

detected influence upon the course of chemical digestive changes in mammals. The question remained, "Is the spleen connected with production of blood corpuscles?" The methods he and his colleagues had employed were (1) comparison of corpuscles in blood entering and leaving the spleen; (2) effect of removal of spleen on number of blood corpuscles; (3) the rate of recovery of the number of corpuscles in animals with and in animals without spleen after hæmorrhages and after hæmolytics.

The results obtained by these methods were:—(1) No difference observed in blood of splenic vein and splenic artery. Rollett's well-known statement in Stricker's "Handbuch" of the great relative increase of leucocytes in the blood of the splenic vein was therefore not confirmed. (2) Removal of the spleen (dog, rabbit, cat) produced no perceptible change in the number of corpuscles in the blood. (3) Recovery of number of corpuscles after hæmorrhage and hæmolytics proceeded as fast in the animals without spleen as in those with spleen.

Dr. W. Brodie Brodie (Glasgow) made a communication on the action of oxalates on the calcium of muscle. From a series of observations made it was argued (1) that the action of oxalates in destroying muscular irritability was only manifest when the muscle was thrown into repeated contractions; (2) that the irritability of resting muscles was not injured by oxalates; (3) that it was probable that calcium was liberated from a complex compound when the muscle entered into contraction.

Dr. W. H. R. Rivers (Cambridge) communicated the results of testing the vision of natives of Murray Island and that of a number of English people with the visual illusion known as the Müller-Lyer. This well-known illusion is one in which additional straight lines lengthen or shorten in appearance an original straight line according to the inclination of the direction toward it. By means of a slide the line could be made of the same length as a standard line. Observations were carried out on forty-two English people and thirty-eight natives of Murray Island, between New Guinea and Australia. Each person made ten trials. The standard line measured 75 millimetres; to the average English person the line compared with it appeared equal to it when of 53 millimetres length. The average Murray Islander made the line 60 millimetres, so that the illusion was less pronounced with him than with the average English observer. There was marked agreement among the Murray Island men, who were as uncultured and unskilled in the European sense as any population could be. The Murray Islanders, though they could be regarded as savages, were yet able to make these observations very well. When Dr. Rivers went out on his expedition he anticipated great difficulty in getting people of that degree of civilisation to enter into the making of such observations. He had, however, in fact found that they made them with even more attentiveness than the average Englishman could be induced to give to the test. The English individuals tested could be divided into two classes, those acquainted with the illusion, such as students of psychophysiology, and those who were roughly acquainted with it through the advertisements of soap manufacturers, &c. It was interesting that the results obtained from both these classes were practically the same. The English individual when told to make the two lines equal as he saw them no doubt sometimes involuntarily corrected to some extent the tendency developed in the illusion. The Murray Islanders gave more consistent results than the Europeans. This greater consistence may have been due to the total ignorance by the Islanders and their thus remaining uninfluenced by speculation founded on knowledge of the illusion. Prof. McKendrick, in thanking Dr. Rivers for his valuable communication, urged the great interest, both practical and theoretical, of the labour of psycho-physiologists. At present the labour was chiefly the accumulation of facts many of which as yet were difficult to coordinate into general laws. It was exceedingly important that the subject should be seriously taken up in this country. In the American schools a great deal of useful progress was being made.

On Tuesday, September 17, Dr. C. S. Myers (Cambridge) communicated the results of a series of observations made with Galton's whistle upon the hearing of the Murray Islanders and some inhabitants of Buchan, Aberdeenshire. The result showed that the Murray Islanders could not at any age hear such high-pitched notes as the people of Buchan. The latter had from childhood upward a finer perception for high-pitched notes than the former.

Prof. Marcus Hartog demonstrated a model showing the mechanism of the frog's tongue.

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UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The 230th meeting of the Junior Scientific Club was held on November 29. Dr. Gustav Mann (New College) read a paper on the theory of dyeing and staining, and Mr. D. A. Gilchrist one on agricultural experiments at Reading and in Canada.

Mr. A. J. Jenkinson, of Hertford College, has been elected to the John Locke scholarship in mental philosophy.

Mr. G. W. S. Farmer, of Balliol College, has been appointed Litchfield lecturer in clinical surgery for two years.

CAMBRIDGE.—The Allen scholarship for research in medicine, mathematics, physics and chemistry, biology and geology, or moral science, will be awarded in the ensuing Lent Term. The emolument of the student is 250*l.* for one year. Any graduate of the University is eligible, provided he is not more than twenty-eight years of age on January 8, 1902. Candidates must send their names, with a definite statement of the course of research they propose to undertake, to the Vice-Chancellor by February 1, 1902.

THE annual prize distribution and members' and students' conversazione of the Northampton Institute, Clerkenwell, will be held to-morrow, December 6. The Marquis of Northampton will distribute the prizes.

MR. HERBERT J. FLEURE, a student of Prof. Ainsworth Davis at University College, Aberystwyth, has been elected a Fellow of the University of Wales. The Fellowship is one of the highest distinctions of the University, and its conferment for the first time upon a student who has been engaged in zoological research is of noteworthy interest.

THE influence which the universities in Germany have had upon industrial progress was emphasised by Prof. Senier in an address entitled "Bonn on the Rhine: Pages from its History and Stray Thoughts on Education" (Dublin: Edward Ponsonby), recently delivered at Queen's College, Galway. It is sometimes thought that the advance of German industry has been due to technical schools, but Prof. Senier remarks: "Probably it would be more correct to say that the technical schools are due to the rise of industries. No doubt technical schools have had and will have some effect in assisting manufactures. But the main source of those industries depending upon science has always been and must always be science itself, the outcome of university work." In this opinion Prof. Senier follows what the readers of NATURE have been familiar with during the last twenty years.

A GIFT of 5000*l.* has been offered to the University of St. Andrews by Dr. T. Purdie, professor of chemistry in the University, for the purpose of building and equipping a small chemical research department. In his letter to Principal Donaldson intimating the gift, Prof. Purdie says that their universities are very poorly provided for research when compared with those of foreign countries, and that scientific industries suffer in consequence. At St. Andrews in particular, except in zoology, there is no special provision in any of the science departments for original investigation. He therefore trusts that the University Court will accept his gift for the purpose mentioned, and that means may soon be found to equip other science departments. The success of the scheme, however, presupposes that scholarships will be available to encourage students to undertake post-graduate work, and also that an annual grant of money will be provided for laboratory expenses. He makes it a condition of his gift that the Carnegie trustees shall regard the scheme with favour and signify their willingness to help in the direction indicated. The gift is made in memory of his late uncle, Mr. Thomas Purdie, of Castledelfe.

So many subjects are dealt with in the latest report of the U.S. Commissioner of Education that it is impossible to do more than mention a few matters considered in this volume, the contents of which occupy as many as 1280 pages. An account is given of the origin, growth, influence and relation to the public of the great secondary schools of England. The change in the character of secondary instruction in some schools from the old exclusively classical system to one related to modern requirements is pointed out in connection with its cause—the demands of commerce and industry. The national conservatism appears in the slow rate of change and the spirit in which science is even now accepted in the secondary school

curriculum. A detailed table of the schools of Berlin is given in the report, and it shows a surprising variety of educational agencies in the German capital. The table reveals the fact that Berlin has 103 secondary schools and 306 elementary schools. It is evident from the table that the city is making great efforts to assist the industrial education of its youth. Another article in the report contains a statement of the number of students in higher institutions of learning in fifteen prominent countries. The tables show, first, that the Teutonic nations—Germany, Austria, Switzerland, Belgium and the Netherlands—are in the front rank, not only in the number of students in higher institutions, but also in the ratio of increase. Second, that the percentage of increase in students of technical institutions, such as polytechnic institutions, agricultural and mining schools, is everywhere larger during the year 1898-99 than in those of universities and colleges. We note, for instance, that the attendance in universities in Germany increased 6.5 per cent., but that of technical institutions increased 8.2 per cent. In Austria the increase in universities was 4 per cent.; in technical institutions it was 7.8 per cent. In Russia the increase in universities was 1.2 per cent.; in technical institutions it was 7.7 per cent. Such figures are significant, inasmuch as they indicate that the industries of Europe and America are claiming more thorough and more special preparation than formerly.

SCIENTIFIC SERIAL.

Transactions of the American Mathematical Society, vol. ii. No. 4, October.—Geometry of a simultaneous system of two linear homogeneous differential equations of the second order, by E. J. Wilczynski, is a continuation of a previous paper (in No. 1 of the present volume), entitled "Invariants of Systems of Linear Differential Equations." In this some new theorems are deduced, but it is mainly concerned with geometrical interpretations. The author confines himself to the special case of the equations

$$\begin{aligned} y'' + p_{11}y' + p_{12}z' + q_{11}y + q_{12}z &= 0, \\ z'' + p_{21}y' + p_{22}z' + q_{21}y + q_{22}z &= 0, \end{aligned}$$

the independent variable being x . The consideration of configurations in hyperspace is avoided. The treatment is connected with the work of Halphen and Fano upon the single linear differential equation (*cf. Math. Annal.* vol. liii.).—The chief result of Dr. L. E. Dickson's theory of linear groups in an arbitrary field is the exhibition of four infinite systems of groups of transformations which are simple groups in every domain of rationality. For the case of the field of all complex numbers these groups are the simple continuous groups of Lie. The chief results in a finite field are given in the author's "Linear Groups" (Teubner, Leipzig, 1901). Corresponding to the isolated group of 14 parameters, there exists in the Galois field of order p^n a new system of simple groups of order p^{6n} ($p^{6n} - 1$) ($p^{2n} - 1$).—On certain aggregates of determinant minors, by W. H. Metzler. In 1888 Dr. T. Muir showed (*Proc. Roy. Soc. Edin.*, pp. 99-105) that a linear rotation exists between certain minors of a centro-symmetric determinant similar to Kronecker's relation between the minors of an axi-symmetric determinant; and in 1900 he gave two theorems connecting the minors of any determinant, the first of which reduces to Kronecker's relation and the second of which reduces to his 1888 relation.—Prof. Metzler extends these relations and gives a series of types of linear relations between the minors of a centro-symmetric determinant. The present memoir gives the number of relations of each type.—Two papers by A. Pringsheim are (1) ueber die anwendung der Cauchy'schen multiplicationen regel auf bedingt convergente oder divergente reihen, and (2) ueber den Goursat'schen beweis des Cauchy'schen integral-satzes. These, as well as several of the other papers in the number before us, were communicated to the Ithaca meeting of the Society (August 19).—New proof of a theorem of Osgood's in the calculus of variations, by Oskar Bolza, is a simple one of the important characteristic property of a strong minimum in the calculus.—On certain pairs of transcendental functions whose roots separate each other, by the same author, proves the theorem, if, in a certain interval, $p, q, \phi_2, \phi_1, \psi_2, \psi_1$ are continuous real functions of the real variable x , and if the last four of these functions have continuous derivatives, then, y being a solution not identically zero of the differential equation $y'' + py' + qy = 0$, the roots of the functions $\phi_2y' - \phi_1y, \psi_2y' - \psi_1y$ will separate each other if no one of the three func-

tions $\phi_1\psi_2 - \phi_2\psi_1, \phi_1'\phi_2 - \phi_1\phi_2' + \phi_1^2 + p\phi_2\phi_1 + q\phi_2^2, \psi_1'\psi_2 - \psi_1\psi_2' + \psi_1^2 + p\psi_2\psi_1 + q\psi_2^2$ vanishes at any point of the interval in question. Certain extensions of the above theorem are also established.—On the system of a binary cubic and quadratic and the reduction of hyperelliptic integrals of genus two to elliptic integrals by a transformation of the fourth order, by J. H. Macdonald, effects the reduction by a special involution of order four containing a form which is the square of a quadratic. Reference is made to Prof. Bolza's inaugural dissertation (Göttingen, 1886). The sections discuss theorems on the biquadratic involution having a complete square, the system of a cubic and two linear forms and their conjugate system, the system of a cubic and quadratic and their conjugate system, certain involutions, and miscellaneous results on biquadratic involutions containing a complete square.—On the theory of improper definite integrals, by E. H. Moore. In the paper the author discusses the types connected with the names of Cauchy, Riemann, du Bois-Reymond, Dini, Schoenflies, Harnack and Jordan, Hölder, and de la Vallée-Poussin. Prof. Moore himself defines a system of types, which differ according to the way in which the integral depends (by definition) upon the sets of points of singularity of the integrand function with respect to definite integration.—On the convergence and character of the continued fraction $\frac{a_1z}{1} + \frac{a_2z}{1} + \frac{a_3z}{1} + \dots$, by E. B. Van Vleck, is a portion of the paper, contributed by the author to the August meeting of the Society, on the convergence of the continued fraction of Gauss. In this portion the theorem established is—if, in such a fraction, the greatest modulus of any point of condensation of the sequence a_1, a_2, a_3, \dots is k , then within a circle of radius $1/4k$, described about the origin as centre, the continued fraction will represent an analytic function, and the only singularities of the function contained within the circle will be poles. In any region excluding these poles and lying in the interior of the circle the convergence will be uniform.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, November 21.—"The Pear-shaped Figure of Equilibrium of a Rotating Mass of Liquid." By Prof. G. H. Darwin, F.R.S.

"Sur la Stabilité de l'Équilibre des Figures Pyriformes affectées par une Masse Fluide en Rotation." By H. Poincaré, For. Mem. R.S.

"On the Process of Hair Turning White." By E. Metchnikoff, For. Mem. R.S.

Although the fact of hair turning white is a most familiar one, its mechanism has not as yet been unveiled. The authors of works on hair and dermatology acknowledge their ignorance concerning this subject.

Having undertaken a study on atrophic processes, and especially on senile atrophy, my attention has been called to the atrophy of hair pigment so frequent in old people.

Observations on grey hair, or on hair beginning to turn grey, showed me that the atrophy of its pigment is due to the intervention of phagocytes of the hair.

These cells have a single nucleus and their very different aspect one from another is due to numerous amoeboid prolongations of their protoplasm. They are derived from the medullary part of the hair and make their way out into its cortical layer, where they absorb the pigment granules, which they then remove from the hair.

If we consider hair, one part of which is already white and the other still pigmented, we find a great many of these phagocytes. They are supplied with greatly developed prolongations and become insinuated between the keratic cells of the peripheral layer.

In absolutely white hair the phagocytes filled with pigment become more and more scarce, and most frequently completely disappear.

It is thus indubitable that the phagocytes of the hairs swallow up the granular pigment of the cortical layer and transfer it elsewhere, the result being the complete whitening of such hair. On observing the root of hair beginning to whiten, we often find a great many phagocytes filled with pigment.

The whitening of the hair of old dogs proceeds by the same mechanism. We equally find here a great number of phagocytes