

BALLOONERS will rejoice at hearing that Messrs. Hachette and Co. have issued a magnificent work on the Aërial Voyages of Glaisher, Camille Flammarion, W. de Fonvielle, and Gaston Tissandier. The illustrations are excellent.

Two handsome volumes devoted to the "Life and Letters of Faraday" have been issued by Messrs. Longmans, and received by us just as we were going to press. The author is the Secretary of the Royal Institution, Dr. Bence Jones, whose delightful memoir of Faraday communicated, to the Royal Society last year has been perused with pleasure by all scientific men.

THE committee of the Council on Education have placed at the disposal of the University of Oxford two of the thirty exhibitions, value 25*l.* each, given by Sir Joseph Whitworth, to assist deserving students in competing for his scholarships in mechanical science.

BOTANY

Spontaneous Movements in Plants.

M. LECOQ, of Clermont Ferrand, records in the *Belgique Horticole* some singular spasmodic movements in the leaves of *Colocasia esculenta*. These motions bear no resemblance to those produced in the Sensitive plant by the warmth of the hand, but occur spontaneously independently of the action of the wind or of any external cause, at irregular intervals, and at different periods of the day and night. M. Lecocq describes the movement as a kind of trembling or quivering affecting the whole plant, sufficiently powerful to tinkle little bells attached to the branches, and on one occasion even to shake the pot in which the plant was contained, and to resist a pressure of the hand, the number of the pulsations varying from 100 to 120 per minute. He states that the *Colocasia* is destitute of the stomata with which the leaves of plants are generally provided, especially on their under-surface, and attributes the phenomenon to the incessant pulsations of the imprisoned sap.

Decomposition of Carbonic Acid by Leaves

M. P. P. DEHERAIN has been continuing his researches on the evaporation of water from the leaves of plants, and the decomposition by them of carbonic acid. His previous investigation had established the fact that these two functions of the leaves proceed *pari passu*, the same conditions favouring the one as the other; and that both are determined by the degree and nature of the light to which the leaves are exposed, and not by the temperature. He now attempts to show that it is not the intensity only of the light which determines the rapidity of the evaporation of the water, and of the decomposition of carbonic acid; but that certain rays of light are far more efficacious than others. A careful series of experiments on the submerged leaves of *Potamogeton crispus*, accurately weighing the quantity of gases emitted, showed that under the influence of yellow light 26.2 c.c. of gas were exhaled, while under the influence of blue rays of the same intensity the plant disengaged only 5.8 c.c. of gas in the same time. A repetition of the experiment established the following laws,—1st. That all the rays of light are not equally efficacious in determining the decomposition of carbonic acid. 2d. That even with the same intensity yellow and red rays act more powerfully than blue or violet. 3d. That the relation which has been established between decomposition and evaporation is maintained also with respect to the relative influence of different rays of light. [Comptes Rendus.]

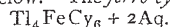
New Coffee Fungus

THE Rev. M. J. Berkeley forwards to the *Gardener's Chronicle* a letter from the well-known botanist, Mr. Thwaites, of Ceylon, in which he speaks of the consternation caused among the coffee-planters of that island in consequence of the rapid increase of a parasitic Fungus in the coffee-plantations, causing the leaves to fall off before their proper time, and endangering the safety of the crop. It is a singular fact that among more than one thousand species of Fungus which have been received in this country from Ceylon this particular one does not occur; not only is it an entirely new species, but it is with difficulty referable to any recognised section, being intermediate between the true moulds and the *Uredos*. Mr. Berkeley establishes from it a new genus *Hermilia*. A. W. B.

CHEMISTRY

Thallium Salts.—II.

MM. LAMY AND DES CLOISEAUX have again examined the thallous salts named below. The *ferro-cyanide*—

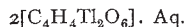


has a beautiful yellow colour, a density of 4.641, and is readily dehydrated by heat. Exposed to dry air, the crystals gradually lose their transparency. Water dissolves more of this than of potassic ferro-cyanide; the actual solubility is shown by the following numbers—

100 grm. water dissolve at 18° . . . 0.37 grm. ferro-cyanide
 " " " at 101° . . . 3.93 " " "

The crystalline type to which this salt belongs is a doubly oblique prism. It exhibits a high degree of double refraction; fine plates of it, cut parallel to the plane of cleavage, show a well-defined system of rings under the polariser. The crystals are very fragile.

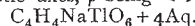
Thallous tartrates and paratartrates are remarkable for the readiness with which they yield large and brilliant crystals. *Hydro-thallous tartrate*, $\text{C}_4\text{H}_5\text{TlO}_6$, generally crystallises in beautiful white prisms, which have a silky lustre, due to the presence of a number of longitudinal striæ; it is soluble in 122 parts of water at 15°, and in 6 parts of water at 101°. The density of the crystals is 3.496, and they are, as already found by Lang, optically and geometrically isomorphous with hydro-potassic tartrate. The *neutral tartrate* is prepared by adding thallous carbonate to boiling aqueous hydric tartrate, until alkalinity ensues. On cooling, large, transparent, lustrous crystals make their appearance; their specific gravity is 4.658; they are unalterable in air at the ordinary temperature; at 100°, however, they become opaque and anhydrous. They dissolve in five times their weight of water at 15°, and in a tenth of their weight of boiling water. The formula of this salt is—



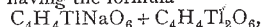
It crystallises in forms belonging to the clino-rhombic system—

Plane angle of the base 106° 59' 26"
 Plane angle of the lateral faces . . . 101° 57' 41"
 Obliquity of the primitive prism . . . 110° 23' 00"

The double refraction is very energetic. The plane of the optic axes is normal to that of symmetry. The acute bisectrix is negative and perpendicular to the horizontal diagonal of the base. The horizontal dispersion is pretty decided, as is also the proper dispersion of the optic axes, ρ being $< \nu$. *Sodio-thallous tartrate*—



is prepared in the same manner as common Seignette salt, with which it agrees not only in composition, but also in figure; but it differs from that body in the orientation of its optic axes. The crystals are soluble in half their weight of water at 20°, and effloresce when handled. The acute bisectrix of the optic axes is negative and normal to the base; the dispersion, though considerable (with $\rho > \nu$), is much smaller than in the common Seignette salt. When redissolved in water, and allowed to evaporate spontaneously, the above compound yields a more complex tartrate, having the formula—



and crystallising in the rhombic system. As regards form, it may be referred to a right rhomboidal prism of 98° 40', differing chiefly in height from the tartrate just described. The acute bisectrix is positive. *Thallio-stibiosylic tartrate*—



is less soluble in water than the corresponding potassic salt. The crystals are quite permanent, and have the specific gravity 3.99. Although geometrically isomorphous with the potassic salt, the two tartrates differ completely in optical properties. At 15° to 20° the optic axes are perfectly united for all the colours of the spectrum; but at 70° they separate to the extent of 20°—25°, in the plane passing through the principal diagonals of the bases of the primitive prism. Their acute bisectrix is negative; dispersion inappreciable. *Dithallous paratartrate* is anhydrous, has a density of 4.659, and is capable of crystallising in two distinct forms. The two forms, which both belong to the clino-rhombic system, are distinguished by the following numbers—

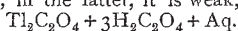
	Normal.	Irregular.
Plane angle of the base	68° 55' 56"	80° 16' 22"
Plane angle of the lateral faces . . .	90° 16' 24"	95° 9' 36"
Obliquity of the primitive prism . . .	90° 20' 00"	96° 45' 00"

In both, however, the dispersion is weak, with $\rho > \nu$; the acute bisectrix is positive and the separation of the optic axes

is considerable. Thallium has three *oxalates*, much resembling those of the potassium series; their solubility, however, increases (instead of decreasing) as the oxalic factor accumulates. The *normal oxalate* dissolves in 68 parts of water at 15°, and in 11 of boiling water. The density is 6.31. On heating, it behaves like plumbic oxalate. The crystals of this salt belong to the clino-rhombic system, but are quite unrelated to any of the corresponding potassic or ammoniac oxalates hitherto described. The plane of the optic axes is parallel to the plane of symmetry; the double refraction is very energetic. *Hydro-thallous oxalate*—



crystallises in the clino-rhombic system; but its primitive form is irreconcilable with that of hydro-potassic oxalate. The specific gravity is 3.971. It is soluble in 19 times its weight of water at 15°, and in less than its weight of boiling water. There is also an anhydrous salt, whose primitive form is an oblique rhomboidal prism, likewise incompatible with the potassic salt. In both, the double refraction is energetic, and the acute bisectrix positive: but, in the former, the plane of the optic axes is parallel to the plane of symmetry; in the latter, it is normal to that plane. In the former, the proper dispersion is strong, with $\rho < \nu$; in the latter, it is weak, with $\rho > \nu$. The oxalate—



(“quadroxalate”), is closely akin to the corresponding potassic salt, both in composition and geometrical form. It shows a powerful double refraction. The plane of the optic axes is almost normal to the base. The proper dispersion of the axes is decided, with $\rho < \nu$; the acute bisectrix is negative, and very oblique to the base. The crystals are very fragile.

Thallous *picrate* is anhydrous. Its colour is yellow, when prepared with but once cooling; but, by Deville's method, this is gradually modified to a vermilion-red. At 150° the dry red salt is soon transformed into the yellow modification. Thallous picrate is less soluble than potassic picrate, one part of it requiring 280 parts of water at 15°, while potassic picrate requires 245. Its density is 3.039. Even a temperature of 270° fails to decompose it, but at 300° it detonates with violence. The red crystals are clino-rhombic; they have a vitreous lustre, and the plane of their optic axes is parallel to that of symmetry. The mean value of the index of refraction is $\beta = 1.827$ (for the yellow line of sodium).

Reduction of Cupric Salts by Tannin

E. PALLUCCI has pointed out that tannin in all its forms reduces cupric oxide in alkaline solution, and forms a red precipitate of cuprous oxide, just in the same way as glucose does; and that the neglect of this circumstance has led to many errors in the estimation of sugar and vegetable juices, and especially in the valuation of the must of the grape: for this liquid contains the tannin derived from the skins of the grapes; and consequently, if the quantity of sugar contained in it is determined by that of the cuprous oxide thrown down, without regard to the reducing power of the tannin, the sugar in the must, and therefore also the alcohol which it is capable of yielding by fermentation, will be over-estimated. This source of error may, however, be easily eliminated by first treating the liquid under examination with basic lead acetate, which completely precipitates the tannin; the glucose may then be estimated in the filtrate.

The importance of attending to this matter in saccharimetric researches will be evident, when it is remembered that tannin is a substance very widely diffused in the vegetable kingdom; and that many vegetable substances, in which sugar is frequently sought for, contain at certain stages of their growth a quantity of tannin two, three, four, or even five times as great as that of their sugar; the greater number of fruits, not excepting the grape, belong indeed to this category. Other substances besides tannin, as for example gallic acid, pyrogallic acid, and many colouring matters, including that of wine, are also capable of reducing the alkaline cupric solution; but all these, as well as tannin, are completely precipitated by basic acetate of lead.—[Ann. di Chem. app. alla Med., Sept. 1869, p. 132.]

In the preparation of quinine and cinchonine, a black, tarry substance is found in considerable quantity. This product, the “quinoidine” of commerce, contains a number of cinchona alkaloids, but is not used to any great extent in medicine. MM. Henry, Duguët, and Perret have much increased its value by converting the alkaloids into picrates, thus forming a mixture which can be used with advantage as a very cheap and efficient febrifuge.

GEOLOGY

The Tithonian Stage

PROFESSOR PICTET has communicated to the Swiss Society of Natural Sciences a most interesting report, containing a detailed discussion of a question which has lately acquired much importance, namely, the limitation of the cretaceous and jurassic periods. The Tithonian beds (Titonische Etage) of Opper, as is well known, occupy a sort of intermediate position between the great jurassic and cretaceous series of deposits, and they have been referred by different authors sometimes to one and sometimes to the other of these great formations. Thus, Professor Opper himself considered that his Tithonian stage brought the jurassic period a step forward in time, whilst M. Hébert regarded the deposits studied by him as carrying the lower part of the cretaceous formation further back. Of late years these doubtful deposits have been detected in many places, scattered from the Carpathians to the Mediterranean, through Italy, Switzerland, France, and Spain.

Professor Pictet considers that wherever these beds occur, the arrangement of the strata is in accordance with the following sectional view:—

1. Neocomian stage proper.
2. Valangian stage and marls with *Belemnites latus*.
3. Berrias limestone.
4. Tithonian stage.
5. Bed with large specimens of *Aptychus* (Kimmeridgian).
6. Jurassic fauna with *Ammonites tenuilobatus*.

The question to be settled is where, if anywhere, in this section the line of division between the jurassic and cretaceous formations is to be drawn, between 3 and 4, between 4 and 5, between 5 and 6, or finally through the middle of 4, dividing it into a jurassic and a cretaceous Tithonian.

The Stramberg limestone, which the author regards as nearly identical with the limestone of the Porte de France and Aizy, contains 55 species of Cephalopoda, of which 50 have been described as new by Zittel, whilst the other 5 have their analogues in the cretaceous period. This would seem to be in favour of the cretaceous nature of this bed; but the Brachiopoda, which have been thoroughly worked out, tell a different tale: of 38 species 26 are new, 11 belong to the jurassic period, and 1 (*Terebratula janitor*, Pict.) is common to this deposit and that of the Porte de France. It appears, however, that the strict contemporaneity of these fossils is somewhat doubtful, inasmuch as Zittel has found that the molluscan fauna of Stramberg (omitting Cephalopoda and Brachiopoda) is nearly identical with those of Wimmis and Mount Salève, which have been hitherto regarded as Corallian. But neither at Wimmis nor at Mount Salève does *Terebratula janitor* occur, nor are any of the Cephalopoda of Stramberg found there, so that it is possible the Stramberg deposit consists of two beds, of which the newer contains the above-mentioned Cephalopoda and *Terebratula janitor*, and the older corresponds with the Swiss deposits at Wimmis and Mount Salève—the latter might then be the highest term of the jurassic series, and the upper Stramberg bed the lowest of the cretaceous, thus carrying the divisional line through No. 4 of the above section. M. Coquand has found the fauna of *Terebratula moravica*, which is also that of Wimmis and Mount Salève, occupying deposits in Provence which are covered by beds containing Kimmeridgian and Portlandian Ammonites, and therefore evidently jurassic. From the consideration of these facts the author infers that there have been in different regions two different orders of succession. In one (Provence, Salève, Wimmis,) the stages are nearly in conformity with those which occur in the rest of France, and the limits of the jurassic and cretaceous periods appear to be clear. In the other, included between the Carpathians and Italy (with a portion of the French Alps, &c.), the Tithonian stage prevails upon the confines of the two great periods.

By an investigation of the palæontology of the beds thus characterised as forming the Tithonian stage, Professor Pictet arrives at the following divisions in ascending order:—

1. The fauna of *Ammonites tenuilobatus*.
2. The fauna of the inferior Tithonian, known principally from Rogoznik, the blue marble of the Apennines, and probably the Tyrolese limestone with *Terebratula diphyca*.
3. The fauna of the upper Tithonian or Stramberg limestone (*Terebratula janitor*).
4. The lower Neocomian stage, especially the Berrias limestone (*Terebratula diphyoides*).