researches of Mr. Murray, Dr. H. R. Mill, and others, that all these necessary correlations actually existed, although hitherto some of them had been looked upon as mere curious and inexplicable coincidences.

But if the fold or wave rules in the arrangement of the forms of the earth-surface of the present day, it must of necessity rule also in corresponding planetary surfaces, both in space and time; and the author gave it as his opinion that it afforded an equally natural and plausible explanation of cycles, systems, and transgressions of the geological formations, and of the surface (for example) of the planet Mars.

The final conclusion which the author drew from a consideration of the known facts and phenomena was, that the wave or fold appeared to be the natural unit of classification of all the grander forms of the earth-surface. The recognisable surface undulations of the present earth-surface are, broadly speaking, the surfaces of corresponding waves or warpings of the outer parts of the earth-crust, in part obliterated by erosion, &c., and in part masked by deposition. In the crust-wave, its divisions, modifications, combinations, and intersections, we seem to find the key to the dissymmetries, the harmonies, the contrasts, and even the supposed anomalies of the surface features of the globe. Upon the surface of the earth, the crust-deformation expressible in terms of this unit seems to be the paramount factor. Denudation, deposition, earthquake movement, volcanicity, and even the surface forms and distributions of the main land and water areas, appear to be all subordinated to this ruling element. As the minor undulations stand related to the major undulations as subordinates, it is probable that not the slightest local change can be brought about without disturbing to that extent the balance of parts, and so leading to a readjustment of the equilibrium of the whole. The fold theory, however, affords us merely a natural and convenient means of classification of surface form, and in the meantime does not concern itself with the mode of origin of these forms. It is a theory, not of causes, but of the most natural grouping of effects.

SCIENTIFIC SERIALS.

American Journal of Science, April.—Further studies of the drainage features of the Upper Ohio basin, by T. C. Chamberlin and Frank Leverett. The general view adopted is that of Carll, according to whom the present drainage system of the Upper Ohio basin has been formed by the union of several pre-glacial systems that formerly flowed into what is now the Lake Erie basin. These were blocked up by the ice of the earlier glacial period, which invaded their lower courses and forced them to flow over low divides and unite to form a common south-westward flowing system nearly parallel to the border of the ice. The evidence for reversals and displacements of river beds is given in detail, and four hypotheses are presented to account for them. They all greatly emphasise the importance of the first glacial epoch, and indicate that, while the last glacial invasion was very much more pronounced in its apparent effects, it was, after all, much the smaller factor in the glacial period.—An apparatus to show, simultaneously to several hearers, the blending of the sensations of interrupted tones, by Alfred M. Mayer. A short brass tube is cemented in a hole in the bottom of a glass flask. When the tube is closed the flask resounds powerfully to a tuning-fork of suitable pitch vibrating near its mouth. When the tube is open the resonance is very feeble. The opening and closing is effected by a perforated disc rotating in contact with the brass tube. At a certain velocity the interrupted sounds blend into the sound of the tuning-fork, the velocity giving an indication of the amount of residual sensation.—The appendages of the pygidium of *Triarthrus*, by Charles E. Beecher. Further studies of the Yale Museum specimens have enabled the author to make out the main characteristics of the appendages of the caudal shield. At the pygidium, the endopodites preserve the slender, jointed, distal portion found at the thorax, but the proximal part is composed of segments which are considerably expanded transversely, thus making a paddle-like organ, the anterior edge of which is straight, while the posterior one is serrated by the projecting points of the expanded segments. These points bear small bundles of setæ. The specimens from which these details are gathered are very perfectly preserved. The author proposes next to describe the structure of the under side of the head, and then to review the present enlarged knowledge of *Triarthrus*, with its bearings upon the position and affinities of the Trilobites generally.

Bulletin de l'Académie Royale de Belgique, No. 2.—The sense and the period of the Eulerian movement, by F. Folie. The sense of the Eulerian movement of the pole of inertia round the instantaneous pole is direct; that of the movement of the instantaneous pole at the surface of the earth is retrograde. The period of the latter is 321 days; for an integral number of years, a direct and somewhat slower motion may be substituted for this, giving the commonly accepted period of 423 days. But the shorter period is free from the geometrical objections attached to the latter.—The influence of pressure upon specific heat, taken below and above the critical temperature, by P. de Heen. The law governing this influence is analogous to that determining the relation between pressure and compressibility. Little variable at first, the specific heat rises with increasing pressure up to a certain limit, and then diminishes.—On the phenomenon of beats in luminous vibrations, by Dr. J. Verschaffelt. Prof. Righi showed in 1878 that if two rays are brought to interference whose periods are only slightly different, fringes are obtained which move with such velocity that a number equal to the difference of frequency passes each point of the screen in one second. Righi realised this practically by means of a rotating Nicoll prism and Fresnel's mirror. The principle applied by Dr. Verschaffelt is that of Doppler, according to which a motion of the source with respect to the ether changes the wave-length of the light emitted. The retardation was produced by a moving wedge of quartz cut parallel to its axis, and placed at 45° between the crossed Nicolls of a polarising microscope.—On absorption by the bile ducts, by Célestin Tobias. Ligature of the thoracic canal suppresses absorption of acids and biliary pigments, as pointed out by Harley. But it does not affect that of sodium ferrocyanide, of strychnine, or of atropine at the surface of the bile ducts. Sodium iodide is not absorbed at all. Whether the absorption is lymphatic or sanguine depends upon the nature of the substance.

SOCIETIES AND ACADEMIES.

LONDON.

Physical Society, April 13.—Prof. A. W. Rücker, F.R.S., President, in the chair.—The President invited discussion on Prof. Henrici's paper on calculating machines, and said a description of Mr. Sharp's harmonic analyser, giving direct readings of the amplitude and epoch of the various constituent simple harmonic terms, had been sent in. This machine requires no adjustments to be made before using. The amplitude is given by the length of a line joining the initial and final positions of the point of contact of a roller with a rotating disc, whilst the epoch is determined by the angle which this line makes with the plane of the roller in its initial position.—Prof. Perry congratulated Prof. Henrici on the success attained with his analysers. Referring to planimeters, he said the average error made in working out indicator diagrams with Hine and Robertson's instrument was only about one-third that made with Amsler's. After pointing out the great importance of Fourier's series to practical men, and especially to electrical engineers, he said that in studying reciprocating motions, such as those of pistons, valve gears, &c., it was most useful to resolve the motion into its fundamental harmonic motions and its overtones. In this way remarkable differences could be seen between various motions which have the same fundamental, and which are usually considered equivalent. In the *Electrician* of February 5, 1892, he had published the numerical work for a given periodic curve developed in Fourier's series, and he now exhibited a graphical solution done by one of his students, who was probably the first to carry out the late Prof. Clifford's idea of wrapping the curve round a cylinder and projecting it on different planes. Prof. Henrici had, he said, based the construction of his first analyser on Clifford's method, but used the Henrici principle (viz. $\int y \sin\theta\, d\theta = \int \cos\theta\, dy$, when integrated over a complete period) to explain the later machines. As a matter of fact the first machine in which the coefficients were determined by an Amsler planimeter carried by a reciprocating tangent plane, was a beautiful example of the Henrici principle, and he, Prof. Perry, saw far greater possibilities before it. The defects in the first instrument were mechanical ones, and could be got over by in-

creasing the amplitude of the harmonic motion. Not only was the machine useful for Fourier expansions, but by giving suitable motions to the tangent plane developments of arbitrary functions in spherical harmonics, Bessel's functions, Lamé's functions, and other normal forms could be determined. He had designed a machine which, on Prof. Henrici's principle, develops arbitrary functions in Bessel's, and hoped to have shown it in working order at the meeting; the Easter holidays had prevented its being finished in time. In this machine the motion is given to the table by a cam and roller, the cam being shaped so that the displacement of the table is $x \times J(x)$ when the shaft turns through an angle proportional to x. The revolving cylinder is driven by variable gearing from the cam shaft. By using cams of other shapes, developments in many normal forms may be obtained; the machine is therefore of general analytical use. An example of development in Bessel's worked out arithmetically by two of his students, Messrs. Hunt and Fennel, was given, and the process of performing the integration by the machine described. Prof. Boys, speaking of arithmometers, said Prof. Selling's machine had several inconveniences. In the first place, it occupied a large space, and the projecting racks were apt to upset things put behind the machine. Secondly, the result of any operation was indicated by continuous motion, and therefore cannot be read off instantly with certainty. On the other hand the "Brunsviga" machine was very compact and convenient, the only serious defect being that one cannot carry on figures obtained as the result of one operation to work with again, as was possible in the well-known Colmar machine. As another improvement he suggested that the two sets of numbers on the wheels showing the result of any operation, should be coloured differently, so that it would be easy to see whether multiplication or division had been performed. The labour of operating with large digits could then be considerably reduced with certainty. For example, in multiplying by 2998, instead of 28 (2+9+9+8) turns of the handle, 5 would be sufficient, viz. 3 in the forward direction and 2 backward, thus giving 3002. In his opinion logarithm tables were not nearly so convenient for ordinary calculations as this machine.—Mr. A. P. Trotter described how, by the use of templates cut to suitable shapes, one could obtain true curves from those given by recording voltmeters and similar apparatus. Mr. Yule said he had recently seen the newest analyser made by Coradi for Prof Weber, and was present when it was tested by the latter on a simple harmonic curve. It gave excellent results, the errors not amounting to 1 part in 2000. Speaking of the "hatchet" planimeter, he thought the first one was exhibited by Mr. Goodman at the Institution of Civil Engineers. Mr. A. Sharp, he said, remarked that since last meeting he had designed an inversion of the mechanism in his harmonic analyser, which made it much more practical. Prof. Henrici, in reply, said the uses of his first machine, suggested by Prof. Perry, might lead to great developments in this subject. Lord Kelvin had shown that with the sphere and roller integrator products of two functions such as $f(x)\,F(x)\,dx$ could be got. Referring to Prof. Boys' criticism on the Selling arithmometer, he did not consider the difficulty in reading off the result at all serious. Mr. Trotter's method of solving problems by templates might be very useful. Speaking of the "hatchet" planimeter, he said he believed it was first brought out in Denmark. Mr. F. W. Hill, of the City of London School, had sent him a solution of its action. Mr. Sharp, he said, had made a very considerable improvement in his machine, and the elements of this integrator may be useful for other purposes.—Mr. P. L. Gray read a paper on the minimum temperature of visibility, describing experiments made to find the lowest temperature at which bright or blackened platinum becomes visible in the dark The instrument used was a Wilson and Gray's modification of Joly's meldometer, in which a thin strip of platinum, about 10 c.m. long and 1 c.m. wide, is heated by an electric current. The expansion of the strip is indicated by an optical method, and used for estimating the temperature of the strip. To calibrate the arrangement, small particles of substances having known melting points were placed on the strip, and observed through a microscope, the position of the spot of light showing the expansion being noted when the substance melted. The general conclusions arrived at are:—(1) That the minimum temperature of visibility is the same for a bright polished surface as for one covered with lampblack, although the intensity of radiation in the two cases may be different. (2) That the visible limit at the red end of the spectrum varies greatly for a normal eye according to its state of preparation. Exposure to bright light diminishes the sensitiveness of the eye, and darkness increases it. (3) That for the less sensitive condition, the minimum temperature of visibility for the surface of a solid is about 470° C., but this may be much reduced by even a few minutes in a dark room. (4) That at night a surface at 410° C. is visible, and that by resting the eyes in complete darkness this may be reduced to 370° nearly. (5) That different people's eyes differ somewhat in their "minimum temperature of visibility," but probably not to any great extent if tested under the same conditions as to preparation, &c. To most observers the strip at these low temperatures had no appearance of red, but looked like a whitish mist. Inserting a plate of glass or a layer of water in the line of vision had no effect on the temperature of visibility. Mr. Blakesley inquired if the author had tried condensing the light from the strip? As to colourlessness, he observed that the parts of the retina active in oblique vision were less sensitive to colour than the central portions. Dr. Burton remarked that in the experiments, the presence of light and not colour was being observed. When illumination was faint, as in twilight or moonlight, it was very difficult to distinguish colours. In the solar spectrum one did not see any whitish termination at the red end. Mr. Elder said Captain Abney had shown that all colours appear grey when of small intensity. The President thought the question as to whether visibility depends on wave-length or on energy was an important one. Probably a minimum amount of energy was essential. At such low temperature the emission curves of the different wave-lengths may not have become sufficiently separated to be distinguished. Mr. Gray, in reply, said Prof. Langley had shown that a minimum, but very small, amount of energy was necessary to vision in all parts of the spectrum.—Dr. Burton's paper on the mechanism of electrical conduction was postponed.

Mathematical Society, April 12.—A. B. Kempe, F.R.S., President, in the chair.—The following communications were made:—On regular difference terms, by the President. (Prof. Greenhill, F.R.S., Vice-President, *pro tem.*, in the chair.) In the expression of the invariants of a binary quantic Q_n in terms of the roots, we employ functions such as

$$\Sigma(T),$$

where T is a product of differences of the roots into which each root enters the same number of times, and the summation extends to all expressions derivable from T by transpositions of the roots. If the number of roots be n, and each root enters v times into T, then T is a *regular difference term* of the system of roots considered, and is said to be of degree n and order v. For a given degree n the simplest regular difference terms are of order 1 or 2, according as n is even or odd, and are called *elemental terms* of the system of roots. The object of the paper is to show that every regular difference term of a given system of roots is a rational integral function of the elemental terms of that system. One result of this theorem is that every invariant of the binary quantic Q_n, which is a rational integral function of the roots of Q_n, is expressible as a rational integral function of such of those invariants as are of the form

$$\Sigma(E_1^{\lambda}E_2^{\mu}E_3^{\nu}\ldots)$$

where E_1, E_2, E_3, ... are elemental terms of the n roots of Q_n.—Theorems concerning spheres, by S. Roberts, F.R.S.—Second memoir on the expansion of certain infinite products, by Prof. L. J. Rogers.—A property of the circum-circle, ii., by Mr. R. Tucker.—A proof of Wilson's theorem, by Mr. J. Perott.—On the sextic resolvent of a sextic equation, by Prof. W. Burnside, F.R.S. The group of an irreducible equation of the fifth degree, after adjunction of the square root of the discriminant, is either the icosahedral group, the dihedral group for $n = 5$, or the cyclical group for $n = 5$; the two latter being sub-groups of the former. In the two latter cases the equation is solvable by radicals, and in the former not. For a given equation with numerical coefficients the two latter cases may be distinguished from the former by constructing the sextic resolvent and determining whether or no this has a rational root. This sextic resolvent has been calculated by Cayley ("Collected Papers," vol. iii. 2) for the general quintic. When the quintic is taken in its standard form, $x^5 + ux + v = 0$, the calculation is enormously simplified (see C. Runge, *Acta Math.* vol. vii.). For a given irreducible sextic there is a greater range of possibilities. After adjoining the square root of the discriminant, the group of the equation may be either the alternating group of 6 variables, a transitive group of 6 variables which is iso-

morphous with the icosahedral group, or a group of order less than 60, which is necessarily solvable. In the first case the solution of the given equation cannot be made to depend on an equation of lower degree than the 6th; in the second case the roots of the equation are rationally expressible in terms of the roots of an equatlon of the 5th degree; and in the last case the equation can be solved by radicals. For a given equation with numerical coefficients the cases are distinguished by forming the resolvents of the 6th and 10th degrees and determining whether either of these have a rational root. If the resolvent of the 10th degree has a rational root the equation can be solved by radicals, and if that of the 6th degree has a rational root the solution depends on a quintic. It is this latter resolvent which is calculated in the present paper, on the supposition that the sextic is reduced to the standard form

$$x^6 + ux^2 + vx + w = 0,$$

which is always possible by solving a cubic equation. Representing the roots of the equation by 0, 1, 2, 3, 4, 5, a transitive icosahedral group is generated (see Serret, "Cours d'Alg. Sup." vol. ii.) by the two even permutations

$$(12345) \text{ and } (01)(25).$$

There is no function of the roots of the 2nd degree that is invariable for this group, but it is easily verified that

$$012 + 023 + 034 + 045 + 051 + 124 + 235 + 341 + 452 + 513$$

is such a function; and therefore that this function takes 6 values for all even permutations of the 6 roots. If

$$y^6 + p_1y^5 + p_2y^4 + p_3y^3 + p_4y^2 + p_5y + p_6 = 0$$

is the equation whose roots are these 6 values, p_1 &c., must be rational in u, v, w, and $\sqrt{\Delta}$, where Δ is the discriminant of the sextic. By comparing the degrees of these functions it is seen that

$$p_1 = 0,\ p_2 = m_1w,\ p_3 = m_2uv,\ p_4 = m_3u^3 + m_4w^2$$
$$p_5 = m_5v^3 + m_6uvw + m_7\sqrt{\Delta},\ p_6 = m_8u^2v^2 + m_9w^3 + m_{10}u^3w,$$

where the m's are numbers; and it is further easily shown that

$$m_2 = m_5 = m_6 = 0.$$

Finally, by choosing suitable special cases, the values of the other m's are completely determined. The final result is that this sextic resolvent has the form

$$y^6 + 30wy^4 + (165w^2 - 4u^3)y^2 + 25u^2v^2 - 80w^3 + 64u^3w = y\sqrt{\Delta}.$$

It is obvious that the twelve values that the function

$$012 + 023 + \ldots\ldots\ldots\ldots + 513$$

takes for *all* permutations of the roots are, for the standard sextic equal and opposite in pairs, so that y^2 is a 6-valued function for the symmetric group. If then the above equation be squared, while z is written for y^2 and its value in terms of u, v, w substituted for Δ,

$$(z^3 + 30wz^2 + (165w^2 - 4u^3)z + 25u^2v^2 - 80w^3 + 64u^3w)^2 - \Delta z = 0$$

is the resolvent, a rational root of which will indicate that the solution of the sextic depends on that of a quintic.—Mr. Perigal exhibited some diagrams illustrating circle-squaring by dissection.

Entomological Society, April 11.—Henry John Elwes, President, in the chair.—The Hon. Walter Rothschild exhibited male and female specimens of *Ornithoptera paradisea*, Stdgr., from Finisterre Mountains, New Guinea; *O. trojana*, Stdgr., from Palawan; *O. andromache*, Stdgr., from Kina Balu, Borneo; *Œnetus mirabilis*, Rothsch., from Cedar Bay, Queensland, and a few other splendid species from the Upper Amazons. The President, Mr. J. J. Walker, R.N., Mr. Osbert Salvin, F.R.S., Lord Walsingham, F.R.S., Colonel Lang, R.E., Mr. Champion, and Mr. Hampson made remarks on the geographical distribution of some of the species and the elevation at which they were taken.—Mr. H. Goss exhibited, for Mr. G. A. J. Rothney, several specimens of a species of Hemiptera (*Serinetha augur*, Fab.), and of a species of Lepidoptera (*Phauda flammans*, Walk.), the latter of which closely resembled and mimicked the former. He said that Mr. Rothney had found both species abundantly on the roots and trunks of trees in Mysore, in November last, in company with ants (several species of *Camponotus* and *Cremastogaster*). The Hemiptera appeared to be distasteful to the ants, as they were never molested by them, and he thought that the species of Lepidoptera was undoubtedly protected from attack by its close imitation of the Hemipteron. Mr. Goss said he was indebted to Mr. C. J. Gahan for determining the species. A discussion followed on the mimicking species, in which the President, Mr. Waterhouse, Mr. J. J. Walker, Colonel Swinhoe, and Mr. Hampson took part.—Mr. J. W. Tutt exhibited a typical specimen of *Lycæna corydon*, captured in July 1893; a hybrid male (*L. corydon* and *L. adonis*), taken *in copulâ* with a typical female *L. adonis*, May 20, 1893; a typical male *L. adonis*, May 20, 1893; a female *L. adonis*, the pigment failing in one hind wing; a pale var. of *L. corydon*, probably to be referred to var. *apennina* of Zeller, usually taken in Italian mountains, or var. *albicans*, H. S., taken in Andalusia. Mr. Tutt remarked that, of the first, Staudinger (Cat. p. 12) says "pallidior," of the latter "albicans." He also remarked that the hybrid retains the external features of the species *corydon*, but has taken on to a great extent the coloration of *L. adonis*. It was captured *in copulâ* with a female *L. adonis*, at a time when *L. adonis* was very abundant, and some weeks before *L. corydon* occurred.—The question having been raised by the President as to the number of meetings of the Society which it was desirable to hold during the year, and the most convenient dates for such meetings, a long discussion on the subject ensued, in which Mr. Waterhouse, Mr. Salvin, the Hon. Walter Rothschild, the Rev. T. Wood, Mr. S. Stevens, the Rev. Seymour St. John, and others took part.

Royal Meteorological Society, April 18.—Mr. Richard Inwards, the President, delivered an address on some phenomena of the upper air. He said that there are three principal ways in which the higher atmosphere may be studied: (1) by living in it on some of the great mountain chains which pierce many miles into the air in various parts of the globe; (2) by ascending into it by means of balloons; and (3) by the study of the upper currents as shown to our sight by the movements of the clouds. After describing the effects of rarified air on animal life and natural phenomena, Mr. Inwards proceeded to give an account of various balloon ascents which had been undertaken with the object of making meteorological observations. In 1850 Messrs. Barral and Bixio, when they had ascended to 20,000 feet, found the temperature had sunk to 15° F.; but this was in a cloud, and on emerging from this 3000 feet higher, the temperature fell as low as − 38°, or 70° below freezing point. In 1862, Mr. Glaisher and Mr. Coxwell made their famous ascent when they reached an altitude of about seven miles from the earth. A short time ago a balloon without an aeronaut, but having a set of self-recording instruments attached, was sent up in France, and from the records obtained it is shown that a height of about ten miles was attained, and that the temperature fell to − 104° F. Clouds are simply a form of water made visible by the cooling of the air which previously held the water in the form of invisible vapour. Every cloud may be regarded as the top of an invisible warm column or current thrusting its way into a colder body of air. After referring to the various classifications and nomenclatures of clouds, of which that proposed by Luke Howard in 1803 is still in general use, Mr. Inwards said that whatever system of naming and classifying clouds be adopted, it should depend on the heights of the various clouds in the air, and he gave a few rough rules by which the comparative altitudes of the clouds may be judged when there is no time or opportunity to make exact measurements. Among the indications by which a cloud's height in the air may be gathered are its form and outline, its shade or shadow, its apparent size and movement, its perspective effect, and the length of time it remains directly illuminated after sunset. By the last method some clouds have been estimated to have been at least ten miles above the surface of the earth. The cloud velocities at high altitudes have been carefully noted at the Blue Hill Observatory, Mass., U.S., and show, practically, that at about five miles' height, the movement is three times as fast in summer, and six times in winter, as compared with the currents on the earth's surface. After showing a number of lantern slides illustrating the various types and forms of clouds, the aurora borealis, rainbows, &c., Mr. Inwards concluded his address by urging the desirability of establishing a good cloud observatory somewhere in the British Isles. At the close of the meeting, the Fellows and their friends inspected the exhibition of instruments, photographs, and drawings relating to the representation and measurement of clouds, which had been arranged in the

rooms of the Institution of Civil Engineers. A lantern display of slides, showing cloud effects and other meteorological phenomena, was also given.

PARIS.

Academy of Sciences, April 16.—M. Lœwy in the chair.—On mountain observatories in connection with cyclones, by M. Faye. A polemical paper discussing the evidence afforded as to the causes of cyclones by the institution of meteorological observatories at high altitudes. The author contends that the convection theory is completely overthrown. He observes that the theory of the constitution of the sun should benefit from the work possible at these observatories.—M. Grimaux is elected a member of the chemistry section in place of M. Frémy.—Report concerning a demonstration of Fermat's theorem on the impossibility of the equation $x^n + y^n = z^n$, submitted by M. G. Korneck. The demonstration depends on a lemma which is inexact, and hence is not valid.—On the photography of the chromosphere of the sun, by M. H. Deslandres.—On an application of the theory of continuous groups to the theory of functions, by M. Paul Painlevé.—On the generalisation of algebraical continued fractions, by M. Padé.—On the determination of the number of prime numbers inferior to a given quantity, by M. H. von Koch.—On the structure of diffraction waves from the same source, by M. G. Meslin.—Achromatism and chromatism of interference fringes, by M. J. Macé de Lépinay.—On the magnetic properties of iron at different temperatures, by M. P. Curie. The intensity of magnetisation slowly decreases, then more rapidly lessens, with rise in temperature, the rate of loss attaining its maximum for soft iron between 740° and 750°. There is no definite point for the *temperature of transformation of iron*. At temperatures above 750°, the intensity of magnetisation continues to decrease at a continually lessening rate in general; from 950° to 1280°, the coefficient of magnetisation is almost constant. Between 755° and 1365°, the coefficient is independent of the intensity of the field.—On an electrochemical method of observation of alternating currents, by M. P. Janet. By means of paper soaked in potassium ferrocyanide and ammonium nitrate, and wrapped on a revolving metallic drum, a metallic style registers the periodic variations of the E.M F.—The general problem of transformers in a closed magnetic circuit, by M. Désiré Korda.—On the allotropic transformation of iron, by M. Georges Charpy.—Evolution of organised beings. On certain cases of duplication of Galton's curves due to parasitism and on dimorphism of parasitical origin, by M. Alfréd Giard.—On the poison organs of the Hymenopteræ, by M. Bordas.—The ejection of blood as a means of defence among some of the Coleopteræ, by M. L. Cuénot. The author has particularly studied the following species:—*Timarcha tenebricosa* and *coriaria* Fabr., *Adimonia tanaceti* Fabr., *Coccinella septempunctata* and *bipunctata* L., *Melo proscarabeus* L., and *majalis* L., and *autumnalis* Oliv.—On the muscular buds (*bourgeons musculaires*) of the paired fins of *Cyclopterus lumpus*, by M. Frédéric Guitel.—On the parasitism of a species of Botrytis, by M. Louis Mangin. The conditions under which copper or zinc salts may be used to combat with this parasite are indicated.—Anatomical modifications of plants of the same species in the Mediterranean region and in the region of the neighbourhood of Paris, by M. W. Russell. Plants in the Mediterranean climate differ from those of the Parisian region by (1) the cellules of the epidermis are larger, and have more regular contours and thicker walls; (2) the bark has assimilating tissue supported on parenchyma without chlorophyll (transformed into protective tissue); (3) the diameter of the vessels is greater; (4) the thickness of the leaves is augmented owing to the great development of the palisade tissue.—On the structure of certain varieties of rust; their analogy with the sedimentary ferruginous minerals of Lorraine, by M. Bleicher. The combination of ferric hydroxide and silica in presence of soft water underground may be so rapid as to form rusts comparable in appearance and structure with iron minerals of geological age.—On the fruits of palms found in the Cenomanian near Sainte-Menehould, by M. P. Fliche.—Researches on a mode of striation of rocks independent of glaciation, by M. Stanislas Meunier.—Researches on rigor mortis, by M. J. Tissot.—The mechanism of hyperglycæmia determined by diabetic *piqûre* and by anæsthetics. Experimental facts serving to establish the theory of sugar diabetes and of the regulation of the glucose-forming function in the normal state, by M. Kaufmann.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—The New Technical Educator, Vol. 3 (Cassell).—Elementary Meteorology: Prof. W. M. Davis (Boston, Ginn).—The Microcosm and the Macrocosm; B. Waller (K. Paul).—Law and Theory in Chemistry: D. Carnegie (Longmans).—Rainfall in the East Indian Archipelago, 1892 (Batavia).—Observations made at the Magnetical and Meteorological Observatory at Batavia, Vol. xv. 1892 (Batavia).—Practical Paper-making: G. Clapperton (Lockwood).—Müller-Pouillet's Lehrbuch der Physik und Meteorologie, new edition, Erster, Zweiter (Erste Abthg. Erste Liefg.) und Dritter Bands (Braunschweig, Viewig).—Histories of American Schools for the Deaf: edited by Dr. E. A. Fay, 3 Vols. (Washington).—Recenti Progressi nelle Applicazioni dell' Elettricità: Prof. R. Ferrini, Parte II. (Milano, Hoepli).—La Trazione Elettrica: G. Martinez (Milano, Hoepli).—Trasmissione Elettrica: G. Sartori (Milano, Hoepli).—A Guide to Palmistry: Mrs. E. Easter-Henderson (Gay and Bird).

PAMPHLETS.—The Egg-Blower's Companion: W. M. Roberts (J. Heywood).—The Eight Hours' Day in British Engineering Industries: J. S. Jeans (Ballantyne).—The Constitutional Beginnings of North Carolina: J. S. Bassett (Baltimore).—Geological Club of Philadelphia, Charter, &c. (Philadelphia).

SERIALS.—Journal of the Institution of Electrical Engineers, No. 110, Vol. xxiii. (Spon).—Tufts College Studies, No. 1 (Tufts College, Mass.).—Palestine Exploration Fund Quarterly Statement, April (Watt).—Journal of Anatomy and Physiology, April (Griffin).—Quarterly Review, April (Murray).—Notes from the Leyden Museum, October, January, and April (Leyden, Brill).—L'Anthropologie, Tome v. No. 2 (Paris, Masson).—Proceedings of the American Academy of Arts and Sciences, new series, Vol. xx. (Boston, Wilson).—Royal Natural History, Vol. 1, Part 6 (Warne).—Morphologisches Jahrbuch, 21 Band, 2 Heft (Leipzig, Engelmann).—Journal of the Royal Microscopical Society, April (Williams and Norgate).—Bulletin of the Geological Club of Philadelphia, Vol. 1, No. 2 (Philadelphia).—Bulletino della Società Geografica Italiana, serie 3, Vol. 7, fasc. i.-ii. (Roma).—Mittheilungen der Deutschen Gesellschaft für Natur-und Völkerkunde Ostatiens in Tokio, Band vi. Seite 103-148 (Tokio).—Ergebnisse der Meteorologischen Beobachtungen, Jahrg. iv. (Bremen).—Mathematical Gazette, No. 1 (Macmillan).—Sitzungsberichte der K. Akademie der Wissenschaften Math.-Naturw. Classe.—Anatomie und Physiologie, 1893, January, February, March bis July.—Chemie, 1893, January, February, March, April, May bis July.—Mineralogie, &c., 1893, January bis March, April, May, June, July.—Mathematik, &c., 1893, January, February, March, April, May, June, July (Wien).

CONTENTS.