formed (the third round the entire province), with orders to kill whoever tried to break the blockade and did not stop at the first summons; and some individuals were actually killed. But I cannot think an entire country is able to protect itself thus. Examination of passports would be excellent if those who deliver passports and certificates of health were angels. But the Russian functionaries are men, and think like men. The impossibility of always getting true certificates of origin has been seen in the case of the cattle plague. I consider, however, that pressure should be exerted on Russia to form a blockade of the infected districts. And especially it should be seen to, that the returning Russian army does not bring any pestilential germs with it. As to restrictions on communications by land, the greatest of these are ineffectual for the end desired.

I cannot give an opinion as to whether the matters which are now forbidden to be imported into the German Empire may propagate the plague. The negative does not seem to suffice. We know that the skin or hair of an ox affected with carbuncle may engender contagion after several months in distant countries; we should not forget this, and we have not the right to say that garments, linen, bedclothes, &c., are perfectly innocuous.

A word on two points relative to disinfection. On Prof. Pettenkofer's advice, the German empire has decided for sulphurous acid as a means of disinfection. I question if this substance would penetrate linen, clothes, wool, &c., in such a complete way as to annihilate all germs. In my opinion a better plan is disinfection of clothing, &c., by dry heat in a chamber surrounded by steam-pipes, the temperature being raised to 120° C. or more. This plan is more rational and easy, and damages the objects least.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

In the Cambridge Senate, last Saturday, Mr. Balfour, a recent examiner in the Natural Science "Specials" for the B.A. degree, spoke of the schedule for botany, to which we referred recently, as extremely unsatisfactory and incomplete; histology was altogether neglected, physiology was very unsatisfactorily dealt with, and cryptogamic botany was almost entirely omitted. He was in favour of an examination in elementary biology being substituted, and practical work being required. Physiology should be made a separate subject. Prof. Humphry spoke in favour of reducing requirements in schedules to the narrowest range, in order to make natural science attractive to men. Mr. Trotter thought the schedule in botany an absurdly small representative of a year's work for a man supposed to have no other definite study. Mr. Bettany found fault with the present constitution of the Board of Natural Science Studies, which dealt with too many subjects, each being insufficiently represented by men engaged in teaching and research. No doubt it is hard for many to realise that biology has very many distinctive aspects, each of which must be represented by proficiency in them to prevent injustice and injury to scientific progress. Hindrances also arise from the fact that many of our present leaders and directors of study were developed before the full recognition of cell-study, embryology, and the like, as the basis of sound biology.

Dr. Alexander Dixon, Professor in the University of Glasgow, has been elected to the Professorship of Botany in the University of Edinburgh, vacant by the resignation of Dr. Balfour.

SCIENTIFIC SERIALS

The *Archives des Sciences Physiques et Naturelles* (February, 1879), contain the following papers of interest:—On the hydrocarbons obtained through the action of methyl-chloride upon benzole in the presence of ammonium chloride, by MM. E. Ador and A. Rillet.—On the theory of *timbre* and particularly on that of vowels, by Dr. Schneebeli.—On the scientific principles of the fine arts; essays and fragments on the theory, by E. Brucke, followed by remarks on optics and painting, by H. Helmholtz.—On some rare mosses, by J. E. Duby.—Stratigraphical study of the south-western part of the Crimea, by E. Favre.—Natural history of batrachia, by Fr. K. Knauer.—On apogamic ferns and on apogamy generally, by Prof. A. de Bary.—On the prolification of the fruit of mosses, by Dr. N. Pringsheim.—On polyembryony, by Dr. Ed. Strasburger.

The *Journal de Physique* (March) contains the following more important papers:—On spectroscopes with direct vision and great dispersion, by M. Thollon.—On the logograph, by M. Barlow.—On a new phenomenon of static electricity, by M. E. Duter.—Note on spectrophotometers, by M. A. Crova.—On the vibratory motion generated in the air and in space by electric sparks, by E. Mach.—On the electricity of air, by Rob. Nahrwold.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, March 13.—"On the Influence of Coal-dust in Colliery Explosions." No. 2. By W. Galloway. Communicated by Robert H. Scott, F.R.S., Secretary to the Council of the Meteorological Office.

The first experiment is made with a very simple apparatus consisting of a continuous pipe about 18″ in diameter, which conducts a small portion of the return air from the point at which it is ejected into the atmosphere by the ventilating fan, to a convenient spot on the level of the surface, where it escapes as a strong current, amounting to 1,251 cubic feet per minute. About 6 feet from its point of exit a lamp can be placed in the centre of the current, and at a distance of about a foot still nearer the origin there is a means of allowing coal-dust to fall into and mix with the passing air. It is found that when the coal-dust is added the air becomes instantly inflammable, showing that all the return air in the workings may be easily brought into the same condition by a sudden disturbance such as that caused by a local explosion of fire-damp.

The second experiment is intended to illustrate the effects of an explosion of fire-damp in a dry mine containing coal-dust. One part of the apparatus represents a gallery with coal-dust lying on its floor as well as in the horizontal timbers, the buildings and other rough surfaces at its top and sides; another part represents a cavity in the roof containing an explosive mixture of fire-damp and air. When the explosive gas is ignited the flame sweeps down into the gallery, the disturbance raises the coal-dust, and the results are exactly those that have been foreseen. The gallery is a wooden pipe 14 inches square inside, by 79½ feet long. The explosion-chamber is a sheet-iron cylinder lined with thin wooden laths; it is 5 feet high by 15 inches in diameter, and it stands vertically on the top of the gallery at a distance of 5 feet from one end. Currents of air of different quality can be made to pass along the gallery from the end next the explosion-chamber, which can be isolated by means of a valve, to the other end which is open to the atmosphere; thus the return air of the mine can be made to traverse it, or a current of pure air, or a current of air mixed with any required proportion of fire-damp. At the point where they enter the gallery these air-currents are heated by a steam cylinder, which occupies part of the space between the explosion-chamber and the nearer end, so as to assimilate their temperature to that of the air in a mine. The coal-dust is spread along the floor of the gallery, and some is laid on shelves so that it may more easily mix with the air when it is disturbed.

The explosive mixture is made by admitting about half a cubic foot of fire-damp into the explosion-chamber at its upper end, while a corresponding quantity of air is allowed to escape through a plug-hole at its lower end. The bottom of the explosion-chamber is separated from the gallery by a diaphragm of paper during this part of the operation. After the requisite quantity of fire-damp has been admitted, its volume having been accurately measured so as to guarantee that the results will always be the same, the mixture is effected by rapidly revolving a small fan, situated at the top of the explosion-chamber, and so constructed as to draw in air from the centre of the chamber, and throw it out at the circumference. From the point at which the fan draws in its air a 4-inch pipe descends to near the bottom of the explosion-chamber, and when the fan is revolved the air is drawn up through this pipe and discharged at the top of the chamber, from which it finds its way again to the bottom, and so on. The circulation established in this way is so rapid that a perfect mixture can be made in half a minute. The explosive mixture is ignited by means of a spark from a powerful magneto-electric machine.

When there is no coal-dust in the gallery the flame of the fire-damp explosion does not extend further than from 7 to 9 feet from the bottom of the explosion-chamber.

When the gallery contains coal-dust, on the other hand, on the floor and on the shelves referred to, and when it is filled with the return air of the mine the explosion traverses its whole length, and shoots out into the air to distances varying from 4 to 15 feet. The flame of the fire-damp explosion is thus magnified ten times by the presence of the coal-dust and the return air.

When pure air is employed instead of return air, other things remaining the same, the explosion is only about one-half as extensive; and when an artificial mixture of air and fire-damp is employed, of the same composition as the return air, without its excess of moisture, the explosion is stronger than with the return air. The arrangements whereby pure air and air and fire-damp can be used have only been recently completed, and few experiments have been made with them as yet.

Although the apparatus employed in this experiment appears to be on too small a scale to solve the coal-dust question unequivocally, the results obtained with it appear to be sufficiently conclusive to enable us to affirm that an explosion, occurring in a dry mine, is liable to be indefinitely extended by the mixture of air and coal-dust, produced by the disturbance which it initiates.

The only means of avoiding the dangers due to the presence of coal-dust in mines appears to be to carefully and constantly water the roadways leading to and from the working-places.

It is very interesting to be able to mention a fact in connection with watering the roadways which, although not mentioned in Mr. Galloway's paper, is well worthy of a place here, viz., that the Abercarne explosion, ramified through every part of the workings, which were exceedingly dry and dusty, with the exception of one district from which it was entirely cut off by 200 yards of a very wet roadway, and that the men in the latter district not only escaped unhurt, but hardly felt the explosion. The wetness of this roadway was due to natural causes.

April 3.—"On the Thermal Conductivity of Water," by J. T. Bottomley, Lecturer in Natural Philosophy and Demonstrator in Experimental Physics in the University of Glasgow. Communicated by Prof. Sir William Thomson, LL.D., F.R.S.

The result arrived at by the experiments described, is that the thermal conductivity of water may be taken at from ·0022 to ·00245 in square centimetres per second.

Some experiments have been made on the thermal conductivity of solution of sulphate of zinc, a solution which happened to be convenient for preliminary trials. The specific heat of solution of sulphate of zinc at different densities, which it is necessary to know for comparison as to thermal conductivity of that liquid with water, has been determined.

Experiments are now being carried on on this subject with the assistance of a grant from the Government Fund of 4,000*l*.

Anthropological Institute, March 25.—Mr. E. B. Tylor, D.C.L., F.R.S., president, in the chair.—Mr. Henry Seebohm, F.Z.S., gave some interesting particulars respecting the native races of Arctic Siberia, accompanied by an exhibition of ethnological objects collected in that region. In 1874 he visited Lapland, of which he gave some account, and in the following year he proceeded from St. Petersburg to Archangel, and thence 600 miles eastward, where he first came in contact with the Samoëides, and obtained some particulars about the Voguls, who dwelt across the Ural range. But his most adventurous journey was in 1877, when he accompanied Capt. Wiggins on his expedition for the exploration of Arctic Siberia. After travelling 2,500 miles from London to Nishni-Novogorod, they took sledge thence, and pushed on 3,500 miles farther, until they reached the Arctic Circle. In the Tartar villages there which they visited they found that the crescent predominated over the cross, and what still more surprised them, it seemed to be the symbol of a superior civilisation and order. The native languages were akin to the Turkish. The copper-coloured Buriats, who dwelt behind the Baikal Mountains, were a somewhat different race, and bore a strong resemblance to the Chinese. The Ostiaks and Dolgans were located on the colossal river Yenisei, which was reckoned the third largest river on the face of the globe. The Tungoosks were settled on one of its chief tributaries. The costumes, weapons, tools, smoking-appliances, reindeer-harness, snow-shoes, snow-goggles, idols, &c., of these and kindred tribes were shown, together with a remarkable case of prehistoric bronzes, found in ancient Siberian graves, and thought to be from 4,000 to 5,000 years old.—A paper was read by Sir Charles Nicholson, Bart., D.C.L., LL.D., on some rock carvings found near Sydney, New South Wales. Rude carvings of human and other animal forms, especially kangaroos and fishes, including the whale, had been found at various points of the coast of New Holland, from Cape Howe to Moreton Bay. The present natives had no tradition as to their origin, yet there were no good grounds for refusing to regard them as works of indigenous art. Col. Vigors had copied many of them, and a number of his drawings were handed round. One of these carvings represented a wall thirty feet long. Those found in Sydney cavern included a kangaroo at bay and a man erect, with out-stretched arms. Another class of similar carvings were chromatic. They were found on the north-west coast, and had been plausibly supposed to be the work of Malay pearl-fishers or shipwrecked sailors.

Zoological Society, April 1.—Prof. W. H. Flower, LL.D., F.R.S., president, in the chair.—An extract was read from a letter addressed to the Secretary by Mr. Carl Bock, respecting the habits of the Mountain Antelope of Sumatra (*Capricornis sumatrensis*), of which he had obtained a living specimen destined for the Society's collection.—Mr. J. W. Clark exhibited and made remarks on a drawing of a Dolphin belonging to the genus *Lagenarhynchus*, which had been lately taken off Ramsgate.—Prof. Flower exhibited a coloured drawing of a young female of the common Dolphin (*Delphinus delphi*) lately taken off the coast of Cornwall, and made some observations on the published figures and geographical distribution of the species.—The birds' eggs collected during the *Challenger* Expedition were exhibited. The series was stated to contain about 250 eggs belonging to fifty different species. Amongst tnese were eggs of the Sheathbill (*Chionis minor*) from Kerguelen, and of the Wandering Albatross (*Diomedea exulans*), from Marion Island.—Prof. Mivart exhibited a figure of and made remarks upon a Kestrel with abnormal feet, in the collection of the Marquis de Wavrin, at Brussels.—Mr. R. Bowdler Sharpe, F.Z.S., read an account of the collection of birds made by Mr. F. W. Burbidge, in the Sooloo Islands. A new Jungle Fowl was described as *Gallus stramineicollis*, and a new Parrot as *Tanygnathus burbidgii*.—A second communication from Mr. Bowdler Sharpe, consisted of a list of the birds of Labuan Island and its dependencies, founded principally on the collections formed during the last four years, by Governor Ussher and Mr. W. H. Treacher, but including also descriptions of a large number of eggs carefully collected by Mr. Hugh Low. One new species, *Cypselus lowi*, was described.—A communication was read from Mr. R. Collett, C.M.Z.S., containing the description of a new fish of the genus *Lycodes*, from the Pacific, which he proposed to call *Lycodes pacificus*.—A communication was read from Prof. Garrod, F.R.S., containing an account of the variations in the trachea and tracheal muscles in the different forms of gallinaceous birds.

Institution of Civil Engineers, March 25.—Mr. Bateman, president, in the chair.—The paper read was on the electric light applied to lighthouse illumination, by Mr. J. N. Douglas, M. Inst. C.E. The author showed the progress of lighthouse luminaries from wood and coal fires to the introduction of tallow candles, fatty oils, mineral oils, coal gas, and electricity.

Statistical Society, March 18.—The president, G. J. Shaw Lefevre, M.P., occupied the chair.—Mr. H. H. Hayter, the Government Statist of Victoria, read a paper on the colony of Victoria; its progress and present position.—The following were elected as Honorary Members:—M. le Dr. E. Janssens, of Brussels, M. Arthur Chervin, of Paris, Signor Gerolamo Boccardo, of Genoa, and Prof. Dr. Fr. Xav. von Neumann-Sfallast, of Vienna.

Victoria (Philosophical) Institute, April 7.—Two papers were read, one by Thomas Karr Callard, F.G.S., and one, taking some special points, by Prof. Boyd Dawkins, F.R.S. The subject was the contemporaneity of man with the extinct mammalia (as taught by recent cavern exploration), and its bearing upon the question of man's antiquity. The first paper contended that the cavern evidence points to the more recent extinction of the mammalia referred to, rather than to the remote existence of man.

BOSTON, U.S.A.

American Academy of Arts and Sciences, March 12.—Prof. W. A. Rogers presented a paper on the coefficient of expansion of the brass bars used by the U.S. Coast Survey for standards of length. In order to compare different standards it was found

necessary to determine the coefficients of expansion of the particular bars on which the graduations were made. In the present case the coefficient was found to be ·0000097 by a process extremely simple and effective. The relations between water and air contact also seem to be well determined by this method of investigation.—Dr. J. J. Putnam showed a *pendulum myograph*, modified mainly for the sake of economy, from that of Wundt. The pendulum itself is made of the thickest plate-glass, and arranged so as to be moved up and down, with the aid of a racket and a counterpoise, together with the stage bearing the movable connections described by Wundt. Since for each position of the pendulum a tracing of given length would have a different significance from that in any other position, enameled cards were prepared with lines upon them diverging from the point of suspension, the intervals between which corresponded to ·01″ when the amplitude of swing was 20°. By means of this apparatus the *reliability of Marey's tambour* had been tested, with a view to its use in time-experiments in physiology. The delay for the tambour used, with a tube about 2 m. long, was found to be nearly ·01″, varying not more than ·002″ to ·003″ under impulses of different character and strength.

Geneva

Society of Physics and Natural History, December 19, 1878.—M. God. Lunel spoke of the variations of colour presented by the squirrel, and cited some cases of albinism of that animal in a special locality of the Valais.—Prof. Brun described observations of the phenomenon known as "rain of blood," made by him on May 14 last, on the Jebel Sekra, a summit of the Rist, at the western extremity of the Atlas, in Morocco. He observed it in the form of spots of a very bright red appearing in the rocks, and one to a mixture of siliceous sand and very fine lime, with abundance of unicellular algæ of the species *Protococcus fluvialis*, and containing especially peroxide of iron.—M. Wm. Barbey informed the Society of the gift recently made by Sir J. Hooker to the Museum of Lausanne of the herbarium of the botanist Gaudin of Nyon.

January 2, 1879.—Prof. Graebe made a communication on the discovery of alizarine in the various colouring matters extracted from it, and particularly on alizarine allies.—M. Alph. de Candolle gave an account of the number of specimens contained in his herbarium, commenced by his father in 1798. At the time of the death of the latter in 1841, the herbarium contained 161,748 specimens; now it contains 287,636 belonging to 80,000 or 90,000 vegetable species.

Paris

Academy of Sciences, March 31.—M. Daubrée in the chair.—The following papers were read:—Conformity of the systems of fractures obtained experimentally with the systems of joints which traverse the cliffs of Normandy, by M. Daubrée. These joints form two systems, and the general effect is like that produced in a plate by weak torsion.—Convenience of special denominations for different orders of fractures of the earth's crust, by M. Daubrée. He proposes the name *diaclase* for a fissure produced by rupture; *paraclase*, to express that the fracture is accompanied by displacement; and *lithoclase*, as a general term including the two large groups now specified.—New process for the gauging of rivers, by M. Boileau. This process is based on the property of water-courses, that at the surface there are two streams whose velocity of translation is equal to the mean velocity of the current. The hydrometric operations are reduced to use of a float.—On the last floods of the Seine, by MM. Lalanne and Lemoine. Last winter was marked by two successive floods reaching (at a short interval) very nearly the same high level (6·21 m. at the Pont Royal on January 8 and 6·05 m. on February 24). Since 1872 M. Lemoine has organised, under M. Belgrand's direction, a system of warnings of flood (three days previous) for the Seine and its larger affluents. They are sent by telegraph or otherwise to seventy four persons in Paris and sixty-seven outside of Paris, and have proved very correct.—On some observations of glazed frost similar to that of January last, and on the mode of formation of hail, by M. Colladon. In large hail-storms, the cumuli producing them are divided into several distinct groups, insulated electrically from each other by sections of dry and cold air, resembling smoke-columns from several chimneys. The columns of hail the author conceives as a huge descending piston; hence the violent whirling movements of wind near the ground, and the descent of cold, dry, highly electrified air from the upper regions, to restore equilibrium; this air divides the clouds into nearly vertical columns; hence the peculiar forms of lightning during those storms.—M. Du Moncel presented a work entitled "L'Eclairage Electrique."—Prof. Lawrence Smith was elected Correspondent in Mineralogy in room of the late Sir Charles Lyell.—Chemical researches on a filamentous matter found in the excavations of Pompeii, by M. de Luca. The substance (which seemed formed of numerous filaments) was black and almost completely carbonised; on simple pressure with the fingers it was reduced to powder. The threads seem to have been flax or hemp, altered by various natural agents underground during eighteen centuries.—On the cost of constructing lightning-conductors, by M. Melsens. His system applied to the large new barracks at Etterbeck-laz-Bruxelles, on buildings occupying 20,000 square metres, will be less than 6,000 francs.—Observations of Planet 193, discovered at Marseilles Observatory, by M. Coggia, February 28, 1879, communicated by M. Stephan.—On two equations with partial derivatives relative to the multiplication of the argument in elliptic functions, by M. Halphen.—On cylindric or logarithmic potential with three variables and its employment in the theory of equilibrium of elasticity, by M. Boussinesq.—Anomaly presented by magnetic observations of Paris, by M. Flammarion. Since 1870-71 the last maximum of sun-spots and of diurnal variation of the declination-needle, the amplitude of this variation has decreased everywhere except at Paris; here it seems stationary; and even the year 1877, which should approach a minimum, presents a maximum. Some like anomalies are observable in previous times.—On the thermal and galvanometric laws of the electric spark produced in gas, by M. Villari. *En résumé*, the thermal and galvanometric deflections produced, the former by the spark, the latter by the discharge of a condenser, are proportional to the quantity of electricity which produces them, and to the length of their active circuits.—Magnetic rotatory power of gases at ordinary temperature and pressure, by M. Becquerel. With improved apparatus he has not only got the rotation-effect but been able to measure it with precision. He gives results for coal-gas, &c.—On the magnetic rotatory power of vapours, by M. Bichat. The experiments were like the Strasburg ones, but with a brass instead of an iron tube (which is objected to as forming a hollow electromagnet).—Pressure exerted by galvanic deposits, by M. Bouty. A cylindrical thermometer bulb covered with gold leaf or silver is made negative electrode in decomposition, *e.g.*, of a salt of copper; the rise of mercury when deposit occurs is noted. All metals, zinc included, exert pressure thus; but the pressure is not necessarily normal nor the same at all points, and cannot serve directly as a measure of the phenomenon; it is the result of a change of volume of the metal in deposition.—On the alkalies of pomegranate, by M. Tauret.—On the formation of carbonic acid, alcohol, and acetic acid by yeast alone, without oxygen, and under influence of this gas, by M. Bechamp.—On glazed frost observed in Florida, by Mr. Collin.

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