M. Gosselet furnishes a detailed account of the southern band of Devonian limestones in the district Entre-Sambre-et-Meuse; and M. Selys de Longchamps makes some additions to a synopsis of the Cordulina.—A programme of five questions for medal competition is announced, the subjects being briefly these: disturbing causes in determination of the electromotive force and inferior resistance of a battery element; relations of heat to the phenomena (especially periodic) of vegetation; embryonal development of Tunicata; composition and mutual relations of albuminoid substances; coal system of the Liège valley.

Archives des Sciences Physiques et Naturelles, Feb. 15, 1874.—In this number M. Dufour gives a detailed account of his researches on the variation of temperature which accompanies diffusion of gases through a porous partition. After describing the apparatus (in which a porous vessel, with thermometer and other tubes inserted in its gutta-percha stopper, was enclosed in a cylindrical glass vessel, and this, enveloped in loose cotton, in a larger earthen vessel), the author studies first the influence of the dry or humid state of gases coming into contact with the porous wall, without diffusion; next, variation of temperature where there is no change of pressure; and third, variation where there is such change. With constant pressure, there is fall of temperature on the side where the denser gas is; and rise on the other side. Each current seems to have a heating effect where it enters the porous wall and a cooling one where it issues. With change of pressure, where this rises within the vessel, through endosmose of a lighter gas, the temperature slightly increases, sinking again as the pressure tends to equilibrium. Where exosmose of a lighter gas causes diminution of pressure in the vessel, the reverse occurs.—From observations of the partial solar eclipse of May 26 last, at three Italian stations, D'Aoste, Moncalieri, and Florence, Prof. Denza finds no sensible influence on the declination needle, either as regards its regular diurnal movement, or the absolute value of its displacement. He is confirmed in the conclusion, previously formed (on data of former eclipses), that no connection has hitherto been demonstrated between the two orders of cosmic facts, eclipses and phenomena of terrestrial magnetism.—M. Charles Lory communicates a note on some facts of structure in the central chains of the Alps.—The *Bulletin Scientifique* gives, as usual, a valuable series of notes on recent progress in Physics, Geology, Zoology, and other branches.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, March 26.—On the Motions of some of the Nebulæ towards or from the Earth, by William Huggins, D.C.L., LL.D., F.R.S.

The observations on the motions of some of the stars towards and from the earth, which I had the honour to present to the Royal Society in 1872, appeared to show, from the position in the heavens of the approaching and receding stars, as well as from the relative velocities of their approach and recession, that the sun's motion in space could not be regarded as the sole cause of these motions. "There can be little doubt but that in the observed stellar movements we have to do with two other independent motions—namely, a movement common to certain groups of stars and also a motion peculiar to each star." *

It then presented itself to me as a matter of some importance to endeavour to extend this inquiry to the nebulæ, as it seemed possible that some light might be thrown on the cosmical relations of the gaseous nebulæ to the stars and to our stellar system by observations of their motions of recession and approach.

Since the date of the paper to which I have referred, I have availed myself of the nights sufficiently fine (unusually few even for our unfavourable climate) to make observations on this point. The inquiry was found to be one of great difficulty, from the faintness of the objects and the very minute alteration in position in the spectrum which had to be observed.

At first the inquiry appeared hopeless, from the circumstance that the brightest line in the nebular spectrum is not sufficiently coincident in character and position with the brightest line in the spectrum of nitrogen to permit this line to be used as a fiducial line of comparison. The line in the spectrum of the nebulæ is narrow and defined, while the line of nitrogen is double, and each component is nebulous and broader than the line of the nebulæ. The nebular line is apparently coincident with the middle of the less refrangible line of the double line of nitrogen. *

The third and fourth lines of the nebular spectrum are undoubtedly those of hydrogen, but their great faintness makes it impossible to use them as lines of comparison under the necessary conditions of great dispersive power, except in the case of the brightest nebulæ.

The second line, as I showed in the paper to which I have referred, is sensibly coincident with an iron line, wave-length 495·7; but this line is inconveniently faint, except in the brightest nebulæ.

In the course of some other experiments my attention was directed to a line in the spectrum of lead which falls upon the less refrangible of the components of the double line of nitrogen. This line appeared to meet the requirements of the case, as it is narrow, of a width corresponding to the slit, defined at both edges, and in the position in the spectrum of the brightest of the lines of the nebulæ.

In December 1872 I compared this line directly with the first line in the spectrum of the Great Nebulæ in Orion. I was delighted to find this line sufficiently coincident in position to serve as a fiducial line of comparison.

I am not prepared to say that the coincidence is perfect; on the contrary, I believe that if greater prism power could be brought to bear upon the nebulæ, the line in the lead spectrum would be found to be in a small degree more refrangible than the line in the nebulæ.

The spectroscope employed in these observations contains two compound prisms, each giving a dispersion of 9° 6′ from A to H. A magnifying-power of 16 diameters was used.

In the simultaneous observation of the two lines it was found that if the lead line was made rather less bright than the nebular line, the small excess of apparent breadth of this latter line, from its greater brightness, appeared to overlap the lead line to a very small amount on its less refrangible side, so that the more refrangible side of the two lines appeared to be in a straight line across the spectrum. This line could be therefore conveniently employed as a fiducial line in the observations I had in view.

In my own map of the spectrum of lead this line is not given. In Thalén's map (1868) the line is represented by a short line to show that, under the conditions of spark under which Thalén observed, this line was emitted by those portions only of the vapour of lead which are close to the electrodes.

I find that by alterations of the character of the spark this line becomes long and reaches from electrode to electrode. As some of those conditions (such as the absence of the Leyden jars, or the close approximation of the electrodes when the Leyden jars are in circuit) are those in which the lines of nitrogen of the air in which the spark is taken are faint or absent, the circumstance of the line becoming bright and long, or faint and short inversely, as the line of nitrogen suggested to me the possibility that the line might be due not to the vapour of lead but to some combination of nitrogen under the presence of lead vapour. As, however, this line is bright under similar conditions when the spark is taken in a current of hydrogen, this supposition cannot be correct.

A condition of the spark may be obtained in which the strongest lines of the ordinary lead spectrum are scarcely visible, and the line under consideration becomes the strongest in the spectrum, with the exception of the bright line in the extreme violet.

I need scarcely remark that the circumstance of making use of this line for the purpose of a standard line of comparison is not to be taken as affording any evidence in favour of the existence of lead in the nebulæ.

Each nebula was observed on several nights, so that the whole observing time of the past year was devoted to this inquiry. In no instance was any change of relative position of the nebular line and the lead line detected.

It follows that none of the nebulæ observed show a motion of translation so great as 25 miles per second, including the earth's motion at the time. This motion must be considered in the results to be drawn from the observations; for if the earth's motion be, say, 10 miles per second from the nebulæ, then the nebula would not be receding with a velocity greater than 15 per second; but the nebula might be approaching with velocity as great as 35 miles per second, because 10 miles of this velocity would be destroyed by the earth's motion in the contrary direction.

The observations seem to show that the gaseous nebulæ as a

* Proceedings of the Royal Society, vol. xx. p. 392.

* Proceedings of the Royal Society, vol. xx. p. 380.

class of bodies have not proper motions so great as many of the bright stars. It may be remarked that two other kinds of motion may exist in the nebulæ, and if sufficiently rapid, may be detected by the spectroscope. 1. A motion of rotation in the planetary nebulæ which might be discovered by placing the slit of the instrument on opposite limbs of the nebulæ. 2. A motion of translation in the visual direction of some portions of the nebulous matter within the nebula, which might be found by comparing the different parts of a large and bright nebula.

Sir William Herschel states that "nebulæ were generally detected in certain directions rather than in others, and the spaces preceding them were generally quite deprived of stars; that the nebulæ appeared some time after among stars of a certain considerable size, and but seldom among very small stars; that when I came to one nebula I found several more in the same neighbourhood, and afterwards a considerable time passed before I came to another parcel." *

Since the existence of real nebulæ has been established by the use of the spectroscope, Mr. Proctor † and Prof. D'Arrest ‡ have called attention to the relation of position which the gaseous nebulæ hold to the Milky Way and the sidereal system.

It was with the hope of adding to our information on this point that these observations of the motions of the nebulæ were undertaken.

In the following list the numbers are taken from Sir J. Herschel's "General Catalogue of Nebulæ." The earth's motion given is the mean of the motions of the different days of observation.

No.	h.	H.	Others.	Earth's motion from Nebulæ.
1179	360	—	M. 42	7 miles per second.
4234	1970	—	Σ. 5	12 ,, ,,
4373	—	IV. 37.	—	1 ,, ,,
4390	2000	—	Σ. 6	2 ,, ,,
4447	2023	—	M. 57	3 ,, ,,
4510	2047	IV. 51.	—	14 ,, ,,
4964	2241	IV. 18.	—	13 ,, ,,

Chemical Society, April 2.—Prof. Odling, F.R.S., in the chair.—A paper on Sulpho-cyanide of Ammonium and Sulpho-cyanogen, by Dr. T. L. Phipson, and a note On a Reaction of Gallic Acid, by H. R. Procter, were read by the Secretary. Mr. Procter finds that a mixture of gallic acid and potassium arsenate, when exposed to the air, acquires a beautiful green colour.—Mr. W. Noel Hartley then read a memoir On Cobalt Bromides and Iodides, in which he described the method of preparation and properties of these compounds; they closely resemble the corresponding chlorides. Fine specimens of the different salts were exhibited by the author.—Mr. E. Neison read a paper On the Distillation of Sodium Ricinoleate, and Mr. C. H. Piesse a note On the Solubility of Plumbic Chloride in Glycerin.—Mr. Kingzett read a voluminous communication On Ozone as a Concomitant of the Oxidation of the Essential Oils, Part I., and from his experiments he infers that the compound produced during the oxidation of oil of turpentine is neither ozone nor hydrogen peroxide, but a hydrated oxide of turpentine. The last paper was On the Action of Chloride of Benzyl on Camphor, Part II., by Dr. D. Tommasi.

Royal Microscopical Society, April 1.—F. H. Wenham, vice-president, in the chair.—A paper On the Structure of the Lepisma Scale, by Dr. Anthony, was read to the meeting, in which the author showed that the two sets of markings were upon opposite sides of the scale, the ribs being upon the under side.—Mr. Wenham gave a demonstration of his method of measuring the angular apertures of objectives, and explained his mode of stopping out the extraneous rays which were so frequently a cause of error.—Mr. S. J. McIntire read a paper describing the proboscis of a moth (believed to be a South African species) which was furnished with a means of perforating the nectaries of flowers. A mounted specimen was exhibited under one of the Society's instruments in the room, and drawings in illustration of the paper were placed upon the table.

Linnean Society, April 2.—Mr. J. Gwyn Jeffreys, F.R.S., in the chair.—On the Morphology of the Skulls in the Woodpeckers (*Picidæ*) and the Wrynecks (*Yungidæ*), by Mr. W. Kitchen Parker, F.R.S. The present paper is one of a series in hand in which the writer has endeavoured to work out thoroughly the facial characters of certain types of birds in harmony with the views given by Prof. Huxley in his well-known paper on the Classification of the Feathered Types (Zool. Proc. April 11, 1867). His own mode of research is much more like that followed by the distinguished author of that paper than that pursued by ornithologists proper. Without undervaluing their excellent labours, there are many things which are seen first and first understood by the embryologist and not by the zoologist as such. Prof. Huxley, in the paper just referred to, separated the forms now under consideration into his group Coleomorphæ, and gives (p. 467) a very valuable summary of their characters. It was sought in that paper to bring into more or less zoological contiguity such birds as have a similar structure of the facial, and especially of the palatal, bones. Those group-terms, the Schizognathæ (p. 426), the Dromæognathæ (p. 425), &c., are very important, although some of them are of very wide application. It was the first thought of the author of this paper that the woodpeckers would easily find a place amongst the *non-passerine* aërial birds; but examination of their palatal structures soon dispelled this opinion. They are more allied to the Passerinæ than most of the Zygodactyles; but it is to the *embryos* of that type, and not to the adult, that they are related. The Passerinæ themselves are well termed ægithognathous (p. 450); this huge group is under hand at present. Most of the non-passerine birds that seem to come nearest to the woodpeckers have a very solid palate; they are desmognathous; others, as the humming-birds and goat-suckers (*Caprimulgus*), are schizognathous; whilst the swift (*Cypselus*) is as perfectly ægithognathous as the swallows. But the woodpeckers retain that non-coalescent condition of the palatal structure which we see in the lizards, very unlike that great fusion of parts towards the mid-line which occurs in most of the higher birds. They also have an unusually arrested condition of the palatal part of the upper jaw-bone (maxillary), which is characteristic of the lizard and unlike the bird-class generally, and bones superadded to the palate, vomers, septomaxillaries, &c.; these are persistently in paired groups, more in number, and altogether more evidently embryonic and Lacertian, than the homologous parts of other birds. The writer therefore seeks to introduce a new morphological term for these birds as a group, having relation to their face, namely, the term Saurognathæ; for none of Prof. Huxley's terms are appropriate for this type of palate. The writer has worked out these parts in the nestling of *Yunx torquilla*, in four stages of *Gecinus viridis*, in the young of *Ficus minor*, and in the adult of *P. major*, *P. analis*, *Hemilophus fulvus*, and *Picumnus minutus*.

MANCHESTER

Literary and Philosophical Society, March 3.—*Physical and Mathematical Section.*—Alfred Brothers, F.R.A.S., president of the Section, in the chair.—Results of Rain-Gauge Observations at Eccles, Manchester, during the year 1873, by Thomas Mackereth, F.R.A.S.

March 10.—Ordinary Meeting.—E. W. Binney, F.R.S., vice-president, in the chair.—The chairman said that at a meeting of the Society on January 9, 1872, in presenting to the notice of the members specimens of fossil woods from the lower coal measures of Lancashire, he stated "that from some examples in his cabinet he was led to believe that Cotta's *Medullosa elegans* was merely the rachis of a fern or a plant allied to one." Prof. Renault, of Paris, to whom we owe so much for his researches in fossil botany, read a memoir before the French Academy on January the 26th last, which has since been printed in the *Comptes Rendus*, that completely confirms this opinion.—Further Observations and Experiments on the Influence of Acids on Iron and Steel, by William H. Johnson, B.Sc. At the last meeting of the Society Prof. Reynolds, in an interesting paper On the Effect of Acid on the Interior of Iron Wire, appears to think that Mr. Johnson did not attribute to hydrogen any portion of the remarkable change produced in iron and steel by immersion in acid. That immersion in acid is the primary cause no one, Mr. Johnson thinks, will dispute; but that hydrogen plays an important part in producing these changes and is the cause of the bubbles, the author showed in a paper read before the Society, March 4, 1873. The supposition that the absorption of hydrogen is the sole cause of the change in the breaking strain, diminution in toughness, &c., attendant on the immersion of iron in hydrochloric or sulphuric acids, and that there is no absorption of

* Philosophical Transactions, 1784, p. 448.
† "Other Worlds than Ours," pp. 280–290.
‡ "Astronomische Nachrichten," No. 1908, p. 190.

these acids into the interior of the iron, does not account for a number of phenomena that have been observed so often and so carefully as to leave no doubt of their invariable recurrence if the conditions of experiment be only properly observed. It seems to the author that the only satisfactory way of explaining all the phenomena is to suppose that when a piece of iron is immersed in acid two actions go on, viz.: an absorption of the nascent hydrogen into the interior of the iron, which hydrogen may subsequently be given off by gentle heat or immersion in a liquid, &c. Secondly, an absorption of the acid itself, possibly in a very concentrated form, by the interstices between the fibres or crystals of the metal. It will however be said, the acid must act on the walls of the cavity and form a salt of iron with liberation of hydrogen. This may go on to a small extent, but in opposition to this view we may bring the experiments of Prof. Bequerel on solutions separated by a cracked tube (*Comptes Rendus*, lxxvi.), where he shows that no precipitate is formed on placing a cracked tube filled with nitrate of lead in a solution of potassium sulphate within the crack, thus making it probable that chemical interchanges do not take place in very minute spaces. By this theory we may easily explain the decrease in toughness after immersion in acid. For toughness implies a certain ease of mobility of the particles. When a piece of iron is bent the particles of one side are compressed, thus diminishing the minute cavities between the fibres, while those of the other side are stretched, and the minute cavities elongated. If we fill these cavities with a liquid this mobility of the particles is prevented, for the cavities cannot now be diminished in size and the compression of the one side cannot now take place, consequently the piece tears or breaks off just like a piece of frozen rope. It will also explain the acid reaction of the moistened fracture, and further, as hydrochloric acid is much more volatile and of less specific gravity than sulphuric acid, it is only natural to expect that the effect of immersion in hydrochloric acid will pass off more rapidly than of immersion in sulphuric. This experience fully confirms. The author then gives details of a number of experiments and their results bearing on the point under discussion.—Results of certain Magnetic Observations made at Manchester during the year 1873, by Prof. Balfour Stewart, F.R.S.

GLASGOW

Geological Society, March 12.—A paper was read On some Polyzoa from the carboniferous limestone shales near Glasgow, by Prof. Young, F.G.S., and Mr. John Young, vice-president. The authors described a new genus which they had established under the name of *Rhabdomeson*, and which includes at least two species hitherto referred to *Ceriopora*, namely, *C. gracilis* and *C. rhombifera*. The authors also described and exhibited specimens of other two species of polyzoa, the one having the habit of a *Fenestella*, the other of a *Glauconome*, but both showing the remarkable peculiarity of a series of eight denticles projecting horizontally over the cell aperture. For the fenestrated species, they proposed to constitute a new genus—*Stellipora*. The other they retained, meantime, in the genus *Glauconome*.—Mr. Robert Graig read a paper, the first of a series, On the Fossils found in the carboniferous beds around Beith and Dalry, with special reference to the position of their first appearance in the beds. These beds, he remarked, are highly fossiliferous, and occur in the following general order:—(1) Lower limestone, resting upon volcanic ash, 17 fathoms; (2) coal and ironstone measures, resting upon the lower limestone, above 100 fathoms; (3) upper limestone, taking the Swindridge or Highfield "post" as the lower stratum, about 65 fathoms. Mr. James Dairon read a paper on a new species of Retiolites (*Retiolites fibratus*) found by him last summer in the Moffat shales of the Lower Silurian system of the South of Scotland.

PARIS

Academy of Sciences, March 30.—M. Bertrand in the chair. M. de Quatrefages presented to the Academy the second part of his work (written in conjunction with M. Hamy, assistant naturalist in the Museum) entitled "*Crania ethnica*. The skulls of the human races." The author made additional remarks on fossil human races, calling attention in particular to the race of Cro-Magnon. The characters of this race are well exemplified in the male and female remains discovered at Cro-Magnon in 1868. The male skull is remarkable for its capacity, gauging, according to M. Broca, not less than 1,590 cent. cubes, a number sensibly above the mean of all European populations. With the Cro-Magnon remains the authors class several other specimens of human fossils from the same valley of Vézère, from Bruniquel (caves of Lafaye and Forges), from the south towards the Pyrenees (the cave of Aurignac), and from the cave of Gourdon near Montréjeau. The same race is traced in the Menton skeleton and beyond the Alps in the Cantalupo skulls and in that from Isola del-Liri. In France again male skulls of the same race have been excavated in Mâconnais and Grenelle, while Liège has furnished the celebrated Engis skull. During the quaternary epoch it appears therefore that the Cro-Magnon race had its head-quarters in the south-west of France, particularly in the valley of Vézère, where the intellectual development can be traced from station to station, possibly to the confines of civilisation. The authors think it probable that the earliest representatives of the race will be found in Africa.—M. Pasteur made some verbal observations on M. A. Guerin's recent communication on the pathogenetic rôle of ferments in surgical maladies.—On an apparatus invented by M. Moncoq for the operation of transfusion of blood, by M. Bouley.—On the hydrometric service of the basin of the Seine, by M. Belgrand.—MM. Daubrée and Brongniart presented a report on M. Renault's memoir, entitled "Study of the Genus *Myelopteris*." The reporters consider the conclusions arrived at of sufficient importance to warrant the publication of the memoir in the collections from foreign *savants*.—On the integration of equations to the partial derivatives of the second order, by M. A. Picart.—On the artificial production of the phenomena of gaseous thermo-diffusion of leaves by means of moist porous and pulverulent bodies, by M. Merget. The author concluded by observing that the dynamical utilisation of thermo-diffusive forces would resolve in a simple manner the problem of the direct transformation of solar heat (energy?) into mechanical work.—On some general facts which arise from comparative androgenesis, by M. A. Chatin.—Observations on the disposition of the fibro-vascular bundles in leaves, by M. J. L. de Lanessan.—On a method of photographic enlargement for astronomical observations, by M. C. Zenger. The method proposed is likely to be of service in photographing the forthcoming transit of Venus. The author uses a mirror of long focus instead of a lens to produce the sun's image, and to prevent errors of irradiation and inflexion, proposes to photograph the planet at its moment of passage across a point h of a particular meridian of the sun, The enlarging process suggested corrects aberration in the original photograph.—On an electro-automatic whistle for locomotives, by MM. Lartigue and Forest.—On the employment of luminous signals in geodesic operations, by M. Laussedat.—The analysis (mathematical) of an armed and closed electro-magnetic circuit proves that electric induction does not traverse conducting masses, by M. P. Volpicelli.—On the movement of air in pipes, by M. C. Bontemps.—On the action of ammonia on acetone, by MM. Œchsner and Pabst. The authors believe that the reaction gives rise to Staedeler's *acetonine*.—On Egyptian blue, by M. H. de Fontenay.—Experimental researches on the influences which changes of barometrical pressure exert on the phenomena of life, 13th note, by M. P. Bert.

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