aromatic series from the even-atomic carbon. The specific volume of carbon is C = 21 in the C_nH_{2n} compounds of the former series, and C = 12 in the C_nH_{2n} compounds of the second series.—On Caucasus naphtha, by M. W. Markovnikoff and W. Ogloblin, being a thorough analysis of it.—On the identity $(\Sigma a_i x_i^2)\Sigma a_i = (\Sigma a_i x_i)^2 + \Sigma a_i a_k (x_i - x_k)^2$, and its meaning in physics, by N. Slouguinoff.—On the focal properties of diffraction-nets, by M. Merching.—On the specific properties of indiarubber, by N. Hesehus. They cannot be explained by the presence of air vesicles.

To the *Bulletin of the Belgian Académie Royale des Sciences*, for 1883, part 2, M. C. Malaise sends a valuable paper on the constituent elements of the Silurian formations of Brabant. An approximate thickness of 12,000 or 14,000 feet is assigned to the various groups constituting the older schistose rocks of this province.—Ed. Dupont deals with the origin of the Belgian Carboniferous limestones; and papers are contributed by M. Terby on the aspect and positions of the great comet of 1882; by M. Chevron, on the inflammable nature of the gases liberated in the decomposition of beetroot; by Baron Kervyn de Lettenhove, on the Conference of Bayonne of 1565; by Alphonse Wauterson, on the origin and rise of the early Flemish school of painting previous to the Van Eycks.—Part 3 contains contributions by J. de Tilly, on Chasles' theorem of central axes; by Ed. Van Beneden, on some additions to the ichthyological fauna of the Belgian seaboard; by M. Genocchi, on the algebraic functions of Prymand Hermite; by Joan Bohl, on the reforms recently introduced into the commercial jurisprudence of Italy.

Rendiconti of the *Reale Istituto Lombardo di Scienze e Lettere*, April 12, 1883.—Some applications of symbolic variability to mechanical problems, by S. C. C. Formenti. This paper is concluded in the next number, April 26.—On springs, head streams, and underground currents in the Italian Alps, by Prof. T. Taramelli.—Experimental researches on the decomposition of adipose substances in water, in damp earth, damp rooms, and in water charged with 10 per cent. of ammonia, by C. A. Tamassia.—A stùdy of microscopic organisms in sweet, salt, and mineral waters, by Prof. L. Maggi.—Remarks on the equivalence of magnetic and galvanic distributions, by Prof. E. Beltrami.—A preliminary inquiry into Zanardelli's proposed Italian penal code, by Prof. A. Buccellati.—On an unpublished letter of Francesco Maurolico, dated September 11, 1571, in connection with the battle of Lepanto, by L. De-Marchi.—On an example of realism in classic art, by Prof. J. Gentile.

April 26.—A comparative study of the aracnofauna of Abyssinia and Shoa, by Prof. Pietro Pavesi. The author determines thirty new species of spiders, for one of which (*Chiasmopes*) he establishes a new order.—On the determination of the coefficients of specific force for iron independently of Wöhler's numbers, by Prof. C. Clericetti.—Suggestions on a substitute for capital punishment in Zanardelli's new Italian penal code, by Cesare Oliva.—Remarks on banking and the cheque system introduced into the new Italian commercial code, by L. Gallavresi.

Atti of the Roman *Reale Accademia dei Lincei*, April 1.—On Finlay's comet (1882), by S. Respighi.—On the first observer of the optical illusion converting convex into concave and concave into convex surfaces, by S. Govi. The priority of discovery usually assigned either to Joblot (1718) or to Christopher Cock (1688) is here credited to Eustachio Divini (1663) on documentary evidence.—On the presence of native cinnabar and sulphide of silver in the Tolfa Hills, by S. Blaserna.

April 15.—Biographical notice of the late Bertrando Spaventa, by S. Ferri.—On the migrations of the ancient peoples of the Armenian Highlands and Asia Minor, studied in the light of the Egyptian monuments and hieroglyphical inscriptions, by S. Fiorelli.—A notice of the archæological discoveries made in various parts of Italy duriug the month of March, by S. Fiorelli.

Revue internationale des Sciences biologiques for March, 1883, contains:—On the origin of the vertebrates and the principle of the transformation of functions, by Dr. A. Dohrn.—On the excitability of plants, by Dr. Burdon Sanderson.—On dwarfs and giants, by D. L. Delbœuf.—Proceedings of the Academy of Sciences, Paris, of the Belgian Academy, and of the Academy of Amsterdam.

April, 1883, contains:—On the primordial flora, by Louis Crié.—On the origin and relation of sex, by M. Debierre.—On colour and mimicry in insects, by Dr. Hagen.—Proceedings of the Academy of Sciences, Paris, and the Academy of Sciences, Amsterdam.

SOCIETIES AND ACADEMIES

London

Royal Society, May 10.—"Note on the Motor Roots of the Brachial Plexus, and on the Dilator Nerve of the Iris." By David Ferrier, M.D., LL.D., F.R.S., Professor of Forensic Medicine in King's College.

In a communication to the Royal Society (published in the *Proc. Roy. Soc.*, vol. xxxii. 1881) on the "Functional Relations of the Motor Roots of the Brachial and Lumbo-Sacral Plexuses," my colleague Prof. Gerald Yeo and myself gave an account of the results of electrical stimulation of the several motor roots of the brachial and crural plexuses in the monkey. We there described the muscular actions of the upper extremity as resulting from stimulation of the first dorsal up to the fourth cervical nerve.

The careful dissections made at our request by Mr. W. Tyrell Brooks, Demonstrator in the Physiological Laboratory, King's College, and a repetition of the stimulation experiments which I have made, have revealed an error in the enumeration of the roots of the brachial plexus which, in common with Prof. Yeo, I wish to correct. What we took for the first dorsal nerve has proved in reality to be the second dorsal. Hence the results of the experiments must be read as applying to the spinal nerves from the second dorsal to the fifth cervical respectively, instead of from the first dorsal to the fourth cervical, as stated in our paper.

The anterior division of the second dorsal nerve in the monkey apparently invariably gives a well-developed communicating branch to the first dorsal, besides giving off the second intercostal nerve and a branch to the stellate or inferior cervical ganglion of the sympathetic.

The three branches, as seen in a dissection made for me by Mr. Brooks seem pretty equal in size, and all come off from the main trunk together.

The brachial plexis in man is not usually, in text-books of anatomy, considered as deriving any of its component roots below the first dorsal. In "Quain's Anatomy" (ninth edition, p. 619), however, a branch from the second to the first dorsal is given as a variety. On this subject Dr. D. J. Cunningham has published a note in the *Journal of Anatomy and Physiology*, vol. xi. part iii., p. 539, 1877. Dr. Allen Thomson having mentioned to him that he had on one or two occasions seen such a communicating branch in man, he investigated the point, with the result of finding a communicating branch from the second to the first dorsal in twenty-seven out of thirty-seven dissections. Of the ten cases where it was not found, five were so complicated by previous interference in the dissecting-room or by pleuritic adhesions and thickenings, that they may be considered as doubtful. But, even including these, it appears that the second dorsal sends a communicating branch to the first in 73 per cent. of the cases. Hence it should be considered as more than a mere variety. If a perfect homology exists betwe n the roots of the plexus in man and the monkey, the second dorsal root would be the one presiding over the intrinsic muscles of the hand. Presumably in those cases where it is not found, its functions are represented in the first dorsal.

Dilator Nerve of the Iris.—Prof. Yeo and I mentioned in our paper (*sup. cit.*) that in one case in which we directed special attention to the pupil, stimulation of the anterior roots from the first dorsal to the fourth cervical—in reality from the second dorsal to the fifth cervical—caused no change in the pupil, though the movements of the limb occurred with regularity.

I have since investigated this point during the course of another research on which I have been for some time engaged. I have experimented on four monkeys. The animals were thoroughly narcotised with chloroform and kept so during the whole course of the experiments. The posterior roots of the nerves under investigation were cut, and the anterior stimulated within the vertebral canal with a weak induced current from the secondary coil (distant 20 to 15 cm.) of a Du Bois Reymond's magneto-electromotor and one Daniell. As in former experiments, a large flat electrode was placed on the sacrum as a neutral point, the exciting electrode being a hooked needle, by means of which the roots could be easily insulated and separately stimulated.

In the first experiment I failed to obtain dilatation of the pupil from stimulation of the spinal roots from the second dorsal up to the fourth cervical, though the functional activity of the roots was indicated by movements of the limb. In the second I exposed the dorsal roots from the eighth up to the third inclusive. Though different strengths of current were tried, no change in the pupil occurred, unless when the current was so strong as to cause diffuse stimulation. In such cases both pupils would occasionally become dilated, as under sensory stimulation in general. The functional activity of the roots under investigation was shown by contraction of the thoracic muscles on the side of stimulation.

In the third experiment, however, results were obtained of such definiteness and uniformity as to indicate almost without further confirmation the origin of the dilator nerve of the iris.

In this experiment the spinal nerves were exposed from the sixth cervical to the eighth dorsal inclusive. The posterior roots were cut on the left side, and the anterior roots stimulated, while the eyes were carefully observed by two assistants—my pupils, Mr. Norvill and Mr. East. Dilatation of the left pupil occurred almost invariably on stimulation of the second dorsal root, whereas no change whatever could be perceived on stimulation of any of the other exposed roots. This was verified over and over again, and the several roots repeatedly compared with each other. The distance of the secondary coil in this experiment ranged from 20 to 18 cm.

Stronger currents not carefully insulated caused dilatation of both pupils wherever the stimulation was applied, an expression only of general sensory stimulation.

After death a careful dissection was made for me by Mr. Brooks, and the effective root, which was marked, proved to be the second dorsal. An examination with a lens showed that the fibres of the posterior root of this nerve had been completely severed.

The results of the third experiment were entirely confirmed by the fourth.

In this I exposed the spinal nerves from the seventh cervical to the fourth dorsal and cut the posterior roots on the left side.

Here again with the utmost uniformity on each stimulation of the second dorsal, the left pupil, and this one only, became widely dilated; whereas stimulation of the other roots was entirely negative in respect to the pupil.

I ascertained in this experiment that a strength of current which would suffice to excite the muscles of the limb or trunk to action would frequently fail to cause any dilatation of the pupil when applied to the second dorsal. Somewhat stronger, but yet barely perceptible on the tongue, the current at once caused the pupil to dilate. Occasionally also if the second root had been stimulated repeatedly the iris failed to respond, probably from mere exhaustion of the nerve.

Circumstances such as these would, I think, account for the absence of the pupil-reaction in my first experiment, and also in the experiment related by Prof. Yeo and myself, where the second dorsal root was really under stimulation.

The general result of these experiments is to show that in the monkey, and presumably also in man, the dilator fibres of the iris contained in the cervical sympathetic are derived from the anterior root of the second dorsal nerve.

Mathematical Society, June 14.—Prof. Henrici, F.R.S., president, in the chair.—Prof. W. Woolsey Johnson, of Annapolis, was admitted into the Society.—Prof. Cayley, F.R.S., spoke on the subject of sever invariants, and Mr. Hammond's recent discovery.—Prof. Sylvester, F.R.S. (who was very cordially welcomed), and Mr. Hammond spoke on the same subject.—Mr. Tucker (Hon. Sec.) read parts of papers by Prof. H. Lamb, on the mutual potential of two lines in space; by Mr. H. M. Jeffery, F.R.S., on bicircular quartics with collinear foci; and made a few remarks on the subject of inverse coordinate curves.

Physical Society, June 9.—Prof. Clifton in the chair.—Dr. Obach described an improved construction of the movable coil of galvanometer for determining currents and E.M.F. in absolute measure. This is a more sensitive, accurate, and powerful instrument than the old form. It is intended for accurate measurements and testing other instruments. The needle of the new form does not dip; and its vibrations are rendered dead beat by an air chamber. The secants of the inclination of the coil are the multipliers of the tangents of the deflections. The coil consists of a single solid rod or band of copper for measuring powerful currents; and on the same ring is a fine coil of German silver wire for measuring E.M.F. No shunt is required, owing to the movability of the coil. Dr. Obach gave figures showing the accuracy of the apparatus, which is very great.—Professors Ayrton and Perry read a paper on the electric resistance of water, being the result of some experiments made by them some time ago. A comparison of the galvanometer and electrometer methods of measuring this resistance was made during the experiments, the results being in favour of the latter, especially with currents of less than 6 volts. When the electrodes or platinum plates in the water were end-on, the resistance was less than when face to face. Mr. Boys thought this curious result might be due to the resistance between the surface of the plates and the water being reduced. In answer to Dr. Coffin, Prof. Ayrton stated that the plates were heated between every two experiments in the blowpipe. Prof. G. Guthrie remarked that Kohlrausch had found ordinary distilled water to be much more conductive than pure distilled water, which was an insulator, and inquired if Prof. Ayrton chose pure water. The latter replied that as his experiments were to test the merits of the galvanometer and electrometer modes of testing, ordinary distilled water was used. Prof. Jones stated that he found it best to use alternating currents for measuring the liquid resistance of cells, and described a mercury commutator for rapidly reversing the testing current.—Prof. Ayrton then described a lecture apparatus for showing the laws of centrifugal force. A rapidly rotated arm carrying a movable weight springs from the centre of an aneroid chamber filled with mercury. This chamber is on the rotating axle, and as the centrifugal force of the arm pulls out the diaphragm, the mercury falls in the chamber and in a tube opening from it. Prof. Guthrie remarked that the apparatus would serve as a speed counter.—Prof. Perry then read a paper on the kinetic energy of rotating bodies, in which he pointed out the practical drawbacks to the "moment of inertia" calculations, and suggested the use of a new constant (termed for the nonce the "M"). This is the amount of kinetic energy possessed by a rotating body when making one revolution per minute. To find the energy for N revolutions per minute, multiply this by N^2. In the same way the "M" of a machine can be found and used.

PARIS

Academy of Sciences, June 11.—M. E. Blanchard, president, in the chair.—On some properties of a binary form of the eighth order, by F. Brioschi.—On the homogeneity of mathematical formulas, by A. Ledieu.—Four methods of separating gallium from iridium, by M. Lecoq de Boisbaudran.—Process to be adopted in observing the first radicules of the lymphatic system, and in determining whether these radicules communicate or not with the blood capillaries, by E. Sappey. The intimate union of the radicules with the bloodvessels, which had long been assumed on general grounds, is here demonstrated by actual observation.—Researches on rabies, by Paul Gibier. The points examined are (1) the manner of inoculation; (2) transmission of rabies through the mother; (3) the presence of foreign substances in the stomach of the dog in connection with the diagnosis of rabies; (4) attenuation of the virus: (5) the parasites of rabies. The author shows that the canine, like some other kinds of virus, may be attenuated by cold. That hydrophobia is due to a special parasite, although not yet scientifically demonstrated, is rendered highly probable.—Facts and results serving to determine some new properties of sulphate of iron, by M. Rohart.—On the properties of phosphoric glass (the so-called *verre de phosphate de chaux*), by M. Sidot.—M. de Quatrefages presented, on behalf of M. de Lacerda, a memoir on an organism found in the victims of yellow fever, and by him regarded as a fungus. In the accompanying plate are represented the various stages of development of this organism.—On the track of Encke's comet in the years 1871–1881, by M. Backlund.—On a mode of transformation of figures in space, by MM. J. S. and M. N. Vanecek.—On the theory of the binary form of the sixth order, by R. Perrin.—A study of continuous periodical fractions, by E. de Jonquières (continued).—On the reflection of light on the surface of disturbed fluids, by L. Lecornu.—On the variation of the capillary constant of insulating liquid surfaces, such as ether and sulphuret of carbon, in contact with water, under the action of an electromotive force, by M. Krouchkoll.—On the formation of the glycolate of bibasic soda, by M. de Forcrand.—On the hydrates of barytes, by E. J. Maumené. It is shown that barytes makes no exception to the general law of hydrates, with which the numerous results obtained by Fremy, Filhol, Deville, and others, are in harmony.—On the fermentation of bread-stuffs, by V. Marcano.—On the artificial production of barytine, cœlestine, and anhydrite, by A. Gorgeu.—On the origin and process of formation of bauxite and granular iron, by Stan. Meunier.—On respiration in rarefied air, by MM. Fraenkel and Geppert.

June 18.—M. Blanchard, president, in the chair.—A despatch from San Francisco was read announcing M. Janssen's discovery of the Fraunhofer spectrum and of the dark lines of the solar spectrum in the corona, implying the presence of cosmic matter round the sun. Five photographs were taken of the corona and circumsolar regions to a distance of 15° for intra-Mercurial planets.—A new method of determining the right ascensions and absolute declinations of the stars (continued), by M. Lœwy. —On a drawing of the great comet of 1882, executed at M. Bischoffsheim's observatory near Nice, by M. Faye.—On the movements observed in the monolithic pillars supporting the meridian of the Neuchâtel Observatory, by M. Faye. From these observations, which have been regularly recorded since the foundation of the Observatory in 1859, it appears that even the most solid parts of the earth's crust are subject to slight movements, slow, regular, and partly oscillatory; also that the variable intensity of the movements depends on the one hand on the meteorological conditions of the year, while it is connected on the other with the periodical perturbations produced in the solar photosphere.—On a system of optical telegraphy established by M. Adam between the Islands of Mauritius and Réunion, by M. Faie.—On a carbon meteorite which fell on June 30, 1880, near Nogoga, province of Entre-rios, Argentine States, by M. Daubrée.—Experimental and clinical researches on the method of producing anæsthesia in the organic affections of the encephalon, by M. Brown-Séquard.—Numerous experiments made on dogs, rabbits, &c., seem to show that the paralysis caused by an organic affection of one of the various parts of the brain depends scarcely ever, if at all, on the cause usually assigned to it, that is, the loss of function of the part destroyed. —On the determination of the fly-wheels of tool-engines, by M. X. Kretz.—On the sulphurets of phosphorus, by M. Isambert.—On a method of transformation of figures in space, by MM. J. S. and M. N. Vanecek.—On the theory of the binary form of the sixth order, by R. Perrin (continued).—On the continuous reduction of certain quadratic forms, by E. Picard.—On the magnifying power of optical instruments, by M. Monoyer.—Evaporation of sea water in the south of France, and more particularly in the Rhone delta, by M. Dieulafait. From various observations the author concludes that throughout the deltaic region, even to a distance of twelve miles inland, the mean annual evaporation of the sea water is at least 6 mm. every twenty-four hours.—On some properties of the sulphuret, selenide, and telluride of tin, by A. Ditte.—Determination of the carbonic acid of the air in the stations selected for observing the transit of Venus, by MM. A. Muntz and E. Aubin.—Volumetric quantitative analysis of sulphuret of carbon in sulphocarbonates, by E. Falières.—On the emetics of mucic acid, by D. Klein.—On the respiratory organs in the Chelonia, by L. Charbonnet Salle. —On the cellules of the follicule in the ovum, and on the nature of sexuality, by A. Sabatier. From his protracted studies of the processes of gemmation and parthenogenesis, the author concludes that in the reproductive elements there are two principles of opposed polarities, the centripetal (blastophore) and centrifugal (spermatoblast). When the two polarities are in a reciprocal state of equilibrium the cellule is in a state of *sexual neutrality*, and capable of parthenogenesis. But should the equilibrium become disturbed by the disappearance of either element through any biological change, one of the elements becomes predominant and the cellule acquires a determined sexuality, male by the elimination of the centrifugal, female by that of the centripetal element. There may thus be various degrees of sexuality, which become completely differentiated only through successive processes of elimination.—New method of discolouration of the pigment in the eye of Arthropods, by C. E. della Torre.—Observations on the movements of the ground in the Chiloë Archipelago, by Ph. Germain.

BERLIN

Physiological Society, June 1.—Prof. Kronecker reported that in a demonstration of the action of the cooling down of nerves upon their conductibility, he observed a lesser velocity of conduction of the stimulus instead of the greater velocity that he expected, and that he had found this observation confirmed by subsequent experiments. Hence the correctness of an earlier casual observation of Herr von Helmholtz, that the cooling down of a nerve diminished its conductibility, which had been denied by subsequent observers, has been vindicated; but Prof. Kronecker admits that the contrary may also be true, because frogs may present, under different conditions and at different seasons, utterly diverse phenomena. The influence of temperature on the excitability of sensory nerves, the complement of the above observation, was investigated in frogs whose spinal cord was cut through by measuring the length of time occupied by reflex movements when their legs were dipped into dilute sulphuric acid (·5 or 1 per thousand) at different temperatures. In the case of all frogs and at all active degrees of concentration of the acid, the time required for the reflex action was shortest, *i.e.* the immersed leg was quickest drawn out, when the acid was coldest—0° or +4° up to +6°—and the time required for the reflex action was on the contrary longer at the temperature of the air of the room, and longest at the highest temperature that was employed, 30° to 35°. The influence of cooling down, not the peripheral nerves, but the spinal cord itself, will be investigated in future experiments.—Prof. du Bois Reymond communicated a short notice from a letter of Prof. Babuchin's to him, which contains a fact interesting as showing the power of adaptation to their surroundings that electric fish possess. Prof. du Bois Reymond had previously called attention to the fact that the electric eels and malapterurus that live in badly-conducting fresh water show, in as far as they have accommodated themselves to this medium, a considerable development of their electric organ in length compared with the small size of its transverse diameter, whereas in the electric rays that live in sea water, which is a good conductor, the electric organ has a greater transverse development; consequently the electromotor powers of the electric organs of the electric eel and malapterurus on one side, and of the electric ray on the other, were to one another inversely as the conductibility of the surrounding media. The measurements of Humboldt and of Sachs of growing electric eels had shown that in their growth the electric organ increased proportionately more in length than in transverse diameter, which is a teleological adaptation to the badly-conducting fresh water. Now the above-mentioned note of Prof. Babuchin contained the communication that in growing electric rays the electric organ increased proportionately much more in breadth than in height; this is likewise in conformity with the adaptation to the sea water, which is a good conductor.

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