

logical anatomy, On the Development of Contagious Molluscum.—The Architecture of Ants forms the subject of a communication from Prof. Maggi, who has been studying the habits of *Formica fuliginosa* Lat.—M. Tessori furnishes a geometrical demonstration of the error of representations given in many treatises on physics, as to deviation of the plane of oscillation of the pendulum.—In the department of moral and political science, Prof. Buccellati has a paper on central military prisons.

Archives des Sciences Physiques et Naturelles, March 15.—This number commences with a *resumé* of spectroscopic observations of the sun, made at Geneva, by M. Emile Gautier during the last three years. The results of this work (carried on under much less favourable climatic conditions than in Italy), are mainly a confirmation of those got by other observers. The protuberant phenomena are classed under three heads; eruptions, exhalations, and detached formations; all of which the author illustrates with drawings. Like P. Secchi he was often struck by the fact (which has been doubted), that when a protuberance is observed near a pole, there is generally one symmetrical with it, at the other end of the corresponding solar diameter, and near the opposite pole. The decrease in the number and dimensions of protuberances appeared during these years (from 1869) to precede and exceed that of the spots. M. Gautier adheres to the hypothesis of spots being formed by scorial matters resulting from cooling of the surface by radiation.—In the next paper M. Humbert gives a useful summary of what has hitherto been done by the *Challenger* expedition.—The *Bulletin Scientifique*, which follows, is larger than usual. Among other notes in it, we find an account of some instructive researches by Dr. Macaluso, on polarisation of electrodes, by chlorine and hydrogen. There is also a notice of an important geological map of the Austro-Hungarian Empire, recently completed by M. de Hauer, whose name it bears. The publication, directed by Heidenhain from 1850 till 1863, represents at least twenty years' labour (under considerable difficulties), of a large number of eminent geologists. Each plate is accompanied with detailed explanations. We further note a *resumé* of some recent researches on the minute structure of the eye; and another paper on physiological antagonism of poisons, in which are described some observations by MM. Martin-Damourette, Rossbach and Fröhlich, and others, with regard to the effects of physostigmine, the active principle of Calabar bean, and atropine.

SOCIETIES AND ACADEMIES

LONDON

Mathematical Society, April 9.—Prof. Cayley, vice-president, in the chair.—Mr. G. H. Darwin read a paper On Probable Error in Statistics. He stated that he had been at work at a statistical inquiry, and was desirous of forming some idea of what degree of accuracy he had a right to expect from the collection of a given number of cases. He put the problem into the following form:—A bag is known to contain a very large number of black balls and white balls, mixed at hazard; on drawing a large handful of n balls, I find p are white and the rest black.

What is the probable error in asserting that $\frac{p}{n}$ of all the balls

in the bag, are white? n and p , though large numbers, are supposed to be small compared to the number of balls in the bag. Mr. Darwin then made some further remarks On the Combination of Statistics. The question he considered was the following:—If X and Y are measurements or estimations of quantities such that the errors are distributed according to the exponential law, what is the "probable error" of XY and $\frac{X}{Y}$ in terms of

the moduli c and c' of X and Y respectively? M. J. W. L. Glaisher made some remarks on the papers, drawing the author's attention to the fact that the two questions had been treated of by Laplace and De Morgan.—Mr. Merrifield then gave a sketch of his paper entitled Determination of the Form of the Dome of Uniform Stress. He remarked that the general question of the equilibrium-figure of a thin dome is indeterminate, even when the law of thickness or density is given, and it thus differs from the question of the arch, by requiring the assumption of a further condition in order to render its form determinable. If the two following conditions are introduced simultaneously into the general equations, he stated that a very remarkable simplification occurs in the analysis:—(1) that the thrust along a meridian

hall equal the thrust along the parallel per unit of area at every point; (2) that the normal thickness shall vary in such a manner that the area under compression shall be proportional to the thrust. These seem to be the conditions necessary to the economical use of building materials of homogeneous character, for the maximum stretch is evidently least when the stress is equally distributed through the whole of the material. The form obtained bears a general resemblance to the upper half of a claret bottle, and the dome evidently required a heavy lantern.—Mr. A. J. Ellis gave an explanation of his theory that ordinary (commutative) algebra is the calculus of similar triangles upon one plane. Taking two fixed points O and I , any third point A determines a triangle, so that if B be a fourth point, it is immediately possible to find a fifth point C , such that the triangle BOC shall be similar to the triangle IOA , and have the angles thus named turned in the same direction. Marking this operation by a , as being determined by the position of the point A , and terming it a *clinant*, he showed that clinants obey every law of commutative algebra, so that it was possible to consider any and every existing algebraical expression as a clinant, and hence as determining a point in a plane. Clinants thus embraced not only the integers and fractions of ordinary arithmetical algebra, but incommensurables, negatives, and imaginaries. Hence also if x and y be any clinants, and $f(xy) = a$, if x be determined by taking X anywhere, a corresponding point Y would be determined. Hence arose a complete calculus of the correspondence of points in a plane, which Mr. Ellis calls *stigmatic geometry*, and which he showed comprehended under one set of equations and greatly generalised, not only the algebraical geometries of Descartes and Plücker, but the homographic geometry of Chasles, and from a single general principle gave a perfect geometrical representation of all the imaginary cases as part of one conception with the real cases. The actual algebraical work, though having the old form and obeying the old laws of operation, is greatly simplified by the clinant signification attached to the symbols, and in especial the expression and determination of direction is rendered easy and certain. (A more detailed explanation will be given, the speaker said, in his "Algebra Identified with Geometry," at the present time in the printer's hands.)—Prof. H. J. S. Smith made a short further communication in reference to his former paper On the Higher Singularities of Plane Curves.—A paper by Mr. H. M. Taylor, On Inversion, with special Reference to the Inversion of an Anchor-ring, was taken as read. Some of the properties given in the paper have been already given by Maxwell (Quart. Journ. Math., vol. ix.) where excellent stereoscopic views of four species of cyclides are given, and by Cayley in the same journal, vol. xii., and in a paper in the Phil. Trans. by Casey. The novelty of the paper consisted in the point of view from which the properties of the cyclides are investigated, viz. as the inverse figures of the anchor-ring, many of whose geometrical properties are as easily seen as those of the circle.

Linnean Society, April 16.—H. Trimen, M.B., in the chair.—A number of papers were read, being Nos. 3-14 of the series of contributions to the botany of H.M.S. *Challenger* Expedition, as follows:—Notes on Freshwater Algæ collected in the boiling springs at Furnas, St. Michael's, Azores, and their neighbourhood, by H. N. Moseley.—Note on the foregoing communication, by Prof. Thiselton Dyer.—Notes on some collections made at Furnas, by M. Archer. The diatoms belong to species of most frequent occurrence in fresh water, and appear to be in no way affected by the high temperature. The other Algæ are mostly common species, several of them British, belonging to the genera *Spirogyra*, *Mesocarpus*, *Bulbochate*, *Cedogonium*, &c.—Notes on plants collected at St. Vincent, Cape de Verdes, by H. N. Moseley.—Enumeration of Algæ collected by Mr. Moseley at the Cape de Verdes, by Dr. G. Dickie.—Enumeration of the fungi collected during the expedition of H.M.S. *Challenger*, Feb.-May 1873, by the Rev. M. J. Berkeley.—Note on plants collected at St. Paul's Rock, by H. N. Moseley. The only aerial plant found on the island was a *Chlorococcus*.—Enumeration of the Algæ collected by Mr. Moseley at St. Paul's Rock, by Dr. G. Dickie.—Notes on plants collected at Fernando Noronha, Cape de Verdes, by H. N. Moseley.—Enumeration of Algæ collected by Mr. Moseley at Fernando Noronha, by Dr. G. Dickie.—Enumeration of Algæ collected by Mr. Moseley in 30 fathoms of water at Barra Granda, Pernambuco, by Dr. G. Dickie.—Enumeration of Algæ collected by Mr. Moseley at Bahia, by Dr. G. Dickie.

Chemical Society, April 16.—Prof. Odling, F.R.S., presi-

dent, in the chair.—Dr. A. W. Tilden read a paper On Aqua Regia and the Nitrosyl Chlorides. He finds that when the gases evolved on gently heating aqua regia are passed into concentrated sulphuric acid, a product is obtained which, at a low temperature, deposits crystals of nitrosyl sulphate, NOHSO_4 . Both these crystals, and the liquid producing them, when mixed with sodium chloride and gently heated, evolve nitrosyl chloride NOCl , an orange-yellow gas which may be condensed to a deep orange-red liquid boiling at -8°C . The author could not obtain the dichloride NOCl_2 , which Guy Lussac supposed to exist, but which he believes to be merely a solution of chlorine in the monochloride.—Dr. C. R. A. Wright then read a paper On Isomeric Terpenes and their Derivatives, Part IV. § I. On Cajeput Oil, by C. R. A. Wright and C. Lambert. It was found that the cajeputol, $\text{C}_{10}\text{H}_{18}\text{O}$, boiling at $176^\circ\text{—}179^\circ\text{C}$., obtained from oil of cajeput, combines with bromine forming the compound $\text{C}_{10}\text{H}_{18}\text{Br}_2\text{O}$. On heating this it splits up into cymene, $\text{C}_{10}\text{H}_{16}$, hydrobromic acid, and water. § 2. Action of Pentasulphide of Phosphorus on Terpenes and their Derivatives, by C. R. A. Wright. When cajeputol is treated with the pentasulphide, it yields a mixture of terpene and cymene, the latter being formed by a secondary action of the pentasulphide on the terpene. This was shown really to be the case by treating the terpene from oil of turpentine and hesperedene with the pentasulphide, when cymene was formed in both cases.

Anthropological Institute, April 14.—Prof. Busk, F.R.S., president, in the chair.—Mr. John Brent exhibited and described a series of flint implements from Canterbury and Reculver.—A description, by Mr. Howorth, was read of an Ashanti fetish letter, or curse. The document, which was lent by Capt. Gordon for exhibition, was written in the Arabic character and in the language of the Barbu tribe, on a sheet of rough paper of large foolscap size, folded about two inches square and tied with green thread. The letter contained a prayer that the English might fight among themselves and return to the coast, and that pestilence might overtake them. The Ashanti grievances were enumerated, and it stated that the white man came with covetous eyes and seized the land, and that covetousness brought down the curses of Suleiman the high priest. It was thought by the English scouts that it was Suleiman himself who endeavoured to stay the British troops on their approach by throwing down the fetish, and that his failure would probably cost him his life.—Capt. S. P. Oliver, R.A., contributed a series of papers On the Non-historic Stone Relics of the Mediterranean. The series comprised full accounts, with ample illustrations, of the Torre dei Giganti, Malta; Tumuli near Smyrna; Dolmen-mounds of the Albegna; Sardinian Nuraggs; and the Sepulture de *is Gigantes* of Sardinia.

Meteorological Society, April 15.—Dr. R. J. Mann, president, in the chair.—On the Climate of Patras, Greece, by Rev. H. A. Boys. The author shows that the climate of Patras is naturally mild and relaxing, seldom disagreeably dry, and not often very damp, being indeed drier by a good deal than any part of England.—Remarks on the Atlantic Hurricane of August 20 to 24, 1873, by W. R. Birt.—On the Meteorology of December in the southernmost part of the Southern Indian Ocean, by Robert H. Scott, F.R.S. This paper has been prepared for the purpose of giving information on the climate of Kerguelen Island to those gentlemen who are going out to observe the Transit of Venus in December next.—On the Diurnal Variations of the Barometer, by J. K. Laughton. Whilst it has long been well known that barometric maxima and minima occur daily with unfailling regularity, especially within the tropics, the cause of this recurrence is yet unknown; and though it has been attributed to the different temperature and humidity at different times of the day, such explanation is far from satisfactory, for the maxima occur at the times of mean temperature and humidity without regard to the direction of the change, and the minima occur indifferently at the times of both greatest and least temperature and humidity. It seems that an explanation is rather to be found in the inertia of the atmosphere, which in the first instance permits its elastic force to be increased by a rapidly increasing temperature before the inertia of rest can be overcome sufficiently to allow it to enlarge its volume in due proportion, but when that inertia of rest is overcome, then the inertia of motion permits it to move away from the place of observation in excess of what is due to the increased elasticity; the nocturnal maximum and minimum being caused by the resilient power of the air, which gives it alternately an inward and outward motion, and each way in excess of what is due to the decrease or increase

of elasticity by reason of the inertia of motion. If this explanation is correct, we ought to find a certain tendency of the wind towards east in the morning and towards west in the evening; and this tendency does seem to be shown in the very few published observations which permit a comparison to be made. Further observations, as confirming or disproving the proposed theory, are much to be desired.

Victoria Philosophical Institute, April 13.—Mr. Edmund W. Gosse, of the British Museum, read a paper On the Ethical Condition of the Early Scandinavian Peoples, in which he illustrated the peculiar features of the civilisation of Scandinavia in pagan times, and showed in what salient points that civilisation differed from the spontaneous developments of morality in other cultivated heathen races—the Elder or Poetic Edda of *Scemund Sigfussen* being taken as the text.

MANCHESTER

Literary and Philosophical Society, March 24.—Rev. William Gaskell, vice-president, in the chair.—On some of the Perplexities which the Art and Architecture of the Present are preparing for the Historians and Antiquarians of the Future, by the Rev. Brooke Herford.—A Few Observations on Coal, by E. W. Binney, V.P., F.R.S. From his observations the author was led to conclude that soft or cherry coal was chiefly composed of the bark, cellular tissue, and vascular cylinders of coal plants with some macrospores and microspores. That caking coal had much the same composition, except that it contained a greater proportion of bark in it. That splint coal had a nearly similar composition, but with a great excess of macrospores. That cannel coal, especially that yielding a brown streak, was formed of the remains of different portions of plants with a great excess of microspores, which had long been macerated in water. These conclusions were arrived at merely as to the composition of the different kinds of coal. No doubt each seam would be materially affected by the nature of the roof, whether the latter was an open sandstone or a close and air-tight black shale or blue bind, for the former would allow the free escape of gaseous matter, and the latter would prevent its escape. It is well known that the character of the roof has a deal to do with the quality of the coal under it.

April 7.—E. W. Binney, F.R.S., vice-president, in the chair.—The chairman exhibited to the meeting some portion of the cast-iron roof from the Salford Station of the Lancashire and Yorkshire Railway, which after having been up for a period of four years was so much corroded and damaged that it had to be taken down. He attributed the effects to sulphuric acid and soot arising from the combustion of the coal used in the locomotives passing under it, aided by the action of steam and vibration.—On the Action of Nascent Hydrogen or Iron, by William H. Johnson, B.Sc. In a paper read before the Society last year, the author showed that a piece of iron immersed in hydrochloric, sulphuric, or other acid which evolves hydrogen by its action on the metal, on breaking gives off bubbles of gas from the surface of the fracture. It subsequently occurred to the author that these bubbles might be produced by subjecting the metal to the action of nascent hydrogen for some time, and without the aid of acid at all. To test this he connected two pieces of iron wire $\frac{1}{16}$ " diam. respectively with the copper and zinc plates of a battery of 50 Daniell's cells and immersed them in a vessel of Manchester town's water at a distance of one inch apart. On closing the current, bubbles of hydrogen were given off from the wire connected with the zinc, but none from the wire connected with the copper, the oxygen liberated at the pole apparently forming oxide of iron which in 12 hours formed a thick smudge at the bottom of the vessel. After 24 hours the surface of the wire connected with the zinc was unchanged, but on moistening the fracture bubbles were given off abundantly just as if it had been immersed in acid. The other wire, on the contrary, though much oxidised and eaten away, did not give off bubbles when broken. A variety of experiments were made in the same way with similar results. The author concludes that if the oxidation of the surface of iron be as a rule accompanied by the absorption of nascent hydrogen into the interior of the iron, then the diminution of strength and toughness consequent on this will affect iron ships, telegraph cables, and other structures in which iron is largely used and which are constantly immersed in water.

EDINBURGH

Geological Society, March 13.—Mr. Andrew Taylor exhibited a specimen of coal converted by a recent explosion in

a Lancashire pit into anthracite, and even in some parts into graphite.—A paper by Mr. Payne was read, On the Oolitic coalfield of Brora, Sutherlandshire. One of the coal-seams, about 3 feet 6 inches thick, is being worked at a depth of from 720 to 300 feet.—Mr. Taylor then read three short papers on (1) An analysis of various coals and peats. (2) Specular iron recently discovered in New South Wales. (3) Shale recently discovered at Waitata, New Zealand.—Mr. Peach stated that, in the course of preparing these sections, he had made a discovery which may yet prove to be of some service in the Fine Arts, viz., that the pounded dust of such shale as this, an enormous bed of which occurs in New Zealand, yields a colouring material closely resembling sepia, a costly substance.

April 16.—Mr. David Milne Home, F.G.S., president, in the chair.—The first paper was read by Dr. Ramsay H. Traquair, Keeper of the Natural History collection in the Edinburgh Museum of Science and Art, On the Structure and Affinities of the genus *Cheirolepis*. Dr. Traquair submitted the following conclusions at which he had arrived on the matter:—(1) That Agassiz was correct in ascribing branchiostegal rays and irregular dentition to the cheirolepis, but the larger teeth are placed in a distinct row internal to the smaller ones, not in the same line as Agassiz described them. (2) That the plates described by Powrie as principal jugulars belong to the shoulder girdle, being in fact the interclavicular plates of Parker; and that cheirolepis has no jugular plates. (3) That the osteology of cheirolepis shows it to be so closely allied to *Palæoniscus* that it ought to be included in the same family, notwithstanding the minuteness and non-overlapping character of the scales.—Mr. George Lyon read a paper On a Species of *Griffithides* (*Trilobite*) from a limestone quarry south of Dalkeith, near Edinburgh, and which belongs to a genus extremely rare.—Mr. David J. Brown read a paper On a new Theory of the Formation of Till, or Boulder-clay. The author submitted that till is in reality formed by glaciers, after they enter the sea, tearing up the rocks that form its bed, and grinding them to boulders and mud, and that this mud deposited along with the boulders forms boulder-clay.

VIENNA

Geological Institute, Jan. 7 (anniversary meeting). The Director, Fr. v. Hauer, read the annual report, which states, that during the last year the palace of Prince Liechtenstein has been purchased for the collections, the library, laboratory, and the working rooms of the institute. The staff has been reorganised, and now consists of the Director, Fr. v. Hauer; Vice-Director, Fr. Foetterle; Chief Geologists, D. Stur, G. Stache, and E. v. Mojsisovics; Chief of the Chemical Laboratory, K. v. Hauer; Geologists, H. Wolf and K. Paul; two adjuncts, O. Lenz, the second at present being vacant; two assistants, A. Redtenbacher and K. John; two practitioners, C. Doelter and R. Hörnes.—After mentioning the share which the institute took in the general exhibition of last year, the report announces that geological explorations have been carried on during the last summer in the Bukovina as well as in the Tyrol, whence the examination of the northern chain of the Austrian Alps was finished with the Bregenzen-Wald (Vorarlberg), whilst that of the central chain was continued in the environs of the Oetz valley and the Ortler mountains, and that of the southern chain was begun in the environs of Lienz, in the valley of the Drau. Grateful allusion is also made to the liberal foundation of a capital of 12,000 florins in bonds of the Southern Railway Company, the gift of Albert Schloenbach, of Salzburg, Hanover, in memory of his late son, the eminent geologist, Urban Schloenbach. The annual interest of this sum will be given to officers or friends of the Geological Institute, to enable them to travel in foreign countries to compare geological observations made in the Austrian dominions with those abroad. The first to whom it has been granted is D. Stur, whose studies on the exact geological position of the Bohemian coal-beds are likely to lead to very interesting results; results, however, which require a comparative study of other coal basins, and chiefly of the rich collections of fossil plants in the Museum of Dresden, for their secure confirmation.—The following specimens have been newly arranged in the museum of the Institute:—The silurian fauna of Galizia; the Devonian fauna of Moravia; the carboniferous flora of Ostrau-Orlau-Karwin, of Schazlar-Schwadowitz, of Kladno-Schlan, of Swina, of Stradonitz, of Radnitz and its environs, of the Pilsen basin, of the Kossitz basin, the flora and the fauna of the old red in Austria, Moravia, and Bo-

hemia; the cretaceous flora of Moravia and Bohemia; the flora of many tertiary deposits in Bohemia, and of Wieliczka and Swazawice, in Galizia. In the chemical laboratory, more than 300 analyses and assays have been performed, the library has been augmented by 661 volumes, and the collection of maps by 194 sheets. The progress of the publications appears very satisfactory; besides the periodicals, the *Fahrbuch*, the *Mineralogische Mittheilungen* and the *Verhandlungen*, four sheets of the "Memoirs," were edited, viz., Vol. V., No. 4, On a Fossil Saurian from Lesina, with 2 plates, by Prof. A. Kornhuber; No. 5, On the Cephalopods of the Gosau beds of the north-eastern Alps, with 9 plates, by Dr. A. Redtenbacher; No. 6, Fauna of the beds of *Aspidoceras acanthicum*, with 13 plates, by Prof. M. Neumayr; and Vol. VI., No. 1, The Fauna of the Flambach and Halstatt beds, with 32 plates, by Dr. E. v. Mojsisovich. Also, a Geological Map of the Environs of Vienna, on the scale of 1 : 28800, with explanations by Th. Fuchs, and a Catalogue of the Objects exhibited by the Institute at the General Exhibition, have been published. Finally, the most important work has been the completion of M. v. Hauer's large geological map of the Austro-Hungarian empire, printed in colours on the scale of 1 : 576000, the last four sheets of which were published last year. Further communications were made by T. Hirschwald, On the Transformation of Wood into Brown Coal, in the Mine Dorothee, on the Ober-Starz; by S. Nedeljkovic, On the Sanidin-Trachytes of Sylvania; by Dr. A. Redtenbacher, Remains of *Ursus spelæus* from a cavern near Wildalpe, Upper Styria; Dr. G. Stache, On the Fauna of the lower eocene beds of Cosina, in Istria; Dr. C. Doelter, On some Eruptive Rocks in the Transylvanian Erzgebirge.

GÖTTINGEN

Royal Society of Sciences, Jan. 3.—M. Wielen communicated the results of an examination of Greek names of makers inscribed on ancient earthenware lamps in several archæological collections in Athens, Corinth, and Smyrna.—M. Lolling presented a paper on the Thesieon and the Hephaisteion in Athens.

RIGA

Society of Naturalists, Nov. 5, 1873.—M. Russwurm furnished some interesting particulars as to the seal-fishing on the Russian coasts. The Baltic supplies annually about 12,000 animals, with a value of 125,000 roubles (the rouble = 3s. 1½d.); the White Sea and neighbouring parts, 18,000 animals, worth 212,000 R.; the Caspian Sea, 100,000 animals, worth 900,000 R. The Russians (unlike the Finns, &c.) do not eat the flesh of seals, but throw it away. The various species met with, as also the mode of capture, were described.

Nov. 19.—Dr. Gutzeit gave an account of a new official map of Russia, just completed at St. Petersburg.—M. Teich communicated some observations on the power of scent in butterflies; he thinks they are greatly guided by the sense of smell, which has its seat in the feelers.

Dec. 3.—Prof. Petholdt read a paper on structural relations of ice and axes of crystals.—Prof. v. Siviers made some observations on driftwood collected in the Arctic regions by the recent German expedition.

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