Mr. Solomon often succeeded in taking as many as 500 per minute. In this process some hundred shells are exposed at a time to the rays. The oysters, spread on trays, are carried under the specially constructed cylinders by means of an electric motor. These great cylinders are cooled by means of suitable water jackets, and can thus be kept working continuously.

The oysters in which there is no sign of pearl formation are put back to their beds. Those in which good-sized pearls are detected are removed and opened, and the pearls promptly utilised. Those showing no pearls of adequate commercial value, but containing promising seed or immature pearls, are carefully placed in hospital. This hospital has rather a novel object; not the cure of the pearl disease (for the much prized gem is but a pathological growth), but, on the contrary, everything is done to keep the mollusc in *stutu quo ante* so that the disease may progress as rapidly as possible to the production of valuable pearls and to the death of the incurable patient.

The question seems to arise, can the normal, or perhaps we should say the abnormal, conditions of the pearl-producing bivalve be well enough imitated in captivity to ensure the continued growth of the pearls? May not the "change of water" (as they must be kept nearer the surface) secure for the sufferers immunity from their diseased process? One might have imagined that a greater amount of sunlight, more oxygen, altered temperature, different nutrition, lessened pressure, and other changed conditions we think not of, would so influence the life of the mollusc that it might depart from its pathological but useful habit of producing these valued round bits of shell material, and the hospital might thus prove a true *Kur-Anstalt* instead of a pearl-breeding depôt. But Mr. Solomon tested these points, and he has satisfied himself that, if he can be certain to transmit in all circumstances the oysters to and from his laboratory without injury to their well-being, all other difficulties have already been overcome. As to the lucrative commercial value of the undertaking, time alone can tell; sufficient has not yet elapsed to make it demonstrable by actual proof that pearls can thus be hatched *en gros*.

## UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Two Graces will be offered to the Senate at the Congregation on Thursday, February 13; the first gratefully accepts the generous offer of the Drapers' Company to contribute a sum of 200*l.* a year until 1919 towards the stipend of a second professorship in the department of agriculture, and the second establishes in the University a professorship of agricultural botany.

The council of the Senate has reported that it is of opinion that the University should hold a Darwin celebration in the course of the year 1909. The council points out that Charles Darwin was born on February 12, 1809, and that the "Origin of Species" was published on November 24, 1859. The hundredth anniversary of the former event, and the fiftieth anniversary of the latter, will therefore fall in the course of the year 1909. It is suggested that representatives of universities and other learned bodies, together with distinguished individuals, should receive invitations to visit the University on the occasion. Should this report be confirmed by the Senate, the council will appoint a committee to consider the details of the proposed celebration. The week beginning June 20, 1909, appears to the council to be the most suitable time for the celebration.

LONDON.—The degree of D.Sc. has been conferred on Mr. H. B. Fantham for a thesis entitled "*Spirochaeta* (*Trypanosoma*) *balbianii* (Certes) and *Spirochaeta anodontae* (Keysselitz); their Movements, Structure, and Affinities," and other researches in zoology.

Dr. Otto Stapf has commenced a university course of ten lectures on "Grasses: their Structure, Biology, Distribution, and Classification," and Dr. Beddard, F.R.S., a course of four lectures on "The Circulatory System of Reptiles." Both courses are being delivered at University College on Mondays, the botany lectures at 4 p.m. and the zoology lectures at 5 p.m., admission to these lectures being free.

A university course of four advanced lectures in zoology on "Tooth Development and Morphology" will be given by Prof. H. W. Marett Tims, at Bedford College for Women, at 5 p.m. on Tuesdays, commencing March 3. Admission will be free.

Arrangements have been made for university courses in geology by Prof. Garwood, on "The Geology and Physiography of Arctic Europe" (in March); by Prof. Seeley, F.R.S., on "The Thames and its Tributaries" (in May); by Dr. Evans, on "Recent Advances in the Determination of Minerals by Optical Methods" (in June); and by Miss Raisin, on "The Geological Structure of the Area of the Vosges" (in October).

In future, a candidate for the D.Sc. degree may be required by the examiners, as an additional test, to submit within a given period a reasoned report on a subject prescribed by them. Candidates for the B.Sc. honours degree in mathematics as internal students are to be allowed, under certain conditions, to submit research work, and such work will be taken into account in estimating their qualifications.

---

THE Lord Alverstone, G.C.M.G., Lord Chief Justice of England, will present prizes and certificates to students of evening classes and the day college of the South-Western Polytechnic, Chelsea, on March 13.

THE Board of Education has issued a return (325) showing the application by local authorities of funds for higher education in England and Wales during the official year 1905–6. It appears that the total expenditure on account of education other than elementary during the year was 3,355,434*l.* Of this amount, 706,149*l.* was spent on secondary schools and 234,182*l.* on pupil-teacher centres. On behalf of evening schools and institutions for higher and technical education, 1,200,789*l.* was expended, and in day schools of similar scope 258,517*l.* Exhibitions and bursaries at secondary schools, pupil-teacher centres, evening and day technical institutions, accounted for 376,762*l.* The training of teachers cost 71,910*l.*, the salaries of officers other than teachers 120,531*l.*, and 150,660*l.* was paid on account of loans. The part of the total amount which was expended in Wales reached 214,185*l.*, more than half of which was devoted to secondary schools.

## SOCIETIES AND ACADEMIES.

### LONDON.

**Royal Society,** November 21, 1907.—"Note on the Sensibility of the Ear to the Direction of Explosive Sounds." By A. **Mallock,** F.R.S.

Soon after the introduction of modern rifles, which give their projectiles a velocity much higher than that of sound, the author noticed that when standing in a position in front of the gun, and not far from the line of fire, the sound seemed to come, not from the firing point, but from some point considerably in advance of the gun. The natural explanation seemed to be that the sound thus heard was not that of the explosion itself, but was caused by the wave-surface, which is generated in the air by the projectile moving at a velocity higher than that of sound. In 1898 the author made observations at the ranges at Broundown to see if the apparent directions agreed with this supposition; and in the present year he has again made similar experiments in much more favourable circumstances. It is clear (if the source of the sound is due to the wave caused by the projectile) that the apparent direction of the sound will be the normal to the wave-surface, and that if the direction of this normal is known, the velocity of the projectile, at the time that that particular portion of the wave-surface was generated which ultimately reaches the observer, can be calculated.

These observations are now recorded, not as giving a practical method of ascertaining the velocity of projectiles, but as showing that the ear can distinguish with considerable accuracy the direction of a sound which consists, not of a train of waves, but, at most, of two waves only. The figure gives the plan of the range and the stations at which the observations were made.

The arrows through these points show the direction of the sound as judged by ear. Each arrow is the mean

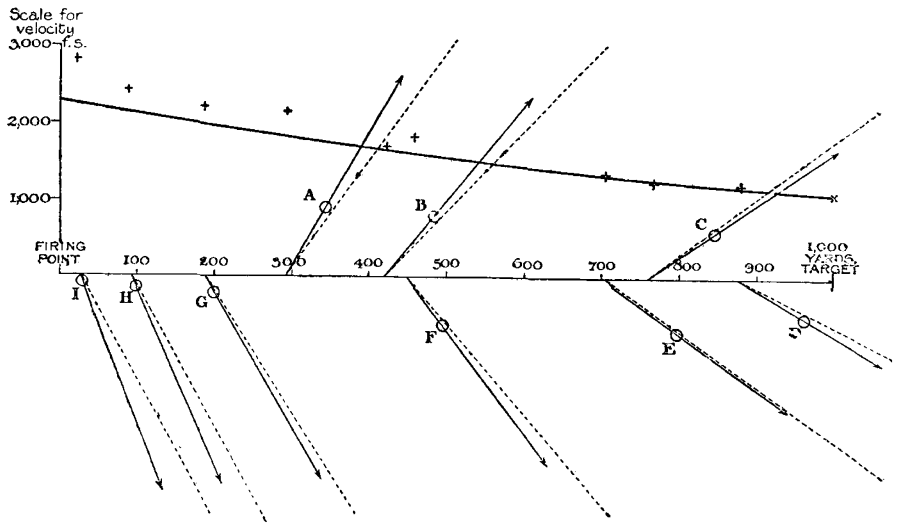
of eight observations, which rarely differed among themselves by more than two or three degrees.

That portion of the wave-surface which passes the observer at any station was generated at the point where the apparent direction of the sound cuts the line of fire, and since the trace of the wave on the trajectory necessarily has the velocity of the projectile at the place where it was formed, and moves along the normal with the ordinary velocity of sound, it is plain that at those points the velocity of the bullet is the velocity of sound ÷ the sine of the angle which the tangent to the wave-surface makes with the trajectory.

The spots, +, show the velocities thus computed, and the full curve gives the actual velocity, as determined by firing, at various ranges up to 1000 yards, into a ballistic pendulum.

The agreement of the values of the velocities thus obtained with the true velocities shows the degree of accuracy with which the direction of the sound was estimated. In this case the difference between the true and observed directions was seldom more than a few degrees, and was generally in one direction.

A sound which is caused by the detached waves, such as those which accompany a bullet, can scarcely be said to have a pitch, but the wave-length is certainly small




The arrows show the apparent direction of the sound at the stations A B C . . . The dotted lines are the normals to the wave-surface, calculated from the known velocity of the projectile. The full curve is the velocity of the projectile, obtained from experiments with the ballistic pendulum. The spots, +, are the velocities of the projectile, as deduced from the observed direction of the sound.

compared with the distance between the ears, and is, indeed, comparable with the dimensions of the bullet itself. It would seem, therefore, that the ears can determine the direction of a sound, not only by difference of phase, but by the actual difference in the times at which a single pulse reaches them.

"Results of the Interaction of Mercury with Alloys of other Metals." By Dr. J. W. **Mallet,** F.R.S.

It being well known that alloying metals with each other often modifies notably their relations to acids and other non-metallic reagents, it seemed desirable to ascertain what the behaviour would be of solid alloys to liquid metallic mercury.

In the experiments reported in this paper three alloys were used, namely, tin-platinum, silver-platinum, and copper-tin, approximately $PtSn_2$, $PtAg_4$, and $SnCu_4$. These were shaken up in a finely divided state with pure mercury in large excess. In the first case the tin was completely protected by the platinum from amalgamation, and neither of the solid metals was dissolved by the mercury. In the second case the presence of the silver brought about amalgamation of the platinum, which would not have been so affected if alone, and both metals were dissolved by the mercury, the platinum, however, in less proportion than that in which it was present in the solid alloy. In the third case, mere traces of the copper and tin were dissolved by the mercury, although each of the constituent metals of the alloy would by itself be readily taken up. A solid amalgam was, however, formed.

These experiments, which were interrupted by illness of the author, go to show that the relations of mercury to alloys are not the same—at any rate for those tried—as to the component metals taken separately.

December 5, 1907.—"The Reciprocal Innervation of Antagonistic Muscles. Note XI. Further Observations on Successive Induction." By Prof. C. S. **Sherrington,** F.R.S.

This communication announces that an essential part of the flexion-reflex of the limb is a contraction of the extensor muscles which sets in immediately the external stimulus which excites the reflex is discontinued. The external stimulus, it may be recalled, while exciting the flexor muscles to contraction, produces relaxation of their antagonists, the extensors. This latter it effects by quelling (inhibiting) all nervous discharge for the time being in the extensor moto-neurones of the spinal cord. The inhibition of the moto-neurones is on cessation of the stimulus followed by a superactivity in them accompanied by the discharge of impulses from them into the muscles they innervate, namely, the extensors. This tendency to motor discharge which follows on the inhibition had been noted in previous communications by Prof. Sherrington, but the evidence of it had hitherto been only indirect. It had been found that on withdrawing the inhibitory stimulus the inhibited part of the reflex arc showed itself more easily excitable by stimuli than it had been before the inhibition occurred.

In the present communication it is shown that the inhibited centre actually discharges spontaneously on withdrawal of the external inhibitory stimulus that depresses it. It is further shown that the inhibited centre will spontaneously discharge even in face of a weak inhibitory stimulus if that stimulus follows on a strong inhibitory one. The process in virtue of which inhibition of the arc leads to or induces a subsequent superactivity of the arc is called *successive induction*, because of its analogy to certain processes in the physiology of vision which are also called inductive. The intensity of the successive induction increases with increase of the intensity of the inhibitory stimulus and with increase—up to certain limits—of the duration of the inhibitory stimulus. In other words, *the stronger and longer the inhibitory stimulus*, the greater the contraction which ensues on the withdrawal of the stimulus.

The contraction of the extensors of the limb which thus follows on their relaxation by reflex inhibition is probably an important, perhaps the most important, factor in the extension phase of the reflex stepping of the limb. Its occurrence supplies an explanation for the relatively poor representation of extension as a primary movement in the motor area of the cortex cerebri. It may be fundamentally analogous to the excitation which occurs in a peripheral nerve at the site of the anode of a voltaic current when the passage of the current is broken. It is, at any rate, perhaps the most striking instance known of a depression which in Arnim v. Tschermak's terms is *allonomic*, being followed by a reverse condition the process of which is *autonomic*. In other words, an allonomic depression

(? assimilatory) of the nerve-centre induces an autonomic (? dissimilatory) excitation.

**Geological Society**, January 8.—Sir Archibald Geikie, K.C.B., Sec.R.S., president, in the chair.—Chronology of the Glacial epoch in North America: Prof. G. F. **Wright.** In the case of Plum Creek, Lorain County (Ohio), the study of the activity of the stream and of the amount of work done since the Glacial epoch has yielded important results. This stream began erosion when the temporary lake, held up by the ice, was maintained at the level of its Fort Wayne outlet; it has never had anything more resistant than Till to act upon. From a section 5000 feet long it has excavated 34 million cubic feet of Boulder-clay, removing it from exposed banks 1600 feet long. Twelve years' erosion of a 500-feet length of a part of the trough of the stream gives a rate of 8450 cubic feet per annum. Therefore, the removal of 34 million cubic feet from the 5000-feet section would give a period of 2505 years. The erosion of the Niagara Gorge began later than that of Plum Creek, and dates from midway between the disappearance of the ice from northern Ohio and from Quebec. If conditions have been uniform, the age of the gorge would be 7000 years. The author concludes, with some confidence, that the gorge is less than 10,000 years old, and that the ice of the Glacial epoch continued down to that time to such an extent over the lower St. Lawrence Valley and Central New York that it obstructed the eastern drainage of the Great Lakes.—The application of quantitative methods to the study of the structure and history of rocks: Dr. H. C. **Sorby**, F.R.S. The angle of rest in the case of sand-grains of varying size and quality enables the velocity of current necessary to keep such sand drifting, and that needed to move it when at rest, to be ascertained approximately. The comparison of this angle with that in sedimentary rocks made of similar materials may be used to determine the vertical contraction of rocks since deposition, the average in cases studied in Tertiary and secondary rocks being from 100 to 57. The connection between the structure of "ripple-drift" and time is discussed. The connection between the structure of a deposit and depth of water is found to be difficult to study quantitatively. From the occurrence of "drift-bedding" the depth of water may be determined to within a few feet. The deposition of fine deposits, like clay, varies according to the amount of mud present and whether the grains subside separately or cohere together. When no pressure is applied, the amount of water included in the deposited clay may be 80 per cent., and when dry the empty spaces may still amount to 32 per cent. Many of the older rocks must now be only 20 per cent. of their original thickness. In the green slates of Langdale the volcanic eruptions sometimes occurred probably within a few weeks of one another, and at other times at more distant intervals. When deposited, part of the rock was probably analogous to fine, loose sand, and part to semi-liquid mud. In the Coal-measure sandstones deposition at the rate of 1 inch per minute was common, with intervals of little or no deposit. The volume of invisible cavities in rocks varies from 49 per cent. in some recent rocks to nearly 0 in the ancient slates. The packing of grains was discussed mathematically and experimentally. The methods of determining the volume of minute cavities in rocks were given. In some limestones the cavities have been reduced by pressure to close on the mathematical minimum, whereas in others the cavities are filled with carbonate of lime. Some oolites have had their cavities filled in a similar manner; in others most of the material of the original grain has been removed, and the present solidity is due to the filling-up of the cavities mainly by internal segregation. Among fine-grained rocks, the Chalk probably was originally a sort of semi-liquid with 70 per cent. of water, and in its present state is about 45 per cent. of its original thickness; the thickness of some clays must have diminished still more. By the measurement of green spots in slates it can be deduced that the rock before cleavage was more consolidated than rocks of the Coal-measures now are, and was then greatly compressed. The development of "slip-surfaces" in cleaved rocks is great, and furnishes additional proof that the cleavage is of mechanical origin. The volume of minute cavities in clay-rocks and their analogues of various ages were discussed. There is a distinct relation between it and the probable pressure to which the rocks have been exposed.

**Zoological Society**, January 14.—Prof. J. Rose Bradford, F.R.S., vice-president, in the chair.—Mammals obtained in the Shantung Peninsula, N. China, by Mr. M. P. Anderson, for the Duke of Bedford's exploration of eastern Asia: O. **Thomas.** No mammals had come from this region since the time of Consul Swinhoe, who visited it in 1866–8. The present series contained 106 specimens belonging to six species, of which one was new.—The musculature and other points in the anatomy of the engystomatid frog *Breviceps verrucosus*: F. E. **Beddard.**—The hermaphroditism of the amphipod *Orchestia deshayesii*, Audouin: C. L. **Boulenger.**

**Linnean Society**, January 16.—Prof. W. A. Herdman, F.R.S., president, in the chair.—Stages of soil denudation and forest destruction in the Tyrol: A. P. **Young.** Slides were shown from photographs taken in two valleys, one north of the Brenner Pass, the Navistal, near Innsbruck, and one south of the pass, the Schalderertal, near Brixen, illustrating various limits, commencing near the upper limit of the vine cultivation at about 700 metres to the snow limit at about 2800 metres. Great waste of soil is caused in forest land by the simultaneous felling of trees over single plots of ground, and in the higher levels by the encroachments of grazing animals. One effect of this waste is the recession, not only of the tree line, but also of the limit of continuous forests, which is generally considered as distinct from the tree line.—Notes on Brassica crosses: A. W. **Sutton.** The origin of some of the cultivated forms of Brassicas has been very obscure, and this has led to much confusion in their classification. It has naturally been supposed that by careful study of those types which intercross with one another, and of those which refuse to intercross, some light might be thrown upon the origin of many Brassicas which to-day form so important a portion of the plants used in agriculture and horticulture. Consequently, experiments were undertaken to investigate the tendency or otherwise to intercross. Various accepted forms of *Brassica oleracea* (such as kale, cabbage, savoy, and Brussels sprouts) were planted side by side and allowed to flower and seed. *Result*:—A large collection of nondescript plants, some of which, after selection, have been practically fixed as new and useful types. Some of the generally accepted types of *Brassica oleracea* were arranged in "sets" together with types of *Brassica campestris*, *B. rapa*, and *B. napus*, that is to say, swedes with rapes, cabbages with turnips, &c., and these were allowed to bloom in juxtaposition. *Result*:—Many hybrid plants resulted from certain "sets" where natural cross-fertilisation took place, and in other cases the pure parental types were reproduced when no cross-fertilisation occurred. The results were quite in accordance with what experience led the author to expect. As in the preceding experiments several types had been seeded together, the experiments were repeated under carefully controlled conditions in order to find by artificial cross-fertilisation to which of the types the resulting hybrid forms were due. Artificial crosses (about eighty-six) were attempted between many of the different types of Brassicas. As was expected, many attempted crosses failed to produce hybrid forms, no seed being developed, probably showing that in these cases crossing was impossible. Other crosses gave seeds, in some cases these being well developed, but in others small and immature. These seeds when sown produced intermediate or hybrid plants quite unlike the parental forms, thus showing that cross-fertilisation was possible and had occurred, confirming experience gained in the practical work of seed-growing.—Revision of the genus Illigera, Blume: S. T. **Dunn.**

**Chemical Society**. January 16.—Sir William Ramsay, K.C.B., F.R.S., president, in the chair.—Colour and constitution of azo-compounds, part ii., the salts of *p*-hydroxy-azo-compounds with mineral acids: J. J. **Fox** and J. T. **Hewitt.** The authors accept Tuck's statement that benzeneazonaphthol and its ethyl ether are similar in structure, but not his hypothesis that this structure is of the

azo type. They also regard Baker's attempt to formulate these compounds as carbonium salts as unsatisfactory, since it would involve an assumption that *p*-bromobenzene-azophenol hydrochloride is identical with *p*-chlorobenzene-azophenol hydrobromide, and they suggest, instead of the formulæ hitherto proposed, the constitution of oxonium salts for these substances thus, $NHPh.N:C_6H_4:O(H$ or $Et)Cl$.—A new method of determining vapour densities, part i.: P. **Blackman.**—Studies in the camphane series, part xxv., action of diazomethane on the two modifications of *iso*nitrosocamphor: M. O. **Forster** and H. **Holmes.** Diazomethane produces with the stable *iso*-nitrosocamphor the N-methyl ether, whilst with the unstable modification isomerisation to the stable variety only takes place.—The oxidation of aromatic hydrazines by metallic oxides, permanganates, and chromates: F. D. **Chattaway.** Experiments on the oxidation of a number of hydrazines have afforded evidence of the correctness of the view already put forward by the author that an unstable hydroxyhydrazine is first produced, which, in presence of alkalis, breaks down into the hydrocarbon, nitrogen, and water.—Studies in fermentation, part ii., the mechanism of alcoholic fermentation: A. **Slator.** A number of conclusions are drawn as to the relative velocities with which the four principal hexoses are fermented by living yeast, and it is shown that the results can be explained on the assumption that the reaction, which mainly controls the velocity of fermentation, is the decomposition of a stable compound between the enzyme and the sugar. Yeast appears to contain *glucozymase*, fermenting dextrose and levulose; *galactozymase*, fermenting galactose; and *mannozymase*, fermenting mannose.—Organic derivatives of silicon, part iv., the sulphonation of benzylethylpropylsilicyl oxide and of benzylethyldipropyl silicane: H. **Marsden** and F. S. **Kipping.** The authors have prepared benzylethylpropylsilicyl oxide, and find that on sulphonation it furnishes a sulphonic acid identical with that previously resolved into optical isomerides, so that there can now be no doubt as to the constitution of this substance.—The formation and reactions of imino-compounds, part vi., the formation of derivatives of hydrindine from *o*-phenylenediacetonitrile: C. W. **Moore** and J. F. **Thorpe.**—Valency: J. A. N. **Friend.**—The esterification constants of the normal fatty acids: J. J. **Sudborough** and J. M. **Gittings.** The value $E^{15^\circ}_{MeOH}$ for formic acid is 1124, acetic 104, propionic 92, and from butyric to stearic varies from 50 to 54.—The anomalous behaviour of the hydrogen electrode in solutions of lead salts and the existence of univalent lead ions in aqueous solutions: H. G. **Denham** and A. J. **Allmand.**—Amphoteric metallic hydroxides, part i.: J. K. **Wood.**—The use of pyridine bases as hydrogen carriers: W. E. **Cross** and J. B. **Cohen.** It is shown that pyridine facilitates the chlorination of benzene and toluene, and the bromination of the same hydrocarbons and of chlorotoluene and naphthalene.—Decomposition of hyponitrous acid: E. **Divers.**

EDINBURGH.

**Royal Society**, January 20.—Prof. J. C. Ewart, F.R.S., vice-president, in the chair.—The arterial pressure in man, i., methods: Dr. G. A. **Gibson.** A brief historic sketch of the methods used and instruments devised to measure the arterial pressure was followed by a demonstration of Dr. Gibson's own improved form of sphygmomanometer. The records of the pulsations were obtained in the usual way by pointers moving over a smoked surface rolled round a slowly rotating vertical cylinder. To estimate the pressure, the method introduced by Riva-Rocci was adopted. It consisted in compressing the brachial artery above the elbow until the radial artery ceased to beat. The compression bag was connected by flexible tubes with a mercury manometer, the pressure value of which was indicated by a float to which one of the recording pointers was attached. The radial pulsation was recorded by a transmission sphygmograph. As the pressure on the radial artery was gradually diminished by opening the valve the oscillations of the mercury began to increase in amplitude, and at a certain point the radial pulsations began to show themselves. The pressure in the mercury manometer, as given by the height of the record above the abscissa at the instant when the radial sphygmograph began to show distinct oscillations, was the measure of the systolic pressure. The gradual diminution in average pressure of the compressing bag as measured by the manometer was accompanied by an increase in amplitude of the oscillation until a certain average pressure was reached, followed by a decrease until the pressure was the ordinary atmospheric pressure. The lowest point of the maximum oscillation was taken to be the diastolic pressure. The two simultaneous records thus obtained gave all the data at a glance. Interesting examples of records were shown bearing upon various diseases and abnormalities.—Seismic radiations, ii.: Dr. C. G. **Knott.** On the assumption of a particular law of variation of the speed of propagation of elastic waves with distance from the earth's centre, the forms of the rays and the times of propagation along them were calculated and compared with the results of observation. The conclusion was that the observed facts of the transmission of the preliminary tremors could be co-ordinated on the assumption that throughout all but a comparatively thin crust of the earth the elastic waves of highest speed were transmitted with a speed of 12·23 km. per second, and that within this crust, of thickness equal to one-tenth the radius, the speed increased from the value 6 km. per second at the surface to the value 12·23 at the depth one-tenth of the radius. The second phase of the preliminary tremors was similarly transmitted, but with speed less than that of the first phase in the ratio of 18 to 31·3. The hypothesis that the two phases represented the compressional and distortional waves led to the conclusion that the interior of the earth satisfied the uni-constant elastic theory associated with the names of Navier and Poisson. The curving of the rays within the crust of variable speed of propagation led to a concentration of the energy towards the immediate neighbourhood of the epicentre, a result which had important bearings upon the interpretation of seismograms from distant stations.

PARIS.

**Academy of Sciences**, January 27.—M. Henri Becquerel in the chair.—The emission spectra of varieties of fluor-spar: Henri **Becquerel.** The peculiarities recently pointed out by A. Dufour in the spectra of fluor-spar as regards the Zeeman effect are probably due to the presence of rare earths in the spar.—Concerning a hitherto unknown fragment of the "Opus tertium" of Roger Bacon: P. **Duhem.** This manuscript, No. 10,264 in the Bibliothèque nationale, is headed "Liber tertius Alpetragii." M. Duhem surmises that it is really a portion of the "Opus tertium" of Roger Bacon, and points out that it indicates a clear knowledge of the composition and explosive power of gunpowder before the middle of the thirteenth century.—The geological history and phylogeny of the Anthracotherideæ: Charles **Depéret.**—A class of surfaces: M. **Tzitzéica.**—The equation $\frac{\partial^2 z}{\partial x^2}-\frac{\partial z}{\partial y}=0$: Eugenio Elia **Levi.**—The definition of the area of a portion of a curved surface: E. **Cartan.** The author points out that his note of December 30 last on this subject has been anticipated by M. Schwarz.—The theory of thin bodies: Eugène and François **Cosserat.**—The action of the X-rays on the photographic plate: M. **Chanoz.** These experimental results show a parallelism between the successive aspects presented for increasing irradiation by radiographic and photographic negatives. It furnishes an argument in favour of the luminous nature of the X-rays.—The abnormal mobility of the ions of some rare earths: Jules **Roux.** With the exception of the samarium ion, the mobility of which is of the order of the usual monovalent ions, the mobilities of the other earths studied (lanthanum, yttrium, cerium, and gadolinium) are greater than those of monovalent and divalent ions. This difference may be of use in the separation of these metals, pointing to a possibility of effecting their separation by diffusion or by electrolysis.—The radio-activity of the waters at Plombières: André **Brochet.** These researches confirm a point already established, that, contrary to a view very commonly expressed, there is no relation between the radio-activity of a water and its temperature.—The dissociation by water

of the double chlorides of dimercuriammonium and ammonium: H. **Gaudechon.** The compounds

$$NHg_2Cl.NH_4Cl, \qquad NHg_2Cl.3NH_4Cl,$$

in presence of water at the ordinary temperature behave as true double salts.—The establishment of the constitutional formula of fenone: L. **Bouveault** and M. **Levallois.** The authors regard their experimental work as definitely eliminating the formula suggested by Wallach, and giving great probability to that of Semmler.—The essence of *Magnolia kobus*: Eug. **Charabot** and G. **Laloue.** This essence consists chiefly of citral (15 per cent.) and anethol.—The volcano of Siroua, Moroccan Anti-Atlas: Louis **Gentil.**—Researches on the pulp called Netté flour: A. **Goris** and L. **Crété.** The name flour applied to this substance, which is obtained from the fruit of *Parkia biglobosa*, is a misnomer, as it contains no starch. It is rich in fatty matter, phosphates, and sugar (saccharose). As regards the latter, it contains about 25 per cent. of saccharose and 20 per cent. of glucose and levulose, and surpasses either the sugar beet or sugar cane.—The erythrolytic function of the spleen in fishes: Richard **Blumenthal.** In fish the spleen appears to be normally the place where the red corpuscles of the blood are destroyed.—Modifications of the blood caused by the injection of atropine or of peptone: MM. **Doyen** and Cl. **Gautier.**—Bovine bacilliform piroplasmosis observed in the neighbourhood of Algiers: H. **Soulié** and G. **Roig.**—An attempt at grafting articular tissues: Henri **Judet.** These experiments were made on rabbits, dogs, and cats, and show that it is possible to repair a loss of articular cartilage by the transplantation of fragments arising either from the costal cartilages of the same animal or the articular cartilages of an animal of closely allied species.—The nature of the urns of the Siphuncles: J. **Kunstler.**—*Bacillus endothrix*, a new bacterial parasite of the hair: Fernand **Guéguen.**—A Laboulbenacieæ, *Trenomyces histophtorus*, an endoparasite of the lice (*Menopon pallidum* and *Goniocotes abdominalis*) of the domestic fowl: Édouard **Chalton** and François **Picard.**—The middle Lias in the Seybouse basin (Algeria): J. Dareste **de la Chavanne.**—A neotype of *Pinus* (*Pseudostrobus*) *Defrancei* in the Lutetian of the Trocadero (Paris): Paul **Combes,** jun.—Characteristics of the foliar trace in genera Gyropteris and Tubicaulis: Paul **Bertrand.**

## DIARY OF SOCIETIES.

*THURSDAY*, FEBRUARY 6.

ROYAL SOCIETY, at 4.30.—On the Weight of Precipitum obtainable in Precipitin Interactions with Small Weights of Homologous Protein: Prof. D. A. Welsh and H. G. Chapman.—Nitrification in Acid Soils: A. D. Hall, N. H. J. Miller, and C. T. Gimingham.—A Criticism of the Opsonic Theory based upon Studies carried out by Means of Melanin: S. G. Shattock and L. S. Dudgeon.—A Contribution to the Study of the Mechanism of Respiration, with Especial Reference to the Action of the Vertebral Column and Diaphragm: J. F. Halls-Dally.

ROYAL INSTITUTION, at 3.—The Story of the Spanish Armada: Major Martin Hume.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Protective Devices for High Tension Transmission Circuits: J. S. Peck.

LINNEAN SOCIETY, at 8.—Fruits and Seeds from the Pre-Glacial Beds of Britain and the Netherlands: Clement Reid, F.R.S.—On a Method of Disintegrating Peat and other Deposits containing Fossil Seeds: Mrs. Reid.—On a Botanical Expédition to Fokien: S. T. Dunn.

CIVIL AND MECHANICAL ENGINEERS' SOCIETY, at 8.—Some Devices for the Absorption of Shock on Wheeled Vehicles: F. G. Woollard.

CHEMICAL SOCIETY, at 8.30.—The Metallic Picrates: O. Silberrad and H. A. Phillips.—Organic Derivatives of Silicon. Part V., Benzylethylsilicone, Dibenzylsilicone and other Benzyl- and Benzylethyl-derivatives of Silicane: R. Robison and F. S. Kipping.—Some Physico-chemical Properties of Mixtures of Pyridine and Water: H. Hartley, N. G. Thomas, and M. P. Applebey.—The Constitution of Umbellulone, Part III.: F. Tutin.—The Residual Affinity of the Coumarins and Thiocoumarins as shown by their Additive Compounds: A. Clayton.—The Influence of Foreign Substances on Certain Transition Temperatures, and the Determination of Molecular Weights: H. M. Dawson and C. G. Jackson.—The Bromination of *p*-Hydroxydiphenylamine: Miss A. E. Smith and K. J. P. Orton.—Colour and Constitution of *az*-Methine Compounds, Part I.: F. G. Pope.—The Decomposition of Ammonium Bichromate by Heat. Preliminary Notice: W. M. Hooton.

*FRIDAY*, FEBRUARY 7.

ROYAL SOCIETY OF ARTS, at 8.—The Hygiene of the Pottery Trade: W. Burton.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Electric Hardening and Annealing Furnaces: P. T. Steinthal.

GEOLOGISTS' ASSOCIATION, at 8.—Presidential Address: The Centenary of the Geological Society: R. S. Herries.

JUNIOR INSTITUTION OF ENGINEERS, at 8.—Aërial Navigation: H. Chatley.

*MONDAY*, FEBRUARY 10.

ROYAL SOCIETY OF ARTS, at 8.—The Theory and Practice of Clock Making: H. H. Cunynghame, C.B.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—The Story of London Maps: Laurence Gomme.

*TUESDAY*, FEBRUARY 11.

ROYAL INSTITUTION, at 3.—Membranes: Their Structure, Uses, and Products: Prof. W. Stirling.

ROYAL ANTHROPOLOGICAL INSTITUTE, at 8.30.—Additional Notes on New Guinea Games: Dr. A. C. Haddon, F.R.S.—Exhibition of a New Instrument for determining the Colour of the Hair, Skin, and Eyes: J. Gray.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Erection of the Pwll-y-Pant Viaduct on the Brecon and Merthyr Extension of the Barry Railway: A. L. Dickie.—Notes on the Erection of Cantilever Bridges: Prof. T. C. Fidler.

*WEDNESDAY*, FEBRUARY 12.

ROYAL SOCIETY OF ARTS, at 8.—The Application of Science to Foundry Work: R. Buchanan.

ROYAL SANITARY INSTITUTE, at 8.—Rivers Pollution, with Special Reference to the Board proposed by the Royal Commission: Sir William Ramsay, K.C.B., F.R.S.

*THURSDAY*, FEBRUARY 13.

ROYAL SOCIETY, at 4.30.—*Probable Papers*:—The Constitution of the Electric Spark: T. Royds.—On the Determination of Viscosity at High Temperatures: Dr. C. E. Fawsitt.—The Effect of Hydrogen on the Discharge of Negative Electricity from Hot Platinum: Prof. H. A. Wilson, F.R.S.—The Decomposition of Ozone by Heat: E. P. Perman and R. H. Greaves.

ROYAL SOCIETY OF ARTS, at 4.30.—The New Imperial Gazetteer of India: R. Burn.

MATHEMATICAL SOCIETY, at 5.30.—Proof that every Algebraic Equation has a Root: Dr. H. A. de S. Pittard.—On the Uniform Approach of a Continuous Function to its Limit: Dr. W. H. Young.—Note on *q*-differences: Rev. F. H. Jackson.

*FRIDAY*, FEBRUARY 14.

ROYAL INSTITUTION, at 9.—Biology and History: Dr. C. W. Saleeby.

ROYAL ASTRONOMICAL SOCIETY, at 5.—Anniversary Meeting.

PHYSICAL SOCIETY, at 8

MALACOLOGICAL SOCIETY, at 8.—Annual Meeting.—President's Address: Malacology *versus* Palæoconchology: B. B. Woodward.

## CONTENTS.