must be inhaled with every breath of the dwellers there. But every man in Leadville believes himself potentially rich, and has a mine or a claim for sale. Speculation in claims, and mere gambling in fractional ownerships, is the principal business. Prof. Newberry had seen the law papers in the examination of a mining property where no less than 14 claims overlapped one another. There is really valuable mining property in abundance, not yet developed, in Colorado and Utah; but the properties that are put on the market for sale in New York are generally worth little or nothing, and will tend to discredit investment in all Western mines.

Prof. J. Lawrence Smith gave an informal account of some recent researches for new elements. A few years ago he found a field of research in the cerium and yttrium minerals, and was well satisfied that he had obtained a new substance, which he named mosandrum, in the cerium group. Since then he has been studying the components of samarskite, and has found, he believes, two new elements, one of which he calls columbium, and the other he proposes to name in honour of his friend and the instructor of his youth, Prof. William B. Rogers. But having much other business requiring his attention, Prof. Smith has done little in that line of research, since then, except to purify some mosandrum. Not wishing to delay the progress of discovery, he turned over a mass of the earthy material to Messrs. Lafontaine and Lecoq Boisbaudran, who have since announced several discoveries. The new elements are not yet separated; the supposition of their existence is based upon observations on their absorption spectra. Prof. Smith has great doubts whether this method is trustworthy. He found that a given solution showed a different spectrum the second day from that of the day before. The addition of nitric acid in greater or less strength was found to alter a spectrum to an extent fully as great as would be considered indicative of the presence of a new metal. But in nitric acid itself there is nothing to provide these new spectra. Hence a doubt is thrown over all discoveries that rest exclusively upon absorption lines. There are probably 8 or 10 new earths in the yttria group. Of the newly announced metals, Prof. Smith thought philippium was more likely to prove real than most of the others. In the discussion that followed, Dr. Barker pointed out that the colour of a solution affected its spectrum. He regarded the discoveries based solely on absorption spectra as not to be trusted until supplemented by chemical tests.

The other papers read at the meeting were as follows: "On the Mean Pressure of the Atmosphere over the United States at Different Seasons of the Year," by Prof. Elias Loomis; "Questions as to a very Direct and Simple Method of Ascertaining the Ellipticity of the Terrestrial Spheroid," and "The Completion of the Theory of Parallel Straight Lines," by Prof. Stephen Alexander.

The meeting closed with a brief address by its presiding officer, Prof. Rogers. In the course of his remarks he expressed a wish that hereafter some measures should be taken for a more general and widespread invitation to the public to be present at the meetings of the Academy. This suggestion will probably be adopted.

WM. C. WYCKOFF

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—The following Statutes, which the University of Cambridge Commissioners contemplate making for the University, having been communicated to the Council of the Senate, the Vice-Chancellor hereby gives public notice thereof in the University.

"The University shall have power to adopt as an affiliated College in any place within the United Kingdom or in any part of the British Dominion any institution founded for the education of adult students, with such conditions as to the provision of lectures, and as to the rules and arrangements for the students, as may be determined from time to time by Grace of the Senate. Students of the institution who shall have continued members of it for such length of time, not less than two years, and shall have attended such lectures, and passed such examinations, as may be required from time to time by Grace of the Senate shall, if admitted as members of the University, be deemed to have kept already three of the terms required for any degree."

"Students in Science, who having already taken a degree in Arts, Law, Medicine, or Surgery, have given proofs of distinction in Science by some original contribution to the advancement of Science, and having done all that is required by the statutes and Ordinances of the University, may be admitted to the title of Doctor designate in Science, and shall afterwards be created Doctors at the time prescribed by the University."

"The management and regulation of the Botanic Garden, together with the appointment and removal of the Curators, Superintendents, Officers, and servants employed therein, shall henceforth be vested in a Syndicate consisting of the five Governors and Visitors appointed by Dr. Walker, that is to say, the Chancellor, or in his absence the Vice-Chancellor of the University, the Master of Trinity College, the Provost of King's College, the Master of St. John's College, and the Regius Professor of Physic, together with such other persons as may be appointed from time to time by Grace of the Senate."

The Syndicate appointed on May 31, 1877, to consider how to encourage students to read for honours in more than one tripos, in consequence of urgent representations on the part of head masters of public schools, have made a sixth and final report, leaving the Board of Natural Science Studies to propose the necessary and more than formal changes required in the regulations. With this exception, the Syndicate consider the duties committed to them to have been completely discharged.

Lord Rayleigh, we are glad to learn, has consented to become a candidate for the Chair of Experimental Physics at Cambridge; the election takes place to-morrow.

Mr. E. B. Tawney, F.G.S., Assistant to the Woodwardian Professor, who has made most valuable donations to the Woodwardian Museum, has had the degree of Master of Arts conferred upon him. Every geologist and palæontologist who knows Mr. Tawney will be glad to see this recognition of his merits.

THE number of matriculated students attending the University of Edinburgh this season is 2,510, the number of students in medicine being 1,138, in law 363, and in divinity 74. There is an increase, as compared with last year, in all the faculties, that in medicine being 96, and the total increase 178.

THE Court of Assistants of the Cordwainers' Company being impressed with the importance of the City Guilds employing part of their funds in the establishment of a central institution for the promotion of technical education, have, in addition to a grant of 250*l.* per annum already made, voted a donation of 500*l.* towards the building fund, on condition that the total sum agreed to be subscribed for that purpose be in their opinion adequate to the satisfactory fulfilment of the object contemplated.

SCIENTIFIC SERIALS

Gazetta Chimica Italiana, fasc. viii. and ix.—On cimene of cuminic alcohol, by SS. Paterno and Spica.—Decomposition of chlorhydrates of ethylamine by means of heat, by SS. Fileti and Piccini.—Gasometric analysis and methods, by SS. Amalo and Figuera.—Artificial improvement of leaves of indigenous tobacco by means of the sap of exotic leaves, by S. De Negri.—On phenoltolylates, by Dr. Mazzara.—On meta-amido-cinnamic acid, by the same.—Synthesis of phenyl-cumarine, by Dr. Ozliaboro.—On sulph-acids of cumene and on a new cumophenol, by Dr. Spica.—On insecticide powders from the flowers of *Chrysanthemum cinerieæfolium*, Trev., by Prof. Dal Sie.—Artificial production of the oligiste of Vesuvian lava, by S. Coppola.—Researches on the products of oxidation of alcoholic derivatives of natural and synthetic thymol, by SS. Paterno and Canzoneri.—On a new organic acid, lithobilic acid, found in oriental bezoar, with lithofellic acid, by Dr. Roster.—On a new method of preparing phenolglycolic acid and on pyrogallotriglycolic acid, by Dr. Giacosa.—Resistance of seeds (especially clover) to prolonged action of gaseous and liquid agents, by S. Giglioli.—On lapacic acid, by S. Paterno.

Journal of the Franklin Institute, November.—We note here the following:—A general differential equation in the theory of the deformation of surfaces, by Mr. Craig.—Future water supply of Philadelphia, by Mr. Bukinbine.—A new illustration of persistence of vision, by Prof. Tobin.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, November 27.—"On the Structure of Serous Glands in Rest and Activity." By J. N. Langley, M.A., Fellow of Trinity College, Cambridge. Communicated by Prof. Michael Foster, M.D., F.R.S.

The Parotid Gland of the Rabbit.—The alveoli of the gland can be observed in the living state without serious interference with the blood circulation. When the gland has been quiescent for several hours, the alveolar-cells are granular throughout, and the outlines of the cells are only faintly marked as clear lines without granules. When the gland secretes, the granules disappear from the outer borders of the alveolar-cells, that is, from that portion of the cells nearest the basement membrane. After prolonged secretion, very few granules are left in the cells; those that do remain in any cell form a thin layer at its inner portion, that is, at the portion bounding the lumen, and stretch outwards, also as a thin layer, along the cell-sides a variable distance from the lumen.

In an alveolus during secretion, the cells separate from one another slightly near the lumen; thus the lumen stretches out for a short distance between the cells; it becomes larger, at the same time, by the diminution which takes place in the size of the cells.

The above described changes occur whether the secretion is induced by giving food to the animal, or by giving it pilocarpin, or by stimulating the sympathetic nerve running to the gland. The two zones of the fresh state are not preserved by alcohol and other reagents.

Osmic acid shows some considerable differences between the resting and the active gland, the chief amongst which is the more equal staining of the substance of each alveolar-cell in the active state.

The Parotid Gland in the Rat, Cat, and Dog behave in rest and activity like the parotid of the rabbit in a corresponding condition. The living condition in these cases, however, has not been observed in the glands with intact blood-circulation.

In one case where the sympathetic nerve of a dog was stimulated, a saliva was obtained from the parotid, of unusual character. The saliva clotted readily, and contained 8·3 per cent. of solids, of which 7·8 per cent. were organic substances. Jacobson's nerve was uncut. The much more rapidly flowing saliva following subsequent injection of pilocarpin had a slightly lower percentage of salt than the slowly secreted sympathetic saliva. In several cases in other glands I have also seen a diminution in percentage of salts, notwithstanding an increased rate of secretion of fluid.

The Sub-maxillary Gland of the Rabbit undergoes changes in activity similar in the main to those which occur in the parotid. The changes are, however, less marked; the granular condition of the gland has a less direct relation to the state of hunger of the animal.

The sub-maxillary gland has one very characteristic feature, the transition- and some of the ductule-cells contain, in life, granules more distinct and larger than those contained in the alveolar-cells. How far these disappear during secretion is uncertain.

As in the parotid so in the sub-maxillary, reagents do not preserve the normal appearances. The secreting gland treated with osmic acid shows alveolar-cells much more evenly stained throughout than does the resting-gland.

The deep black staining of the transition-cells with osmic acid described by Nussbaum does not take place if the gland be treated with osmic acid only; the deep coloration is the result of a subsequent treatment with alcohol. With osmic acid alone, the ducts stain darker than any other part of the gland.

I must uphold my previous objection to Nussbaum's view that ferment is formed in the transition-cells and not elsewhere. Briefly my objections were that the ductule-cells, in their method and depth of colouring behave like the transition-cells, and that the black coloration of the transition-cells with osmic acid does not occur if the gland is previously treated with absolute alcohol, in which the ferment is said by Nussbaum to be insoluble.

I can in the main confirm Bermann's description of a "tubular gland" in the sub-maxillary of the rabbit.

The Infra-orbital and Lachrymal Glands of the Rabbit show an outer clear and an inner granular zone in activity even more distinctly than the parotid. In both these glands osmic acid preserves more nearly the living appearances. The two zones if present normally, are also present after treatment with osmic acid.

In the *Mucous Glands* during secretion the changes in life are less readily followed, but they are probably similar to those mentioned above. In rest the alveolar-cells form granules like the alveolar-cells of a serous gland; but in the former case the granules are of nearly the same refractive power as the surrounding substance and so not conspicuous. In activity the granules are used up, and disappear first from the peripheral parts of the cells.

"Report on Phyto-Palæontological Investigations on the Fossil Flora of Sheppey." By Dr. Constantin Baron Ettingshausen, Professor in the University of Graz, Austria. Communicated by Prof. Huxley, Sec. R.S.

Physical Society, November 22.—Prof. W. G. Adams in the chair.—New Members, Prof. Reilly and Prof. Heath, of Cooper's Hill Engineering College.—Prof. Guthrie exhibited a new photometer in its crude form and demonstrated its action to the meeting. It consists of two fixed plane mirrors inclined to each other at an angle. The rays from the two sources of light to be compared, are allowed to fall on these mirrors, those from one source, say that on the right hand, falling on the right hand mirror, and those from the left hand source on the left hand mirror. These rays are again reflected from the mirrors at right angles to their former paths and thrown upon a semi-transparent screen where their relative intensities can be compared by the eye of the observer between the mirrors and each source of light; a revolving shutter is interposed. These shutters are formed of brass disks and they are both mounted on the same axis which can be turned by hand or otherwise. They would completely screen the light from the mirrors were it not that each is provided with four radial apertures or slots through which the rays can pass. The slots on the side at which the brighter source of light is placed are narrower than those on which the weaker source is placed. The latter slots are made adjustable in size by sliding blinds and a scale is added to measure the degree to which they are closed. On revolving the shutters the reflection of the rays to be compared are seen side by side and (owing to persistence of images on the retina) continuously on the screen placed in front, and they are brought to equality of brightness by closing or opening the blinds of the adjustable shutter. When this is so the ratio of the respective orifices of the shutter as given by the scale is the inverse ratio of the luminous intensities compared. Prof. Adams remarked that the speed of rotation should be such as to produce a uniform field of light on the screen, a result which hand-turning was not very conducive to. Prof. Foster observed that the use of this new photometer might be less fatiguing to the eye than those photometers which presented a steady beam to the eye undiluted with intervals of darkness during which the light is cut off, as on the instrument before the meeting. —Prof. Reinhold then read a paper by Prof. Rücker of the Yorkshire College, Leeds, on a suggestion as to the constitution of chlorine offered by the dynamical theory of gases. If a gas of density δ consists of molecules each of which possesses *no* degrees of freedom, and if also the inter-molecular forces are negligable, the specific heats at constant pressure (Cp) and at constant volume (Cv) are connected by the two well-known equations,

$$(1)\quad (Cp - Cv)\ \delta = \cdot 0694$$

$$(2)\quad \frac{Cp}{Cv} \ldots 1 + \frac{2}{m+e}$$

where e is a quantity which depends upon the potential energy of a molecule; hence if Cp is given by experiment Cv can be calculated from the first equation, and then $m + e$ is known from the second. Regnault determined the specific heats at constant pressure of 35 gases, and from the experiments of E. Wendemann and of Wullier it appears that his values are correct within 6 per cent., and that $m + e$ can be calculated very approximately from the above equations if Cp is given. One of the chief difficulties of the thermo-dynamic theory of gases has been to attribute to m and e values which would at once lead to the observed ratios of Cp and Cv and satisfy any rational supposition as to the interior mechanism of a molecule. Kundt and Warhng proved that for mercury $\frac{Cp}{Cv} = 1{\cdot}666$, which is consistent only with the supposition that the atoms of mercury are smooth rigid spheres; and Boltzman and Bosanquet have pointed out that for a smooth rigid surface of revolution $\frac{Cp}{Cv} = 1{\cdot}4$, a number agreeing closely with the experimental value for air, O, N, H, CO and NO. The molecules of these gases may therefore be constituted of two spheres rigidly united, or, as Prof. Rücker suggests, bound together by forces which prevent their separation of their surfaces while leaving them otherwise free to move. The principal object of Prof. Rücker's paper was to point out an interesting fact connected with the application of this theory to chlorine.

The maximum number of degrees of freedom which a molecule composed of n smooth rigid spheres could possess would be $3n$, but the forces in play between the spheres might reduce this number. Thus the value of $m + e$ could not exceed but might be less than $3n + e$. When the molecule consists of two atoms $e = o$ but for complexer molecules we should, *cæteris paribus*, extract its value to increase with the number of molecules. From two tables of results calculated by him, Prof. Rücker, however, finds that for a number of simple and complex gases and vapours the value of $m + e$ is for each substance less than $3n$ (or the maximum possible value of m), while for the majority of chlorine compounds examined the reverse statement holds good, that is, the value of $m + e$ is generally greater than $3n$. This difference may be explained by supposing that for chlorine e is abnormally large, and that the spheres are not necessarily in contact; or that n has been taken too small, that the symbol Cl_2 is incorrect, and that the chlorine atom contains a larger number of sub-atoms than has been supposed, a supposition which accords with the recent researches of Prof. Victor Meyer on the vapour density of chlorine. Prof. Rücker also finds that the ratio of the specific heats of bromine and one of its compounds studied (C_2H_5Br), agree with those of chlorine and the corresponding chlorine compounds. Dr. Shettle, of Reading, then read a paper on the influence of heat upon certain forms of induction coils considered more especially in relation to the inductive power which the blood exercises on the various structures of the body. The author found that when a copper and a zinc wire were insulated from each other by parchment paper and paraffined silk, and wound in close proximity to each other, an (induced) current was indicated on a galvanometer whose terminals were connected to the neighbouring ends of the zinc and copper wires respectively, the other ends being left free. When the latter were connected across the deflection was *nil*. On raising the temperature of the two wires by causing hot water to flow inside the coil into which they were wound the deflection was largely increased. These experiments lead Dr. Shettle to imagine there is a similar action in the animal body. The heart is made up of nerves and muscular fibres winding spirally, and some of these wind round each other so as to form a spiral cord round which the blood capillaries also wind. Dr. Shettle compares these nerve and muscle bundles to the coils of zinc and copper wire in his experiments, and infers that electric currents may be induced in them as in the wires. The flow of the warm magnetic blood would also tend to produce currents in them. Dr. Shettle further drew attention to the fact that animals live and move in a magnetic field, and that electricity must be generated in them by their movements internal and external.—Mr. Emmott exhibited Crossley's form of microphone, which consists of four short rods of carbon jointed loosely into four blocks of carbon so as to form a square. It is used as a transmitter for telephones, and Mr. Crossley regularly transmits the services of a church with it to several hearers. Its speaking, singing, and whistling powers were successfully demonstrated to the meeting.

PARIS

Academy of Sciences, December 1.—M. Daubrée in the chair.—The following papers were read:—Observations on M. Trecul's last note relative to chlorophyll, by M. Chevreul. He asks whether chlorophyll is a constituent part of the organ, or is only accessory and without organic activity.—On some properties of glucoses, by M. Peligot. By action of alkalies on glucose, he obtains a crystalline substance (which he calls *saccharine*), having the composition of ordinary sugar, or saccharine, not yet sugar. In presence of yeast it does not ferment; its taste is not that of sugar, but almost *nil*, with a slight after-bitterness. The common view, that saccharine matters should be regarded as polyatomic alcohols, is not (M. Peligot thinks) confirmed by production of this new substance. In the action of lime on glucose, a true saponification occurs.—Note on the crystalline form and optical properties of saccharine, by M. Des Cloizeaux. The optical phenomena do not enable one to conclude with certainty whether saccharine belongs to the rhombic or the clinorhombic system.—Questions relative to phylloxera addressed to M. Thenard, by M. Fremy.—Reply to these questions by M. Thenard. This relates to the use of sulphide of carbon, and its effects on vines.—Demonstration, by means of elliptic functions, of a theorem in the theory of the libration of the moon, by M. Gyldén.—Note on the measurement of quantities of electricity, by M. Hirn. He calls attention to M. Villari's demonstration that the action of the spark of Leyden batteries on the magnetic needle is proportional to the quantities accumulated, and seeks to show that this law is in harmony with those he himself has indicated as to the effect of continuous currents; (he expresses a wish that M. Villari's important memoir might be published *in extenso* in French).—Periodic movements of the ground revealed by spirit levels, by M. Plantamour.—This gives results of a year's observations at Secheron from October 1878. The east side went down with decreasing temperature until June, (there being a pretty exact parallelism between the curves); then the east rose until the beginning of September, in a much greater proportion than the exterior temperature. From 32·8mm. the greatest depression to the east, on January 15, to the maximum of elevation 19·5 mm. on September 8 gives 52·3mm. as the total amplitude of oscillation during the year, (or 28·08s). There was generally besides a daily movement, with amplitude on September 5, of 3″·2. The minimum is usually between 6 and 7·45 a.m. the maximum twelve hours later. In the meridian direction, the movements of the ground are much less; the total amplitude for the year was only 4″·89. They show an unexplained anomaly relative to the movements east and west. The daily movements in the meridian are very rare, irregular, and small. It seems, then, that at Secheron there are periodic movements of rise and sinking of the ground, and that, generally, they are determined by the exterior temperature. Perhaps the configuration and nature of the ground have also some influence.—Establishment of scientific and hospital stations in Equatorial Africa, by M. de Lesseps. It has been decided by the French Committee of the African Association to establish such stations between Zanzibar and the Gaboon; the Chambers have voted 100,000 fr. for the purpose.—Astronomical junction of Algeria with Spain; international operation under General Ibañez and M. Perrier, by the latter.—Note rectificative of M. Viallanes's opinion regarding phylloxeric spots in the environs of Dijon.—M. Lamarre described an electric phenomenon lately observed by him during a fall of snow at Cherbourg. Luminous *aigrettes* appeared at the points of his umbrella.—Determination of curves and surfaces of two surfaces which have double or stationary contacts with each other, by M. Zeuthen.—On series relative to the theory of numbers, by M. Lipschitz.—On a dynamometric brake regulated automatically, by M. Carpentier.—Separation of phosphoric acid from sesquioxide of iron and alumina, by M. Derome.—On the constitution of stag's horn, by M. Bleunard. It is an inferior homologue of coagulated egg-albumen. It is more hydrated than albumen.—Determination of chlorine in different grains and forage plants, by M. Nolte. Chlorides form part of all vegetable food.—Rhythmic contraction of muscles under the influence of salicylic acid, by M. Livon. A rhythmic tetanic period with contractions decreasing in intensity, precedes exhaustion.—On the mode of distribution of phosphates in muscles and tendons, by M. Jolly.—Influence of different colours on the development and respiration of infusoria, by M. Fatigati. The respiration is more active in violet than in white light, and less active in green than in white.

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