To prevent the direct action a small uninsulated metal screen can be placed between the vibrator and the tube, or the tube can be hung by a long and fine wire, in order to be removed from the sphere of the direct action of the vibrator. The best plan is, however, to surround the tube by wire gauze, which stops the direct action of the vibrator on the tube, and yet permits the tube to be observed. The absence of direct action can be ascertained in the different positions which the tube takes by insulating it from the resonator without changing its position, and noticing if it becomes quite dark.

If we place before the vibrator a resonator, consisting of a straight wire 220 centimetres long (I used copper wire No. 6), we find, by the tubes, that nodes exist in the middle and the two ends of the wire, consequently two segments at 55 centimetres from each end of the wire.

(The above-described circular resonator can be likened to a linear one which is curved to a circle and its two ends soldered together, thus the two nodes of the ends becoming one single node.)

If this straight wire is cut in the middle, a torrent of sparks passes between the separated ends, even if they are removed several millimetres apart. If then we examine each half of the wire, we find that it possesses a node in the middle and two segments, each at one end, but the node is not so well defined as in the case of the uncut wire; there is no single point the potential of which remains continually equal to zero, but a line in which the difference of potential from zero is a minimum. This complicated form of oscillation is produced by the fact that the forces acting in this resonator are not equal at all points or symmetrically distributed with respect to it, as in the case of the long resonator. The oscillations of the short resonator may be compared to those of a rod which is not firmly fixed by its middle. The state of these oscillations is not stable. If one or both ends of this resonator are touched by the finger, they become nodes, and a well-defined segment appears at the middle of the resonator. If the Geissler tube be connected with this middle point, it begins to light up when the ends of the resonator are touched, and ceases to light the moment the fingers are removed; the contrary takes place if the tube be connected with one end of the resonator. This phenomenon is analogous to the change of the form of the vibration of a rod when fixed by its middle or by its ends.

Quite similar is the mode of oscillation of a resonator 220 centimetres long disposed on one side of the vibrator; it possesses also a node at the middle not well defined, and a segment at each end.

To conclude, I will describe the mode of oscillation of a resonator, 110 centimetres long, disposed parallel and symmetrically to the vibrator. This resonator possesses one node in the middle, very clearly defined, and a segment at either end. This form of oscillation is the same as would occur in the long resonator if one-fourth of its length from each end were cut off.

In the case of the latter resonator and of the long one, which is also symmetrically disposed to the vibrator, the oscillations are very stable, and much stronger than in the case of the resonators placed on one side of the vibrator. The mode of the oscillations of these symmetrical resonators is not disturbed by touching them by the fingers at any point, although the mode of oscillation is disturbed if we touch the unsymmetrical resonators at any point whatever.

The experiments described must be performed in a dark room, and much care be used in the choice of the proper Geissler tubes. Tubes containing mercury are very sensitive, and they become more so if the mercury be allowed to flow several times from one end of the tube to the other.

Liverpool, March. E. J. Dragoumis.

SOCIETIES AND ACADEMIES.

London.

Royal Society, March 21.—"An Experimental Investigation of the Circumstances under which a Change of the Velocity in the Propagation of the Ignition of an Explosive Gaseous Mixture takes place in Closed and Open Vessels. Part I. Chronographic Measurements." By Frederick J. Smith, M.A., Millard Lecturer on Mechanics, Trinity College, Oxford. Communicated by A. G. Vernon Harcourt, F.R.S.

It has been noticed by several investigators, viz. MM. Berthelot and Vielle, MM. Mallard and Le Chatelier, and Prof. H. B. Dixon, F.R.S., that explosive gaseous mixtures after ignition do not reach their maximum velocity of propagation at once, but that a certain maximum velocity is attained soon after initial ignition.

In order to investigate this period, which may be called the acceleration period of an explosion, chronographic measurements of a peculiar nature were found necessary.

It was at once evident that but little advance in this branch of the subject of explosions could be made unless exceedingly minute periods of time could be measured with certainty.

A new form of chronograph has been devised to meet as far as possible all the requirements of the case, by means of the instrument. The following results have been obtained:—

(1) The $\frac{1}{20000}$ of a second can be measured with ease, and periods of time differing from $\frac{1}{10}$ of a second to $\frac{1}{20000}$ of a second can be recorded on the same moving surface.

(2) The surface which receives the record moves at a velocity which is practically constant during the traverse of 5 cm.; also its velocity can be varied between wide limits.

(3) A large number of time records can be made side by side, all records being made in straight lines.

(4) Fractions of recorded vibrations of a fork can be subdivided by means of a micrometer microscope. This is not the case with vibrations recorded on a surface attached to a pendulum, where the velocity varies from zero up to a maximum at the middle of the swing.

The electro-magnetic styli, by means of which events are marked, are so constructed that their period of "latency" is almost absolutely constant, and their electro-magnets are so wound that no sparking takes place on breaking the circuit.

A moving surface is carried on a carriage, which is propelled by means of a falling weight, which after a certain velocity has been attained is removed: the surface then moves with a velocity which is found to be practically constant for the limits between which a time record is made.

The chronograph is used in conjunction with a steel tube in which the explosions take place. At even distances along the axis of the tube, conducting bridges, eight to ten in number, of Dutch metal insulated from the tube, are placed; each bridge is connected electrically with a recording stylus, so that as each bridge is broken by the explosion, a mark is made on the surface of the chronograph; these markings when duly interpreted provide data for constructing a curve, which indicates the rate at which the velocity of the explosion is changing during its propagation.

The rest of the paper treats of the methods by means of which the errors due to the use of electro-magnets in chronographic work have been dealt with and reduced as far as possible.

Chemical Society, March 7.—Mr. W. Crookes, F.R.S., in the chair.—The following papers were read:—The decomposition of carbon disulphide by shock; a lecture experiment, by Prof. T. E. Thorpe, F.R.S. The author, in studying the action of the fluid alloy of potassium and sodium on carbon disulphide, obtained a yellowish-brown solid substance which exploded with great violence when subjected to pressure or friction. If the explosion occurred in contact with carbon disulphide, that substance was resolved into its elements. A similar decomposition of carbon disulphide into carbon and sulphur can readily be effected by exploding a charge of 0·05 gramme of fulminate within a stout glass tube containing carbon disulphide vapour, and the experiment affords a good illustration for class purposes of the resolution of an endothermic compound into its elements by sudden shock.—The determination of the constitution of the heteronucleal $\alpha\beta$- and $\beta\beta$-di-derivatives of naphthalene, by Prof. H. E. Armstrong and Mr. W. P. Wynne. A preliminary note on the constitution of the three chloramidonaphthalenesulphonic acids obtained by sulphonating α-chloro-β-amidonaphthalene hydrochloride with weakly fuming sulphuric acid.—The action of chloroform and alcoholic potash on phenylhydrazine, by Dr. S. Ruhemann.

March 28.—Annual General Meeting.—The following is an abstract of the Annual Report, read by the President, Mr. W. Crookes, F.R.S.:—The pleasant duty again devolves on me to present to you the annual report on the state of the Chemical Society during the twelve months just past. The following statement shows the numerical position of the Society—

Number of Fellows (March 28, 1888)	1534
Present number of Fellows	1614
Increase	80

103 papers have been communicated to the Society this session. Our library continues to increase, and every year becomes richer in rare volumes and books of reference. The duplicate library for lending is also becoming increasingly useful. The expenditure under this head for the current year is £308 5*s.* 6*d.*

I must now ask your attention to an event of which none of you can be ignorant, which, though not exclusively relating to chemistry, bears closely upon it and upon the future of British science. I refer to the protest against the examination system in education which appeared in November last. That protest had long been in the air. For years past, men who take the trouble to observe and to reflect have come to the conclusion that competitive examination is injurious to the individual, injurious to the race, and that it starves original research at the root. They have convinced themselves that if we flag in scientific investigation, that if a large and increasing proportion of professorships and of leading positions in industrial establishments, both in the home kingdom and in the colonies, are filled by aliens, the fault lies mainly with our educational system. Men trained chiefly to pass examinations either in theoretical or practical departments cannot equal those who have been schooled in actual research, trained to accurately observe and draw correct inferences from facts. All the earlier protests were desultory, and calculated to produce no lasting impression; but the recent manifesto is the expression of the collective opinion of many earnest representative men and women. Hence it cannot be slighted as the mere outcry of a faction, a sect, a school, or an interest. A most satisfactory feature is the adhesion to the protest of men who formerly were in favour of competitive examination as the test for entrance into the civil or military service of the State. Prof. Max Müller, of Oxford, frankly admits he now considers competition to be a mistake, and avers that the failure springs not only from the manner in which the system has been worked, but is involved in its very nature. But if this protest is to avail it must be energetically followed up, for I must repeat what I have before declared, that the position of science in Britain is far from satisfactory. Though the number of articles devoted to research in German Transactions and journals exceeds those in our own publications, we must remember that the population of the German Empire is greater than that of the United Kingdom by at least one-fourth; further, that the *savants* of Russia, of the Austrian Empire, of Switzerland, of Holland, and Scandinavia, largely select German journals as their medium of publication. Not a few English and American scientific men follow the same course. Hence, as regards quantity, our share in the world's scientific work is more considerable than appears at the first glance. Further, I think that if deficient in quantity English research excels in quality. If we do less detail work we furnish a larger proportion of generalizations and laws than most of our rivals. As the discoverers of laws and generalizations, Black, Boyle, Dalton, Faraday, Graham, Joule, Newton, Wollaston, and Young are household words in the laboratory—yet none of these men were the products of the examination system. There is another evil against which I must strongly protest. I refer to the system of "sealed papers." Everyone knows that on the Continent, more especially in France, it is common for anyone who has, as he thinks, approached the solution of some important question, to deposit a sealed sketch of his incomplete results with the President or Secretary of some learned Society. The sketch may lie *perdu* for years, until the author requests it may be opened and read before the Society. The practice arose from a desire that the author's priority should be guaranteed against others who might lay claim to his ideas. But priority can be quite as effectually secured by a brief preliminary notice read before some Society or sent to some journal, the author thus reserving to himself the further investigation of the subject. Among men of honour such reservations are invariably respected. But the "sealed paper" system lends itself to something which borders unpleasantly upon fraud. Suppose an investigator takes up some question, sees that it admits of two or more solutions, or that various hypotheses present themselves to him as possible. To work out the matter conclusively might require much time and trouble. He therefore writes out each hypothesis, and incloses them separately in "sealed papers," duly numbered, carefully retaining copies. In process of time some other investigator, ignorant of what the first author has done, takes up the subject, and works out one of these hypotheses to demonstration. So soon as his supplementary memoir is before the world the first investigator requests that the "sealed paper" No. 2 or No. 3 be opened and read. The new theory, laboriously considered and worked out, is found to have been anticipated, and the man who has really done the work is robbed of much of his credit. The seeming anticipator says nothing about the contents of other "sealed papers," in which he has proposed totally different hypotheses: these he now leaves to oblivion. I think the Fellows of our Society will agree with me that a system which thus enables a man to reap the fruit of another man's experiments does not deserve to be naturalized in England. There is a further abuse to which attention may usefully be drawn. It sometimes happens a man of science will send an account of researches he has completed to two journals simultaneously, English or foreign, leaving each editor under the impression that he is the sole recipient of the communication. Or, still worse, a man reads a paper before our Society, and sends it to some foreign journal, so that it may figure in print before it appears in the Society's Transactions. To this subject I felt compelled to refer when I had the honour of addressing you last year. And you are now aware, your Council declines to publish any memoir which has previously appeared in a foreign journal, unless specially recommended by the Publication Committee and approved by the Council. The reasons for this resolution are not hard to seek. Not merely is the reputation of the Society, as the original channel of the researches in question, imperilled, or at least obscured, but a serious waste of time and labour is inflicted upon anyone who needs to read up the literature of the subject. We in England are by no means the only sinners in this respect. It often happens that memoirs which have been read before the Paris Academy of Sciences reappear as "original matter" in certain French journals. I cannot pass over a discovery made this season by Prof. Krüss concerning nickel and cobalt. As at first reported it seemed that these two metals might be eliminated from our text-books, and that two or three new substances would take their place. Had this been the case, it would undoubtedly have been one of the greatest steps in pure chemistry taken this century. It now appears that each of the two metals contains a common impurity, which Prof. Krüss has been the first to detect and isolate. Nickel and cobalt thus purified will still retain their individuality, though their accepted properties, physical and chemical, will need careful revision. In any case the discovery is most instructive, warning us how careful we should be to have firm ground under our feet. It is almost humiliating that two metals which have been subjected to infinite research and scrutiny should now be found to contain such a proportion of unsuspected impurity. You are aware that at the ballots for the election of Fellows half an hour or more of valuable time is spent in a manner which, to say the least, is not very interesting. An attempt has been made to save time by taking the ballot in the library, after the meeting, but so many Fellows leave before the end of the meeting that the number remaining has not been found sufficient to meet the requirement of the by-laws. Your Council have from time to time had this matter under discussion, and at their last meeting, on March 21, it was resolved "that in future the balloting for Fellows be conducted by means of papers." The best manner of carrying out this resolution will be a subject for future arrangement. A posthumous memoir on the compressibility of hydrogen, by the late Prof. Wroblewski, reminds us of the sad and untimely death of this meritorious and distinguished worker in physical chemistry. His death, as most of us doubtless are aware, was due to the frightful burns which he received from the overturning or explosion of a paraffin lamp. In the memoir in question Prof. Wroblewski treats of the compressibility of hydrogen at 99°, at 0°, at $-103^{\circ}\cdot5$ (boiling-point of ethylene), and at $-182^{\circ}\cdot4$ (boiling-point of oxygen), for pressures ranging from 1 to 70 atmospheres. From the results the following data were calculated: critical temperature -240°; critical pressure, 13·3 atmospheres; critical volume, 0·00335. Hence it appears very doubtful whether M. Pictet or M. Cailletet really succeeded in liquefying hydrogen. Last year I had the pleasure to announce that one of our Fellows, Mr. Newlands, had received the "Davy Medal" of the Royal Society for his splendid discovery of the Periodic Law of the Chemical Elements. I may also be allowed to state that to me, your President, the Royal Society has likewise awarded the same distinction for my researches on the behaviour of substances under the influence of the electric discharge in a high vacuum, with especial reference to their spectroscopic reactions. Hence it has been suggested that might not unprofitably claim your attention this evening for a history of the so-called rare earths, as they have been brought to light and discriminated by the aid of the spectroscope. [We print elsewhere Mr. Crookes's address on this subject.]

Linnean Society, March 21.—Mr. Carruthers, F.R.S., President, in the chair.—Mr. T. Christy exhibited the pod (36 inches in length) of an Apocynaceous plant received from Gaboon as *Strophanthus*, but believed to be allied to the *Holarrhena*.—Prof. Stewart, referring to the specimens of *Noctilio leporinus* exhibited at the last meeting of the Society, stated that he had examined the contents of the stomachs submitted to him by Mr. Harting, and had found without doubt fragments of fish, scales, and fin-rays, and a portion of the lower jaw of a small fish, proving the correctness of the assertions which had been made regarding the piscivorous habits of this bat.—Mr. W. B. Hemsley furnished a report on the botanical collections made on Christmas Island during the voyage of the *Egeria*. This included a complete list of the plants collected, with remarks on their general distribution, the author being of opinion that the flora of this island, which lies about 200 miles south of the western end of Java, was more nearly related to that of the Malayan Archipelago than to that of Australia. Mr. C. B. Clarke, commenting on the author's observations on the buttresses of trees, described some remarkable instances which he had seen of this singular mode of growth. Mr. J. G. Baker, referring to the Ferns which had been collected, noticed their affinities and distribution. Mr. R. A. Rolfe commented on three species of Orchids which had been brought home by this Expedition, all of which were new. Mr. Thiselton Dyer, referring to Mr. Lister's Report to the British Association on the zoological collections from this island, in which it was stated that the character of the avifauna was Australian, considered that this was not borne out by an examination of the flora, which was decidedly Malayan.—A paper was then read by Mr. R. A. Rolfe on the sexual forms of *Catasetum*, with special reference to the researches of Darwin and others. The purport of Darwin's paper (Journ. Linnean Soc., 1862) was to show that *Catasetum tridentatum* had been seen by Schomburgk to produce three different kinds of flowers, belonging to the same number of supposed genera, all on the same plant, and that the three represented respectively the male, female, and hermaphrodite states of the species. Mr. Rolfe showed that Schomburgk's remarks applied to two distinct species, *C. tridentatum* and *C. barbatum*, the females of which resembled each other so closely that they were thought to be one and the same—namely, *Monacanthus viridis*. Neither of these, however, belonged to the true plant of that name, which was really the female of another species—namely, *C. cernuum*, a fact hitherto unsuspected. The key of the situation was that the females of several species resemble each other very closely, and to three of them the name *Monacanthus viridis* had been applied.—After some critical remarks by the President and Mr. Bull, a paper by Mr. MacOwan was read, on some new Cape plants.

Geological Society, March 6.—W. T. Blanford, F.R.S., President, in the chair.—The following communications were read:—On the subdivisions of the Speeton Clay, by G. W. Lamplugh. Communicated by Mr. Clement Reid. The reading of this paper was followed by a discussion, in which Prof. Judd, Mr. Strahan, Prof. Blake, Mr. Hudleston, and Mr. Herries took part.—Notes on the geology of Madagascar, by the Rev. R. Baron. Communicated by the Director-General of the Geological Survey. With an appendix on some fossils from Madagascar, by Mr. R. Bullen Newton. The central highlands of Madagascar consist of gneiss and other crystalline rocks, the general strike of which is parallel with the main axis of the island, and also, roughly, with that of the crystalline rocks of the mainland. The gneiss is frequently hornblendic; its orthoclase is often pink; triclinic felspar often occurs in places; biotite is the most common mica, but muscovite is not uncommon; magnetite is generally present, often in considerable quantities. The gneiss is often decayed to great depths, forming a red soil, and the loosened rock is deeply eaten into by streams. The harder masses of gneiss, having resisted decay, stand out in blocks, and have been mistaken for travelled boulders of glacial origin. Other more or less crystalline rocks are mica-schists, chlorite-schists, crystalline limestone, quartzite (with which graphite is often associated), and clay-slate. Bosses of intrusive granite rise through the gneiss. That east of the capital contains porphyritic crystals of felspar which near the northern edge of the granite are arranged roughly in a linear direction; here also the granite contains angular fragments of gneiss. For the most part the granite of Madagascar is clearly intrusive, but this may not always be the case. The volcanic rocks are of much interest. The highest mountains, those lying to the south-west of the capital, consist, in their higher parts, of a mass of lava, for the most part basaltic, but with some sanidine-trachyte. The lava-streams are sometimes twenty-five miles long, and successive flows, up to 500 feet in thickness, are exposed by the valleys. From the great denudation which this area has undergone, and from the fact that no cones now remain, we may assume that this volcanic series is of some antiquity. Of the newer volcanic series there are numerous very perfect cones, dotting the surface of the gneiss in many places. No active volcano now exists in the island, but the occasional emission of carbonic acid gas, the occurrence of numerous hot springs and deposits of siliceous sinter, and the frequency of small earthquake-shocks, seem to show that volcanic forces are only dormant and not entirely extinct. The ashes generally lie most thickly on the side of the cone between north and west; this is accounted for by the prevalence of the south-east trade-winds. The volcanic areas are ranged roughly in a linear direction, corresponding with the longer axis of the island. Sedimentary rocks occur mainly on the western and southern sides of the island. The relations of these to each other have not yet been determined; but from the fossils (referred to the European standard) it seems that the following formations are represented: Eocene, Upper Cretaceous, Neocomian, Oxfordian, Lower Oolites, Lias. Possibly some of the slaty beds may turn out to be Silurian or Cambrian. The crystalline schists, &c., are probably, for the most part at least, Archæan. Recent deposits fringe the coasts, and are largely developed on the southern part of the island. East of the central line of watershed there is a long depression containing a wide alluvial deposit, probably an old lake-bed. Terraces fringe its sides in many places. The lagoons of the eastern coast are due to alluvial deposits. The paper concluded with some remarks on the geological antiquity of the island, its separation dating from early Pliocene times, if not earlier. This is the conclusion arrived at by Wallace from its fauna; the author's detailed researches into its flora, recently described before the Linnean Society, show that while about five-sixths of its *genera* of plants are also found elsewhere, chiefly in tropical countries, at least four-fifths of its *species* are peculiar to Madagascar. The appendix, drawn up by Mr. R. Bullen Newton, consisted of notes upon the fossils collected by the author, with tables, and descriptions of two new species—namely, *Astarte* (?) *Baroni* and *Sphæra madagascariensis*, both from deposits of Lower Oolitic age.—Notes on the petrographical characters of some rocks collected in Madagascar by the Rev. R. Baron, by Dr. F. H. Hatch. Some remarks on Mr. Baron's paper were made by the President, Dr. Geikie, Mr. H. B. Woodward, and Mr. Topley.

PARIS.

Academy of Sciences, March 25.—M. Des Cloizeaux, President, in the chair.—On the achromatism of interferences, by M. Mascart. The conclusions arrived at by Cornu and Stokes are here applied to the particular cases of interference fringes and of Newton's rings. In the phenomenon of W. Herschel's fringes the condition of achromatism is shown to be—

$$\frac{\cos^2 i}{\sin i} = \mathrm{L}\,\frac{\sin \mathrm{A}}{\cos r}.$$

—Remarks accompanying presentation of Prof. Karl Pearson's work, "The Electrical Researches of Barré de Saint-Venant" (Cambridge, 1889), by M. Boussinesq. The period from 1850 to 1886, covered by this important treatise, comprises the most remarkable researches, by the late M. de Saint-Venant, on torsion, flexion, live resistance, the distribution of elasticities in heterotrope bodies, plasticodynamics, &c. The work, which will be found of great service to English physicists, geometricians, and engineers, unfamiliar with the French language, forms the first part of the second volume of the series begun by Todhunter on the "History of the Theory of Elasticity."—On elliptical polarization by vitreous reflection, by M. A. Potier. Rejecting Cauchy's assumption of evanescent longitudinal waves, the author here develops a theory in which he takes as his starting-point the differential equations of the vibratory movement. The principle and results of this theory were already announced at the meeting of the French Association for the Advancement of the Sciences in 1872.—Researches on the cultivation of the potato, by M. Aimé Girard. The author here deals with the progressive development of the plant, and arrives at the general conclusion that the origin of the starch is to be sought in the leaves, where it is probably represented in its initial form by saccharose, or some analogous sugar. By its twofold decomposition this sugar becomes on the one hand the generator of the cellular tissue, on the other of the starch which is stored up in that tissue.—On the peroxides of cobalt and nickel, and on the volumetric analysis of these metals, by M. Adolphe Carnot. The action of potash combined with that of chlorine, bromine, iodine, or of an alkaline hypochlorite, yields in cobalt and nickel solutions certain black granular precipitates almost identical in appearance. Herrenschmidt, however, has pointed out that the peroxide of cobalt thus obtained has a brown colour, while the peroxide of nickel remains black under the microscope. M. Carnot here describes a series of experiments carried out for the purpose of determining the state of oxidation of the metals in these various precipitates. The general result is that the brown oxide obtained by precipitating cobalt with hydrogen dioxide and caustic potash at the boiling-point has the exact composition of the sesquioxide, Co_2O_3, and that the black oxide of nickel, precipitated by hypochlorite or by bromine and potash, is the sesquioxide, Ni_2O_3.—On the limits of the errors that may be committed in assaying fine gold, by M. Paul Charpentier. The figures here given are the result of about 300 assays executed by the author at the laboratory of the French Mint.—On the initial phase of electrolysis, by M. Piltschikoff. A protracted study of the phenomenon of retardation in the electrolytic process leads to the following results. The minimum electromotive force required to at once set up a visible electrolysis does not depend within certain limits on the nature of the salt, nor on the concentration of the solution (gold, zinc, sulphate of zinc; platinum, copper, sulphate of copper, nitrate of copper, gold, platinum or silver, &c.). The minimum does not depend perceptibly either on the heat of combination of the two metals, or on their contact electromotive force; but it depends essentially on the physical state of the cathode (negative pole), which may modify the resulting figures as much as 20 or even 25 per cent.—On the electric transport of salts in solution, by M. A. Chassy. The special case is here considered of a non-electrolyzed metallic salt, a salt of zinc, for instance, in a mixture of salts of copper and zinc.—On the glycol-ether of chloral, by M. de Forcrand. The author has prepared this compound,

$$CCl_3 . CH(OH).OC_2H_4OH,$$

in the crystallized state, by combining molecular proportions of chloral and glycol at the ordinary temperature. It is soluble in water, and melts at 42° C., which is also the melting-point of chloral ethylate, according to M. Berthelot.—Determination of the heats of combustion of metaldehyde, erythrite, aud tricarballylic acid, by M. Louguinine. These experiments have been carried out by means of the calorimetric apparatus under precisely the same conditions as those already published.—Papers were contributed by MM. J. Héricourt and Ch. Richet, on the varying toxic effects of the blood of the dog transfused into the rabbit; by M. V. Galtier, on the liability of sheep and other animals to contract infectious pneumo-enteritis, hitherto regarded as a disease peculiar to the pig; by M. Joannes Chatin, on the homologies of the inferior lobes in the brain of fishes; and by MM. Jules de Guerne and Jules Richard, on the fresh-water fauna of Greenland.

BERLIN.

Physical Society, March 8.—Prof. von Helmholtz, President, in the chair.—Dr. Rubens described the experiments which he had made on the selective reflection of light by metals. The method employed was as follows: the light emitted by an incandescent plate of zirconium was concentrated by a lens on to a mirror-surface of the metal under investigation, and the reflected rays were then allowed to fall into a spectroscope with flint-glass prism, whose ocular had been replaced by a bolometer. In this way the intensity of each part of the spectrum could be determined. The next step consisted in removing the mirror and putting the glowing zirconium in the place of the virtual image of the first source of light, in such a way that the rays of light, coming from the point previously occupied by the mirror, pursued the same course as in the first experiment. These rays were then allowed to fall into the spectroscope, and the intensity of each part of the spectrum thus formed by light which had undergone no change by reflection was measured by the bolometer. The intensity was determined at fifteen different points in the spectra, extending from near F in the blue into the ultra-red down to the wave-length 2μ. The changes produced in the light by reflection from the metals were represented by curves whose abscissæ corresponded to wave-lengths while their ordinates corresponded to the intensities of the several rays after reflection. The results thus obtained showed that silver possesses even for blue rays a very considerable reflexive power, which gradually increases and reaches its maximum in the red, at which maximum the intensity of the reflected light then remains constant even for rays of the greatest wave-length. Gold possesses a much smaller reflexive power for blue and green rays; the curve then rises very rapidly to a maximum in the yellow and falls again towards the red. Copper reflects the blue and green rays even less than gold does: its reflexive power then increases rapidly into the red, and then somewhat more slowly, until in the ultra-red it reaches a value equal to that for silver. Iron and nickel gave very similar curves, rising at first somewhat rapidly, but subsequently more slowly and continuously into the ultra-red, without however reaching the maximal values observed for copper or silver. On the basis of these experimental values for the reflexive power of the above five metals, the speaker had calculated their coefficients of extinction and refraction for red and blue light, making use of Cauchy's and Beer's formulæ. From this it was possible to deduce the dispersive powers of the metals, and to compare their indices of refraction with those which had been experimentally determined by Prof. Kundt: the agreement was in most cases very close.—Prof. Preyer gave an account of some letters of Robert Meyer which are shortly to be published. They were written in the years 1842 and 1844 to his friend Dr. William Griesinger. Prof. Preyer read out several characteristic passages from these letters, in which Meyer states how he arrived at his discovery of the conservation of energy, and from which his firm belief in the correctness of his theory is quite apparent. No less characteristic is the way in which Meyer takes pains to explain his theory to his medical friend, who was but little experienced in physical matters, and to put it before him in a way which he could easily understand.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

A Class-book of Geography (revised edition): C. B. Clarke (Macmillan).—A Treatise on Chemistry, vol. iii., Part 5: Roscoe and Schorlemmer (Macmillan).—The Principles of Empirical or Inductive Logic: J. Venn (Macmillan).—Borneo; Entdeckungsreisen und Untersuchungen; Gegenwärtiger Stand der Geologischen Kenntnisse; Verbreitung der Nutzbaren Mineralien: Dr. T. Posewitz (Berlin, Friedländer).—Tägliche Oscillation des Barometers: J. Hann (Wien).—Journal of Physiology, February (Cambridge).—Records of the Geological Survey of India, vol. xxii., Part 1 (Calcutta).

CONTENTS.