lines, of which a few characteristic individuals were mapped with difficulty. These were afterwards found in the spectrum of calcic chloride, with which some gas-carbon electrodes had been impregnated; but with electrodes of a different material the lines did not reappear. Perfectly pure titanic chloride, however, readily furnished them; and titanium was also obtained, by a chemical process, from the ash of the coal which had yielded the gas-carbon. A direct comparison of the numerous and delicate titanium lines with those of Fraunhöfer, under high dispersive power, left no doubt whatever that titanium must now be added to the list of solar metals.

PHYSIOLOGY

Gases of the Secretions

PFLUGER has investigated the gases of urine, milk, bile, and saliva. The quantity of nitrogen gas is very much alike in all, being in urine ·9, in milk ·75, in bile ·5, in saliva ·75 per cent. in volumes. The quantity of oxygen, on the contrary, varies much more, being in urine ·075, in milk ·095, in bile ·1, in saliva ·5 per cent. Pflüger attributes the larger quantity of oxygen in saliva to the fact that in the much less rapid secretions of bile, &c., the epithelium of the secreting passages consumes, during secretion, a large portion of the oxygen contained in the secreted fluid. In the more swiftly secreted saliva, the oxygen escapes in a large measure this consumption. The quantity of carbonic acid varies according to the reaction of the secretion. In alkaline, bile, and saliva, it reaches 56·1, and 64·7 per cent.; in neutral or acid urine, milk, and bile, it sinks as low as 13·7, 7·6, 5 per cent. respectively.—[Archiv. für Physiol. ii. 156.]

According to Bogoljubow, the carbonic acid of the bile depends largely on the quality and quantity of food taken. It seems to diminish during the stay of the bile in the gall bladder.—[Centralblatt f. Med. Wissen. 1869, No. 42.]

Changes in Milk

KEMMERICH brings forward observations to show that in standing milk, especially at blood-heat, an increase of the *casein* takes place at the expense of the *albumen*. He also confirms the statements of previous observers, that in milk (and cheese) the quantity of fat increases on keeping. He attributes, however, this "ripening of the cheese," to the action of fungi.—[Archiv. für Physiol. ii. 401.]

Effect of Alcohol on Animal Heat

CUNY BOUVIER affirms as the result of experiments on rabbits (apparently carefully conducted with due sense of sources of error) that alcohol lowers the temperature of the body, in small doses to a slight in large doses to a very marked degree.—[Archiv. für Physiol. ii. 370.]

Metamorphosis of Muscle

O. NASSE, extending the previous observations of MacDonnell and others, affirms that *glycogen* is a normal constituent of muscle, the quantity existing in frog's and rabbit's muscle amounting to 3—5 per cent. of the wet mass. He also states that in living quiescent muscle sugar is totally absent, or present in inappreciable quantity only. The conversion of glycogen accompanies rigor mortis, whether natural or artificial, and is also brought about by muscular contraction. Nasse further shows that muscular contraction and rigor mortis are accompanied by a consumption of the total carbo-hydrates of the muscle. The amount of sugar (or glycogen) lost under these circumstances is insufficient, however, to account for the acid (paralactic) produced at the same time; indeed the two processes run by no means parallel, and apparently are not connected.—[Archiv. für Physiol. ii. 97.]

Vertebrate Epidermis

F. E. SCHULTZE describes various modifications of the uppermost layers of the epidermis in vertebrata, distinguishing between *cuticular thickenings* of living cells and *cornification* of dead ones. In particular he describes curious laminated cuticular thickenings of the epidermic cells of various species of *hippocampus*. These cells he proposes to call *flame*-cells, from their curious resemblance to the flame of a candle.—[Max Schultze's Archiv. v. 295.]

Development of Grey Matter of Brain

ACCORDING to Arndt, the grey matter of the convolutions of the rabbit at birth consists of nuclei imbedded in a protoplasmic matrix, studded with granules, and very faintly fibrillated. After birth the matrix becomes increasingly fibrillated, the granules partly coalesce and partly become dispersed. The nuclei become separated through a greater development of the matrix, and a nucleolus appears in them by coalescence of previously existing nucleolini. Part of this differentiated matrix is directly gathered round various nuclei to form the ganglionic cells and their branches, other parts become arranged in strands to form the axis cylinders of nerves, while the rest remains as the permanent granular faintly fibrillated matrix of the adult brain. Arndt tries to accommodate the "Cell theory" to these new facts.—[Max Schultze's Archiv. v. 317.]

Regeneration of Spinal Cord

MASIUS and VAN LAIR assert that if strong frogs be operated on in early or mid winter, complete reparation of structure with restoration of powers takes place, even when sections of the whole spinal cord 1–2 mm. in length have been removed. Degeneration occurs first at either cut surface: the central end swells by deposition of new tissue into a hollow cup-shaped bulb; the peripheral contracts into a cone fitting into the former; and so union takes place.—[Centralblatt, Med. Wissen. 1869, No. 39.]

SOCIETIES AND ACADEMIES

Syro-Egyptian Society, Nov. 2.—Mr. W. H. Black, F.S.A. in the chair. The latest communication from Dr. Livingstone, that he has found what he believed "to be the true sources of the Nile, between 10° and 12° south (latitude) or nearly the position assigned to them by Ptolemy," was received with much satisfaction; and the passages in the Greek text of Ptolemy's geography, relative to "the mountain of the moon," from which the lakes "of the Nile receive the snows," *twice placed by him in 12½ south latitude*, were read; and the old traditional maps, showing a mountain range of about 10° of longitude in extent, with streams running northward into two lakes (as published in the Amsterdam edition of 1605), were compared therewith. A resolution was then passed, sympathising with Dr. Livingstone in his laborious researches, and congratulating the present age on this confirmation of ancient scientific literature by means of modern exploration.

Mr. Black described the results of his own recent application of the symbolic and mathematic teaching of the great pyramid to the geometric geography of Africa; stating the full conformity of that monument to the geodetic laws and uses of other uninscribed megalithic monuments in Asia and Europe, which have been erroneously assigned to religious and superstitious purposes. He promised to illustrate the subject further, and to demonstrate by diagrams the results then verbally described, at a future meeting of the society.

Anthropological Society, Nov. 2.—Dr. Beigel, V.P., in the chair; the following new members were announced:—*Fellows.*—Captain G. J. D. Heath; Dr. Samuel E. Maunsell, R.A.; Messrs. Thomas Milne, M.D.; E. W. Martin; Robert Watt; Horace Swete, M.D.; Lieut. Wm. Francklyne; and Wm. Pepper. *Hon. Fellow.*—M. Le Baron d'Omalius d'Halloy. *Corresponding Member.*—Professor Dr. August Hirsch.

Mr. Pike read a paper on the Methods of Anthropological Research. He considered it useless to speak of methods of research without some previous definition of the objects of research. The real difficulty in anthropology was to know what to observe, and how to verify. He believed that the science could advance only by a double method of observation—the observation of mankind individually and in masses, and that the conclusions suggested by the observation of masses, races, or nations must be verified by the observation of individuals, and *vice versâ*. For this reason he thought it was a mistake to speak of ethnology as a science, as it consisted only of a series of disjointed observations without conclusions, and without the means of verifying conclusions if made. Mr. Pike then reviewed at considerable length the ramifications of Anthropology into anatomy, physiology, psychology, and the various subdivisions of those studies, suggesting that all kinds of unsuspected correlations were yet to be discovered by a rigorous application of a scientific method. The relations of mind to body, of faculty to faculty, of one part of the body to another, were still removed but little from the realms of mystery from which only anthropology could thoroughly drag them away. Mr. Pike concluded by describing anthropology in one of its aspects as the only kind of philanthropy which could be of service to mankind—philanthropy founded upon science.

Birmingham

Natural History and Microscopical Society, October 26.—Mr. G. Heaton exhibited a collection of sea urchins, of the species *Echinus Sphæra*, recently taken on the North-West coast of Ireland, and exceeding in dimensions the largest recorded by Professor Forbes. Mr. W. R. Hughes, in reference to these magnificent specimens, gave a general account of the structure and functions of the Echinodermata. He contrasted the mode in which calcareous matter is deposited in the Mollusca and other classes, with that which is characteristic of the Echini. Thus, in the Mollusca it is secreted in various directions by the "mantle" of the animal; in Crustacea it is deposited externally to the epidermis, and is cast off when the animal becomes too large for its covering, and replaced by a new shell reproduced in like manner; while in the tubicular Annelids a similar process prevails. In Anthozoa and Madreporidæ it is secreted at the base of the animal from its gelatinous investment; and again in Spongiadæ innumerable calcareous spiculæ are deposited throughout the mass. In Echinodermata, on the contrary, a method totally different from all the preceding is observed, the calcareous matter really forming a box, as distinguished from a shell, in which the viscera float in a surrounding medium of sea-water, and inasmuch as this box can never be cast off or replaced during the growth of the animal, from its original size of a pea, up to its full dimensions of 13 in. or 14 in. in circumference, a very special and wonderful provision is made for the gradual enlargement of the dwelling. This is effected by the secretion of the calcareous salts, not only on the interior but at the margins of the 600 pieces or plates of which the case is composed; so that by the slow extension of every one of these at its edges, the whole undergoes a corresponding gradual expansion in every direction, commensurate with the development of its tenant. Mr. Hughes referred to the fact that the magical number 5 prevails in a peculiar manner throughout the class, instancing the 5 rayed star-fish, the 5 teeth, 5 jaws, &c., of the Echini. The subject was further illustrated by various recent and fossil Echinoderms, contributed by Mr. R. M. Lloyd; spines of *Sidaris* from the South Sea Islands, the star-fishes *Cribella rosea* and *Uraster rubens*, by Mr. G. S. Tye, &c.

Edinburgh

Geological Society, November 4.—The president, Mr. Geikie, delivered the opening address. After congratulating the society on its recent progress, he passed on to bring before its notice three special branches of inquiry, wherein much useful work remained to be accomplished. The first of these related to the study of organic remains, which, in the opinion of the speaker, was too much dissociated from that of the strata among which they are preserved. He thought that the palæontology of each geological formation should be as far as possible the natural history of a certain period of the past life of the globe. We should try to discover from the fossil remains more of the general character of the contemporaneous fauna and flora; the nature of the sea-bottom or land-surface on which they flourished; their various modes of growth; their distribution in space as well as in time; the light which they cast upon changes in the organic world, and the influence of these changes upon them; the causes of their decay as individuals and as species, and the circumstances under which they had been finally entombed. Mr. Geikie illustrated this subject from the rocks of the central valley of Scotland. He then passed on to the second topic, which related to the mineral structure of rocks or petrography. That branch of the science had fallen into strange neglect in this country. After indicating what had been done and what was now doing in Germany in that department, he pointed out the special way in which it lay open to observers in Scotland, and pressed upon the society the desirability of cultivating it. The third branch of his address bore on the balance of the various forces which have been instrumental in modifying the surface of the earth. Observers in Britain, he said, enjoyed special advantages when they set themselves to investigate this question. The completeness of their geological series, the diversities of configuration in their country, the extent of their coast line, the multiplicity and variety of their brooks and rivers, all conspired to aid them. On the other hand, they were apt from this very completeness of their opportunities to take a local and limited view of the phenomena. This he thought had really happened in the case of their estimate of the potency of the sea as a geological agent. Their position as islanders had led them to take an exaggerated view of the results attributable to the waves in the general economy of nature, and to undervalue the power of rains, springs, frosts, and rivers, which in this country do not produce the changes which they effect elsewhere. He pointed out how vast was the extent of coast-line where the sea did not reach the solid framework of the land, but was barred back by long lines of alluvial deposit—the waste of the land brought down by the streams. The sea in these instances, although perpetually wasting the sand-bars, did not perceptibly encroach on the land, for the bars were constantly being renewed from behind. The land, though not diminishing in breadth, was inch by inch sinking in height, the power of the sea being no more than equal to sweeping away the detritus brought down to the coast by the drainage from the interior. Although seemingly paradoxical, he yet believed that in the general balance of forces the influence of the ocean is more conservative than destructive, there being a greater area of rock under the sea, preserved there from that universal corrosion and removal which befall every part of the earth's crust that rises above the waves. The concluding portion of the address dealt with the relation at present subsisting between science and religion.

Berlin

Chemical Society, October 25.—Prof. Fritzsche communicated a paper on the action of cold on tin. Tin was exposed to 40° C., the temperature produced by Carré's refrigerator. It was found changed in colour and structure, the latter becoming granular, and the colour turning from white to grey. By heating it to less than 100°, the white colour could be restored. By prolonging the action of the cold, the tin became so brittle, that it could easily be powdered, and a kind of blister appeared on the surface of the metal. This explains similar changes observed by the same chemist in block-tin and organ pipes exposed to the cold of a Russian winter. Emmerling reported on liquefied oxychloride of carbon. It constitutes a colourless liquid, and boils at 8° above zero. The oxychloride of carbon prepared in the usual way contained an excess of chlorine, which was absorbed by passing it over antimony, before the gas was condensed through cold. Der Müller communicated some observations on the preparation of Chloral. Prof. Kekulé sent in a report on Chemistry at the German Association of Innsbruck. This report being not as yet complete, we shall return to the subject.—A. O.

Paris

Academy of Sciences, November 2.—MM. Sainte-Claire Deville and Dieudonne communicated a paper on the industrial employment of the mineral oils for heating engines, especially locomotive engines, in which they describe certain experiments made by the company of the Chemins de Fer de l'Est, tending to show that petroleum and coal oils may be advantageously employed to heat the boilers of locomotives. M. P. Thenard read a note in reply to that communicated to the Academy at its last meeting, by M. Pasteur, on the employment of heat for the preservation of wines. M. de Verneuil made some remarks on the conclusion of M. de Tchikatcheff's work on Asia Minor, giving a general account of the contents of the volume, which treats of the physical geography and natural history of that region. A memoir was presented by M. Hébert, entitled "Researches on the Chalk of the North of Europe." He distinguishes in the chalk of the Paris basin some distinct stages, the distribution of which, especially in the north of Europe, he indicates. A paper, by MM. Fougué and Gorceix, containing a chemical investigation of several of the gases with combustible elements of Central Italy, was presented by M. C. Sainte-Claire Deville. The authors have analysed 28 gases, collected in Italy—4 from the Tuscan *lagoni*, 24 from various stations in the Apennines, between Modena and Imola. Their analyses of the former confirm the results of MM. C. Sainte-Claire Deville and Leblanc: they contain free hydrogen. None of the gases contain acetylene, hydrocarbons of the series $C^{2n}H^{2n}$, or oxide of carbon. The gas from Sassuno contains hydride of æthyle, and those from Porretta carbonic acid in considerable quantity, and traces of sulphuretted hydrogen. These gases are characterised by the predominance of marsh gas in their composition, and they are very frequently impregnated with vapours of liquid hydrocarbons of the series $C^{2n}H^{2n+2}$. M. Faivre communicated an account of experiments upon the effects of wounds of the bark by annular incisions under various physiological conditions. In a note upon a measure of length unalterable by changes of temperature, M. H. Soleil proposes to make stan-

dard rules of beryl. He remarks that beryl, when heated, dilates in a direction perpendicular to the axis, and contracts in the direction of the axis; there will consequently be an intermediate direction in which no dilatation takes place, and in this he proposes to cut his standard rules. Some observations on the constitution and movement of glaciers, by MM. C. Grad and A. Dupré, were presented by M. Leverrier. The authors investigated the structure of the ice of the great Aletsch and other glaciers at different points of their course, and found that in all cases the size of the grains or constituent elements of the ice gradually increased from above downwards. They also noted the movements of the Aletsch glacier at those points of its course, and the amount of surface loss which it underwent by the action of the sun in the latter part of August, when their observations were made. A note by M. J. B. Baille on the heat reflected by the moon, was presented; the author confirms the results obtained by MM. Piazzi Smyth, Marié Dacy, and Lord Rosse. A notice of a new synthesis of guanidine, by M. G. Bouchardat, was presented. The author, in repeating M. Natauson's experiment for the production of urea by the action of gaseous ammonia upon oxychloro-carbonic gas, found that other amides of carbonic acid were produced, especially guanidine, the sulphate of which he obtained crystallised. Melanuric and cyanuric acids are also produced. M. C. Dareste communicated a note on arrest of development regarded as the proximate cause of most simple monstrosities; M. Bonchut read a note on hydrate of chloral, with especial reference to its physiological action, which led to some remarks by MM. Bussy and Dumas. An extract from a report by M. Gauldrée Boilleau on the recent earthquakes, and a fresh outbreak of yellow fever at Peru, was read, a note on the etiology of goître, by M. D. Brunet; a note on the phosphorescence of the sea, by M. Duchemin; and a note on the causes of the mortality of new-born infants and on the means of restraining it.

PRAGUE

Royal Society of Bohemia—Natural Science Section, October 6.—M. E. Weyr read a memoir on the conic sections inscribed or circumscribed upon a triangle, having a double contact with a fixed conic section.

October 27.—Dr. E. Schöbe read a paper on the discovery of the terminations of the nerves in the wings of the Chiroptera. The well-known power possessed by bats of finding their way through numerous small obstacles, even when blinded and deafened, has led several anatomists to seek for the nervous apparatus by which this great sensibility is attained. Cuvier described a complete nervous network in the wings; but what he took for nerves, turn out to be elastic trabiculæ. Leydig and Krause have also published upon this subject. The author describes the wings in several genera of bats as composed of a duplication of the general integument, in which the two layers of cutis become amalgamated. The epidermis consists of a single layer of lineagonal cells, and the *rete Malpighianum* of two layers of cells, the upper ones large, polymorphic, and filled with colouring matter. The cutis contains very complete systems of elastic trabiculæ and striated muscles, and a vascular system, which were described in detail by the author, as also the hair-follicles, each surrounded by 7 or 8 sebaceous glands, and a hydrotic gland. Each wing has from 8,000 to 10,000 hairs, with their glandular systems. The nervous system is very highly developed and delicate. The principal branches follow the direction of the great vessels; the last ramifications, composed of from 8 to 12 fibrillæ, issue from the neurilemma, and form bundles, each consisting of 4 fibrillæ. Each bundle runs to a hair-follicle; two of its fibrillæ surround this in a loop, and terminate in a stratiform, *terminal papilla*, formed by the twisting of the fibrillæ into a ball; the other two interlace with the free fibrillæ of adjacent follicles, and form an extremely delicate terminal nervous network. The terminal papillæ are compared by the author to those in the human skin; he has sought and found papillæ also in the mouse, shrew, and mole. Dr. A. Fritsch announced the discovery of a new reptile, or batrachian, in the coal of Nyran, in the south-west of the carboniferous basin of Pilsen. The head is triangular, less elongated than that of *Archegosaurus;* the orbits are large; the lower jaw furnished with denticles; the vertebræ numerous, very close and equal, and the anterior limbs slender, and but little developed. The animal was probably about a foot in length. It is compared by the author with the well-known *Proteus anguinus* (= *Hypochthon Laurentii*).

SCHAFARIK

DIARY

THURSDAY, NOVEMBER 11.

LONDON INSTITUTION, at 7.30.—On Architecture, or the Fine Art of Building: Prof. Robert Kerr.

ZOOLOGICAL SOCIETY, at 8.—On the Anatomy of the Aard-Wolf (*Proteles cristatus*: Prof. Flower, F.R.S.

LONDON MATHEMATICAL SOCIETY, at 8.—General Meeting at Burlington House.

FRIDAY, NOVEMBER 12.

ASTRONOMICAL SOCIETY, at 8.

MONDAY, NOVEMBER 15.

LONDON INSTITUTION, at 4.—Elementary Physics: Prof. Guthrie.

TUESDAY, NOVEMBER 16.

STATISTICAL SOCIETY, at 8.—Inaugural Address by the President: W. Newmarsh, F.R.S. Report on the International Statistical Congress of 1869: Mr. Samuel Brown.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Discussion on Mr. Gandard's Paper on the Strength and Resistance of Materials; and, time permitting, Public Works in the Province of Canterbury, New Zealand: Mr. Edward Dobson, Assoc. Inst. C.E.

WEDNESDAY, NOVEMBER 17.

METEOROLOGICAL SOCIETY, at 7.—Lunar Influence upon Rainfall: Mr. J C. Bloxam, M.R.C.S. On the Summer of 1868: Dr. G. H. Fielding.

THURSDAY, NOVEMBER 18.

ROYAL SOCIETY, at 8.30.

LINNEAN SOCIETY, at 8.—Review of the genus *Hydrolea*, with descriptions of three new species: Mr. A. W. Bennett, F.L.S.

CHEMICAL SOCIETY, at 8.

LONDON INSTITUTION, at 7.30.—Architecture: Prof. R. Kerr.

BOOKS RECEIVED

ENGLISH.—Cassell's Technical Manuals: Projection, Linear Drawing, Building, Construction (Cassell).—Our Houses (Cassell).—First Book of Indian Botany: Prof. Oliver (Macmillan).—Via Medica: B. Langley (Hardwicke).—Wonders of Italian Art: Louis Viardot (Sampson Low).—What is Matter? Inner Templar (Wyman and Sons).—Essays on Physiological Subjects: G. W. Child (Longmans).—Phenomena and Laws of Heat: A. Cazin, translated by E. Rich (Low).—Thunder and Lightning: W. De Fouvielle, translated by T. L. Phipson (Low).—Wonders of Optics: F. Marion, translated by C. W. Quin.—Tommy Try and what he did in Science (Chapman and Hall).

AMERICAN.—Origin of Genera: E. A. Cope (Trübner).—Annual Report of the Trustees of the Museum of Comparative Zoology at Harvard College.

FOREIGN.—Vierteljahrsschrift der Astronomischen Gesellschaft.—Les Pierres, Esquisses Minéralogique: L. Simonin (Hachette).—Bibliothèque des Merveilles: 4 vols. (Hachette).—Dictionnaire Général des Sciences: Privat-Deschanel et Ad. Focillon.—Untersuchungen über einige merkwürdige Thiergruppen des Arthropoden-und Wurm-Typus: Dr. R. Greeff.—Handbuch der Edelsteinkunde: Dr. A. Schrauf (Through Williams and Norgate).

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