THE *Revue Scientifique* announces the death of the naturalist M. Pictet.

THE *Cologne Gazette* states that Herr Heuglin, the African traveller, has declined the offer of the Khedive to take the command of the troops sent to Abyssinia, in place of the late Munzinger Pasha, but is organising an Abyssinian exploration for scientific purposes.

DR. VON RICHTHOFEN, the well-known traveller and geographer, has been appointed Professor of Geography at the University of Bonn. He is still occupied at Berlin with the editing of his great work on China.

THE additions to the Zoological Society's Gardens during the past week include a Le Vaillant's Cynictis (*Cynictis penicillata*) from South Africa, presented by the Viscount Maudeville; a Hooper Swan (*Cygnus ferus*), European, presented by Mr. Montague Kingsford; a Weeper Capuchin (*Cebus capucinus*) from Brazil, presented by Mr. August Kettner; a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Mr. T. J. Dunn; two Darwin's Pucras (*Pucrasia Darwini*) from China, purchased.

SCIENTIFIC SERIALS

Zeitschrift der Oesterreichischen Gesellschaft für Meteorologie, Nov. 15, 1875.—Dr. Billwiller, of Zürich, contributes an article on a local occurrence of the northerly "Föhn." It was formerly believed that the Föhn came from the Sahara Desert, whence it derived its warmth and dryness, but Hann showed a few years ago that, according to known physical laws, descending air becomes warmer and drier, that winds of the Föhn kind are not confined to the Alps but occur in other mountainous regions, and that the southern slopes of the Alps have a north wind, which is the exact counterpart of that called the Föhn. A mass of observations made in Switzerland have since proved the correctness of his theory. Herr Billwiller, from the data he has as yet examined, finds that isolated Föhn winds prevail only when a broad current flows over the whole Alps in the same direction, ascending on one side and descending on the other. But there are cases in which no perceptible upward movement can be traced on one side, and yet on the other the Föhn descends into the valleys from above. A difference of density, often great, is the cause of this. The lower strata being obstructed the outflow of air necessary to restore equilibrium comes from above. The merely local Föhn blows strongly down a valley, but on reaching the colder air of the plain mixes with it and quickly comes to rest. Tables are given showing meteorological conditions in particular cases.—The next article, written by Dr. Wild, and quoted here from the Annual Report of the Imperial Observatory at St. Petersburg, is a review of the work of the Meteorological Congresses of 1873 and 1874. Perhaps the most important result of these congresses will be the general use of more trustworthy instruments by official and private observers. The following advantages have already been gained: an international system of ciphers for telegraphic despatches throughout nearly the whole of Europe; an international form of publication in the following countries: Norway, Sweden, Denmark, Russia, Austria, Switzerland, Italy, and part of Germany; and lastly, the establishment in many States of central institutions. We shall thus obtain better, more uniform, and more accessible data as a consequence of the late congresses.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, Jan. 6.—On the refraction of sound by the atmosphere, by Prof. Osborne Reynolds, Owens College, Manchester. Communicated by Prof. Stokes, Sec. R.S.

This paper may be said to consist of two divisions. The first contains an account of some experiments and observations undertaken with a view to ascertain how far the refraction of sound caused by the upward variation of temperature may be the cause of the difference in the distances to which sounds of the same intensity may be heard at different times.

Some rockets, capable of rising 1,000 feet, and then exploding a cartridge containing 12 oz. of powder, having been procured, an effort was made to compare the distance at which the rockets could be heard with that at which a gun, firing ¼ lb. of powder and making a louder report than the rockets, could be heard under the same conditions of the atmosphere. In the first instance the rockets and the gun were fired from a spot in Suffolk, around which the country is tolerably flat, observers being stationed at different distances. Owing, however, to the effect of the wind and the time required for the observers to proceed to the distant stations, these experiments were not successful in establishing the comparative merits of the gun and the rockets. They were, however, important as showing that on hot calm days in July the reports of the rockets never failed to be distinctly audible at distances of four and five miles, although the sun at the time was shining with full force on the ground, and rendering the air near the surface so heterogeneous that distant objects seen through it appeared to wave about and twinkle.

The next attempt was made during a cruise on the east coast. After three weeks cold and windy weather, the 19th of August was a fine day, and some experiments were made in Lynn Deeps, which revealed a very extraordinary state of the atmosphere as regards the transmission of sound. A party rowed away from the yacht in one of her boats, it having been arranged beforehand that either a rocket or a large pistol was to be fired from the yacht when signalled for; also that when those on the yacht heard those in the boat call they should answer. The boat proceeded to a distance of five miles, until those on the yacht had completely lost sight of it; but all the time the calls from the boat were distinctly heard by those on the yacht, although after they had lost sight of the boat they ceased to answer the calls. On the boat also not only were the reports of the pistol and rockets distinctly heard, but every answer from the yacht was heard plainly. The last came after an interval of thirty-five seconds, which gave the distance 3½ miles. Nor was this all; but guns, and on one occasion the barking of a dog, on the shore eight miles distant, were distinctly heard, as were also the paddles of a steamer fifteen miles distant.

The day was perfectly calm, there was no wind, the sky was quite clear, and the sun shining with great power—conditions which have been described as most favourable to the stoppage of the sound by the heterogeneity of the atmosphere, and which may also be described as most favourable for great upward refraction. On this day, however, it was observed that all the time distant objects *loomed* considerably, *i.e.*, appeared lifted. This showed that the air was colder near the surface of the sea than it was above. It is to this circumstance that the extraordinary distances to which sounds were heard on this day is supposed to be due. The diminution in the temperature of the air being downwards, the sound, instead of being lifted as it usually is, was brought down, and thus intensified at the surface of the water, which, being perfectly smooth, was thus converted into a sort of whispering-gallery.

The report of the pistol and the sounds of the voice were attended with echoes, but not so the reports of the rockets; and it is suggested that these so-called echoes may be found only to attend sounds having a greater intensity in one direction than in another.

The second part of the paper refers to a phenomenon noticed by Arago in his report of the celebrated experiments on the velocity of sound made on the nights of the 21st and 22nd of June, 1822.

It was then found that, although the guns fired at Montlhery could be distinctly heard at Villejuif (eleven miles distant), those fired at Villejuif could not be heard at Montlhery without great attention, and at times (particularly on the second night) they were not heard at all; although on both nights the wind was blowing from Villejuif to Montlhery, the speed of the wind, which was very light, being about 1 foot per second. No explanation of this phenomenon was offered by the observers, although it was much commented on. And on the second night the gun at Villejuif, which on the previous night had been pointed upward, was brought down in the hope that this might improve its audibility (this step was, however, found to render matters worse than before).

From this lowering of the gun at Villejuif it seemed as though there was probably some difference in the conditions under which the guns at the two stations were placed, as if that at Villejuif was fired from a level, while that at Montlhery might be fired over a parapet. An inspection of the district confirmed this view; for Villejuif is on a low, flat hill, while Montlhery is on the top of a steep cone; and not only is it 80 feet above Villejuif, but it is surmounted by the mound of an old castle, which

is supported by a vertical wall towards Villejuif and surrounded by a low rampart. Hence it is suggested that in all probability the advantage of the gun at Montlhery was due to its being fired over this parapet, while that at Villejuif was fired from the level ground.

The fact that the wind blowing from Villejuif did not reverse this advantage, suggested the possibility that at night, when the diminution of temperature is downward, a light wind may not produce the same effect upon sound as when the diminution of temperature is upward, as it generally is during the day.

To ascertain if this is the case, some observations were made on some calm nights in May and June of the present year, from which it was found :—

(1) That the sky was cloudy and there was no dew. The sound of an electric bell 1 foot above the grass could always be heard further with the wind than against it; but

(2) That when the sky was clear and there was a heavy dew, the sound could invariably be heard as far against a light wind as with it, and in some cases much further. On one occasion, when the temperature at 1 foot above the grass was 38° and at 8 feet 47°, and the speed of the wind was 1 foot per second at 5 feet above the grass, the bell was heard 440 yards against the wind and only 270 with it.

Since, therefore, on the nights of the experiments at Villejuif and Montlhery it is stated that the sky was clear, that there was dew, and the temperature recorded at the two stations shows the diminution to have been downwards, it is argued that the effect of the wind to render the sound less audible at Villejuif was completely balanced by the downward refraction of temperature.

Another phenomenon recorded by Arago is, that while the reports of the guns at Montlhery as heard at that station were attended with prolonged echoes, this was not the case with those at Villejuif. It is thought that this difference is sufficiently accounted for by the fact that while Montlhery is surrounded by high hills with precipitous or wooded sides, which must produce echoes, the country in front of Villejuif is very flat and has not a tree upon it for miles.

In concluding the paper reference is made to the Appendix to the last Report of the American Lighthouse Board, in which Dr. Henry, the Chairman, gives an account of his experiments, extending over thirty years, and the conclusions to which they have led him; both of which are in favour of the apparent stoppage of the sound being due to refraction.

Zoological Society, Jan. 4.—Prof. A. Newton, F.R.S., vice-president, in the chair.—An extract was read from a letter addressed to the Secretary by Mr. George Brown, dated Port Hunter, Duke of York Island, stating that he had shipped for the Society to the care of Dr. G. Bennett, of Sydney, two cassowaries and some other birds from New Britain and Duke of York Island.—A letter was read from Mr. R. Trimen, Curator of the South African Museum, Cape Town, containing some remarks on *Canis chama*.—Dr. Hector, F.R.S., exhibited and made remarks on three ancient feather-mats, made by the Maoris of New Zealand, which had been obtained by Dr. Buller, from a chief on the Upper Wanganui River.—Prof. W. H. Flower, F.R.S., gave a description of the skull of a fossil species of the genus *Xiphodon*, Cuvier, from a specimen belonging to the Museum of the Royal College of Surgeons, supposed to have been found near Woodbridge in Suffolk.—Prof. Huxley, F.R.S., read a paper on *Ceratodus*, in which he pointed out the special characters presented by this remarkable fish in the structure of its nasal apertures, brain, skull, and fore-limb. Prof. Huxley also called attention to the close connection shown by certain details of structure between *Ceratodus* and the Chimæroid fishes, especially as regards the skull.—A communication was read from Dr. Julius Von Haast, F.R.S., containing the description of a new Ziphioid whale from the coast of New Zealand.—Mr. Sclater read a paper on some additional species of birds from St. Lucia, West Indies, which had been sent to him by the Rev. J. E. Semper of that island. The collection contained one very remarkable form which appeared to be referable to a new genus of *Mniotiltidæ*, and was proposed to be called *Leucopeza semperi*.—A communication was read from Mr. W. H. Hudson containing some notes on the spoonbill of the Argentine Republic.—A paper was read by Messrs. Sclater and Salvin, on Peruvian birds collected by Mr. Whitely, being the ninth of a series of communications on this subject.—A communication was read from Dr. Otto Finsch, containing notes on some Fijian birds, including description of a new genus and species proposed to be called *Drymochæra badiceps*.—Mr. A. H. Garrod read a note on the *cæcum coli* of the Capybara, as observed in a specimen recently deceased in the Society's menagerie.

Royal Microscopical Society, Jan. 5.—Mr. Chas. Brooke, F.R.S., vice-president, in the chair.—Messrs. W. A. Bevington and B. D. Jackson were elected auditors of the Society's accounts, and a list of gentlemen nominated for election as officers and council for the ensuing year was read by the Secretary.—Attention was called to a number of specimens sent to the Society a short time since by Mr. Hanks, of San Francisco, and which had since been mounted for the cabinet by Mr. Loy; also to some slides of *Aulacodiscus kittoni*, presented by Mr. Thos. Curties from material collected on the late Congo Expedition, by Mr. Martin, H.M.S. *Spiteful*.—Mr. C. Stewart then gave an interesting account of the structure and development of sponges, freely illustrating his remarks by drawings upon the black-board, and concluded by stating his reasons for believing that the well-known perforations in oyster-shell were really made by the sponge.—Mr. Hickie exhibited to the meeting some photographs from Germany of *Navicula crassinervis* and *Frustulia saxonica*, and read some letters from Dr. Rabenhirst and Herr Seibart in support of his opinion that the two were widely distinct.

Entomological Society, Jan. 5.—Sir Sidney Smith Saunders, C.M.G., president, in the chair.—Messrs. F. J. Horniman and D. G. Rutherford were elected ordinary members, and Prof. W. Dickson, of Glasgow University, and Mr. F. Enoch were elected subscribers.—The Rev. R. P. Murray exhibited a collection of Lepidoptera taken by himself on the Higher Alps, amongst which were some interesting mountain varieties.—Mr. S. Stevens exhibited a specimen of a dragonfly, rare in this country (*Æschnia mixta*), which he had picked up, nearly dead, in his garden at Upper Norwood, in the middle of November.—Mr. Champion exhibited some rare British Coleoptera.—Mr. H. W. Bates communicated a paper entitled "Additions to the list of Geodephagous Coleoptera of Japan, with synonymic and other remarks."—Mr. W. H. Miskin, of Queensland, communicated a description of a new and remarkable species of moth belonging to the genus *Attacus*, of which a male and a female specimen had been taken in the neighbourhood of Cape York. He had named the species *A. Hercules*. The expanse of the wings measured nine inches, and the hind wings were furnished with tails. The specimens had been deposited in the Queensland Museum.—Mr. C. O. Waterhouse forwarded a paper on various new genera and species of Coleoptera belonging to the *Geodephaga*, *Necrophaga*, *Lamellicornia*, and *Rhyncophora*.—Part IV. of the "Transactions" for 1875 was on the table.

MANCHESTER

Literary and Philosophical Society, Dec. 14, 1875.—Mr. Edward Schunck, F.R.S., &c., president, in the chair.—On graphic methods of solving practical problems, by Prof. Osborne Reynolds. In the first part of this paper it is pointed out that, when dealing with practical problems by the aid of the graphic method, it is not necessary to break off the operations of drawing, and find numerical values for the quantities represented, in order to perform on them the operations of multiplication and division. For by the aid of a parallel ruler the operations of multiplication and division may be performed graphically with great facility. The only geometrical proposition involved being that of finding a fourth proportional to three distances. When two distances have to be multiplied or divided the one by the other, a third distance is chosen equal to unity, and a fourth proportional found which represents the product or ratio of the first according as unity is the first or third of the given quantities. The method was illustrated as applied to the determination of areas, centres of gravity, and moments of inertia. In the second part of the paper a graphic method is described by which the velocity and acceleration of a moving point can be determined when the times at which it occupies certain positions are known, *i.e.* the curves representing the velocity and acceleration of the point may be drawn from the curve representing the positions of the point. Also a converse method by which the position of a point at any time may be found from the curve representing either its velocity or displacement.—On explosions of fire-damp. E. W. Binney, F.R.S., said that the fearful loss of life in our coal-mines deserved the careful attention of all societies like ours. It ought to be one of the objects of science to endeavour to find out the cause of these explosions, and to devise some means to prevent their occurrence or lessen their frequency. No doubt Government inspection had been of service, and the examination of managers would tend to improve the efficiency of

mining officers; but still, notwithstanding these improvements, the explosions of fire-damp are sadly too frequent. The lamentable events which have taken place within the last few weeks clearly show that they sometimes occur without any great change in the barometric pressure of the atmosphere, although undoubtedly sudden depressions in a barometer ought to caution miners against emission of gas from the seam of coal and coal-wastes, and put the men more on their guard at such times. It has been stated in this Society that certain conditions of the atmosphere quite irrespective of barometric pressure may have something to do with causing the "drag" in the currents of air circulating through a mine, as explosions have frequently occurred during an east wind and a muggy state of the atmosphere, and a vesicular condition of water in the air has been suggested as the probable cause of this lessening of the speed of the air passing through the galleries of mines. Now, careful observations with a good anemometer in the return air-course of a mine ought to determine whether or not such an effect is produced, and thus settle this point by direct experiment. Another source of accidents at this time of the year has to be taken into consideration. Before Christmas and in cold weather there is often a brisk demand for coal, and both managers and men are in a hurry to increase the output, and under such circumstances probably there may be sometimes not so much care and caution exercised as are necessary for them to use in the dangerous work in which they are engaged. In the management of a fiery mine, in my opinion—1. There ought not to be any unventilated wastes. 2. The mixed use of Davy lamps and naked lights should not be permitted where the former are commonly employed. 3. Blasting of coal by gunpowder should not be sanctioned where Davy lamps are in common use. 4. An anemometer under the care of a competent man should be in constant use, in order to see that a sufficient current of air is passing through the workings to insure perfect ventilation of the mine. 5. When there are marked indications of firedamp in a mine, shown by a cap on the flame of a lamp, the men engaged in hewing and drawing coal should be removed from the pit until by ventilation the place is cleared of gas and rendered safe for a working collier. The above precautions may probably cause an increased cost in the getting of coal, but they are necessary for the preservation of human life if such catastrophes as now frequently occur are to be prevented. It is now pretty generally admitted that all explosions of fire-damp are caused by there being too little pure air and too much of that gas in a mine.—Chemical notes, by M. M. Pattison Muir, F.R.S.E., Assistant Lecturer on Chemistry, Owens College.

PARIS

Academy of Sciences, Jan. 3.—Vice-Admiral Paris in the chair.—M. Peligot was elected vice-president for 1876; and MM. Chasles and Decaisne were elected to the Central Administrative Commission. The following papers were read:—On the interior constitution of magnets, by M. Jamin.—New thermic researches on the formation of organic compounds; Acetylene, by M. Berthelot. The heat liberated by combustion of acetylene with free oxygen = + 321 cal. for C_4H_2 = 26 grs.—Final reflections on the production of saccharoid matters in plants, by M. Duchartre.—Ephemerides of the planet (156) determined by M. Rayet, from observations at Marseilles, by M. Lœwy.—On the way in which caloric vibrations may dilate bodies, and on the coefficient of dilatation, by M. de Saint-Venant.—Sixteenth note on the electric conductivity of moderately conducting substances, by M. Du Moncel. Minerals, when truly conductors, have but two kinds of conductivities, an electrolytic conductivity and one which is proper to them and approximates more or less to metallic conductivity. The electrotonic conductivity proper to dielectrics exists only in rocks known to be isolating and in crystals. But there are effects which imply a characteristic polarity of a moderately conducting medium.—New crystallised hydrate of chlorhydric acid, by MM. Pierre and Puchot. Mixing two parts of snow with one part of hydrochloric acid (cooled previously to − 15° or − 16°), one may obtain a temperature of − 35° C.—On a new fundamental law of electrodynamics, by M. Clausius.—On the study of thermic motors, and on some points of the theory of heat in general, by M. Hirn. This is an outline of Vol. II. of the author's work on Thermodynamics.—Osseous heads of fossil and actual human races; history of ethnic craniology; Negrito race, by MM. Quatrefages and Hamy.—Report on M. de Magnac's method for representing the daily course of chronometers.—Determination, by the principle of analytical correspondence, of the order of a geometric place defined by algebraic conditions, by M. Saltel.—On a point of infinitesimal geometry, by M. Serret.—On left cubics, by M. Appell.—Physiological conditions influencing the character of unipolar excitation of nerves, during and after the passage of a battery current, by M. Chauveau. He studies four cases: nervous system intact, spinal cord separated from brain, cord destroyed, and nerve cut above point of application of electrode.—On a commensal Amphipodan (*Urothoe marinus*) of the *Echinocardium cordatum*, by M. Giard.—Elliptic elements of the planet (157) Dejanire, and calculated ephemerides, by M. Stephan.—Researches on the law of transmission, by the earth's atmosphere, of calorific radiations from the sun, by M. Crova.—On the phenomena of induction, by M. Mouton. He studies the electric state of an induced bobbin with the ends unconnected, and too far apart for a spark to pass; a series of oscillations in potential is observed.—On the *rôle* of acids in dyeing with alizarine and its congeners, by M. Rosenstiehl.—On the phosphates of sesquioxide of iron and alumina, by M. Millot.—On a secondary hexylic alcohol, by M. Œchsner de Coninck.—On the assimilability of fossil phosphates, and on the danger of exclusive use of azotised manures, by M. Roussille.—On the preparation of gaseous bromhydric acid, by M. Bertrand.—Researches on the functions of glands in the digestive apparatus of insects, by M. Jousset. He was able, in *Blatta orientalis*, to obtain the liquids in the gland itself before entrance into the alimentary canal.—On the floral glands of *Parnassia palustris*, new physiological functions, by M. Hæckel. These glands are a carnivorous organ.—Undulations of the clay in the north of France, by M. Hebert.

VIENNA.

Geological Society, Dec. 7, 1875.—After welcoming Dr. E. Tietze on his return from Persia, M. von Hauer presented some papers sent in by Dr. K. Peters on the interesting limestone from the Sauerbrunngraben, near Stainz, in Styria, which encloses crystals of a plagioclastic felspar belonging to the species Albite.—Dr. A. Feistmantel, on the minerals of the peculiarly large-grained granite (Pegmatite) from the districts of Behar and Rangun, in Bengal. Among them large plates of mica are very remarkable, which the inhabitants make use of as ground for paintings, but they are also, like the Russian mica, brought to Europe for sale.—Dr. Kapf, of Stuttgart, on some very interesting remains of Saurians found in the so-called Stuben sandstone of Wurtemberg.—Dr. Mojsisovics presented the second volume of his work on the Mountains of Hallstadt, and gave a short account of its contents. In this volume the genera Arcestes (with 112 species), Didymites (with 6 species), and Lobites (with 26 species) are described, and illustrated in thirty-eight lithographic plates.—Dr. Dölter reported on the composition of the Melaphyres from the Southern Tyrol. Among the essential constituents of them, he recognised in some cases Amphibole, in others Augite.—R. Hörnes exhibited some remains of *Anthracotherium magnum*, from the coal-mines of Trifail, in Styria, and expressed the opinion that the carboniferous strata of Trifail and Sotzka are not identical with those of Eibiswald and Wies, but belong to an older stage of the tertiary period.

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