formation of graphite. Until within the last few years the transformation of carbon into the form of graphite had only succeeded by dissolving it in cast-iron. This involves a temperature of twelve or fourteen hundred degrees; but Dr. Pauli had shown that the oxidation of cyanides in crude caustic soda at a temperature not exceeding a low red heat, say 500°, resulted in the production of a quantity of graphite. Now under ordinary conditions of pression diamond will withstand a high temperature without changing into the stable form, and in this it resembles graphite. From all that is known of the thermal relation of diamond and graphite it would appear that the passage from the one state to the other involves little or no absorption or evolution of heat—quite unlike the corresponding changes in the allotropic modification of phosphor; and therefore it would appear that some such process of separating nascent carbon, probably through the presence of cyanides, at a relatively low temperature and under great pressure,

is one not unlikely to produce the diamond form of carbon.

Some questions asked by Mr. De la Rue and by Dr. Debus regarding the principle of Mr. Hannay's process were responded to by Prof. Stokes, who pointed out the relation of the process sketched at present only in outline by Mr. Hannay, and the paper which had been communicated just previously to it by that gentleman.

A large tube some four inches in diameter, made of wrought iron, and bored with a small cylindrical hollow along its axis, was shown as one of the tubes in which Mr. Hannay's experiments were performed.

NOTES

THE following grants have been made by the Council of the Chemical Society from their Research Fund:—100*l.* to Dr. C. R. A. Wright, for determinations of chemical affinities in terms of electrical magnitudes; 100*l.* to Mr. F. D. Brown, for experiments on vapour tensions.

MR. J. R. HIND has been elected president of the Astronomical Society.

THE French Government has appointed M. Hervé-Mangon, the new director of the Conservatoire des Arts et Métiers, as one of its representatives in the International Metric Commission. The death of General Morin has created a vacancy on the Committee of the Breteuil International Observatory. This observatory has been constructed in the Parc de Saint Cloud on the site of an old imperial mansion, at the expense of the associated nations. The contribution levied is in proportion to the population multiplied by one, if the nation does not make any use of the metric system, by two if the metric system is permissive as in the United States, and by three if it is the only legal measure as in Belgium, Italy, or France. The president of the Committee is General Ibanez (Spain), the secretary, Dr. Hirsch (Switzerland), and the director of the Breteuil Observatory Dr. Broch (Norway). England declined to join the Association. Bavaria, Saxony, and Würtemberg has each a vote and a representative, as well as Prussia.

THE boring of the St. Gothard Tunnel was completed on Sunday morning at 9 o'clock. The length of the tunnel is 9¼ miles, and the boring was begun in 1872, with machinery worked by compressed air, devised by the engineer, Prof. Colladon, of Geneva; the piercing of the tunnel has taken seven years and five months. The tunnel is expected to be ready for traffic by the end of September, and the entire system of which it is the centre in the summer of 1882.

THE savage process of producing fire by the friction of wood, so often described in books of travel, but seldom seen in this country, was performed by Farini's Zulus at the Westminster Aquarium on Monday, in the presence of Dr. Tylor, Gen. Lane Fox, Mr. Francis Galton, Col. Godwin-Austen, and other members of the Anthropological Institute. Some straw being laid on the ground as a bed, two sticks were placed on it a few inches apart to form a support for the third stick, which was laid across them, having a deep notch cut in it to receive the blunt point of the drilling-stick; this was twirled like a chocolate-muller between the palms of the hands, and when the twirler's hands reached the bottom they were either dexterously shifted to the top again, or another of the Africans squatting round took on and relieved the first. A spark was got in the charred dust in about five minutes, and was received with shouts and leaps of delight by the fire-makers, one of whom, carefully shielding it in a handful of the straw, soon fanned it into a flame. We understand that the operation will be made a regular part of the afternoon performance of these interesting barbarians. They are physically fine specimens of the Kafir type, varying in complexion from negroid blackness in some of the men to dark *café au lait* colour in the women. Their show-scenes, such as the marriage procession, war-dance, &c., are genuine exhibitions of native life. The Zulus are in exuberant health and spirits, and as yet but little spoilt by contact with civilisation.

THERE died at the Rectory, Newcastle Lyons, Hazlehatch, county of Dublin, on January 20, the Rev. Eugene O'Meara, M.A., for some nineteen years curate of Saint Mark's Parish, in the City of Dublin, and for nineteen other years Rector of Newcastle Lyons. Amidst the hard struggles of a laborious life Mr. O'Meara found time to do some scientific work, on account of which he deserves a brief notice in our columns. Born about the year 1815, he entered Trinity College, Dublin, in 1834, taking his B.A. degree in 1840, and that of M.A. in 1858. He soon obtained the post of Curate in St. Mark's, one of the poorest parishes in Dublin. Finding the necessity of having some definite object of research to serve him as a recreation after the toils of his daily labours, O'Meara began the study of the diatoms, attracted to them at first by the ease with which their siliceous frustules could be preserved and observed. He soon showed that he had a good eye for minute differences in outline and markings, and many a refreshing hour was spent by him in the investigation of the seemingly endless forms, for we will not call them species, of these interesting algæ. His first published communication was made to the British Association at its meeting in Dublin in August, 1857, on "Diatoms occurring in the Chalk of the County Antrim;" this was speedily followed by "Notes on Diatoms and Sponge Spicules in the Cambrian Rocks of Bray Head, near Dublin;" and a very long list might indeed be given of his numerous contributions to a catalogue of Irish diatoms, and of his descriptions of new forms. He was one of the original founders of the Dublin Microscopical Club, and continued to the very last one of its most diligent working members. It ought to be remembered that all this work was done at stray leisure moments snatched from more serious business; and however open to criticism his largest work, the "Report on Irish Diatomaceæ," is, none were more conscious of its defects than its author. Pleasant and cheerful in his manners, he was often a great source of encouragement to his many friends. The small circle in Dublin, bound together by many ties for these now more than twenty-five years, will very sadly feel his loss, and there are doubtless others, too, who, when they read this notice, will sympathise with them, and feel that they may add to the names of Harvey, Jones, Kinahan, and Moore, that of O'Meara.

THE Municipal Council of Paris have decided with respect to the electric lighting of the Avenue de l'Opéra, to continue the agreement with the Jablockhoff Company up to May 1, 1881. We understand the gas experiments in the Rue de Quatre Septembre are not to be continued.

THROUGH the Clarendon Press, Col. A. R. Clarke, C.B., is about to publish a treatise on Geodesy, in which the whole subject is treated in the light of the latest researches.

A TELEGRAM from Prof. Milne, of Japan, to Prof. John Perry, dated February 25, at 2 p.m., states that there had just occurred in Yedo a severe earthquake. Prof. Perry states that about two months ago occurred the most severe earthquake felt in Yedo for twenty years, so that we must regard the present as a period of great seismic activity. Mr. F. V. Dickins, writing to the *Times* in connection with this announcement, states that up to the end of 1878, when he left Japan, after some years residence in that country, the natives constantly predicted severe and destructive earthquakes in this pre ent year 1880. "The Japanese are singularly accurate observers of natural phenomena and of their cyclical periods, and are also, according to the