nearest congeners, at present existing. It is also incorrect to assert that only in man, a few American monkeys, and the anthropoid apes, does the hair slope towards the elbow. This Human Type is seen in the corresponding area of this segment of the anterior extremity of almost all hairy mammals, excepting most of the Ungulate types, and those with woolly hair. It is found very constantly in Carnivores, especially those which frequently rest in a "couchant" attitude, in which the head is held erect, the fore-limbs planted in front of the body, and the extensor surface of this limb-segment resting flat on the ground, also in certain other positions of rest; and it can be seen in nearly all wild Carnivores and domestic cats and dogs. In those Carnivores which assume this attitude the posterior limbs adopt a much more variable "pose," and here there is no constant form of hair-slope. The backward curl of hair on this narrow area of the fore-arm in man, certain monkeys, and many other hairy mammals, seems to be due to a mechanical force, slowly acting downwards and forwards, which makes for this direction of hair-slope. In all these three classes it is obvious that such pressure is frequent. This explanation of an inherited character, maintained by a simple physical cause, meets the case far better, I submit, than any supposed tracing out of ancestral vestiges. WALTER KIDD.

IS ANIMAL LIFE POSSIBLE IN THE ABSENCE OF BACTERIA?

SOME ten years ago Pasteur, in one of those "causeries du laboratoire" which those who were privileged to take part in will never forget, discussed with the young scientific men around him the interest which would attach to the nourishment of an animal from its earliest existence with sterilised food under conditions which would ensure the absence of all microbial life. "Sans vouloir rien affirmer," he added, "je ne cache pas que j'entreprendrais cette étude, si j'en avais le temps, avec la pensée préconçue que la vie dans ses conditions deviendrait impossible. . . . Que le résultat soit positif et confirme la vue préconçue que je mets en avant ou qu'il soit négatif et même en sens inverse, c'est-à-dire que la vie soit plus facile et plus active, il y aurait un grand intérêt à tenter l'expérience."

To decide this question Messrs. George Nuttall and H. Thierfelder have carried out elaborate experiments in the Hygienic Institute of the Berlin University with young guinea-pigs removed from the mother by means of the Cæsarean operation. Every conceivable precaution was taken to prevent all access of bacterial life. The young guinea-pig was placed in a sterilised chamber, supplied with sterilised air, and it was fed exclusively upon sterilised milk. It had to be supplied with food every hour, day and night, a process which so exhausted the investigators that at the end of eight days, when it had consumed 330 cubic centimetres of milk, and to all appearances was in perfect health and spirits, it was killed.

A microscopic examination of the contents of the alimentary canal revealed no bacteria whatever; ærobic and anærobic cultures in various media were further made of the intestinal contents and of the excreta, but in every case the culture tubes remained sterile, not a single colony made its appearance. Messrs. Nuttall and Thierfelder claim by these experiments to have proved conclusively that the presence of bacteria in the alimentary canal is not essential to vital processes, at any rate in the case of guinea-pigs; and they consider themselves justified in assuming that other animals, and also human beings, could similarly exist in the absence of bacterial life, as long as the food supplied is purely animal in character. Whether the conditions would be altered by the addition of *vegetable* food to the diet, they next endeavoured to determine. In this series of experiments the food selected was so-called "English" biscuits containing about 7 per cent. nitrogenous material, 9 per cent. fat, 17 per cent. sugar, 58 per cent. of other non-nitrogenous matters, and 0·2 per cent. cellulose; these, together with the milk employed, were sterilised before use. The same rigorous precautions characterised these experiments as the previous ones; more animals were, however, secured, and they were allowed to live longer. The weight of the animals was this time carefully noted, and during the ten days, during which the experiment lasted, one animal gained 23 grammes and another 11 grammes. This calculation could only be an approximate one, as the experimental animals were not weighed when originally removed from the mother, and their initial weight was only arrived at by weighing the other guinea-pigs which were removed at the same time, but not experimented upon. Thus in the case of vegetable substances bacterial life is apparently also not essential for carrying on digestive processes. The authors made also as careful an examination as was possible with the limited amount of material at their disposal, of the urine, and state that aromatic oxyacids were undoubtedly present. This result they regard as confirmatory of E. Baumann's assertion that aromatic oxyacids may be elaborated independently of intestinal decomposition. To this point they intend, however, to return later; at present further investigations are in progress with fowls, and the results will be awaited with the greatest interest, while immense credit is due to the authors for the ingenuity of the methods they have devised, and the self-sacrificing laboriousness with which they have conducted the experiments.

SOCIETIES AND ACADEMIES.

EDINBURGH.

Royal Society, Dec. 21, 1896.—Lord Kelvin in the chair.—The first paper, on atomic configurations in molecules of gases according to Boscovich, was by the President himself. At the outset Lord Kelvin confessed that the problem was quite beyond him, and he only desired to throw out some suggestions. Boscovich's theory would quite well explain the atomic configuration of a gas if we could only apply it. In a monatomic gas the problem was fairly easy, collision between molecules leading to change in direction, either backwards on the original path, or at an angle, according as the impact was direct or oblique. For a diatomic gas we must imagine a "pair of somethings" held together by a mutual force which knocked about like one. He thought he could see why a diatomic gas should become monatomic when its temperature was sufficiently raised. But he could not yet understand why, when the process was reversed, molecules should combine in quartettes rather than in pairs, or triplets, and he illustrated his conjectures by means of models. He showed by means of these how, for example, the mutual repulsion between the H's might prevent O from combining with any more than two, and hence we did not have H_3O. And he explained, similarly, how O_3 was unstable, as the octohedral arrangement of the atoms (taking $O = O_2$) was easily broken up. But the whole subject was one of tremendous difficulty.—In an abstract from a paper on the cæcal fossæ, Dr. Richard Berry pointed out that the pericæcal folds and the resulting fossæ were primary in origin, and vascular in evolution. He strongly dissented from Treves' view that the meso-appendix is a substituted mesentery, maintaining that the ilio-colic and ilio-cæcal folds were the true cæcal mesenteries, primary and subsidiary respectively, the meso-appendix being the true appendicular mesentery. Arguing from this and other facts which he adduced, Dr. Berry stated that it would almost appear as though the appendix were gradually replacing the cæcum in functional activity. Passing on to the retro-cæcal fossæ, he pointed out the inaccuracy of the term retro-cæcal as applied to these fossæ, suggesting for them the name retro-colic as being more accurate and more scientific. He proceeded to show that these fossæ were secondary in origin and depended for that origin upon the secondary coalescence, sometimes wanting, of the colon, cæcum, and mesentery, to the posterior abdominal wall. In this respect Dr. Berry differed from almost every British author. He pointed out the variability of these fossæ in number and position, and strongly emphasised their importance to the surgeon in view of the prevalence of appendicitis and the part which these fossæ, according to the author, play in the etiology of that disease.—Dr. T. H. Milroy read a paper dealing with research into the nature of the nucleins and paranucleins of the animal cell. During the last few years much attention has been paid to two great classes of proteids intimately connected with the life of the cell, viz. the nucleins and paranucleins. The former class has been rather vaguely defined as including proteids which have only two points in common—a high percentage of phosphorus in organic combination, and a marked resistance to the action of the gastric secretion. The natural nucleins examined were those of the thymus gland of calves, of the red blood-corpuscles of birds, and of the pancreas of the ox; and these were found to agree in almost every particular with artificial syntonin-nuclein. That is, they were only slowly dissolved, not decomposed by the gastric juice (with the exception of the pancreas nuclein), while trypsin and sodium

carbonate rapidly split them up, the phosphorus passing into solution in organic combination. This phosphorus-holding body is acid in nature, and possesses marked proteid-precipitating properties. It does not seem to be either nucleic or metaphosphoric acid. It was not present in the products obtained from tryptic digestion of the nucleins of the red blood-corpuscles of birds. The combination between paranucleic acid and albumin in ovovitellin is not a firm one, as the acid is easily obtained by the action of weak alkaline solutions upon the mother substance. The acid so obtained is not impure nucleic acid, as Altmann thought, because no nuclein bases appear among its decomposition products. It is very soluble even in cold water, and the solutions so obtained precipitate albumins, &c., out of their solutions. It gives a distinct Buiret reaction but no red colour with Milton's reagent. It does not give any precipitate with ferrocyanide of potassium and acetic acid. It contains, on an average, about 7·8 per cent. phosphorus. From the nucleic acid of the thymus another acid can easily be obtained which still retains the proteid-precipitating power of the original acid, but no longer gives, on decomposition, nuclein bases, agreeing in these particulars with the paranucleic acid of the paranucleins. These point at least to means by which the nuclein series of proteids may be built up and decomposed in the animal organism.—A paper by Dr. Thomas Muir, on the expression of any bordered skew determinant as the sum of products of Pfaffians, was taken as read.—Lord Kelvin then, by permission of the Council, gave an extra paper describing the result of experiments conducted by him along with Drs. Beattie and Smolan as to the effect of Röntgen rays on air (see p. 199).

PARIS

Academy of Sciences, December 28, 1896.—M. A. Cornu in the chair.—On the method of Bruns, by M. Poincaré. An account of an exception to Bruns' theorem, and an amendment to part of his proof.—A new theory of cicatrisation, and on the part played by the anterior epithelium of the cornea in the healing of wounds in this membrane, by M. L. Ranvier. Observations showing that cellular multiplication is not indispensable to the formation of a cicatrix, and that this multiplication, when it occurs, is of only secondary importance in the process of healing.—New note on the application of radioscopy to the diagnosis of diseases of the thorax, by M. Ch. Bouchard. Several cases of diseases of the thorax were clearly made out by the use of the Röntgen rays with fluorescent screen, but a study of diseases of the abdomen has given much less satisfactory results.—The energy consumed by a muscle in static contraction sustaining a load, studied by means of the respiratory exchanges, by MM. A. Chauveau and J. Tissot.—On the fossil hippopotami of Algeria, by M. A. Pomel. Some remarks on a monograph submitted by the author on the quaternary fossil hippopotami of Algeria.—New nebulæ, discovered at the Observatory of Paris, by M. G. Bigourdan. The positions are given of nebulæ numbered 245 to 281.—On the transformations of differential systems, by M. Etienne Delassus.—On a series relating to the theory of linear differential equations with periodic coefficients, by M. A. Liapounoff.—On the movement of a solid in an indefinite liquid, by M. W. Stekloff.—On the use of a system of numbered points in the representation of equations, by M. M. d'Ocagne.—On a thermic machine, by M. Delsol. An account of the theory of a machine designed to utilise the work done by the gas given off on heating a solution of ammonia.—On the problem of vibrating membranes, by M. Le Roy.—Methods of calculation in electromagnetism, by M. Vaschy.—Effect of the state of the polar surfaces of an exciter on the explosive potentials, static and dynamic, by M. Swyngedauw.—Action of the X-rays on gaseous dielectrics, by M. L. Benoist. It is shown that the law recently found experimentally by M. Jean Perrin, is really identical with that previously enunciated by MM. Benoist and Hurmuzescu.—New facts in the application of radioscopy to intrathoracic lesions, by M. J. Bergonié. The outline of the shadow cast by tubercular lesions was traced out in pencil on the body, with the aid of the fluorescent screen. The line thus drawn was found to coincide with remarkable precision with that previously marked out after a careful study by auscultation and percussion.—On a Crookes' tube for use with alternating current dynamos, by MM. Oudin and Barthélemy.—The Hall-phenomenon in liquids, by M. H. Bagard. A reply to the criticism of M. Floris.—Action of lithium upon carbon and some carbon compounds, by M. Guntz. When lithium, contained in a carbon boat, is heated in nitrogen gas, the boat is attacked, lithium carbide and cyanide being formed. Lithium carbide alone is produced if the heating is performed in a vacuum. The same substance is found among the products of the action of CO and CO_2 upon heated lithium. At 700°, ethylene is completely absorbed by the metal, with the formation of a mixture of lithium carbide and hydride. Acetylene behaves similarly. Methane is only very slightly attacked by lithium at a red heat.—On cyanuric chloride, by M. Paul Lemoult. A thermo-chemical study of the chloride $C_3N_3Cl_3$.—Action of carbonic acid of waters on iron, by M. P. Petit.—The action exerted on solutions of haloid alkaline salts by the corresponding haloid acid, by M. A. Ditte.—On the action of phosphorus on platinum, by M. A. Granger. At very high temperatures, the phosphide obtained appears to be Pt_2P, at lower temperatures using platinum black a phosphide is obtained from which aqua regia extracts Pt_3P_5.—Action of hydrogen chloride in the gaseous state upon alkaline sulphates, by M. Albert Colson.—The reduction of wolfram by carbon in the electric furnace, by M. Ed. Defacqz. The metal produced contained 92·5 per cent. of tungsten, 50 per cent. of carbon, and traces of iron and other metals.—New examples of normal rotatory dispersion, by MM. Ph. A. Guye and P. A. Melikian.—On the transformation of the sulphonated camphophenols into dinitro-orthocresol, by M. P. Cazeneuve.—On hexadiinediol, by M. R. Lespieau. Propargyl alcohol is converted into its cuprous compound by shaking with ammoniacal cuprous chloride, and this oxidised with potassium ferricyanide gives the alcohol, $CH_2.OH-C\equiv C-C\equiv C-CH_2.OH$.—Contribution to the study of borneols and their ethers, by M. J. Minguin.—The freezing point of milk; reply to a note by MM. Bordas and Génin, by M. J. Winter.—Optical analysis of urine and the exact estimation of the proteids, glucosides, and non-fermentable saccharoid substances, by M. Frédéric Landolph.—General observations on wheat, by M. Balland.—Immunising properties of the serum of the eel against snake venom, by M. C. Phisalix.—On the morphology of *Cryptococcus guttulatus*, by MM. J. Kunstler and P. Busquet.—The regeneration of the vesical epithelium, by M. Etienne de Rouville.—On the presence of an oxydase in the branchia, palps, and blood of the Acephala, by MM. Pieri and Portier.—Parasitism and evolution of two Monstrillidæ in the interior of the vascular system of the Filigranæ and Salmacynæ, by M. A. Malaquin.—New mosasauria found in France, by M. Armand Thévenin. The fossil described was found in the grey phosphatic chalk beds in the north of France, and appears to be the skull of a reptile closely allied to *Mosasaurus giganteus* (Moestricht). The teeth, however, show differences, and the name *Mosasaurus Gaudryi* is given to the species. Another skull found appears to be allied to the American species *Platecarpus*, and the name *Platecarpus Somenensis* is proposed for it.—On the structure of the fundamental protoplasm in a species of *Mortierella*, by M. L. Matruchot.—A new micrococcus of the potato, by M. E. Roze.—Synthesis of hauksite, by M. A. de Schulten. The hexagonal crystals of $4Na_2SO_4.Na_2CO_3$, obtained by pouring a hot solution of sodium sulphate and carbonate into a strong solution of caustic soda, possess the composition and properties of natural hauksite.—Observations on some asphaltic rocks and on the origin of asphalte, by M. Stanislas Meunier. The conclusion is drawn from the behaviour of bituminous rocks towards solvents, that bitumen is the result of purely mineral reactions, of the type of the double decomposition between metallic carbides and water.—On the identity of the phosphates from the Paris and London basins, and on the Tertiary age of this deposit, by M. N. de Mercey.—Documents serving for the geological study of the neighbourhood of Luang Prabang (Cochin China), by M. Counillon.—On the Foiba of Pisino (Istria), by M. E. A. Martel.

NEW SOUTH WALES.

Linnean Society, November 25, 1896.—The President, Mr. Henry Deane, in the chair.—On the comparative anatomy of the organ of Jacobson in Marsupials, by Dr. R. Broom.—Observations on the eucalypts of New South Wales, Part ii., by Henry Deane and J. H. Maiden.—On a new species of *Macadamia*: together with notes on two plants new to the colony, by J. H. Maiden and E. Betche. (*a*) *Macadamia integrifolia*, n.sp., is a small tree originally found near Camden Haven, N.S.W., now under cultivation in the Botanic Gardens, Sydney. It is very closely allied to the well-known Queensland nut, *M. ternifolia* (also found in N.S.W.), from which it may be readily distinguished by the petiolate entire leaves, rather smaller fruits,

and less hairy flowers and inflorescence. (*b*) *Cheirostylis grandiflorus*, Blume, found "in moist forests between rocks on the coast of New Guinea," is now recorded from similar situations near Lismore, Richmond River, N.S.W. Its discovery adds a genus to the flora of Australia. (*c*) *Grevillea alpina*, Lindl., hitherto only recorded from Victoria, has been found in the Albury district.—On a new fungus (*Capnodium callitris*) attacking the Murray pine; together with observations on a fungus found on *Hypochæris radicata*, L., by D. McAlpine.—On some Australian gudgeons (*Eleotridinæ*), by J. Douglas Ogilby.—Descriptions of some new *Araneidæ* of New South Wales, No. 7, by W. J. Rainbow.—Contributions to a knowledge of the arachnidan fauna of Australia, No. 1, by W. J. Rainbow. This paper, the first of a new series, is descriptive of a new scorpion (*Buthus flavicruris*) from Como, obtained by Mr. J. D. Ogilby.—On Domatia in certain Australian and other plants, by Alex. G. Hamilton.—Description of a new species of Pupina from Queensland, by C. E. Beddome.—Revision of the genus *Paropsis*, Part i., by Rev. T. Blackburn.—The Silurian trilobites of New South Wales, with references to those of other parts of Australia. Part iv. The *Odontopleuridæ*, by R. Etheridge, jun., and John Mitchell.—Note on a Papuan throwing-stick, by J. Jennings.—On the so-called evidences of glaciation on the Mt. Kosciusko plateau, by Rev. J. Milne Curran. The author concluded that (1) there is no satisfactory evidence of glaciers in the present valleys. (2) There is absolutely no evidence of extensive glaciation on the Kosciusko plateau. (3) The "glacial epoch in Australia" in Post-Tertiary times as described by Dr. Lindenfeld, has no foundation in fact.

DIARY OF SOCIETIES.

THURSDAY, JANUARY 7.

ROYAL INSTITUTION, at 3.—Visible and Invisible Light: Prof. S. P. Thompson, F.R.S.

FRIDAY, JANUARY 8.

ROYAL ASTRONOMICAL SOCIETY, at 8.—A Method of Clearing a Lunar Distance: F. C. Penrose.—Determination of the Diameter and Compression of the Planet Mars, from Observations with the Repsold Heliometer of the Royal Observatory, Göttingen: W. Schur.—On the Comparison of Reflector and Portrait Lens Photographs: Dr. Isaac Roberts.—Note on the Magnitude of η Argûs, 1896: R. T. A. Innes.—Orbit of 44 Boötis ⨳ I. 15 = Sh. 193 = Σ 1909: S. W. Burnham.

SATURDAY, JANUARY 9.

ROYAL INSTITUTION, at 3.—Visible and Invisible Light: Prof. S. P. Thompson, F.R.S.

SUNDAY, JANUARY 10.

SUNDAY LECTURE SOCIETY, at 4.—Artificial Light: Prof. Vivian B. Lewes.

TUESDAY, JANUARY 12.

ANTHROPOLOGICAL INSTITUTE, at 8.30.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Superheated Steam Engine Trials: Prof. W. Ripper.

ROYAL PHOTOGRAPHIC SOCIETY, at 8.—Photography by the Röntgen Rays, up to date: Dr. Hall-Edwards.

WEDNESDAY, JANUARY 13.

SOCIETY OF PUBLIC ANALYSTS, at 5.—Annual Meeting.—Also, some Analyses of Water from an Oyster Fishery; Note on Weighing out Fats; Remarks on Formaldehyde: Chas. E. Cassal.—A Specific Gravity Pipette: W. F. Keating Stock.—A Modified Schmidt Process: R. W. Woosnam.

THURSDAY, JANUARY 14.

MATHEMATICAL SOCIETY, at 8.—Supplementary Note on Matrices: J. Brill.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Inaugural Address of the President, Sir Henry Mance.

SOUTH LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.—Some Marine Mimics: E. Step.

FRIDAY, JANUARY 15.

EPIDEMIOLOGICAL SOCIETY, at 8.—Age Incidence in Relation with Cycles of Disease Prevalence: Dr. Hamer.

INSTITUTION OF CIVIL ENGINEERS, at 8.—On "Monier" Girders and Arches: Walter Beer.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—Register of the Associates and Old Students of the Royal College of Chemistry, &c.: T. G. Chambers (Hazell).—Œuvres Scientifiques de L. Lorenz, Revues et Annotées par H. Valentiner, Tome 1, Fasc. 1 (Copenhague, Lehmann).—A Handbook to the Game Birds: W. R. Ogilvie-Grant, Vol. 2 (Allen).—Microscopic Researches on the Formative Property of Glycogen: Dr. C. Creighton. Part 1. Physiological (Black).—Coloured Figures of the Eggs of British Birds, with Descriptive Notices: H. Seebohm, edited by Dr. R. B. Sharpe (Sheffield, Pawson).—The Collected Mathematical Papers of Arthur Cayley, Vol. xi. (Cambridge University Press).—The Constitution and Functions of Gases, &c.: S. J. Corrigan (St. Paul, Pioneer Press Company).—Untersuchungen über Bau, Kernteilung und Bewegung der Diatomeen: R. Lauterborn (Leipzig, Engelmann).—Smithsonian Institution Report to July 1894 (Washington).—Notes of Lessons on Elementary Botany: W. Bland, 12th edition (Bemrose).—Outlines of Psychology: W. Wundt, translated by C. H. Judd (Williams and Norgate).—A Dictionary of Birds: A. Newton and others, Part 4 (Black).—Catalogue of the African Plants collected by Dr. F. Welwitsch in 1853-61. Dicotyledons, Part 1: W. P. Hiern (London, British Museum, Natural History).—Inorganic Chemical Preparations: Dr. F. H. Thorp (Boston, Ginn).—Oceanic Ichthyology: Drs. G. B. Goode and T. H. Bean, Text and Plates (Washington).—Life Histories of North American Birds: Captain C. Bendire (Washington).—A Catalogue of 16,748 Southern Stars deduced by the U.S. Naval Observatory from the Zone Observations made at Santiago de Chile (Washington).—Sixteenth Annual Report of the U.S. Geological Survey, Part 1 (Washington).—Annals of the Royal Botanic Garden, Calcutta, Vol. v. Part 2; Vol. vi. Part 1; and Vol. vii. (Calcutta, Bengal Secretariat Press).

PAMPHLETS.—Annuaire Astronomique et Météorologique pour 1897: C. Flammarion (Paris, E. Flammarion).—An Account of the Crustacea of Norway, Vol. 2, Parts 1 and 2: G. O. Sars (Bergen).—Annuaire de L'Académie Royale des Sciences, &c., de Belgique, 1897 (Bruxelles).—The Camera and the Pen: T. C. Hepworth (Lund).—Museums Association Report (Dulau).—Meteorological Observations and Results obtained at the U.S. Naval Observatory for the Year 1890 (Washington).

SERIALS.—History of Mankind: F. Ratzel, translated, Part 15 (Macmillan).—Lloyd's Natural History. Game Birds, Part 3: W. R. Ogilvie-Grant (Lloyd).—Lloyd's Natural History. British Birds, Part 7: R. B. Sharpe (Lloyd).—Longman's Magazine, January (Longmans).—Century Magazine, January (Macmillan).—Notes from the Leyden Museum, Vol. xviii. Nos 2 and 3 (Leyden, Brill).—Economic Journal, December (Macmillan).—Bibliographia Physiologica, 1896: Prof. Ch. Richet, Premier Fasc. (Paris, Alcan).—Zeitschrift für Physikalische Chemie, xxi. Band, 3 Heft (Leipzig, Engelmann).—National Review, January (Arnold).—Contemporary Review, January (Isbister).—Natural Science, January (Page).—Science Progress, January (Scientific Press).—Reliquary and Illustrated Archæologist, January (Bemrose).—Astrophysical Journal, December (Chicago).—Fortnightly Review, January (Chapman).—Humanitarian, January (Hutchinson).—Scribner's Magazine, January (Low).—Bibliography of the more important Contributions to American Economic Entomology, Part 5 (Washington).—Journal of the Chemical Society, December (Gurney).—Journal of the Royal Agricultural Society of England, December (Murray).—Geographical Journal, January (Stanford).—American Journal of Psychology, Vol. viii. No. 2 (Worcester, Mass.).—Internationales Archiv. f r Ethnographie, Band ix. Heft 6 (Leyden, Brill).

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