for this occasion or for any other purpose. If he has been engaged in any scientific or literary research he should indicate its character, and generally give evidence as to his previous career and *bonâ fides*. The holders of the fellowships are required to reside in Baltimore during the entire academic session, and they are not permitted to engage in teaching, out of the walls of the University, unless for exceptional reasons in other colleges which may ask for some temporary service. They are expected to devote all their time to study under the guidance of one of the professors, or if there be no professor in the chosen department, under the general approbation of the Faculty. Toward the close of the Academic year a report of his work is expected from each Fellow. As opportunities offer, the Fellows are encouraged to prepare and read lectures or essays on subjects to which they have given special attention. They are also required to render occasional services as examiners or as assistants in the laboratories; but those services are not burdensome, unless they are compensated by additional stipends. Those who become distinguished by their attainments may be assured of the constant encouragement of the Faculty. With all these precautions there seems little chance of the Johns Hopkins University being eaten up by idle Fellows.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, April 11.—"The Acceleration of Oxidation caused by the Least Refrangible End of the Spectrum," by Capt. Abney, R.E., F.R.S.

In a paper contributed to the *Philosophical Magazine* in January last, the author expressed an opinion that Chastaing's idea regarding an acceleration of oxidation being caused by red light might prove true in regard to the oxidation of the photographic image, and elsewhere[1] that Becquerel's coloured spectra might be explained on the same principles, and this he finds to be true as regards oxidation of the photographic image.

A silver bromide film was exposed to diffused light. It was then submitted to the action of the solar spectrum, whilst immersed in a solution of potassium permanganate, hydroxyl, potassium bichromate, or nitric acid, or in ozone. When the strength of these was correct, a reversed image of the least refrangible end of the spectrum was obtained, an increase in oxidation taking place where the red rays acted, the reversal commencing somewhere near D, and extending into the ultra-red.

The accelerating effect of the red rays is most marked when the solutions are weak; but there is a limit to the dilution caused by the fact that in the films employed the silver salt is sensitive as far as the wave length 10,000, and there must be sufficient strength to oxidise the invisible image as it is formed, besides gradually destroying the effect of the preliminary exposure. With silver iodide, as there is no reduction by the red rays, the reversed action is much more readily obtained.

A reversed image of the least refrangible end of the spectrum can thus be produced by using solutions of a certain strength, whilst if made more dilute an unreversed image is obtained. This throws a light on Draper's photographs of this region of the spectrum.

Geological Society, March 6.—Henry Clifton Sorby, F.R.S., president, in the chair.—Henry Edward Richard Bright, George James Cotton Broom, William James Farrer, George Scamell, and Joseph Fletcher White were elected Fellows of the Society.—The following communications were read:—On the geology of Gibraltar, by Prof. A. C. Ramsay, F.R.S., and James Geikie, F.R.S. In this paper the authors, after giving some account of the physical features of Gibraltar, described in detail the various rock-masses of which the peninsula is composed. The chief rock is a pale grey, bedded limestone, overlain by shales containing beds and bands of grit, mudstone, and limestone. Fossils are very rarely met with in the limestone, and have never as yet been found in the shales. The only recognisable fossil they obtained from the limestone was a *Rhynchonella*, which Messrs. Etheridge and Davidson think is most likely *Rh. concinna*. This would make the beds of Jurassic age. The limestone forms the great eastern escarpment, and dips west under the shales, which form the lower slopes upon which the town is built. The dips vary from 12° or 20° up to vertical. The connection of these strata with the rocks of the adjoining districts in Spain and the opposite coast of Africa was traced, and it was shown that the Gibraltar limestone reappears in Ape's Hill in Barbary, while the overlying shales and the sandstones of Queen of Spain's Chair form all the ground to the west of Ape's Hill up to Cape Spartel. The Jurassic strata of Gibraltar are overlain by various superficial accumulations, the oldest of which is a great mass of limestone agglomerate, which is unfossiliferous, and shows as a rule no trace of stratification. It is made up of angular blocks of limestone of all shapes and sizes, and rests upon an uneven surface of limestone: it also covers wide areas underneath which only shales are present. It is excessively denuded, being worn into ravines and gullies, and presents generally a highly honeycombed surface. Terraces of marine erosion have also been excavated in it. It is not now accreting, and could not have been formed under present conditions of climate and surface. The authors gave at length their reasons for believing it to have been the result of a severe climate. The blocks were wedged out by the action of frost, and the heaps of angular *débris* thus formed were saturated by water derived from melting snows, and so were caused to flow *en masse* down the mountain slopes and over the gently inclined ground at their base. The caves and fissures of Gibraltar were then described. It was shown that the true bone-breccias were confined to these. Many of these fossiliferous breccias are of later date than the great agglomerate, since they are met with in fissures and caves that intersect the limestone and limestone agglomerate alike. When the mammalia tenanted Gibraltar, Africa and Europe were united, and the climate was genial. All round the rock occur platforms, ledges, and plateaus, which are evidently the work of the sea. These erosion-terraces are covered in many places with calcareous sandstones containing recent species of Mediterranean shells. Such marine deposits occur up to a height of 700 feet. The movement of depression was interrupted by pauses of longer or shorter duration, and the climatic conditions were probably much the same as at present. After the rock had been re-elevated, the subaërial forces modified the surface of the marine sands that covered the limestone platforms, so that they came to form long sand slopes. The land at this period was of greater extent than it is now, and some grounds exist for believing Europe to have been again united to Africa, for mammalian remains occur here and there in the deposits that overlie the limestone platforms. These relics, however, it is just possible may be derivative. The climate was probably still genial like the present. Overlying the marine and subaërial deposits just referred to occurs an upper and younger accumulation of massive unfossiliferous limestone agglomerate. This deposit the authors believe to owe its origin to severe climatic conditions. After the marine deposits that cloak so much of the eastern side of the rock had been weathered into subaërial sand-slopes, large blocks were detached from the cliffs and steep slopes, and these dropped down upon the sand and were soon drifted over. By and by the blocks fell in such quantities that the sand-slopes in many places were completely buried under a talus of limestone *débris*. This was subsequently consolidated by infiltration into a solid agglomerate, in the same way as the underlying sands were hardened into sandstone. These sandstones contain a few blocks of limestone only in their upper portions. In their horizontally-bedded and lower-lying portions no limestone blocks occur. This later agglomerate bears every stamp of great antiquity, and could not have been formed under present geographical and climatic conditions. The surface is honeycombed and worn, just like that of the solid limestone and the older limestone agglomerate. Since its accumulation the climate has greatly changed, the present being characterised by the absence of frost. In concluding, the authors discussed at length the cause of the cold conditions that gave rise to the great limestone agglomerates, and argued that this cause could not have been *elevation of the land*. They also pointed out that a *submergence of the Sahara* would be equally incompetent to bring about the desiderated climatic conditions, and that even a former much greater elevation of the land, combined with the appearance of a Sahara sea, would fail to supply us with the severe winter climate that was necessary to produce the great agglomerates. They thought that the most probable explanation of the phenomena described is that the cold conditions referred to were contemporaneous with that general refrigeration of climate which took place over so vast an area in our hemisphere during pleistocene times. The limestone agglomerates they look upon as the equivalents of those glacial deposits that occur so plentifully in our own and other countries, and the bone breccias, which are intermediate in date between the lower and upper limestone agglomerates, are paralleled by the interglacial beds of the British Islands, Sweden, Switzerland,

[1] "Treatise on Photography," p. 225. Longmans.

&c.—Notes on the geology of Japan, by J. G. H. Godfrey, F.G.S.

Physical Society, March 16.—Prof. W. G. Adams, president, in the chair.—A special general meeting was held for the election, as an *ex officio* honorary member of the Society, of the President of the Physical Society of Paris.—The following candidates were then elected Members of the Society:—J. S. Bergheim, W. M. Hicks, M.A., Dr. J. Hopkinson, M.A., D.Sc., Miss E. Prance, and T. Wills.—The Secretary read a paper by Mr. W. J. Millar, C.E. on the transmission of vocal and other sounds by wires. The author was led, mainly by a consideration of the manner in which sounds are conveyed through walls and partitions, to make an extensive series of experiments on this subject, from which he concludes that conversation can be carried on at considerable distances by simply employing stretched wires provided with suitable vibrating discs. In one experiment two copper wires were attached to points on a telegraph wire 150 yards apart, and breathing, singing, &c., were distinctly audible; by stretched wires extending through a house and provided with mouth- and ear-pieces in the several rooms, conversation could be carried on without difficulty. The materials employed for terminals were very varied, and the vibrating disc, whether metal, wood, or india-rubber, &c., was generally formed as a drum-head, the wire being fastened at its centre. The volume of sound appears to be greater with a heavy wire, but in all cases it requires to be stretched.—The President referred to the experiments of Wheatstone on the conduction of sound by vibrating bodies, especially long wooden rods. He mentioned that in 1856 a performance was given at the Polytechnic at which numerous experiments connected with such conduction were exhibited. Some years ago M. Cornu, in conjunction with M. Mercadier, made experiments which showed that vibrations can be transmitted along a copper wire and rendered visible at the distant end on a rotating blackened drum. The free end of the wire was attached to a piece of copperfoil fixed at its base and provided with a point which left a clear trace on the drum when the distant end was attached to, say, a vibrating tuning-fork. By connecting such an arrangement with different instruments and varying the players also, M. Cornu has ascertained the form and extent of vibration corresponding to each. The arrangement adopted by him was exhibited by Prof. Adams, and in conclusion he referred to a passage in Hooke's "Micrographia," which clearly showed that he was aware of the facility with which sounds can be transmitted by solid bodies.—Mr. W. H. Preece described some experiments made in September of last year, by Mr. A. W. Heaviside and Mr. Nixon at Newcastle-on-Tyne on this subject, from which they conclude that the method might certainly be applied with success to the transmission of speech within a building. They find that a No. 4 wire gives the best results. The terminals were wooden discs about $\frac{1}{8}$ in. thick, and to these the wire was attached "end on," but speech could be distinctly heard by laying such a disc on any intermediate point of the wire. When the wire was particularly still speech was audible up to 200 yards.—Mr. G. W. von Tunzelmann then read a paper on the production of thermo-electric currents in wires subjected to mechanical strain. The wire, of iron, steel, or copper, was stretched vertically between two cans which could be maintained at different temperatures. It was fixed in the base of the lower can and held in the upper one by a clamp attached to the shorter arm of a lever, to the longer arm of which the stretching weight was applied. The free ends of the wire were joined to copper wires which led to the Thomson galvanometer, these junctions being covered with cotton wool. He has succeeded in reconciling the contradictory conclusions arrived at by Sir W. Thomson and M. Le Roux; whereas the former only used moderate strains, the latter worked near the breaking limit, and the author finds that if the weight be gradually increased the direction of the current changes, and hence these two authorities found the currents to flow in opposite directions. A great number of experiments were made, and from them it is evident that on applying a strain the deflection does not immediately attain a maximum, but it gradually rises for about eight minutes, and then gradually falls, attaining a stationary point at the end of about twelve minutes.—Prof. Adams then exhibited a simple arrangement for projecting Lissajous' figures on to the screen which has been made by his assistant, Mr. Furze. It consists of two strong straight steel springs, fixed in separate heavy iron frames, the one horizontally and the other vertically. The latter carries at its end a double convex lens and the former carries a black disc perforated with a small hole and is so mounted that its length may be varied as required. If now the disc be placed before the lamp and the point of light be focussed on the screen by means of the lens on the vertical spring, the two springs may be caused to vibrate and the spot will describe a figure corresponding to their relative rates.—Dr. Guthrie exhibited an experiment to show the behaviour of colloids and crystalloids in relation to electrolysis. A solution of gelatine was coloured with litmus, made acid and mixed with sulphate of soda; two platinum poles of a 6-cell Groves' battery were then immersed in it and the gelatine was allowed to set. The mass became comparatively clear round the positive pole and red and blue clouds were formed which met across a space of about $1\frac{1}{2}$ in. in three-quarters of an hour. The relative advance of the ions was indicated by the brightening of the litmus round one pole and by the blue coloration produced at the other.

Chemical Society, April 4.—Dr. Gladstone, president, in the chair.—A lecture "On the Application of the Microscope to some Special Branches of Chemistry" was delivered by Mr. H. C. Sorby, F.R.S. The lecturer confined his discourse to the application of the microscope for determining the refractive indices of liquids and solids. An object is placed on the stage of a microscope and the focus adjusted accurately; on covering the object with a plate of some refracting substance, the object will be invisible; to bring it again into focus the body of the microscope must be moved further out. If this distance be "d" and the thickness of the plate be T, then the index of refraction $= \frac{T}{T-d}$. This distance can be measured either by a scale and vernier attached to the body of the microscope or by graduating the head of the screw which works the fine adjustment. The lecturer then described the various methods by which the two quantities T and d could be practically measured to $\frac{1}{1000}$th of an inch; the curious and diversified images seen by observing with a microscope a circle or a grating through transparent plates of various substances were then explained. Minerals having no double refraction are unifocal, *i.e.*, both systems of lines in a grating can be seen at the same focus. Minerals having double refraction are bifocal, *i.e.*, only one system of lines can be seen at one focus, a new focus having to be found in order to see the lines at right angles to the first set. This method has enabled the author to identify various minerals in sections $\frac{1}{500}$th inch thick and $\frac{1}{100}$th inch in diameter. Thus in a dolerite $\frac{1}{1000}$th inch thick, a zeolite, labradorite, calcite, and augite were identified with almost absolute certainty. In sections of shells $\frac{1}{1000}$th of an inch thick calcite can be easily distinguished from arragonite. In conclusion the lecturer referred to the connection between the indices of refraction and chemical composition; the data are defective at present, but several points have already been made out; thus of two minerals having similar compositions, but one containing calcium and the other one of the alkalies, the first has a higher index of refraction; a lime garnet on the other hand has a lower index than a precious garnet which contains iron instead of calcium.

Linnean Society, April 4.—W. Carruthers, F.R.S., vice-president, in the chair.—There was exhibited by Dr. H. Trimen the base of the stem of the Water Hemlock (*Cicuta virosa*, Linn.) in its floating winter state, obtained near Yarmouth. This was well figured in the *Phil. Trans.* last century, but since has seldom been referred to by botanists.—Mr. G. Murray showed under the microscope specimens of growing Saprolegnia, exhibiting terminal and interstitial oogonia.—A paper on some minute hymenopterous insects, by Prof. J. O. Westwood was, in his absence read by Mr. McLachlan. This contains descriptions of the following new forms: *Mymar taprobanicus, M. wolastonii, Alaptus excisus, Oligosita subfasciata, O. stanforthii, O. nodicornis*, and *Trichogramma erosicornis*. All singular insects alike interesting structurally and as regards habits, &c.—A short notice was made by Mr. M. C. Cooke on a collection of fungi from Texas, made by Mr. Ravenel. Adding all other recorded species the series shows that much yet remains unknown in the mycologic flora of what probably is one of the richest States of the Union.—The Secretary read some remarks on the peculiar properties ascribed to a fungus by the Samoans, by the Rev. Thos. Powell. The natives name it "Limamea"; specimens of which have been forwarded to the Rev. M. Berkeley for identification. It destroys their bread-fruit trees and the Chestnut (*Inocarpus edulis*). An antidote to its ravages is said to exist in the liliaceous plant *Crinum asiaticum*, which the natives grow

between the trees liable to be affected.—The following gentlemen were elected Fellows of the Society:—Frederick Manson Bailey, Dr. Archibald Hewan, George Payne, jun., and James R. Reid.

Zoological Society, April 2.—Prof. Newton, F.R.S., vice-president, in the chair.—A communication was read from the Marquis of Tweeddale, F.R.S., containing the seventh of his contributions to the ornithology of the Philippines. The present paper gave an account of the collection made by Mr. A. H. Everett in the Island of Panaon.—Mr. A. G. Butler, read descriptions of new Lepidoptera of the group Bombycites in the collection of the British Museum.—A communication was read from M. E. Oustelet, containing the description of a new species of cassowary, from New Guinea, proposed to be called *Casuarius edwardsi*.—A communication was read from Mr. F. Nicholson, F.Z.S., containing the description of an apparently new species of American pipit from Peru, which he proposed to call *Anthus peruvianus*.—Prof. A. H. Garrod, F.R.S., read some notes on the placentation of *Hyomoschus aquaticus* as observed in the pregnant uterus of a fresh specimen of this animal recently examined.

Victoria (Philosophical) Institute, April 1.—A paper on modern geology and its bearing on the antiquity of man, was read by Prof. Birks, of Cambridge.

Institution of Civil Engineers, April 9.—Mr. Bateman, president, in the chair.—The paper read was on the embankments of the River Thames, by Mr. Edward. Bazalgette, Assoc. Inst. C.E.

EDINBURGH

University Chemical Society, March 13.—Mr. W. Inglis Clarke, B.Sc., vice-president, in the chair.—A paper was read by Mr. Adrian Blaikie on the salts of trimethylsulphine, containing the results of a joint investigation carried on by Prof. Crum-Brown and himself. They find that the oxalate of trimethylsulphine crystallises in clear hydroscopic plates with one molecule of water of crystallisation, $\{(CH_3)_3S\}_2C_2O_4 + H_2O$. On heating, the salt at 110° C. gives off its water of crystallisation, and at 140° gives off sulphide of methyl, leaving pure oxalate of methyl, $\{(CH_3)_3S\}_2C_2O_4 = (CH_3)_2C_2O_4 + 2(CH_3)_2S$. The sulphide of trimethylsulphine, obtained by mixing equal quantities of sulphydrate and oxyhydrate of trimethylsulphine, can only be obtained in a solution which when evaporated over phosphoric anhydride in an atmosphere of coal gas, decomposes, after a certain strength of solution has been reached, into sulphide of methyl, $\{(CH_3)_3S\}_2S = 3(CH_3)_2S$. The hyposulphite of trimethylsulphine is obtained either by oxidation of the sulphide or polysulphide of trimethylsulphine. It crystallises in clear hydroscopic four-sided prisms with one molecule of water of crystallisation, $\{(CH_3)_3S\}_2S_2O_3 + H_2O$. This salt has all the characteristics of an alkaline hyposulphite. On drying over phosphoric anhydride it gives off its water of crystallisation, and on heating the anhydrous salt at 137° C. it gives off 23·5 per cent. sulphide of methyl, leaving a white crystalline substance, soluble in water, alcohol, and ether, which is at present under investigation.—A paper was also read by Mr. John Treharne, M.B., C.M., on some phenomena observed in the cooling of fats.

PARIS

Academy of Sciences, April 15.—M. Fizeau in the chair.—The following among other papers were read:—Sun-spots and magnetism, by M. Faye. Replying to Prof. Piazzi Smyth's question (NATURE, vol. xvii. p. 220), M. Faye says:—1. The periods 10·45 years for the needle, 11·11 for the spots, have been well determined by Mr. Broun and M. Wolf respectively. 2. The two phenomena are not related. 3. A combination of favourable circumstances, reproduced every 176 years, has led to belief in their connection. 4. These temporary concomitances are not absolutely rare in the history of sciences.—On a new compound of palladium, by MM. Sainte-Claire Deville and Debray. This relates to an ammoniacal sesquichloride of palladium, obtained by causing chlorine solution to act in the cold state on yellow chloride of palladamine. One analysis of it gave: palladium, 42·6; chlorine, 43·5; ammonia, 12·9.—Experiments tending to imitate various forms of foldings, contortions, and ruptures met with in the earth's crust (continued), by M. Daubrée. A thin layer of an adhesive colouring matter is applied to the surface of a distended balloon of vulcanised caoutchouc. On letting some of the air escape the coated portion forms a protuberance with regular and parallel wrinkles in certain directions; and M. Daubrée finds like phenomena in the earth's crust.—On the annual temperature of the air, the earth, and the water, in the Jardin des Plantes of Montpellier, according to twenty-six years of observations, by M. Martini. The mean annual temperature (of the air) is 13·42°; at Paris and Montsouris Observatories it is 10·67° for the same twenty-six years. The mean annual temperature at 0·10m. depth in unsodded ground is inferior to that of the air (about 2°) if only morning observations are taken; but from observations morning and evening they are nearly the same (ground, 14·65°, and air 14·11°, in the year 1863). The mean temperature of the subterranean sheet of water is 12·77°.—Report on a memoir by M. Jobert relating to aerial respiration of some Brazilian fishes. M. Jobert has found several fishes in the Upper Amazon, having two modes of respiration, one by the gills, the other by the alimentary canal, swallowing air and evacuating by the anus a gas which has more CO_2 and less O than air has. The intestine has a number of filiform appendices composed of blood vessels, which doubtless absorb some of the swallowed oxygen. In other fishes the gas returns by the mouth instead of the anus. In others the swimming-bladder (which has numerous blood vessels in its walls) takes the place of the lungs.—On the equivalent of gallium, by M. Lecoq de Boisbaudran. From calcination of the alum and calcination of the nitrate the mean obtained for the equivalent is 69·865. This agrees closely with a theoretical number got for a body between aluminium and indium.—On the mode of formation of the meteoritic breccia of Santa Catharina, Brazil, by M. Meunier. Four phenomena are traced:—1. Shattering of the metallic iron, and accumulation of the fragments with spaces between. 2. Penetration of sulphuretted hydrogen into these spaces, producing sulphur, and a mixture of pyrrhotine and graphite. 3. Mechanical crushing of the mass. 4. Production of new graphitous matter filling the fissures of the second formation.—On the dissociation of hydrate of chloral, by MM. Moitessier and Engel. From experiment they find that the tension of the vapour of the substance, when boiling, is superior to atmospheric pressure, hence they infer dissociation of the hydrate between 78° and 100° as affirmed by M. Wurtz.—On a rare form of the hepatic organ in worms, by M. Chatin. In a nematoid of the group of *Agamonema*, Dies, an exterior glandular mass is developed round the middle intestine.—Experiments proving that pure urea never causes convulsive disorders, by MM. Feltz and Ritter.—On two rainbows with opposite curvature, by M. Faraguet. This was observed at Agen, on April 8. The bows formed a figure like x.—M. Tommasi presented a new system of relays for long submarine cables.

CONTENTS