Royal Academical Institution, Belfast. In 1872 he became a student at Queen's College, Belfast, where he succeeded in winning several scholarships and also two Peel Exhibitions, one for general proficiency and the second for mathematics. In 1875 he was elected to an open scholarship at St. Peter's, and in October of that year he graduated B.A. at the Queen's University, subsequently proceeding M.A. On each occasion he obtained a first-class for mathematical science, and was awarded a gold medal. He has won several college prizes during his residence at Cambridge. Mr. Walker is a native of Durham, and was educated at Durham University, of which he is a Fellow, and proceeded to Queen's College in October, 1875. He has been a prizeman of the college for mathematics. Mr. Pearson was educated at University College School, and also under private tuition with the Rev. L. Hensley, of Hitchin. He gained an open scholarship at King's College in 1875, and has been each year college prizeman in mathematics.

A REPORT just published by the Swiss Statistical Board gives some information as to the state of primary instruction in the various cantons of Switzerland. Out of 21,875 recruits examined during the year 1877, 11·7 per cent. proved to have primary instruction quite insufficient, and were sent back to the primary military schools. The better educated cantons are those in which manufactures are more developed, namely, Basel (town), Geneva, and Zurich, Schaffhausen and Thurgau. The worst educated are those of Appenzell (land), Uri, Wallis, and Freiburg (Catholic). Primary education seems to have become worse during recent years, as the results for 1877 are far below those of 1876.

SCIENTIFIC SERIALS

Journal of the Franklin Institute, December, 1878.—From experiments here described by Mr. Jacques, it appears that currents of air of varying density, as in Tyndall's well-known experiment, not only diminish the *intensity* of a sound, but affect its *distinctness*. This holds good especially for the human voice, and for musical instruments with few overtones (as the flute). The effect on the voice is that of a repetition of each syllable several times in close succession. Sound-waves were traced out in the space of an auditorium in Boston, and their confusion shown on introducing air-currents. The good acoustic properties of the Baltimore Academy of Music are proved to be due to arrangements by which a large volume of air is conducted, in gentle current, across the stage and diagonally towards the roof. When, by closing certain valves, ventilation was arrested and currents of circulation generated, the sound was noticed to be "dead," or "confused and indistinct."—Dr. Dudley investigates the chemical composition and physical properties of steel rails, deducing some rules for guidance of the Pennsylvania Railroad Company.—Mr. Dupuy writes on the direct process of making wrought iron and steel,—Mr. Dumont on tests of boiler iron,—and Prof. Haupt on the use of the heliotrope in geodetic surveys.

THE *Archives des Sciences physiques et naturelles* (parts 251 and 252, November and December) contain the following papers of interest:—On ytterbina, a new earth contained in gadolinite, by C. Marignac.—On a transformation of dibromethylene into an acetone with four atoms of carbon, brought about by the action of hypobromous acid, by E. Demole.—A note on Dr. Heine's work on the formation of mountains, by E. Renevier.—On the geography and archæology of forests, by Dr. Asa Gray.—Recent researches in solar chemistry, by J. Norman Lockyer.—Observation of a case of migration of carps, by A. Bartholoni.—On a general method of continuous integration of any numeric function, applied to several theorems furnished by the mathematical analysis of the calculation of the curves of a new thermograph, by Raoul Pictet and Gustave Cellérier.—On the limnograph of Secheron, near Geneva, by Ph. Plantamour.—A note on the useful effect of magneto-electric machines and the production of electric light, by A. Achard.—On the reappearance of Encke's comet of short period, with a history of this comet, by Alfred Gautier.—Some remarks on the migration of carps by G. Lunel.—On the ophite of Spain, by M. Calderon.

Bulletin de l'Académie Royale de Belgique, Nos. 9 and 10, 1878.—This contains an account, by M. Dupont, of a recent important "find" of fossils in the Sainte Barbe, one of the coal mines of Bernissart (a village near the French frontier), consisting of five skeletons of large adult iguanodons together with tortoises, numerous fishes, and plant-impressions, constituting a fauna and flora wholly new for the country. The bones are unfortunately impregnated with pyrites, so that they are readily disaggregated on contact with air, but they have been carefully removed in plaster to Brussels, after precise noting of position, &c. The fossils were found at several different levels separated by layers of sterile clay. There is no indication of molluscs of any kind. The deposit is thought to be of the Wealdian horizon, and is remarkable, both in itself, and in its relations to the subterranean orography of the valley of Mons, and the lower cretaceous strata of Hainaut.—M. Plateau writes on a law of the persistence of impressions in the eye. With two disc having the same number of sectors, and the white sectors of the one being equal in angular width to the black discs of the other, the "times of apparent constancy," of the two impressions are to each other in inverse ratio of the brightnesses of the two grey tints producing these impressions. A complete impression, whether intense or weak, has no appreciable time of apparent constancy; and the time is longer, the more incomplete the impression. The degree of illumination of the object has but a weak and indirect influence on the time of apparent constancy.—M. Longchamps contributes further additions to the synopsis of the Gomphines; and M. Renard lithological researches on the phtanites of the carboniferous limestone of Belgium.—M. Montigny describes an experimental arrangement for the study of coloured stars.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, December 19, 1878.—"On the Torsional Strain which remains in a Glass Fibre after Release from Twisting Stress," by J. Hopkinson, D.Sc., F.R.S.

It has long been known that if a wire of metal or fibre of glass be for a time twisted, and be then released, it will not at once return to its initial position, but will exhibit a gradually decreasing torsion in the direction of the impressed twist. The best method of approximating to an expression of the facts has been given by Boltzmann ("Akad. der Wissensch. zu Wien," 1874). He rests his theory upon the assumption that a stress acting for a short time will leave after it has ceased a strain which decreases in amount as time elapses, and that the principle of superposition is applicable to these strains, that is to say, that we may add the after-effects of stresses, whether simultaneous or successive. Boltzmann also finds that, if $\phi(t)\tau$ be the strain at time t resulting from a twist lasting a very short time τ, at time $t = 0$, $\phi(t) = \frac{A}{t}$, where A is constant for moderate values of t, but decreases when t is very large or very small.

The glass fibre I examined was about twenty inches in length. The glass from which it was drawn was composed of silica, soda, and lime; in fact, was glass No. 1 of my paper on "Residual Change of the Leyden Jar" (*Phil. Trans.*, 1877). In all cases the twist given was one complete revolution. The deflection at any time was determined by the position on a scale of the image of a wire before a lamp, formed by reflection from a light concave mirror, as in Sir W. Thomson's galvanometers and quadrant electrometer.

The first point to be ascertained from the results was whether or not the principle of superposition, assumed by Boltzmann, holds for torsions of the magnitude used.

The experiments indicate a large deviation from the principle of superposition, the actual effect being *less* than the sum of the separate effects of the periods of stress into which the actual period may be broken up.

They also appear to indicate the form $\phi(t) = \frac{A}{t^\alpha}$, α being less than, but near to, unity. If $\alpha = 0{\cdot}95$ we have a fairly satisfactory formula for the case in which the fibre was twisted two hours.

In the author's paper on "Residual Change of the Leyden Jar" that subject is discussed in the same manner as Boltzmann discusses the after-effect of torsion on a fibre, and it is worth remarking that those results can be roughly expressed by a formula in which $\phi(t) = \frac{A}{t^\alpha}$. For glass No. 5 (soft crown) $\alpha = 0{\cdot}65$, whilst for No. 7 (light flint) it is greater: but in the electrical experiment no sign of a definite deviation from the law of superposition was detected.

January 16.—"On the Effect of Strong Induction-Currents upon the Structure of the Spinal Cord," by William Miller Ord, M.D.

Conclusions.—1. That, in young dogs, the protoplasmic constituent of the grey matter contracts under the influence of strong faradaic currents.

2. That it contracts unequally and irregularly by reason of its unequal and irregular sectional area, causing thereby condensations at certain points—notably in the anterior horns and around the central canal—and rarefaction at others—notably in the middle of each crescent, such rarefaction going on sometimes to rupture of tissues.

3. That nerve-corpuscles contract in various degrees according to the strength and duration of currents, and that while they tend in contraction to become spherical, they also tend to become vacuolated.

4. That the vessels are in some places strongly contracted and empty; in others dilated and filled with blood-clot, having the appearance of embolus.

5. That the appearances correspond so decidedly with appearances in chorea and tetanus as to give ground for the supposition that contractions, such as are produced by electricity, do actually occur during life under the effect of nervous shock, and may be phenomena, casual, or associate, of such diseases.

"On some Points connected with the Anatomy of the Skin," by George Thin, M.D. Communicated by Prof. Huxley, Sec. R.S.

It is partly the object of this paper to describe some methods by which it can be demonstrated that the connective tissue-bundles of the cutis are, as has been long ago pointed out by Rollett, composed of subdivisions, which are again composed of minute fibrillæ. These subdivisions the author terms primary bundles to distinguish them more markedly from the fibrillæ, and also to describe some other points in the anatomy of the skin which were observed by means of these methods.

The primary bundles isolated by these methods were flattened, cylindrical elements, even contoured, homogeneous in appearance, and uniform in breadth over the whole length isolated. The difference in breadth between individual bundles was very slight. By measurement he found that they were from 0·004 to 0·005 millim. broad.

In gold preparations the following facts regarding the disposition of the elastic fibres were noted:—

If a portion of skin is hardened in bichromate of potash, and the sections moderately stained by eosin, all the large elastic fibres are stained much more intensely than the bundles, and it is then observed that they lie on the surface of the bundles, and run parallel to them. In the gold preparations, after maceration in formic acid, further details regarding the fibres can be detected. It is then seen that there is a close network of minute elastic fibres, of which no traces are observed in eosin-stained bichromate preparations, on the surface of the bundles, and that at certain points the larger fibres give off branches which join this network. At these points the network is so dense over a small defined space that the size of the meshes is nearly equalled by that of the fibres.

Elastic fibres which penetrate the bundles enter between the primary bundles, and the primary bundles are embraced by the fibres which entwine them very closely.

The dark very finely granular deposit produced by the reduction of the gold chloride had a special relation to the elastic fibres. Strictly defined narrow strips of this deposit were found investing the fibres, and this so closely that it was only at points where it had been disturbed in the preparation that the fibre itself could be observed.

The distinctly localised character of the deposit around the elastic fibres supports, according to the author, the idea that the larger ones are surrounded by an albuminous fluid, of a like nature to that shown by gold preparations, to be present between the laminæ of the cornea.

The "spiral" fibre, as observed on the bundles of the skin, is an elastic fibre that encircles the bundles like a ring, and is stained yellow by pikro-carminate of ammonia.

The cells seen in the preparations were in two positions. Some of them were found in a delicate tissue between the bundles; other cells were found in direct connection with the bundles. Of the latter cells the greater number seen were applied to the surface of the bundles, but others were found in the substance of the bundles between the primary bundles.

These cells were all of the endothelial type. In all of them the cell-contour was clearly marked, and in none of those observed was there a trace of a process, or of ridges and depressions similar to those described by some histologists in tendon.

"On Hyaline Cartilage and Deceptive Appearances produced by Reagents, as observed in the Examination of a Cartilaginous Tumour of the Lower Jaw." By George Thin, M.D. Communicated by Prof. Huxley, Sec. R.S.

This paper is written with a twofold object: firstly, as a contribution to the histology of hyaline cartilage; secondly, to illustrate how much the apparent structure of a tissue which is being examined microscopically depends on methods of preparation.

The author was able to isolate the cells from the cartilaginous substance of the tumour after the action of osmic acid. All the cells thus isolated were flattened, rounded, or somewhat polygonal bodies, with round nuclei. Their contours did not correspond exactly with those of the rounded cartilage "capsules."

The examination of this tumour showed that most delusive appearances as regards the nature of cartilage cells may be sometimes produced by staining and hardening agents. Carmine and eosin by staining an unformed substance that exists in the structure in a localised form, may simulate branched protoplasmic cells, and bichromate and logwood preparations, either in sections or teased out, may as closely simulate cells with fibre processes.

The facts adduced by the author justify, as he believes, serious doubts as to the correctness of interpretation in all cases in which histologists have described branched cells in hyaline cartilage, whether the latter existed as a normal structure or as a pathological growth. They further show that, taken alone, carmine or eosin staining should not be held as conclusive evidence of the existence or limits of cellular protoplasm in any animal tissue.

Meteorological Society, January 15.—Annual Meeting.—Mr. C. Greaves, president, in the chair.—The Report of the Council showed that the chief features of the proceedings during the year 1878 had been the final completion, on a comprehensive and well-organised basis, of the arrangements for systematic inspection of the Society's stations, an object which has engaged the sedulous attention of successive Councils for the last four years; and the delivery of a series of lectures on Meteorology by certain Members of the Council. The total number of Fellows now amounts to 425, forty-one having been elected during the year.—The President having delivered his address on Dryness *versus* Humidity, the following gentlemen were elected officers and Council for the ensuing year:—President: Charles Greaves, M. Inst. C.E., F.G.S. Vice-Presidents: Charles Brooke, M.A., F.R.S., F.R.C.S., Henry Storks Eaton, M.A., Rev. William Clement Ley, M.A., Capt. Henry Toynbee, F.R.A.S. Treasurer: Henry Perigal, F.R.A.S. Trustees: Sir Antonio Brady, F.G.S., Stephen William Silver, F.R.G.S. Secretaries: George James Symons, F.R.S., John W. Tripe, M.D. Foreign Secretary: Robert H. Scott, M.A., F.R.S. Council: Arthur Brewin, F.R.A.S., Edward Ernest Dymond, William Ellis, F.R.A.S., Rogers Field, B.A., M.Inst.C.E., Rev. Charles Higman Griffith, William John Harris, M.R.C.S., James Park Harrison, M.A., John Knox Laughton, M.A., F.R.A.S., Robert John Lecky, F.R.A.S., Hon. Francis A. Rollo Russell, Richard Strachan, Henry Samuel Tabor.

Royal Microscopical Society, January 8.—J. W. Stephenson, treasurer, in the chair.—Five gentlemen were proposed for election as Fellows, and the list of nominations for the Council was read.—The following papers were read:—Observations on *Dactylocalyx pumiceus* (Stuchbury), with description of a new variety, *D. Stuchburyi*, by Mr. W. J. Sollas.—Note on a revolver immersion prism for sub-stage illumination, by Dr. James Edmunds.—Immersion illuminators, by Mr. J. Mayall, jun.—Is not the genus Pedalion of Hudson synonymous with Hexarthra of Schmarda? by Mr. J. Deby.—The thallus of Diatoms, by Mr. F. Kitton.—Mr. Crisp (secretary) described the two new sense-organs in insects discovered by Prof. Graber, of Czernowitz.—The following were exhibited:—Specimens showing parasitism of a coral on a sponge (Dr. Matthews); the Sorby miniature micro-spectroscope; Recklinghausen and Meyer's pathological micro-photographs and specimens of microscopic printing (Mr. Crisp); sections of mistletoe on an apple tree double stained (Mr. Ward); Amici's original form of camera lucida referred to at the December meeting (Mr. Ingpen).

Entomological Society, January 15.—Anniversary meeting. H. W. Bates, F.L.S., F.Z.S., president, in the chair.—The following gentlemen were elected Members of the Council for the ensuing year, viz.:—H. W. Bates, F.L.S., F.Z.S., W. L. Distant, Rev. A. E. Eaton, M.A., E. A. Fitch, Ferd. Grut, F.L.S.,

R. Meldola, F.C.S., Edw. Saunders, F.L.S., J. Jenner Weir, F.L.S., J. W. Dunning, M.A., F.L.S., Sir Jno. Lubbock, Bart., V.P.R.S., Saml. Stevens, J. Wood Mason, F.G.S. The following officers were elected:—President: Sir Jno. Lubbock, Bart., V.P.R.S. Treasurer: J. Jenner Weir. Librarian: F. Grut. Secretaries: R. Meldola and W. L. Distant. The retiring president delivered an address which was immediately ordered to be printed.

WELLINGTON, N. Z.

Philosophical Society, November 9, 1878.—Mr. Carruthers, vice-president, in the chair.—Further contributions to the ornithology of New Zealand, by Dr. Buller, C.M.G. This paper consisted partly of technical matters and partly of observations on the habits and life-economy of a number of the more common species of native birds. The author gave the results of his examination of the group of *Platycerci* in the British Museum, and showed that many of the so-called species had no real existence, the same bird having been described under different names by different naturalists. He gave his reasons for considering *Platycercus Rowleyi*, described by himself from specimens in the Canterbury Museum, a good and valid species. He disputed Mr. Sharp's generic substitution of *Harpa* for *Hieracidea* in the British Museum catalogue of Accipitres, and his reduction of *H. ferox* to the rank of a "sub-species," as being unintelligible; either the two forms of sparrow-hawk represent distinct species, as the author and others believe; or they are one and the same, as contended for by Captain Hutton in the controversy which took place some time ago. Referring to that discussion and to Captain Hutton's emphatic denial that the New Zealand kingfisher ever caught fish, he proceeded to give some further facts in support of his own view to the contrary. In treating of the kaka (*Nestor meridionalis*) he mentioned the singular circumstance that at a certain season of the year, when these birds are migrating across the Strait at its widest part, numbers of them, owing to their fat condition, succumb to fatigue, and are washed up in Golden Bay and on the spit beyond, the set of the current being in that direction. The paper contained many other interesting notes, and a full account of the capture and subsequent history of a specimen of the plundering gull (*Stercorarius antarcticus*) still living in the author's garden.

PARIS

Academy of Sciences, January 20.—M. Daubrée in the chair.—The following papers were read:—On the development of the perturbative function in the case where, the eccentricities being small, the mutual inclination of the orbits is considerable, by M. Tisserand.—Observations on the second reply of M. Pasteur.—Reply by M. Pasteur, &c.—On the special apparatus of nutrition of phanerogamous parasite species, by M. Chatin. He distinguishes in the sucker a *cone de renforcement* (the central, mostly solid part), and a *cone perforant*, or parenchymatous cone continuing the other, and capable, notwithstanding its delicacy of tissue, of progressing through the hardest woods. (There are variations from this in some cases.) The suckers of parasites show great analogies to ordinary roots of plants.—On the temporary magnetic properties developed by induction in different specimens of nickel and cobalt, compared with those of iron, by M. Becquerel. The ratio of the temporary magnetic effects developed at ordinary temperature, by increasing magnetic inductions, in any of the nickel bars and in a bar of soft iron of the same length, weight, and section, is a number variable with the magnetic intensity to which the metals are submitted. This ratio, for very small intensities, first decreases, passes a minimum, then increases to a maximum, and lastly decreases to an inferior limit. Carburetted and forged nickels show the variations most. Pure cast or porous bars of nickel give results very like those of soft iron. Cobalt behaves similarly to nickel. The variation of the ratio considered is due to unequal saturation of the two metals.—On linear differential equations of the third order, by M. Laguerre.—On the classification of colours, and on the means of reproducing coloured appearances by three special photographic negatives, by M. Cros. Under the word colours he distinguishes lights and pigments. To get immediately the elementary tints of lights and pigments, look through a prism at a white bar on a dark ground, and a black bar on a white ground; in the first case you see a spectrum orange, green, violet; in the latter a spectrum red, yellow, blue. In the one case the orange, green, and violet are elementary lights; in the other, the blue, red, and yellow, are lights combined two and two. This he demonstrates with an apparatus he calls a *chromometer* (which distinguishes the colours by numerical data); and he makes this act on the positions from three negatives obtained through green, violet, and orange screens, ultimately reproducing coloured appearances.—Researches on the effects of induction through telephonic circuits, by means of the microphone and the telephone, by Prof. Hughes. A battery of three Daniells, a microphone, an inducing spiral, and a clock, were put in one circuit; another helix (to receive induction) and a telephone in another circuit. The sounds were still heard in the induced circuit when the spirals (containing 100 m. wire) were 30 ctm. apart. Conducting plates interposed weakened the effect, and spirals with closed circuit better. Flat helices gave more intense reproduction than long ones. Putting a telephone bobbin, in circuit with a microphone, to one ear, and the bobbinless telephone to the other, one can hear thus; and the arrangement is a sort of electric analyser revealing what passes in organs traversed by currents. (Other experiments are given.)—New voltaic element with constant current, by M. Heraud. The exciting liquid is chlorhydrate of ammonia, the depolarising body protochloride of mercury, or calomel. The former, in presence of zinc, gives chloride of zinc with ammonia and hydrogen. The hydrogen reduces the protochloride, giving metallic mercury, chlorhydric acid, and consequently, chlorhydrate of ammonia. To prevent deposition of ammoniacal oxychloride of zinc on the zinc, the solution of sal ammoniac used is diluted one-tenth with liquid ammonia. The zinc is suspended by a coated copper-plate about the middle of the liquid. The positive electrode is carbon in a canvas bag. One element, after 248 days' use, retained 0·66 of its original intensity.—On tetric acid and its homologues, by M. Demarçay.—Researches on the development of eggs and of the ovary in mammalia, after birth, by M. Rouget.—Description of the strata forming the ground in the department of Meurthe-et-Moselle, by M. Braconnier.

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