THURSDAY, APRIL 17, 1919.

GYROSCOPICS.

A Treatise on Gyrostatics and Rotational Motion. Theory and Applications. By Prof. Andrew Gray. Pp. xx + 530. (London: Macmillan and Co., Ltd., 1918.) Price 42*s.* net.

THE exhibition at the International Mathematical Congress at Cambridge in 1912, although unnoticed in the official record of the Proceedings, was attractive as a collection of scientific books on view of all the chief publishers in the world, and of apparatus designed for use in mathematical instruction, including a very complete assortment of calculating machines of all kinds.

But the foreign visitor was delighted chiefly to see and handle the gyrostats and apparatus, and so to clear up much of the obscurity in the mere description and diagrams of the "Treatise on Natural Philosophy" of Thomson and Tait.

The apparatus was designed, and explained, and shown at work in the skilful hands of Dr. James Gray, son of our author, engaged since in the development of the warlike applications; and we are promised a sequel devoted to this side of the subject of gyrostatics as soon as the seal of secrecy has been removed with the advent of peace.

Mention and description can then be made, too, of the peaceful applications of gyroscopic principles, such as to the design of the centrifuges employed for centrifugal and whirling operations in chemical and laundry work, to drain off the moisture in a saturated substance swiftly and with no internal disturbance. These were described in *Engineering* for February 7 last, where each centrifuge must be treated as a great spinning-top, upright as if asleep, requiring the upper end to be quite free in precession, and so actuated from the lower end of the axle, in this case by a Pelton wheel.

The gyro-compass is held over to the sequel, as involving the operation of secret processes; without it the navigation of a submarine could not have been possible. But a full description is given in chap. viii. of Schlick's sea gyroscope, with the theory designed to ensure a dry ship and easy roller in all weather.

Prof. Gray has succeeded, in the chair of natural philosophy at Glasgow University, to the gyrostatic apparatus of Lord Kelvin, his predecessor, and has added important developments of his own invention. As shown in the diagrams, these are of elaborate construction, and demand the aid of electric motive power to impart and maintain the high rate of revolutions required, and so will not be allowed far from the lecture-desk.

But Maxwell's opinion must be maintained that the real instruction of the student is derived from the crude apparatus made by his own hands, and that he learns most from his own failures.

So we venture to suggest to Prof. Gray the encouragement of his students in the use of such simple apparatus as that in his Fig. 30(*b*) on p. 128, where a bicycle wheel is shown as a cheap, efficient top, spun by hand, and no string or electric motor is required. If the ordinary 28-in. wheel is not considered large enough, it will cost little more to order one of double or three-fold diameter, as the delicate part of the hub and ball-bearings can serve for all, and is bought cheap when manufactured in large quantities. These can be handled and thrown about, and brandished, and so provide the muscular sensations on a large scale of gyroscopic domination. Any inventor's idea can be tested at once and an advantage followed up.

If the point of a top is free to wander about on the floor, either as a sharp tip or a rounded ball, the dynamical treatment is intractable in the present state of mathematical analysis.

The point must be kept still, and we avoid the hideous unreality of the "perfectly rough" of the text-book jargon by placing it, as in Fig. 30(*a*), in a small cup recess, the wheel spinning freely about the ball-bearings of the hub fixed on the stalk.

The top must then have uniaxial symmetry if the motion is to be expressible by the elliptic function, as explained in chap. xii.; and these functions appear created expressly to speak the language of such gyroscopic motion.

In the old Cambridge mathematical tradition, praised by Todhunter, it was considered of no intellectual merit to have seen and worked an experiment in Natural Philosophy and not to have grasped the idea by mere thinking.

Maxwell strove hard to destroy this tradition, and pointed out the superiority at Glasgow of Sir William Thomson's stimulating treatment of dynamics with experiments. Maxwell was given a chance of working out his ideas by the erection of the Cavendish Laboratory for his benefit, gift of the Chancellor, the Duke of Devonshire. But as Maxwell's inaugural lecture was delivered to bare walls, the Chancellor desired to make his gift complete by presenting an appropriate collection of apparatus. Such an order could not be given out at once in those days, and the demands extended over a few years, during which some busybodies, self-styled business men, were always worrying Maxwell to make his final demand and declare the Cavendish Laboratory complete; and as Maxwell was then approaching his fatal illness he was too weak to protest, leaving his successor, Lord Rayleigh, the inheritance of a large establishment with no endowment for upkeep and progress.

The tradition there of research has been chiefly electrical, so that the interests of dynamics have not been studied equally, and, to judge from the ordinary text-books in use, the old Victorian tradition still survives, copied from one to the other, and not looking up from the page at the great developments taking place around, a great contrast to Prof. Gray's treatise before us.

The elliptic function solution is restricted to the top of uniaxial symmetry. If the top is taken to be a body of any shape, as may be imitated with

the screws of the Maxwell top, the analytical complexity in chap. xvii. defied a Weierstrass, who handed his difficulties over to the young Kowalevski, to break her teeth over the problem.

The ardent spirit is not deterred, but, on the contrary, rather stimulated, to tackle a question declared intractable; so Prof. Gray gives a *résumé* in chap. xvii. of the progress made so far by other daring mathematicians—Russians for the most part—although we miss a figure and description of the Maxwell top, to be placed on the table in front and twirled by a finger and thumb.

The spherical pendulum of chap. xv. was early to receive attention as a problem in mere particle dynamics, realised in swinging a plummet about at the end of a thread. This is a case of gyroscopic-top motion where the component angular momentum (A.M.) about the axle is zero, and is realised in the apparatus of Fig. 30(*b*) by projecting the wheel without rotation. But this limitation makes the motion very uninteresting analytically, except as illustrating a solution of a Lamé equation of the second order. The simple case of holding out the axle horizontal, and projecting it horizontally without any rotation of the wheel, is of interest as giving a state of motion that has a simple analytical solution, which may be written down here:

$$\sin\theta\cos(\psi - ht) = \sqrt{(\sec\theta_3 - \cos\theta_3)}\sqrt{(\cos\theta)},$$
$$\sin\theta\sin(\psi - ht) = \sqrt{(\cos\theta_3 - \cos\theta.\cos\theta + \sec\theta_3)},$$

where $2h$ denotes the precession when the axle is horizontal, and θ_3 is the extreme angle of the axle with the downward vertical, to which the axle sinks and then rises up again to the horizontal.

This can serve as a penultimate case where the spherical pendulum is whirled round swiftly, apparently in a horizontal circle, as with the lariat or bola, as on p. 302, contrasted with swift whirling in a vertical circle, penultimate case of pendulum motion, and an extreme contrast to small plane oscillation near the vertical.

Lagrange came to grief over the small conical oscillations of the spherical pendulum (*cf.* § 5, p. 302), yet he could have saved himself and detected his error but for the self-imposed restraint of excluding the diagram from his "Mécanique analytique." So it is curious to find the same fashion coming again in the modern school of pure analytical treatment, of doing away with an appeal to the visual sense of a geometrical figure.

In swift rotation about an axis in the neighbourhood of a principal axis, as the axis of figure of a symmetrical top, the instantaneous axis does not wander far from the principal axis, and the axis of A.M. keeps close by also, even when the body, like the top, is acted on continuously by a force or couple which causes the A.M. vector to move.

The kindergarten explanation of top motion, in considering only the rotation about the axis, can then be made more exact, when it is assumed that the divergence of the axis of A.M. and angular velocity from the axis of figure is always small, so that one may be used indiscriminately for the other.

In this way, by calling CR the A.M. above the axis of figure, and $gMh\sin\theta$ the couple of gravity on the top when the axis points up at an angle θ with the upward vertical, the simple formula is obtained for μ, the precession:

$$\mu CR\sin\theta = gMh\sin\theta,\ \mu = \frac{gMh}{CR},$$

provided θ is not too small.

Poinsot applied the same principle in his treatment of precession and nutation ("Connaissance des temps," 1858), assuming the divergence of the axis of rotation and of A.M. from the axis of figure of the earth as insensible; otherwise we should see the stars dancing about. The treatment here in chap. x. could be simplified in Poinsot's method. The Glasgow problem on p. 13 of the calculation of the diameter of the earth's axis at the pole may be cited as a justification of Poinsot's assumption.

It was a mathematical genius who changed in precession to the reckoning in $\frac{A, C}{C-A} = 304$, 305, or some say 305, 306, instead of the usual reciprocals in small decimals, indistinguishable numerically. And we venture to put in a plea for the sidereal day as the unit of time in these measurements, and not the solar year, thus making $R = 2\pi$ for the earth.

The effect of precession is to shorten the year about twenty minutes, and thus the period is 26,000 years of a complete revolution of the equinox through the stars. The classical scholar may be encouraged to take up the study of Astronomy when he hears that stray references to the stars by Homer are a guide to us in assigning limits to the age in which he lived and wrote. Astronomy was a much more living, actual interest in the days before clock and watch was so plentiful.

G. GREENHILL.

A PHYSIOLOGIST'S CONTRIBUTION TO WAR SURGERY.

Intravenous Injection in Wound Shock. Being the Oliver-Sharpey Lectures delivered before the Royal College of Physicians of London in May, 1918. By Prof. W. M. Bayliss. Pp. xi+172. (London: Longmans, Green, and Co., 1918.) Price 9*s.* net.

THE war has brought into touch with directly practical problems many whose interests, before its outbreak, lay in fields of investigation which were popularly regarded as purely academic and remote from contact with everyday needs. In no department of research has the value of "pure" science been more finely vindicated than in that of physiology; and the gain to both physiology and practical medicine from this closer alliance of theory and application has been the subject of general remark. There could scarcely be a better example of this recent tendency than Prof. Bayliss's book on the treatment of "wound shock," which embodies, with much added detail and illustration, the substance of his

Oliver-Sharpey lectures, delivered before the Royal College of Physicians in 1918.

The subject of "shock" was one which offered little attraction, under normal conditions, to the laboratory worker, with his habit of precision in nomenclature and his love of the clearly defined problem. To the surgeon the problem was a sufficiently definite and urgent one, but there was always the suspicion, not even yet dispelled, that the term covered any condition in which the vital functions suffered rapid depression, and that the common factor was obscurity of causation. The same applied to "wound shock" in the earlier stages of the war, but Prof. Bayliss shows how the co-ordinated efforts of physiologists working at home and surgeons working in the clearing stations succeeded in reducing the complexity of the problem. He shows that the question of causation has by no means yet received a final answer; it is still obvious that the contributory factors are numerous, and that their relative importance varies widely from case to case. The central feature of the condition, however, is constant—a deficient volume of the blood in effective circulation. In the large majority of cases the loss has a twofold origin; blood has been lost from the system by actual hæmorrhage, and of what remains part is rendered ineffective for the needs of the body by the tendency to stagnation in the peripheral vessels. In the production of this latter phenomenon a central importance is attributed to the absorption from injured tissues of the toxic products of autolytic changes. Fat-embolism receives brief mention, but might with advantage be given fuller consideration in a future edition. Probably too general a significance has been attributed to it by some American writers, but its occurrence may possibly throw light on the appearance of "shock" in certain cases with no obvious destruction of the tissues, and on the complete failure in such cases of efforts to restore the blood volume.

A large part of the book is devoted, as its title indicates, to the treatment of shock by intravenous injections. The theoretical considerations and experimental findings leading to the introduction of gum-acacia solution, as a substitute for the deficient blood, receive full treatment. The importance which, in certain passages, is attributed to deficient oxygenation of the blood seems scarcely consistent with what is said elsewhere as to the relatively small importance of oxygen-carrying power, in comparison with the volume and the rate of circulation of the fluid in the vessels. There seems as yet to be no evidence which would enable us to estimate the relative importance, as factors in the bad effects of a retarded circulation, of the reduced supply of oxygen on one hand, or of the defect of the mechanical flushing of the tissues on the other, by which toxic metabolites are normally swept away, possibly to be destroyed in the liver or eliminated by the kidneys. The effect on the function of the kidney of replacing blood by gum solution is not here recorded, and seems worth investigation.

Prof. Bayliss does not deal specifically with the application of conclusions, drawn from the study of "wound shock," to the "surgical shock" of civilian practice. It is to be hoped that the efficiency of his gum solution, which has done such splendid service during the war as a substitute for lost blood, will be further tested under the more rigid observation which peaceful conditions will make possible. H. H. D.

INTRODUCTORY METEOROLOGY.

Introductory Meteorology. Prepared and Issued under the Auspices of the Division of Geology and Geography, National Research Council. Pp. xii + 150. (New Haven: Yale University Press, 1918.) Price 4*s.* 6*d.* net.

"IN the United States meteorology is included in the course of study outlined by the Committee on Education and Special Training of the War Department for Students' Army Training Units. The plan involves an intensive study of the elements of the subject in order to familiarise prospective Army officers with its chief conclusions and methods." It is to meet this requirement that "Introductory Meteorology," a work of a hundred and fifty octavo pages, including seventy excellent illustrations, has been prepared by members of the staff of the United States Weather Bureau, including W. J. Humphreys, S. P. Fergusson, W. R. Gregg, J. Warren Smith, A. J. Henry, and C. F. Talman, who are all recognised as experts in the special subjects assigned to them.

In this country no committee on education and special training of the War Department has as yet included meteorology in the course of study for Army officers, but the experience of the war has impressed upon us the necessity for setting out the elements of the subject, and the Meteorological Office has endeavoured to satisfy the requirement provisionally by the issue of the "Weather Map and Glossary" and a number of other publications. It is interesting to compare notes about these endeavours to meet a common necessity.

Though it sets out a considerable number of well-selected facts and illustrations, many of them quite novel, "Introductory Meteorology" is, from the nature of the case, little more than an enlarged prospectus of the whole scope of meteorology, including climatology and forecasting. The primary difficulty of such an enterprise meets us on almost every page, and that is to decide how much preliminary knowledge of physics and mathematics on the part of the reader is to be assumed by the author. The most effective chapter is one on "Atmospheric Optics," in which the author, with an obvious command of the subject, boldly tells the reader what he may see and what may be explained without entering into the details of explanation. There is no attempt to define refraction or diffraction. In other chapters less assurance is shown, and the author hesitates between assuming and expounding the experience

of the physical laboratory, and therein he has our sympathy, combined with some amusement when we think of the lay mind pondering over such a sentence as: "By [dynamic heating and cooling] is meant that, if air is compressed, work is done and its temperature is raised, and if expanded it does work and is cooled"; or the still more cryptic utterance about fog: "When the water appears to be steaming—actually evaporating into air already saturated and thus inducing condensation."

The pose as regards knowledge of the physical processes of such phenomena as the distribution of temperature over the surface and in the upper air, or the trade winds and monsoons, is reminiscent of the heedless assurance of the old physical geographer rather than of the caution of the modern physicist, but the ambition to place the whole of meteorology upon a sound physical basis is a very worthy one and worthily attempted. The book should have a hearty welcome. We look forward to its expansion and development with confidence. It is well executed, and the illustrations are remarkably apt. Among some beautiful photographs of cloud-forms Fig. 54 (alto-cumulus) seems to be printed upside down, but that is the only misprint we have noticed.

NAPIER SHAW.

OUR BOOKSHELF.

Agricultural Laboratory Exercises and Home Projects adapted to Secondary Schools. By Henry J. Waters and Prof. Joseph D. Elliff. Pp. vi+218. (Boston and London: Ginn and Co., 1919.) Price 4*s*. 6*d*. net.

IN this book the authors set out exercises suitable for students in secondary schools where agriculture is a prominent subject and occupies a considerable part of the curriculum. The exercises fall into two groups—those to be carried out in the laboratory, and those to be done at home on the farm, or, in the case of town dwellers, on the school ground.

The laboratory classes follow the conventional lines; indeed, in no branch of agricultural science perhaps has there been less advance during past years than in schemes of exercises suitable for students. Nevertheless, although there is little or no novelty, the book is likely to be quite serviceable to teachers. The old favourite exercises that have served for several generations of students are here, and all of them, as the authors say, have been "tried out," and can be relied upon to give decisive results if the directions are properly followed. In a few cases the experiment does not really prove the point intended. Thus, one exercise is intended "to demonstrate how the soil food enters a plant." The student is instructed to close the end of a thistle funnel with parchment, fill with sugar solution, and invert in a vessel of distilled water. The experiment illustrates several points, but it does not show how soluble solutions pass into the plant. Another experiment, "the air as a source of plant food," shows an even greater divergence between the intention and the accomplishment.

To English readers the novel part is that dealing with "project work." Pupils in all schools in the States receiving Federal aid under the Smith-Hughes Act are required to do some of their agricultural work at home or on the school farm; this is called a project. The project must represent a sustained effort of considerable magnitude; in the authors' description it must be "worth while"; detailed records of costs, time, methods, and income must be kept; the work must be done under proper supervision, and it must form the subject of a written report by the student. The projects described here include the growth of maize and of vegetables for profit, selection of seed corn, preparation of a seed bed, finding the "failure cow" in a herd, the discovery of the soil requirement, etc. The collection will be found of distinct value to the teacher.

The Voice Beautiful in Speech and Song. A Consideration of the Capabilities of the Vocal Cords and their Work in the Art of Tone Production. By Ernest G. White. (New and enlarged edition of "Science and Singing.") Pp. viii+130. (London: J. M. Dent and Sons, Ltd., 1918.) Price 5*s*. net.

THE opening sentences of chap. ii. of this book are as follows: "The whole burden of this book is to show and, if possible, convince the world in general that the vocal cords, situated on the top of the windpipe, in what we call our throat (diagram I.), are not the seat of sound—that is to say, in neither speech nor song do the vocal cords actually create the tone." We venture to say that no physiologist will support this statement. It is true that sound can be produced by other parts of the apparatus, and without necessarily the presence of the vocal cords, but that the vocal cords vibrate and are the chief agents in producing tones has been proved to the satisfaction of all who study the parts and can employ the laryngoscope. The author is right so far in attributing importance to the sinuses in some of the bones of the face and skull, but he exaggerates their function of acting as resonators to strengthen or modify tone. Over and over again he furnishes what he regards as evidence in support of his thesis, but the conclusion, almost invariably, is in the opposite direction.

Still, there is much to admire in this book. It is clever and even witty; it shows wide reading in physiology and in the related sciences, and the illustrations from original preparations are worthy of all praise; indeed, it may be said that the anatomical details are brought out so clearly as to be well worthy of study. As a teacher of vocalisation the author maintains that he has met with success, without laying stress on the alleged functions of the vocal cords; this we admit, but, if he has done so, this success must really depend on the mechanism as generally understood, and not on the production of tone by the sinuses in the head.

J. G. M.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. *No notice is taken of anonymous communications.]*

The Finger-print System in the Far East.

IN Henri Cordier's new edition of Sir Henry Yule's "Cathay and the Way Thither" (1914) I came across the following note by the editor (p. 123, vol. iii.):—

"With regard to the finger-print system in the Far East we shall make the following remarks: In NATURE of October 28, 1880 (p. 605), Mr. Henry Faulds, writing from Tokyo, drew the attention to the use made by Japanese of finger-prints, and came to the conclusion 'that the Chinese criminals from early times have been made to give the impressions of their fingers, just as we make ours yield their photographs.' In the same periodical (November 22, 1894, p. 77) Sir W. J. Herschel claimed to have been the first to exhibit the system of finger-prints on board the P. & O. s.s. *Mongolian* in February, 1877. This system he had found in 1858 and communicated to Mr. Galton, who made use of it in his 'Finger-Prints' (1892); hence the discovery of the system was ascribed to Sir W. Herschel in a Parliamentary Blue Book. Sir W. Herschel added in his letter that, to the best of his knowledge, the assertion that the use of finger-marks in this way was originally invented by the Chinese was wholly unproved. Sir W. Herschel was entirely wrong; Mr. Faulds (*ibid.*, October 4, 1894, p. 548) protested against the claim of Sir W. Herschel, and finally a Japanese gentleman, Kumagusu Minakata (*ibid.*, December 27, 1894, p. 199), proved the case for the Japanese and the Chinese. None of these writers quoted the passage of Rashìd-ud-dìn, which is a peremptory proof of the antiquity of the use of finger-prints by the Chinese."

The passage referred to in Rashìd-ud-dìn is quoted by Yule on the same page in the following words:—

"It is usual in Cathay, when any contract is entered into, for the outline of the fingers of the parties to be traced upon the document. For experience shows that no two individuals have fingers precisely alike. The hand of the contracting party is set upon the back of the paper containing the deed, and lines are then traced round his fingers up to the knuckles, in order that if ever one of them should deny his obligation this tracing may be compared with his fingers, and he may thus be convicted." (Sir H. Yule's translation from the French translation of the Arabic text by Klaproth, in *Journ. As.* for 1833 (?), pp. 335–58 and 447–70.)

It seems to me that the description of the process by Rashìd-ud-dìn, so accurate and explicit, can in no way apply to the method of identification by finger-prints. There is no indication of a preliminary blackening of the hand, or of an impress left on the paper. It is definitely said that the process consists in the drawing of an *outline* of the extremities of the fingers "up to the knuckles" while the hand is set on the sheet of paper

Either Rashìd-ud-dìn has entirely misunderstood the description given to him by Pùlad Chingsang, the envoy of the Grand Khan to Tabritz, from whom he appears to have gathered most of his information regarding the Mogul Empire (*ibid.*, p. 111), or we have here the description of a process of identification hitherto unknown.

Anybody who will take the trouble to trace the outline of the outstretched fingers of the hands of different individuals will easily gather how different are the figures obtained in regard to the absolute and relative lengths of the fingers, to their relative distance from one another, to the angle made by the axis of the thumb with the axis of the index, and so on.

Whether these differences correspond with a distinctly characteristic drawing for each individual person, so as to make the process a real method of personal identification, I am not prepared to say, but the matter might be worthy of further investigation.

FILIPPO DE FILIPPI.

Rome (23), Via Urbana 167, April 3.

Supposed Effect of Sunlight on Water-drops.

Is it not the fact that sunshine causes a kind of "greasiness" which makes drops of water roll up when in contact with glass instead of spreading uniformly over the surface? I have frequently been troubled with this action when endeavouring to mount diatoms, and it is only recently that I have observed that it comes on as soon as the sun begins to shine, and that when the operation is performed in dull weather the difficulty does not arise. In clearing the diatoms from flocculent matter my practice is to rock the material from side to side in a shallow dish, dragging the diatoms into lines and rolling the dust and dirt off into lumps that can be sucked up with a syringe, but this process fails in sunshine owing to the diatoms floating. The evolution of a thin film of gas or vapour on the surface of the glass is a suggested explanation.

G. H. BRYAN.

A SOUTH AFRICAN PIONEER.[1]

THE subject of this biographical volume—the great hunter and pioneer of South Central Africa—has left behind him a name which, as one of his friends—a South African administrator—has said of him, "stands for all that is straightest and best in South African story." The writer of this notice can only think of one close parallel to him, the very similarly compacted James Chapman, of mixed English, Dutch, and French parentage, who preceded Selous, rivalled him as hunter, and resembled him in sweetness of character, transparent honesty, and love of Nature-study. Chapman, however, has been far more unlucky than Selous, not only in lack of Government appreciation of his merits and qualities, but also in never having had a biographer. Selous is at least made known, to those who have the leisure and inclination to read, by this work of Mr. J. G. Millais—mentally a twin brother—who has enriched his "Life of Selous" by some very beautiful drawings, the more beautiful in that they are so wonderfully true to actuality.

The book opens with an account of Selous's ancestry and relations, contributed by a brother and a sister. The genealogy, trailing off to Scottish kings and Midland worthies, mentions the French-Huguenot and Jersey origin and associations of the main stock, but says nothing on a point that certainly interests myself. I remember first meeting F. C. Selous in 1881 at the house in Harley Street of Sir Alfred Garrod, the great gout

[1] "Life of Frederick Courtenay Selous, D.S.O., Capt. 25th Royal Fusiliers." By J. G. Millais. Pp. xiv+387. (London: Longmans, Green, and Co., 1918.) Price 21s. net.

specialist. I was told then that he was a cousin of the family (which also had a French origin, as has been the case with so much of our intellectual, commercial, industrial, and Civil Service aristocracy). I used, earlier than that, to hear of Selous from the Garrods, especially Alfred H. Garrod, the prosector of the Zoological Society (one of the most remarkable men I ever met, who died at the age of thirty-three). My memory cannot have wholly deceived me on this point, since I knew Selous pretty well, and several times in more recent years referred to the Garrods in conversation, believing that this fellow-explorer of Africa had derived—as I had done—some or much of his interest in zoology from Prof. A. H. Garrod.

determined Selous to make for South Africa. But what led to his parents' conversion to the idea, to the extent of allowing him to start at the very early age of nineteen, and to finance him so liberally, we are not told.

Selous soon justified their belief in him and his choice of a career. He came back to England (having pushed far into Zambezia) in 1875, apparently with a good sum of money on the right side of the balance through his luck and skill in shooting elephants. He returned to the land of his love in 1876, and did not revisit England until 1881. He was again back in South Africa in that year; then occurred another few months' holiday in England in 1886; after which Selous became associated markedly with the pioneering work

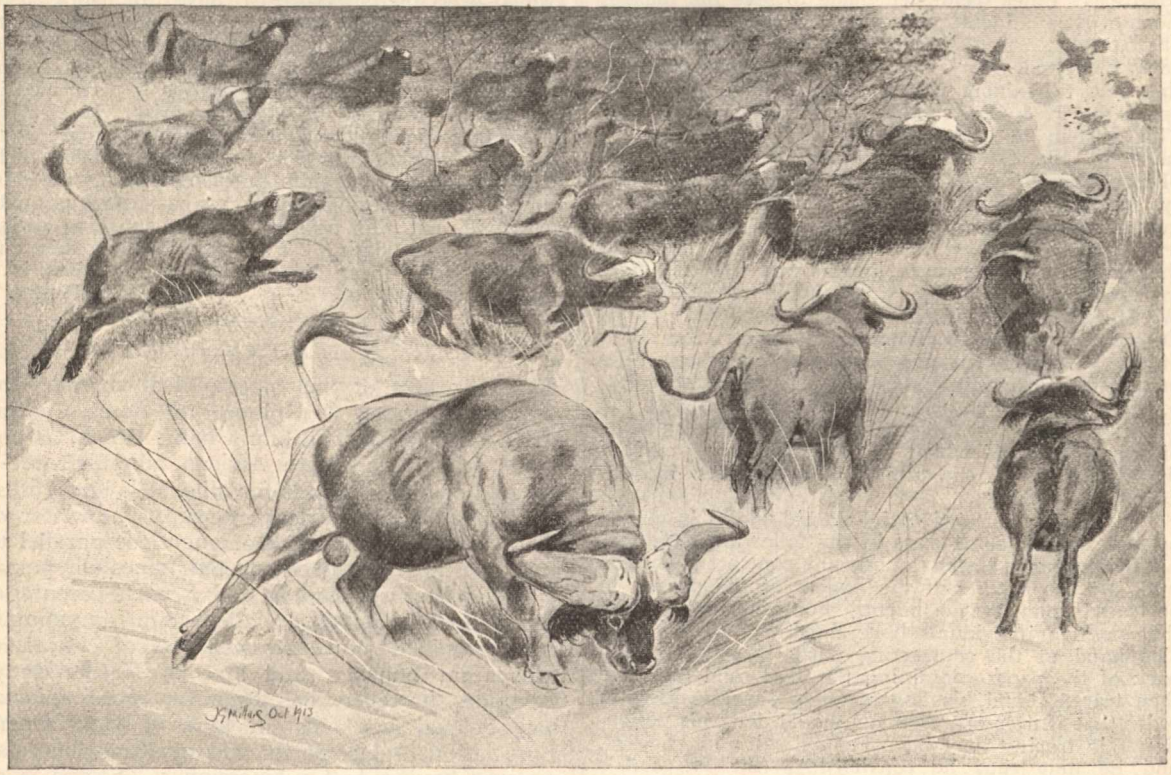

FIG. 1.—Buffaloes alarmed. From "Life of Frederick Courtenay Selous."

Another point in the biography which is left too indefinite for our natural curiosity is what led to the actual starting of Selous for South Africa in 1871, with the helpful capital of 400*l.* in his pocket. He was then only in his twentieth year. After leaving Rugby at seventeen, he was sent by his father to Switzerland, Germany, and Austria to study languages and presumably medicine, since his parents seemed to have wished him to become a doctor. But from early boyhood he had set his desires on the very life he ultimately led, one of adventure in Africa—adventure first, but incidentally the making of sufficient money by the produce of the chase, especially elephant ivory. In Germany he met a family returning on a holiday from Natal, and the enthusiastic account husband and wife gave of that truly delightful colony further which between 1887 and 1893 laid the foundations of Southern Rhodesia. On his return to England in 1893 he was engaged to be married and was proposing to increase his provision for the married state by a lecturing tour in America, when the first war with the Matebele broke out. Consequently he felt it his duty to return to South Africa and place his services at Mr. Rhodes's disposal. He was wounded in this campaign. When it was over he returned home, got married, and made a very extensive wedding tour through Eastern Europe, collecting birds' eggs. The year 1895 found him again in Rhodesia attempting to create a farming settlement.

The second Matebele War, which followed the Jameson Raid, temporarily broke up the farming settlement at Essexvale, and Selous had once more

to take part in South African warfare (the fact that he did so twice with conspicuous success and usefulness, both as officer and negotiator-interpreter, renders more fatuous than ever the attempt of Mr. H. J. Tennant, then Under-Secretary for War, and Lord Kitchener to deter him from going out to German East Africa in 1914). After the second Matebele War was over Selous and his wife returned to England and made their home in Surrey. Although—according to his biographer—Selous was treated shabbily by Cecil Rhodes and the Chartered Company, other South Africans endeavoured in some way to recompense him for his noteworthy services to British South Africa; so that with the remains of the capital he had put together during his many years of elephant-hunting, book-writing, and lecturing, he had by 1897 acquired a modest competence; enough to permit of his living quietly in England and making hunting trips and egg-collecting journeys in America, Asia Minor, and East Africa.

He was not made use of by Mr. Chamberlain or the Colonial Office in any advisory capacity because, it is said, of his plain speaking over the Boer War, mainly as to the causes that led up to that war; and despite the fact that he spoke South African Dutch and was immensely respected by both Dutch and British in South Africa, he was not employed by the War Office during the long-drawn-out campaigns of 1899–1902. A lingering prejudice seems to have actuated the War Office in 1914 in declining his services as a volunteer in any capacity to defend British East Africa in 1914 or to attack German East Africa in 1915. Similarly the Colonial Office and War Office—Lord Kitchener being most to blame—refused to employ other great African pioneers in the East African campaign, with the result that during the first twelve months of the war it was characterised by blunders and disasters, nearly all of them due to complete lack of local knowledge—knowledge of the geography, climate, people—which men like Selous and Sir Alfred Sharpe would have been able to supply.

When Selous was allowed—grudgingly—to go in the middle of 1915, he did some very effective soldiering until he was killed in an attack at the head of his men on a little German fort at Behobeho on January 4, 1917. (Behobeho is the place where another African pioneer, Alexander Keith Johnston, lies buried—1879.)

Selous, between the later 'seventies and 1914, enormously enriched the national collections at the British Museum of Natural History, for which, of course, he received no recognition from a science-ignoring (rather than -disliking) Government. Readers of NATURE will chiefly value Mr. Millais's book for the careful way the author has skimmed the published and private writings of Selous and his correspondents, such as Theodore Roosevelt, for notes on the life-history of the mammals of Africa and North America, and on the bird-life of the eastern Mediterranean countries.

H. H. JOHNSTON.

PART-TIME EDUCATION IN THE UNITED STATES.

THE sixty-fourth Congress of the United States approved on February 23, 1917, an Act to provide for the promotion of vocational education; for co-operation with the several States of the Union not only in the promotion of such education in agriculture and the trades and industries, but also in the preparation of teachers of vocational subjects; and to appropriate money and regulate its expenditure. There was thereupon set aside from Federal funds, first to aid in paying the *salaries* of teachers and directors of agricultural subjects sums of money annually, beginning with 100,000*l.* in 1918, and rising by annual increments to 600,000*l.* in 1926; and secondly, a like subsidy to aid in payment of the *salaries* of the teachers and directors of trade, home economics, and industrial subjects, to be distributed to the several States, as regards agricultural subjects according to the ratio which the rural population bears to the total rural population of the United States, and as regards the other subjects before-named in the proportion which the urban population bears to the total urban population of the United States. The Act further provides funds for the *training* of teachers and directors of agricultural subjects and also of the other subjects before-mentioned to the extent of 100,000*l.* in 1918, increasing to 200,000*l.* in 1921 and thereafter.

The Act is mandatory upon all the States of the Union, each of which must appoint either its existing Board of Education or a special State Board comprised of not fewer than three members to administer the Act in co-operation with the Federal Board for Vocational Education, which consists of seven persons—namely, the Secretary of Agriculture, the Secretary of Commerce, the Secretary of Labour, and the U.S. Commissioner of Education, together with three other persons representing the respective interests of agriculture, manufactures and industry, and labour, and assigns to each of these three a salary of 600*l.* They are to co-operate with the State Boards, and are empowered to make, or cause to be made, studies, investigations, and reports thereon with particular reference to their use in aiding the States in the establishment of vocational schools and classes, and in giving instruction in the various vocations—the inquiries to include processes and requirements affecting the various pursuits and those who follow them, as well as problems of administration of vocational schools, and the Act assigns for these purposes the annual sum of 40,000*l.*

The several State Boards are to submit plans for giving effect to the Act to the Federal Board, which, so far as they are in conformity with its provisions, will be approved. All vocational education aided by Federal funds shall be under public supervision and control, and moneys assigned in aid of the *salaries* of teachers and

directors of vocational education, and all moneys in aid of the *training* of teachers and directors, must be matched by an equal sum on the part of the State Boards, upon which bodies will fall all the initial and annual expense of buildings, equipment, and administration. The purposes of the Act are rigidly defined. They are to fit young persons for useful employment, the teaching is to be less than college grade, and is to meet the needs of persons of more than fourteen years of age engaged in agricultural, commercial, and industrial pursuits and in home economics. The Federal Board is to inquire and to report annually to Congress as to the administration of the Act throughout the States, and as to the expenditure, and to include therein the reports of the several State Boards.

This important Act of Congress, whilst it has many commendable features, does not require compulsory attendance on the part of young people engaged in employment at continuation or part-time schools. This is regarded as vital to the efficiency of the Act in a bulletin issued by the Federal Board for Vocational Education, in which it is stated that the initiative not only for establishing such schools, but also for compelling the attendance of those for whom the instruction is provided, must be taken by the States, and that it is not probable that State schemes for part-time education will develop materially until after the passage of legislation authorising and directing the establishment of such schools, providing State funds for their equipment and support, and compelling the attendance of the young people for whom they are designed within the ordinary working hours. It is officially stated in the bulletin referred to that out of a total population, male and female, between fourteen and eighteen years of age, of 10,250,000, 5,000,000 have ceased school attendance altogether. The only State of the Union which has adopted a real measure of compulsion for pupils between fourteen and sixteen years of age having work permits is Pennsylvania, under a law enacted in 1915, and already there are 100 school districts with 36,000 pupils in attendance at part-time continuation schools; but the movement is growing, and already there appears in Bulletin 19 a draft of a suggested new State law providing for compulsory part-time education and part-time employment for children between fourteen and sixteen.

The total *day-school* enrolment of the States in 1915 was 21,958,836, of which number 91 per cent. were in the elementary schools, 7·13 per cent., or nearly 1,566,000, in high schools, academies, and secondary schools, and 1·84 per cent., or about 404,000, in higher institutions—sufficiently significant figures when compared with those of the United Kingdom. The Federal Board sets forth in a most useful and illuminating bulletin six types of continuation schools: (*a*) The unit-trade school, which deals solely with the needs of a single trade, and into which, having settled upon his future employment, a young person can enter after fourteen years of age for a period of whole-time training of not less than thirty hours per week for not less than thirty-six weeks of the year, half the time to be given to practical work on a useful or productive basis, and the other half to related and non-vocational subjects; (*b*) the whole-time general industrial school for towns of fewer than 25,000 inhabitants on the same basis as the unit-trade school; (*c*) the part-time trade extension school within working hours for persons more than fourteen years of age already engaged in a trade occupation; (*d*) a part-time trade preparatory school for persons already in employment, but desirous of changing it; (*e*) a general continuation part-time school where opportunity would be given for the study of English, civics, home economics, and commercial subjects; (*f*) evening schools or classes for special trades and industries supplemental to day employment for persons above sixteen years of age.

The Federal Board has issued upwards of twenty important bulletins dealing with general policies and methods, agriculture and special trades and industries, different types of schools to suit differing localities and circumstances, measures for emergency training in various industries, training of vocational teachers, rehabilitation and re-education of disabled soldiers and seamen, and, finally, with buildings and the equipment necessary to give full effect to the Act. This series of publications is deserving of the closest study, as the principles and practice they embody are of general application. They should be consulted by every director of education, and be accessible in every reference library of the kingdom. The movements abroad in Germany and the United Kingdom are keenly watched by the executive of the Federal Board, and significant reference is made in the bulletins to recent legislation making compulsory complete attendance at school until fourteen years of age, extending elementary education by means of central schools, and establishing compulsory attendance at continuation part-time schools from fourteen to eighteen throughout Great Britain. A marked feature of the policy of the Federal Board is the insistence upon the avoidance of all vocational instruction in the elementary and secondary schools of the States.

THE FUTURE OF SCIENTIFIC INDUSTRIES.

THE report of the Engineering Trades (New Industries) Committee has recently been issued by H.M. Stationery Office (Cd. 9226, price 6*d*. net). The Committee was appointed, with the Hon. H. D. McLaren as chairman, to compile a list of articles either not made in the United Kingdom before the war, or made in insufficient quantities. A series of fifteen branch committees, consisting of producers and merchants, was arranged to give detailed consideration to groups of manufactured articles. They were required to make recommendations as to the prospect of set-

ting up new, or developing existing, industries, having regard to the financial facilities necessary for success.

The Committee recognises that many engineering firms in this country are threatened with serious financial trouble from the difficulty of raising new capital, and the pressure of the munitions levy and the excess profits taxation. It finds that in some branches the industry has not kept pace with the demands of customers, and that users have been driven to purchase more up-to-date machinery in foreign markets. The principal remedies for this appear to be more specialisation and standardisation in the production of individual firms. Both tend to facilitate manufacture in quantities and so reduce cost. The Committee also emphasises the importance of scientific and industrial research, and regards with satisfaction the formation of associations in some trades for that purpose, assisted by grants from the Department of Scientific and Industrial Research.

Over much of the field surveyed, the resources for production in this country appear to be adequate. But there are cases where articles which could well be manufactured here were, before the war, obtained wholly or in great part from abroad. To take a few examples. Milk-testing appliances were obtained exclusively from Switzerland. Germany had captured most of the trade in white-metal spoons and forks. Lathe and drill chucks, gear-cutting machines, and mechanics' fine tools were, to a large extent, imported from America and Germany. Precision measuring instruments were not adequately made in this country. Electrical insulating materials were, to a great extent, if not wholly, imported from abroad, and, although progress has been made in overcoming the deficiency during the war, the opinion of the industry is that much research work is necessary, and that for success the manufacture must receive State assistance.

The market for tool-room and precision lathes has been almost entirely in the hands of foreign manufacturers, and that for the remarkable class of watchmakers' lathes, with hundreds of interchangeable fittings, is wholly in the hands of German firms.

Some branches of industry, especially the electrical industry, complain of the effect of unrestricted imports. It is pointed out that the insecurity of the home market, due to the fact that foreign products can be introduced and sold at an unreasonable price, discourages the investment of capital, and seriously hampers the development of home manufacture. Foreign makers of electrical plant, protected in their home markets by tariffs, produce on a larger scale and lower cost than the British manufacturer; in face of such conditions the industry cannot be expected to thrive. Magnetos before the war were entirely produced in Germany. During the war they have been quite successfully made here. But the exclusion of German magnetos is demanded for a period after the war except under licence and with a duty on import. Protection or Government support is asked for in many cases. No doubt there are industries so important and so valuable as a means of training skilled workers that a claim of this kind is justified. The clock and watch manufacture seems to be such a case. But such claims must be carefully considered, in view of the fact that it is one of the objects of the Peace Conference to remove, so far as possible, all economic barriers.

It is clear from the report of the Sub-Committee dealing with scientific apparatus that the country has been backward in developing this vital industry, affecting research, education, and many other industries. The Committee recommends that for ten years scientific apparatus should not be imported except under licence, which should be granted and continued only so long as British apparatus is not available at reasonable prices. The following list gives some of the cases examined by the Sub-Committee: Balances and barometers largely obtained from Germany and sold under the names of English dealers; photographic apparatus supplied in large numbers by Germany and the United States; dividing engines supplied chiefly by Switzerland; drawing instruments derived chiefly from Germany; micrometers and measuring instruments largely supplied by the U.S.A.; physical apparatus obtained from Germany and sold under the names of English dealers; photographic lenses, which formerly came from Germany and France, might be manufactured here; also microscopes supplied largely from Germany.

It is stated that there are classes of articles imported which are made in such large quantities, and have such manufacturing and inventive resources behind them, as to make competition extremely difficult. In such cases, if the manufacture is to be developed in this country, it appears to be necessary that State assistance should be given towards overcoming the difficulty of competition. It is also recommended that Government Departments and public authorities should make it a practice to place orders for standard goods of British manufacture, and also have in view the desirability of encouraging the production of articles of new and improved types.

DR. HENRY WILDE, F.R.S. Obituary

DR. HENRY WILDE, whose death was announced in NATURE of April 3, was a man of remarkable individuality and a pioneer in electrical engineering. He was born in Manchester in 1833. During his apprenticeship he experimented with voltaic cells, electrical machines, electrical kites, and the electro-deposition of metals. He soon realised the great commercial possibilities of the applications of electricity, and he decided, when he was twenty-three years of age, to commence in business as a telegraph engineer and lightning-conductor expert. Several years were devoted to the invention of a magneto-electric alphabetic telegraph. Experiments with elec-

tro-magnets led to the design of an improved electric generator described in his patents of 1863 and 1865. Wilde's "dynamo-electric machines"—as they were named by Charles Brooke, F.R.S.—quickly replaced batteries for electro-deposition and arc lighting, but in use they had the serious disadvantage of becoming very hot. In the endeavour to cure this fault Wilde designed a very different type of dynamo. This was a multipolar machine, with sixteen pairs of electro-magnets, which was made self-exciting by a "minor" current from four of the armature bobbins. Both this and the earlier machine were used by Elkington for the electrolytic refining of copper.

Wilde directed his attention to the use of his generators for other electro-chemical purposes. He obtained a patent in 1871 for protecting iron tubes from corrosion by coating them with copper, and four years later he introduced a valuable process for making by electro-deposition rollers of copper used in calico printing. With a revolving cathode he was enabled to employ relatively high current densities, and yet obtain a good quality of copper. This invention proved to be financially the most valuable of all his patents.

Experiments with two of the multipolar machines led to the discovery in 1868 that it was possible to run them, when in synchronism, as alternators in parallel. The importance of this was not realised until fifteen years later, when Dr. John Hopkinson, unaware of the work of Wilde, showed that this was theoretically possible, and now the parallel running of alternators is an everyday occurrence at supply stations.

Wilde designed direct- and alternating-current arc lamps suitable for search- and light-house purposes. Some large battleships were equipped with these under his direction, and after the *Titanic* disaster he strongly urged that mercantile vessels should be fitted with searchlights.

In 1884 Wilde retired from his business as an electrical engineer. During the remainder of his long life he chiefly devoted himself to special scientific subjects. He published a number of papers relating to atomic weights, and invented a magnetarium for reproducing the phenomena of terrestrial magnetism.

Wilde was a considerable benefactor to public institutions, amongst which must be especially mentioned the Literary and Philosophical Society of Manchester. Including the Wilde endowment, his contributions to the society exceeded 10,000*l*. He died at The Hurst, Alderley Edge, Cheshire, where his wife also died twenty-six years previously. He had no children. After some legacies, the residue of his estate has been bequeathed to the University of Oxford. W. W. H. G.

NOTES.

THE projected Atlantic flight is naturally exciting considerable interest at present, but it has recently been bad flying weather, and large storm systems have been sweeping eastwards across the ocean. For the flight to be safe and successful such disturbances must be avoided. In a statement issued on Monday by the Air Ministry relative to the weather factor of the flight, estimates were given of the time required for the flight eastwards and westwards between Newfoundland and Ireland under favourable and adverse conditions during the months of April, May, and June. The report states "that in every case weather conditions are more favourable for flying from Newfoundland to Ireland than from east to west, and that it would on certain occasions be impossible to accomplish the journey in the latter direction." It is not easy to see how the Air Minstry has used the available data, and there must necessarily be a great element of doubt meteorologically. The aeroplane flying eastwards will travel about four times as fast as the average easterly translation of an Atlantic storm, and may quite easily overtake at least one storm. A storm, on an average, takes four or five days in crossing the Atlantic from shore to shore; it may, however, be developed in mid-ocean and start its passage eastwards, and when nearing the European side the track of the storm may quite possibly be to the northward. The upper air generally has a quick movement to the eastward. So far as possible, for a successful air passage choice should be made of a period when the Atlantic is comparatively free from important storm areas; such periods exist, but under the present conditions indefinite waiting has its drawbacks. Meteorologists can scarcely favour an attempt to fly westwards until further experience is gained of the movements of the upper air.

WIRELESS telephony is being installed in the Folkestone-Cologne aerial mail service. Along this route a chain of call-stations is being erected, and the aeroplanes engaged in the service are being fitted with both sending and receiving sets. In practical tests it was found that clear voice signals were transmitted from 'plane to ground, and *vice versa*, at a distance of thirty miles. By operating a simple switch the connections are changed from "send" to "receive." A certain amount of voice-training is desirable, otherwise the voice may be drowned by the engine drone. The operator in the aeroplane wears a carefully fitted helmet with ear-receivers. It is necessary that complete freedom of movement should be ensured and all wind-noises eliminated. At present specially trained men are employed to fit on the helmets. Improvements are continually being effected in the methods and apparatus, so that the complete practical transmission of speech between aeroplanes and ground stations is assured.

NO profession is free from its obscurantists, and the little band of half a dozen medical men who serve the anti-vivisectionist agitation have once again written to the *Times* to declare their conviction that experiments on dogs are unnecessary for the advance of medical science. Such a letter, devoid as it is of authority, serves a useful purpose in emphasising the weighty character of the resolution recently passed at the meeting of the British Medical Association, when the combined sections of medicine, pathology, and preventive medicine expressed their opinion, without a single dissentient, that the prohibition of experiments upon dogs would hamper the progress of medicine, and render Britain alone among civilised nations unable to contribute to progress in a department of medical research in which it has hitherto played a distinguished part. The Royal College of Physicians has also recorded its opinion "that the passing into law of the Dogs Protection Bill, now before the House of Commons, will greatly retard the progress of our knowledge with regard to the prevention and treatment of disease." The supporters of the Bill, to judge from their letters in the Press, are annoyed at the statement made by men who actually carry out

experiments that, as the law is at present administered, it is impossible for dogs to suffer pain. They point to the power possessed by the Home Secretary of allowing painful experiments upon dogs, and see in this a proof that pain is inflicted. It is right and just that such powers should be possessed. Even though for the large majority of experiments infliction of pain is unnecessary, and, indeed, a disadvantage from every point of view, it is always possible that research into certain diseases might involve the necessity of inflicting pain; and in such cases the interests of a dog, as of any other animal, may reasonably be subordinated to those of man. It seems pitiful that there should be all this pother and expenditure of valuable energy just because the Government, which spends thousands annually on medical research, was lacking in the courage or the foresight to declare at the outset that in the interests of the community the Bill could not be allowed to become law. It is to be hoped that, even at this late hour, the Government will take a definite stand in the matter and relieve the investigators and the medical profession from the need of wasting their time in defending science and the welfare of the community against the attacks of misguided zealots.

THE funeral of Sir William Crookes took place in Brompton Cemetery on Thursday, April 10, and was preceded by a service held at St. John's Church, Notting Hill. The three sons and one daughter, together with other members of the family, were present. Most of the learned societies in London were represented, among them being:—Royal Society, Sir J. J. Thomson, Prof. A. Schuster, and Prof. Emerson Reynolds; Royal Institution, the Hon. R. Clere Parsons; Chemical Society, Sir William Tilden and Dr. Alex. Scott; British Association, Prof. John Perry; Institution of Electrical Engineers, Mr. C. H. Wordingham, Col. R. E. Crompton, Mr. W. M. Mordey, and others; Society of Chemical Industry, Prof. Frank Clowes and Mr. J. P. Longstaff; British Science Guild, Sir Boverton Redwood and Lt.-Col. W. A. J. O'Meara; Institute of Chemistry, Sir Herbert Jackson and Mr. R. B. Pilcher; Faraday Society, Sir Robert Hadfield and Mr. F. S. Spiers; Institute of Inventors, Mr. W. F. Reid; Society of Psychical Research, Sir Lawrence Jones; Notting Hill Electric Light Co., of which Sir William Crookes was chairman for many years, the secretary, Mr. Rawkins. There were also present Sir William Davidson (Mayor of Kensington), Dr. Abraham Wallace, Prof. H. E. Armstrong, and many other distinguished men of science. A letter of condolence from his Majesty the King has been received by the family, and messages of sympathy have been sent by many prominent people in the world of science and literature who knew and valued the work of Sir William Crookes.

PROF. F. MORLEY has been elected president of the American Mathematical Society, and Prof. H. E. Slaught president of the Mathematical Association of America.

THE sum of 100*l.* has been voted by the Rumford Committee of the American Academy of Arts and Sciences to Prof. A. G. Webster, of Clark University, in aid of his researches in pyrodynamics and practical interior ballistics.

DR. J. W. SCOTT MACFIE has been presented with the Mary Kingsley medal of the Liverpool School of Tropical Medicine in recognition of his distinguished services in research into tropical medicine and allied subjects.

PROF. J. H. JEANS will deliver a lecture entitled "The Quantum Theory and New Theories of Atomic Structure" at the ordinary scientific meeting of the Chemical Society to be held at Burlington House on Thursday, May 1.

THE work on vulcanology at Kilauea has been placed under the U.S. Weather Bureau. We learn from *Science* that the transfer was made on February 15, and the appointment of the director, Prof. T. A. Jaggar, has been approved. A grant of 2000*l.* for the year is made by the U.S. Government for continuing the work heretofore maintained by the Volcano Research Association.

MR. J. A. CAIRNS FORSYTH has been awarded the Jacksonian prize for 1918 by the Royal College of Surgeons for his dissertation on "Injuries and Diseases of the Pancreas and their Surgical Treatment." The college has accepted an offer from the Barbers Company to endow for five years an historical lecture in anatomy or surgery, to be called the "Thomas Vicary Lecture," the appointment of the lecturer to be in the gift of the college.

ON and after May 1 the library of the Chemical Society will be open daily from 10 a.m. until 9 p.m., with the exception of Saturdays, when it will be closed at 5 p.m. This further extension of the hours of opening has been made possible by the co-operation of the Society of Chemical Industry, the members of which are now able to use the library in common with the members of the societies mentioned in NATURE of December 19 last (p. 310).

MR. A. J. WALTER, K.C., whose death occurred on April 9, was one of the best known members of the Bar in connection with patent actions. He was a man of science as well as an able advocate, and this rare combination secured for him a high reputation in patent trade-mark and technical litigation. He carried out many valuable experiments in chemistry and electricity in his private laboratory, and was thus often able to astonish expert witnesses with first-hand knowledge of importance relating to the points at issue. Mr. Walter had served on the council of the Institution of Electrical Engineers, and his death deprives, not only the Bar of a distinguished leader, but also science of a keen student.

THE Faraday Society and the Röntgen Society are holding a joint general discussion on the examination of materials by X-rays on Tuesday, April 29, at 5 p.m. in the rooms of the Royal Society. Sir Robert Hadfield, president of the Faraday Society, will introduce the discussion, and also contribute some papers, and an address on radio-metallography will be delivered by Prof. W. H. Bragg. Other contributors include Major G. W. C. Kaye, Capt. R. Knox, and M. E. Schneider (Le Creusot). The discussion will include contributions on the examination of timber as well as of metals by X-rays, and there will be exhibits of apparatus and demonstrations by M. Pilon, Major C. E. S. Phillips, Mr. Geoffrey Pearce, and others.

DR. LOUIS A. BAUER has finally selected Cape Palmas, Liberia, as his observing station for magnetic and electric observations in connection with the solar eclipse of May 29. He will be assisted by Lieut. H. F. Johnston, who has rejoined the staff of the Department of Terrestrial Magnetism, having been on duty during the war at the Admiralty Compass Observatory at Slough. The party sailed on the steamer *Benue* from Liverpool on April 12. Mr. Frederick Brown, at one time assistant at the Royal Observatory, Greenwich, has been sent by Dr. Bauer

to Duala, Cameroons; he sailed from Liverpool on April 9. Mr. Brown, in addition to magnetic survey work in West Africa, will make special magnetic observations during the eclipse at a station as near as possible to Ile Principe or Libreville.

THE death of Dr. Bruno Hofer on July 7, 1916, at the age of fifty-four years, is announced in German fisheries papers that have just been received in this country. Dr. Hofer had attained a great reputation as a fisheries biologist; he was director of the Royal Bavarian Biological Experimental Station for fresh-water fisheries at Munich, and was for many years editor of the *Allgemeine Fischerei-Zeitung*. The exploitation of carp and other lake and river edible fishes was of great value to Germany, and was the subject of much sound economic and scientific research. Dr. Hofer's book, "Handbuch der Fischkrankheiten," was well known here; it broke entirely new ground in its treatment of the pathology of fresh-water fishes, and, in spite of its rather limited scope, still remains the only compendium on the subject.

THE following are among the subjects of lecture arrangements at the Royal Institution after Easter:—Prof. Arthur Keith, British Ethnology: The People of Wales and Ireland; Prof. W. H. Bragg, Listening under Water; Dr. H. S. Hele-Shaw on clutches; Prof. F. Keeble on intensive cultivation; Sir Valentine Chirol, The Balkans; Prof. H. S. Foxwell, Chapters in the Psychology of Industry: (1) Fourier and other Pioneers in the Movement for the Humanising of Industry; (2) Modern Industrial Organisation: Where it Fails to Observe the Humanities of Industry, and the Results. The Friday evening meetings, at 5.30 o'clock, will recommence on May 2, when Prof. J. W. Nicholson will deliver a discourse on energy distribution in spectra. Succeeding discourses will be given by Sir George Macartney, Dr. S. F. Harmer, Sir Alexander C. Mackenzie, Sir John Rose Bradford, and Sir Ernest Rutherford.

A NOTE on German and English war-time diets is contributed to the Journal of the Royal Statistical Society (vol. lxxxii., part 1, January) by Dr. Major Greenwood and Cicely M. Thompson. From the records of German towns, according to Government statistics, the average food-value in that country was 2352 Calories per head per day in April, 1916, and 2007 in April, 1917. In June, 1917, the corresponding averages of six canteens and hostels in Great Britain were 3168 and 3073 Calories, while in April, 1918, the averages for three women's munition hostels were 2782 and 2699 Calories per head per day. It should, however, be noted that the German statistics referred to the consumption of food in ordinary families, and this and other circumstances preclude any attempt at a very exact comparison of the conditions of living.

THE Italian Society for the Progress of the Sciences is holding its tenth meeting at Pisa on April 14–19 under the presidency of Prof. Fernando Lori. Unlike our British Association, the proceedings very largely centre round developments of economic importance, and the majority of the papers are divided into three classes: Class A, dealing with mining, mineralogy, and geology; Class B, with agriculture, medicine, fisheries, and biology; and Class C, with economics and political science. A few sectional papers on other branches of science are included in the programme, which opened on Monday, April 14, in the *aula magna* of the University of Pisa with a discourse by Prof. Raffaello Nasini on Italy's mineral wealth. Friday and Saturday, April 18 and 19, are to be devoted to excursions. The ordinary subscription is ten francs, and the offices of the society are at 26 Via del Collegio romano, in Rome.

THE conference representing Allied Red Cross Societies now meeting at Cannes has held important meetings on venereal disease, on tuberculosis, and on malaria. As regards venereal disease, there was a general agreement that some uniform action is needed—as, for example, on such subjects as the control of prostitution and on notification of the disease. Similarly with tuberculosis, there was unanimity of opinion that a common scheme of action is necessary throughout the world on the lines which have been adopted in this country, and also to a large extent in the United States. As regards malaria, Prof. Castellani gave some interesting figures on the control of malaria in four camps in the Adriatic zone. In one camp no anti-malarial measures were taken; in the second, preventive doses of quinine were given; in the third, anti-mosquito measures were employed; and in the fourth both quinine and anti-mosquito measures were used. The results were that the following percentages of the occupants were affected with malaria:—In the first camp, 100 per cent.; in the second, 45 per cent.; in the third, 25 per cent.; and in the fourth, only 6 per cent.

THE British Photographic Research Association, which was incorporated nearly a year ago under the presidency of Sir J. J. Thomson, has just issued a "Programme of Research," in which it is announced that Dr. R. E. Slade has been appointed the director of research, and that he and his staff will work for the time being in laboratories at University College, London. The laboratories assigned to them are distinct from the teaching laboratories. The fundamental subjects that it is intended to investigate include the properties of silver haloids, the properties of gelatin and similar colloids, colloidal chemistry in general, photo-chemical reactions, and the theory of colour-photography processes. Among the subjects of applied research will be desensitising and reducing agents, gelatin (seeking for the causes of the effects of various samples and to obtain standardisation and improvement of the material), photographic apparatus (the treating of wood, canvas, and leather, and the production of special alloys), enamels, paper, cardboard, and colour photography. The association welcomes inquiries from its members on technical points, and will endeavour to reply helpfully. But it is not the intention of the association to attempt to standardise throughout the manufacturing methods of the photographic industry, as manufacturers will continue to determine for themselves the lines on which their businesses shall be developed. It is very truly added that the programme covers a vast field for research, but it is hoped to explore first the most productive portions of this field. It is encouraging to everyone concerned to be assured that results have already been obtained which it is expected will have a wide application in the industry.

THE bark of the locust tree (*Robinia pseudacacia*) is poisonous when eaten by horses and cattle. A toxic albumose is present in it, and a toxic glucoside, named "robitin," has now been isolated by B. Tasaki and U. Tanaka (Journal of the College of Agriculture, University of Tokyo, vol. iii., No. 5, p. 337). In the fresh bark 1 per cent. of the glucoside is present, and toxic reaction is caused by a dose of 0·0015 grm. in the horse and 0·02 grm. in cattle. The reaction caused by the injection of "robitin" into the horse is exactly that produced by the fresh bark, and consists in dyspnœa, increase of secretions and excretions, and paralysis of the hindquarters.

THE Board of Agriculture and Fisheries has issued as a Supplement (No. 18) to the *Journal of the Board of Agriculture* a series of articles dealing with the

cultivation, composition, and diseases of the potato. The various sections of the Supplement deal with potato-growing, the food value of the crop, potato diseases, the causes of decay in potato clamps, potato-spraying, variety tests, and the Wart Disease Order. As a compendium of information on these various phases of the subject the Supplement should prove of great interest and value to growers of potatoes, whether on a large or a small scale. The sections dealing with diseases and disease-resisting varieties form the main features, and are well illustrated by coloured plates and photographs.

IN the March issue of the *Journal of the Board of Agriculture* Dr. W. E. Collinge reports the results of further investigations on the food of wild birds. The observations, together with those previously reported, are based upon the examination of the stomach and crop contents of 4468 adult birds and 761 nestlings, embracing seventeen species of wild birds. On the basis of these observations two species appear to be distinctly injurious, viz. the house-sparrow and the woodpigeon. Three species are too numerous, and consequently injurious, viz. the rook, sparrowhawk, and starling. One is locally too numerous, viz. the missel-thrush. Three species are distinctly beneficial, but do not warrant special protection, viz. the jackdaw, yellow bunting, and song-thrush. Seven species are so highly beneficial that their protection is advisable, viz. the skylark, green woodpecker, kestrel, lapwing, great tit, blue tit, and fieldfare. With regard to the chaffinch the opinion is expressed that, in spite of the injuries it commits, it would be unwise to adopt repressive measures.

IN relation to an inspection of the Sheffield City Museums which he made in 1915, Dr. F. Grant Ogilvie has now issued a report on the subject. While the report deals with Sheffield museums in particular, it will be of value to all local authorities in indicating the lines on which they should develop local museums, especially in industrial centres. The recommendations regarding municipal interests and science and industry are particularly worthy of attention. Among municipal interests should be maps, plans, and models illustrating the local topography, resources, occupations, public works and services, both in the present and past. In fact, this section should comprise a complete survey of the town and neighbourhood. The value of such collections to the architect and town-planner is obvious. They would also serve to give residents a better understanding of their own town, and so might promote the growth of civic consciousness. Dr. Ogilvie's report, however, is severely practical, and, besides discussing the value of the collections he proposes, he indicates what objects should be included and how they can be best displayed. The advice given to details of space and housing is very valuable. The report is issued by the Board of Education as No. 34 of its series of educational pamphlets.

WE have received a copy of the convention between the United States and Canada for the protection of migratory birds. The convention, with an introduction and explanatory notes, is published by the Department of Agriculture, Ottawa. The provisions and regulations of the convention show that it is probably the most important and far-reaching measure ever taken in the history of bird protection. It affects more than a thousand species and subspecies of birds from the Gulf of Mexico to the North Pole, and should lead in a few years to a great increase in the numbers of several species of considerable economic importance. All migratory insectivorous and migratory non-game birds and their eggs are permanently protected, with the exception of certain species which Indians and Eskimo are allowed to take for food, but not for sale. Shore-birds and waders, with a few exceptions, are protected for ten years, and the same protection is given to cranes, swans, and curlew. Wood-duck and eider-duck are protected for five years. Close seasons, varying in different parts, are instituted for wildfowl and other migratory game birds. The convention contains provisions by which specimens of birds and eggs may be secured for scientific purposes, but it is clear that permission will be granted only after careful investigation. Local modifications in the convention may be made in the case of birds which prove injurious to agricultural interests.

AN account of a five months' journey in Colombia, down the Magdalena River, and through the north-east of the Republic, is described in a pamphlet by Mr. M. T. Dawe, agricultural adviser to the Colombian Government. The pamphlet is published in English by the Ministry of Agriculture, Bogota. Mr. Dawe's object was to report on the agricultural possibilities of the region and the occurrence of coal. The article, besides discussing very fully the suitable crops, labour conditions, and transport requirements, contains a great deal of useful geographical information about a little-known region. Mr. Dawe was particularly struck with the stock-raising possibilities of the Goajira peninsula, which has an area of about 4000 sq. miles. Being fairly high and almost surrounded by the sea, the peninsula has a healthy, if rather dry, climate. There are large regions of good pasture-land, of which 90 per cent. is still unoccupied. Artesian wells would have to be sunk to supplement the water supply. Cotton and ground-nuts could also be cultivated in the peninsula. The present inhabitants are some 40,000 Indians, who are steadily emigrating to Venezuela for lack of industries to keep them at home. The Sierra Nevada is another region well suited for colonisation; fruit-growing offers good prospects of success. Speaking generally of these districts and the whole of the Magdalena province of Colombia, Mr. Dawe advocates the encouragement of Japanese colonisation, which he holds has been successful under comparable conditions in Brazil. He does not explain why emigrants from Mediterranean Europe would not be suitable.

MR. R. S. WHIPPLE read two interesting papers on "Electrical Methods of Measuring Body Temperatures" and "The Electro-Cardiograph" before a joint meeting of the Institution of Electrical Engineers and the Royal Society of Medicine on March 21. In the former paper Mr. Whipple arrives at the conclusion that a continuous record of the temperature of the human body can be best obtained by an electric thermometer placed in the rectum. For very accurate research work a thermo-electric couple can be used in conjunction with a photographic recorder. The electro-cardiograph utilises the discovery first made by Prof. Waller that the electric potentials developed in the heart at each contraction of the organ were sufficiently large to deflect a sensitive galvanometer. The cardiograms shown by the lecturer were exceedingly instructive, and it was easy to believe that they have a great and growing value in medical practice.

AT the meeting of the Royal Photographic Society held on February 18, Mr. S. H. Williams described his new process of printing on paper in natural colours, and showed several examples. Mr. Williams makes one plate and one exposure serve for the three colour records by exposing it behind a screen that has 540 lines to the inch, the lines being alternately red, green, and blue, and of equal widths. By placing over this negative a key-plate that is ruled with black

lines of double width and with single-width spaces, that portion exposed behind each colour may be alternately isolated as the key-plate is shifted. This adjustment is done mechanically, identification marks indicating which colour record is exposed, and as contact prints cannot be obtained, an enlarging lantern is used. The prints may be obtained "in any one of a dozen different ways," but Mr. Williams prefers the bromoil process, inking up with the three necessary colours and superposing the prints by transferring the ink images to drawing-paper. The lines are not obtrusive in the resulting pictures, and, if desired, they can be obliterated by putting the image slightly out of focus when making the exposures for the prints. The method of making the screens is also described in the *Photographic Journal* for March.

IN an address to the Franklin Institute, Philadelphia, which is reproduced in the Journal of the institute for January, Mr. H. Leffmann shows that the pioneer experiments in aviation carried out by the late Prof. S. P. Langley were complete enough to form the basis for modern practice. In May, 1896, Prof. Langley launched from a small island in the Potomac an unmanned aeroplane driven by a steam-engine which ascended to an altitude of 60 ft. or 70 ft., and travelled at about twenty miles per hour for eighty or ninety seconds before descending. With the help of a grant from the Government and the mechanical assistance of Mr. C. M. Manly, he constructed an internal-combustion engine of 18 b.h.p. weighing only 108 lb., and in 1903 Mr. Manly made an experimental flight on a machine driven by this engine. Through some accident not clearly understood, the flight came to a premature conclusion, and the pilot narrowly escaped drowning. Prof. Langley died in 1907 without making any further experiments, but in 1914 the machine of 1903 was flown successfully by Mr. G. H. Curtiss. When the engine was replaced by one of 80 h.p. a number of flights were made which demonstrated that the principles of the Langley machine were sound and practical.

THE *Cambridge University Press* is publishing for Dr. A. E. Shipley, Master of Christ's College, and Vice-Chancellor of the University of Cambridge, an account of the author's experiences during his recent visit to the United States of America. It will be entitled "The Voyage of a Vice-Chancellor." "The Furniture Beetle" is in preparation for appearance in the series of Economic Pamphlets of the British Museum (Natural History), and "The Danger of Disease from Fleas and Bugs" for appearance in the Museum's series of Economic Leaflets. *Mr. W. Heinemann* is about to publish "Psychology and Parenthood," by H. A. Bruce, who aims at presenting to parents particulars of the discoveries in child-nature obtained by psychologists and others. *Messrs. Longmans and Co.* announce a book which should be of interest to educationists, viz. "The Manchester Grammar School, 1515–1915: A Regional Survey of the Advancement of Learning since the Reformation." The author is Dr. A. A. Mumford.

OUR ASTRONOMICAL COLUMN.

OBSERVED CHANGES ON JUPITER.—Some remarkable alterations in the surface-markings of this planet have been observed recently. The bay or hollow in the south equatorial belt, which has been almost uninterruptedly visible since Schwabe figured it in September, 1831, appears to have disappeared. Mr. F. Sargent, of Bristol, using telescopes of 10½ in. aperture (reflector) and 5 in. (Cook refractor), has been unable to see any distinct traces of the feature named during his very recent observations. It was an important marking as serving to show the position of the great red spot, which has been very faint during a long series of years. In 1901 a large dark mass made its appearance in the south tropical zone of Jupiter, and in about the same latitude as the red spot. This moved with greater speed than the latter, its rate of rotation being about 12 seconds less, and the marking had so greatly extended in longitude that in January and February of the present year it ranged over about 180°, or half the planet's circumference. This object seems also practically to have disappeared. Mr. Sargent saw the following end of it central on March 7 at 10h. 13m. in longitude 60·3°, but it was extremely faint, and regarded as near the vanishing point. Since that date observations have failed to reveal the object, though the disc has been carefully scanned at those times when it must have been presented to view had it continued visible.

DRAWINGS OF MARS.—*Popular Astronomy* for February contains an interesting series of comparative drawings made by five observers at the last opposition, according to a prearranged scheme organised by Prof. W. H. Pickering. On the whole, the accord of the different draughtsmen is satisfactory; thus of 131 canals appearing on the sketches, eighty-three are confirmed by at least one other observer. The Rev. T. E. R. Phillips noted that he could see nothing with the Greenwich 28-in. that was not visible in his own 8-in. Several observers mention the beautiful blue tint of Syrtis Major; the other maria tended to grey or brown.

THE GEGENSCHEIN OR COUNTERGLOW.—This phenomenon has a great fascination for Prof. Barnard, who in 1899 published his observations extending over sixteen years. Prof. Barnard made another series last autumn (which he states to be the best season to observe it), and gives the results in *Popular Astronomy* for February. As in the previous set, the longitude comes out exactly 180° from the sun, the latitude 0·3° N. The diurnal parallax appeared to be insensible. He favours the explanation that it is an atmospheric phenomenon, the earth's atmosphere acting as a spherical lens and concentrating the sun's light. He mentions two other explanations as possible: that of Evershed, that the earth has a tail like a comet; and that of Moulton, that there is an aggregation of meteoric bodies at the point opposite the sun describing periodic orbits under the combined action of sun and earth.

TYCHO BRAHE'S ORIGINAL OBSERVATIONS.—An article by Dr. J. L. E. Dreyer in *Scientia* for March states that the manuscript books in which Tycho's observations were entered night by night were sold to the King of Denmark, and are now in the Royal Library at Copenhagen. A contemporary fair copy of most of them is now in the Imperial Library at Vienna, and from this copy an edition was prepared by a Jesuit named Curtius in 1666. This is known to be very incomplete and incorrect, and a new edition is being prepared by Dr. Dreyer from the original observing books and from the copy at Vienna, which will form vols. x.–xiii. of the collected works of Tycho Brahe, now being printed at Copenhagen.

THE DEVELOPMENT OF AIRSHIPS CONSTRUCTION.

AMONG the important papers read last week at the Institution of Naval Architects was one on airship construction by Mr. C. I. R. Campbell, who has been responsible at the Admiralty for the design of our airships. In British practice it is assumed for design purposes that the gas has a lift of 68 lb. per 1000

cubic ft. The author gives a curve showing the average lift per unit volume of gas at various altitudes as a percentage of the lift at ground-level. A dominating requirement in design is the provision of the longitudinal strength necessary to withstand the longitudinal shearing forces and bending moments, and the different means adopted to meet this requirement divide airships into three main types, viz. non-rigids, semi-rigids, and rigids. Particulars of three non-rigid airships are given in the paper, having gross lifts of 4690 lb., 14,100 lb., and 11 tons respectively; the disposable lifts when full are 1669 lb., 4655 lb., and 5 tons. For airships larger than 500,000 cubic ft. the non-rigid type can be, and has been, used, but its efficiency tends to compare less favourably with the semi-rigid type as size is increased. The author deals with questions of the gas pressures required to enable the envelope of the non-rigid ship to maintain its form under the distorting forces due to weights, and with the means for supporting the bow against the external air pressure in flight. He considers that non-rigid ships form a class of great utility, which can be given speeds of 45 to 60 miles per hour, with disposable weight percentages from 33 to 45 per cent. They are particularly suitable for short-distance flights and for patrol duties. Their chief merits are simplicity, ease and cheapness of production, and low cost of maintenance.

In semi-rigid airships a longitudinal keel girder is fitted to the underside of the envelope so as to constitute a rigid or slightly flexible backbone. The general effect of the keel is to relieve the envelope of all loads which in non-rigid airships have to be met by means of a relatively high internal gas pressure. As a result it is found possible to fly large semi-rigid airships of more than 600,000 cubic ft. with gas pressures at the axis little more than one-half as great as those required in non-rigids of equal capacity and speed. Particulars of four semi-rigid airships are given in the paper, having volumes up to 1,060,000 cubic ft.; the type in recent years has been developed by the Italians alone. Semi-rigid airships fill the gap between the largest efficient non-rigid and the smallest useful rigid airship.

In rigid airships the whole of the shearing forces and bending moments are sustained entirely by a rigid hull. A typical rigid airship has the following characteristics:—643 ft. long by 78 ft. 9 in. extreme diameter; gas-bag capacity, 1,950,000 cubic ft.; maximum speed, 60 to 65 miles per hour; total lift, 59·2 tons under standard conditions; disposable lift, 30 tons. The machinery weighs 8½ lb. to 9 lb. per brake-horse-power. The author gives curves of shearing forces and bending moments for an airship of this type, both in the fully loaded and in the light condition, and discusses the effects of these curves on the design.

The most striking improvement in the commercial value of airships is to be obtained by increased size. An airship of 2,500,000 cubic ft. capacity, maximum speed 70 miles per hour, would have a disposable lift of 50 per cent. of the total, *i.e.* about 38 tons. To enable this ship to cross the Atlantic at 55 miles per hour she should carry fuel and oil for 4500 miles, and an analysis of the disposable weights shows that there are 8½ tons available for carrying capacity for passengers, luggage, food, etc., which is about 11 per cent. of the total lift.

If an airship of double capacity, *i.e.* 5,000,000 cubic ft., be designed for the same length of voyage, the carrying capacity works out to about 28 tons, which is about 18½ per cent. of the total. The running costs of the larger ship will be less than double those of the smaller, and hence the larger ship is a far better commercial proposition.

There are, of course, many problems other than those of design to be considered in the commercial airship. Thus Lord Weir directs attention to the cost of accommodation, the handling facilities, and the gas-producing plant. The question of mooring airships in the open is also being investigated, and it is hoped that it will shortly be possible to bring airships successfully to rest in the open even in a strong wind.

EXPERIMENTS IN PSYCHICAL RESEARCH.[1]

IN 1912 Mr. Thomas Welton Stanford, brother of Leland Stanford, and one of the trustees of the Leland Stanford Junior University of California, placed at the disposal of the University the sum of 10,000*l.*, the interest on which was to be applied to investigations in the field of spiritualism and psychical research, and Dr. Jordan, the president of the University, asked if the department of psychology was willing to assume the responsibility of applying the endowment to work in this field. After some natural hesitation and consultation with other universities, the offer was accepted. The endowment sufficed not only to refit and equip the laboratory rooms assigned to the work, but also to defray the expenses of a fellowship, to which Dr. Coover, a trained psychologist, was appointed. The present bulky volume constitutes his first report.

Part i. deals with the hypothesis of "thought transference" or telepathy, a subject on which much experimental work has been done, but more, and more carefully controlled, work was urgently needed. Three sets of experiments were carried out:—(1) On the guessing of lotto-block numbers; (2) on the guessing of playing-cards; (3) on the "feeling of being stared at." The playing-card experiments were very extensive, and deserve a longer notice than we can give them. The following was the method:—(i) The experimenter shuffles the pack (court cards discarded). (ii) He throws a die. If the number thrown is odd he holds the card in his mind, the form of content being: for 1, visual impression; for 2, kinæsthetic imagery (incipient pronouncing); for 3, combined visual impression, kinæsthetic image, and auditory image. (For even numbers, see below.) (iii) He turns over the pack, notes the bottom card, taps once to signal the reagent, holds mental content of card, and "wills" the content to be projected into the mind of the receiver. After fifteen or twenty seconds he taps twice to signal the close of the experiment, and, when he notes that the reagent has recorded his guess, himself records colour, number, and suit of the card and number of the die determining the form of the experiment. When the die threw an even number the experimenter ran off the rest of the experiment as usual, but *did not look at the card until the reagent had recorded his guess,* thus affording an effective series of control experiments. The results of 10,000 guesses with University students, favourably disposed, were entirely negative. No statistical analysis shows any deviation in the percentage of right cases exceeding the probable limits of pure chance, or any tendency for the guesses to be more correct when the reagent graded his answers high (indicating considerable confidence that they were right) than when he graded them low. A further set of experiments was made with ten "sensitives," five of them "spiritistic mediums," persons with a sincere faith who gave time and effort to the research without pay. The statistical

1 Leland Stanford Junior University Publications. Psychical Research Monograph No. 1, "Experiments in Psychical Research at Leland Stanford Junior University." By John Edgar Coover, Fellow in Psychical Research and Assistant Professor of Psychology. Pp. xxiv+641. (Stanford University, California, 1917.) Price, paper 3.50 dollars, buckram 4 dollars.

analysis of the results of 1000 experiments revealed no advantage for psychics over normal reagents; there were no deviations in right guesses beyond the limits of chance.

The experiments conducted to test the common belief in sensitiveness to being stared at were equally negative in their results, "regular" and "control" experiments being determined in the same way by the throw of a die. A shorter series, in which a single "starer" was replaced by twelve "starers," gave no more definite result. In this series the twelve "starers" were told in the control experiments to image a black cat on the lecture-table. None of the reagents ever thought of black cats.

In part ii. of the volume previous evidence as to the influence of subliminal impressions on judgment is reviewed and the results of some further experiments are given (guessing letters and digits presented by a tachistoscope, influence of whispering, influence of involuntary signals, *e.g.* eye-movements of an experimenter who had a definite number-form). The experiments showed, generally speaking, evidence of that "fringe of perceptions, most often unconscious, but all ready to enter into consciousness, and, in fact, entering in in certain exceptional cases or in certain predisposed subjects," with which Bergson has insisted that "psychical research could and should concern itself." And it seems more than probable that this sort of perception has played a *rôle* in the evidence for telepathy, as others have even more definitely asserted.

After a discussion in part iii. of the influence of mental habit upon judgment, and of the confirmation by experiment of results obtained by the theory of probability—matter which we should prefer to have seen given in an introductory chapter—the author passes in part iv. to an account of some interesting experiments in "sound-assimilation," *i.e.* the tendency, when sounds are mal-observed, to record not what is actually observed, but an erroneous inference, *e.g.* significant words in lieu of nonsense. How much the mind contributes is shown by preliminary experiments, in which students who could record correctly a significant communication through the telephone, the dictaphone, or the air (at twenty-five metres' distance) could not hear definitely enough to identify a half of the consonantal sounds in nonsense syllables through the dictaphone, a third of them over the telephone, or a quarter of them through the air. As a consequence a dictation garbled into nonsense by substitutions of consonantal sounds when heard, *e.g.*, from the dictaphone is converted by the listener, quite unconsciously, into sense, *e.g.* "amb vuth lekrogootheth vu lambwaj vap yuth sporeb im vu wax" is taken down by the listener as "and thus reproduces the language that is stored in the wax." The ear cannot be trusted correctly to report names or phrases when spoken under conditions which, however apparently satisfactory, permit some degree of indistinctness.

That the authorities of the Leland Stanford Junior University should have had some hesitation in accepting the offered endowment will, we think, be readily understood. That Dr. Coover has justified his appointment will, we hope, be agreed. He has presented the results of a series of very careful investigations, organised by a trained worker, which, even if, as in the case of the "card guessing" experiments, they only justify the scepticism of the sceptics, do something at least to clear the field. It may be noted that Prof. Pearson's "Tables for Statisticians and Biometricians" (Cambridge University Press), of the existence of which Dr. Coover seems to be unaware, would have saved him considerable arithmetical work in comparing observed with theoretical distributions.

MEETING OF THE BRITISH MEDICAL ASSOCIATION.

A SPECIAL clinical meeting of the British Medical Association was held in London last week on April 8–11 under the presidency of Sir Clifford Allbutt. The various sections met at the Imperial College of Science, and the attendance of members was large and the meeting a success in every way. The social functions included a reception by the president at the Guildhall, a conversazione at the Royal Society of Medicine, and receptions by the Presidents of the Royal Colleges of Physicians and Surgeons.

In the Section of Medicine Lt.-Col. Mott introduced the subject of war-neuroses. He emphasised the preponderating part played by hysteria in the production of these conditions, and had found that patients with such suggestive symptoms as constant vomiting, constant headache, and recurring fits might all be suffering from functional disease. He condemned the use of the term "shell shock," declaring that many of the men returned as suffering from shell shock would have been more appropriately designated "shell shy." At the same time a proportion of the cases suffer from definite injury to the brain—the cerebro-spinal fluid may contain blood and albumin, the drum of the ear be ruptured, and microscopic hæmorrhages be present in the brain. Sir James Purves Stewart also deprecated the use of the term "shell shock." The frequent occurrence of neuroses in the present war had excited comment, but it was to be noted that in previous wars our men had been trained and seasoned soldiers, and he expressed surprise that the number of cases of neuroses occurring in our armies during the last five years had been relatively so few. The general opinion was that the treatment of war-neuroses was unsatisfactory, and Dr. Yealland and Col. Gordon Holmes decried the use of hypnotism and psycho-analysis.

Influenza was the subject of a joint discussion between the Sections of Medicine and Preventive Medicine. Sir Wilmot Herringham dealt with the clinical aspects of the disease. He emphasised its extreme infectivity, and dwelt on its changed character; so much was the latter the case that he was tempted to ask whether the present disease was influenza at all. Capt. Greenwood, who dealt with the epidemiology of the disease, stated, on the other hand, that we must provisionally conclude that there is no clear-cut formal difference between the outbreaks of 1889–90 and 1918–19.

Major Bowman contributed a paper on the filter-passing germ discovered in collaboration with the late Major G. Gibson and Capt. J. Connor (see NATURE, April 3, p. 90). It had been found impossible to cultivate from the blood of patients Pfeiffer's so-called influenza bacillus. The conclusion was that the primary cause of influenza is some micro-organism other than Pfeiffer's bacillus, probably the filter-passing germ described.

In the Section of Surgery Prof. Bayliss discussed his method of injecting a solution of gum-arabic in cases of wound shock. In this condition the blood-vessels become emptied of blood and more permeable, and hence, if they are to be kept filled, a viscid fluid is necessary, for which purpose the gum solution answers admirably.

Dr. Dale discussed the nature and causation of wound shock. The heart and great vessels are abnormally empty of blood in this condition, and the question arises, Where does the blood go? The answer seems to be that the blood collects and stagnates in the smaller vessels of the skin and other peripheral areas. With regard to the causation of this altered distribution of the blood it has been found

that injections of histamine produce a similar condition; it annuls the "tone" of the capillary vessels, so that they dilate and their walls become abnormally permeable. In cases of considerable injury to muscles (one of the most potent causes of shock) a substance like histamine is generated. Histamine acts more powerfully in animals anæsthetised with ether, and surgeons during the war have noted that patients suffering from shock bear ether badly.

In the Section of Preventive Medicine the dysenteries were considered. Col. Leonard Dudgeon discussed the bacillary form. The dysentery bacillus is scarcely ever present in the blood—in only two cases out of 145 cases examined. The methods of bacteriological examination for the dysentery bacilli were described, and the three methods by which the disease may be spread among a healthy population referred to. These are by "carriers," by infection of water, and by flies. As regards flies, typical dysentery bacilli were isolated from wild flies captured and examined.

Amœbic dysentery was dealt with by Dr. Warrington Yorke. The dysentery amœba is apparently indigenous in England, for it had been found that of 450 civilians in the Liverpool Royal Infirmary who had never been abroad, 1·5 per cent. were infected. Among recruits 5·6, and among lunatics 9·7, per cent. were found to be infected.

Lt.-Col. Dale Logan gave a demonstration on mine-gas poisoning. By the autumn of 1915 mine warfare had made huge strides, and, with the great increase in size of the explosive charges used, more extensive mine systems, and the employment of thousands of men underground, the casualties from mine-gas poisoning assumed serious proportions. The poisoning was entirely due to carbon monoxide gas. The insidious nature of the poisoning and the serious nature of the casualties lent support to rumours that the enemy was employing a new gas and forcing it through into our galleries. The intensity of mine warfare might be gauged by the fact that in 1916 we fired 750, and the enemy 700, mines. At Messines some mines were charged with 90,000 lb. of explosive, and the total charges in all the mines totalled more than 1,000,000 lb. A description was given of the organisation to cope with mine-gas poisoning and of rescue apparatus employed.

Other important discussions and demonstrations were on malaria, injuries of blood-vessels, gunshot wounds of the chest, and bone inflammation and bone repair, details of which will be found in the issues of the *British Medical Journal*.

AGRICULTURAL RESEARCH IN MADRAS.

THE 1918 Year-book of the Madras Agricultural Department[1] indicates that the officers of the department are giving attention to a variety of problems of great local importance. No results of wide significance for tropical agriculture are recorded, but a good deal of useful work has been done, which is not without its value beyond the Indian province in which it was carried out.

In "A Note on Grading Cotton" Mr. R. C. Wood gives the results of a grading trial made with cotton grown at the Coimbatore Agricultural College. The crude cotton and the two grades produced in the trial were submitted for valuation to five firms—three spinners and two buyers for export. If 1000 lb. of lint had been graded and sold to each of two of the firms on the basis of these valuations, the reduction in profits as the result of grading would have been 32 and 6 rupees respectively, whilst a similar operation with the three remaining firms would only have added 4, 4, and 17 rupees respectively to the price realised for a like quantity of ungraded cotton. More interest is now being taken in Indian cotton in Great Britain, and the utility of this note to the British reader would have been much enhanced if results of examination of the crude and graded cottons had been given in detail as well as the valuations. In explanation of the disappointing results, the author is only able to suggest that possibly the crop was of poor quality owing to the bad season, and that consequently there was less difference between the crude cotton and the first grade than would normally be the case.

Mr. T. V. R. Ayyar writes on the habits and life-history of *Pempheres affinis*, Faust, a stem weevil, which attacks Cambodia cotton. Treatment of the stems with the usual insecticides has not so far protected the crops from serious damage, but the removal and destruction of the plants first attacked in a plantation have sufficed to check the spread of the pest, and the author suggests that the practice adopted in Uganda of clearing and destroying all cotton plants, after the crop is harvested each year, would probably be a useful preventive measure.

Dr. Harrison, Government Agricultural Chemist, contributes "A Report upon the Extent and Character of the Saline Lands of the Madras Presidency" and "Some Notes on Manures in Southern India." The latter refers to the available sources of supply of lime, gypsum, magnesia, and phosphates, and gives information as to the poonacs (oil-cakes) and fish manures obtainable in the Presidency. A paper by Mr. M. R. R. Sivan on "Phosphatic Nodules of Trichinopoly and their Availability as Manure" is also of interest in this connection. It appears that since 1892 much correspondence and several negotiations regarding concessions to work this area for phosphates have taken place, but so far only small quantities have been extracted for local use.

Dr. F. Marsden has a note in the Year-book on "A Hot-water Process for the Extraction of Indigo," but this subject and other matters relating to indigo are more fully dealt with in the same author's "Indigo Manufacture in Madras," which forms No. 74 of the Madras Department of Agriculture Series of Bulletins.[2] Before starting on his tour of inspection of the Madras indigo districts the author had the advantage of visiting with Mr. W. A. Davis, Indigo Research Chemist to the Government of India, some of the chief Indian indigo factories managed by Europeans, and chiefly situated in Behar. In Madras indigo cultivation and manufacture are almost entirely in the hands of natives, though in at least one instance a European firm issues seed to the ryots and provides vats in which the crop can be worked up for dyestuff; a similar arrangement is sometimes adopted on a smaller scale by native merchants. In most cases, however, the ryot sells his crop to a native vat-owner, or hires a vat in which to manufacture the dyestuff. No records are kept as to yields, and Dr. Marsden regards as untrustworthy the rough estimates he was able to get, which are much higher than the yields recorded in Behar. Though indigo as rich in indigotin as that produced in Behar is made in Madras, the quality is, on the whole, poor, and, what is perhaps worse, variable. These defects are due chiefly to carelessness in manufacture, but also in part, at any rate in some areas, to deliberate adulteration with clay and mud.

The work already done by Mr. Davis in India has shown that the cultivation and manufacture of indigo, even in Behar, where the industry is in the control of Europeans and comparatively well organised, presents many problems, which, if solved, might greatly improve its position and prospects. In the case of

[1] (Madras: Superintendent, Government Press, 1918.) Price 1s. 9d.

[2] (Madras: Superintendent, Government Press, 1918.) Price 6d.

the native industry carried on in Madras, Dr. Marsden points out that the difficulties are much more formidable, and he suggests that the first step towards improvement must be the provision of means for the production of indigo of good and uniform quality. One means to this end would be the replacement of small-scale manufacture in native-owned vats by larger-scale production in well-managed factories, the ryot selling his crop to the factory for manufacture into dyestuff. A possible alternative may be the elaboration of a simple process, capable of being used by the ryot, as the result of the researches now being carried on by Mr. Davis, coupled with some system of analytical control of the produce before shipment.

USES OF INVISIBLE LIGHT IN WARFARE.

PROF. R. W. WOOD, of Johns Hopkins University, Baltimore, gave to the Physical Society of London on March 14 a demonstration of the uses of invisible light in warfare. The first device shown was a signalling-lamp, consisting of a 6-volt electric lamp with a small curled-up filament at the focus of a lens of about 3 in. diameter and 12 in. focus. This gave a very narrow beam, only visible in the neighbourhood of the observation post to which the signals were directed. In order to direct the beam in the proper direction, an eyepiece was provided behind the filament. The instrument was thus converted into a telescope, of which the filament served as graticule. When directed so that the image of the observation post was covered by the filament, the lamp, when lit, threw a beam in the proper direction. In many circumstances the narrowness of the beam was sufficient to ensure secrecy; but sometimes it was not desirable to show any light whatever, and filters were employed to cut out the visible spectrum. By day a deep red filter, transmitting only the extreme red rays, was placed in front of the lamp. The light was invisible to an observer unless he was provided with a similar red screen to cut out the daylight, in which case he could see enough to read signals at six miles. By night a screen was used which transmitted only the ultra-violet rays. The observing telescope was provided with a fluorescent screen in its focal plane. The range with this was also about six miles. For naval convoy work lamps are required which radiate in all directions. Invisible lamps for this purpose were also designed. In these the radiator was a vertical Cooper-Hewitt mercury arc, surrounded by a chimney of the ultra-violet glass. This glass only transmits one of the mercury lines, viz. $\lambda = 3660$ Å.U., which is quite beyond the visible spectrum. Nevertheless, the lamp is visible at close quarters, appearing of a violet colour, due to fluorescence of the retina. The lens of the eye is also fluorescent. This gives rise to an apparent haze, known as the "lavender fog," which appears to fill the whole field of view. Natural teeth also fluoresce quite brilliantly, but false teeth appear black.

Reverting to the use of the lamps at sea, they are picked up by means of a receiver consisting of a condensing lens in the focal plane of which is a barium-platino-cyanide screen the full diameter of the tube. An eyepiece is mounted on a metal strip across the end of the tube. When the fluorescent spot has once been found somewhere on the screen, it is readily brought to the central part and observed with the eyepiece. The range is about four miles, and the arrangement has proved invaluable for keeping the ships of a convoy together in their proper relative positions by night.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

LONDON.—A course of eight lectures on "The Physiology of Muscular Exercise" will be given in the Physiological Department, St. Bartholomew's Hospital Medical School, West Smithfield, E.C.1, by Prof. F. A. Bainbridge on Wednesdays at 4.30 p.m., beginning on April 30. The course is intended for advanced students of the University and others interested in the subject. Admission is free, without ticket.

WE learn from *Science* that by the will of the late Mr. Morton F. Plant the Connecticut College for Women receives a bequest of 50,000*l*.

SIR ARTHUR NEWSHOLME has been offered the chair of public health at Johns Hopkins University, Baltimore, and it is understood that he will accept the offer for a year at least.

THE sixth election to Beit fellowships for scientific research will take place on or about July 15. Not more than three fellowships, of the value of 175*l*. per annum, will be awarded. Applications must be received on or before May 31. Forms of application and all information may be obtained, by letter only, addressed to the Rector, Imperial College, South Kensington, London S.W.7.

BY the will of the late Mr. Charles Kerr Marr, the residue of his property, amounting apparently to more than 200,000*l*., is left in trust for educational purposes, defined as follows:—"For granting prizes or rewards to persons who are or have been *bona-fide* residents in the borough of Troon, and who are or have been scholars in some public or elementary school; in or towards building or maintenance of any public school, elementary or otherwise, in Troon; in or towards the maintenance of exhibitions or scholarships tenable at any institution of education higher than elementary, as the trustees may determine, but no exhibition or scholarship shall be awarded to any person who shall not be or have been a *bona-fide* resident in Troon."

IN the issue for April 5 of the *Cologne Post*, a daily paper published at Cologne by the Army of the Rhine, is an article on the education of A iv. boys. The writer states that the boys of eighteen years of age who have been called to the colours recently have, in the majority of cases, proved to be vastly below the standard of education to be expected of boys of that age, as many as 5 per cent. of them being quite illiterate. He goes on to advocate the institution of a system of vocational education while the boys are with the Army of Occupation that will return these lads to their civil occupations each one with his studies completed and with his "apprenticeship" served. The curriculum and time-table of studies sketched in the article indicate a due appreciation of the difficulties of the problem and the possibility of overcoming them successfully.

THE *Cologne Post* of April 1 publishes an interesting account of the work of the 2nd Army Agricultural College at Bonn. The object of the college is to provide interesting and useful occupation for our troops during the period preceding demobilisation. Courses were commenced in January, 1919, since which time large numbers of soldiers, both officers and other ranks, have received short courses of agricultural instruction. At first the lectures were mainly theoretical, dealing with agricultural chemistry and botany, but this was soon altered, and at the present time the students not only have lectures on practical subjects—farm management, etc.—but are also

able to visit the experimental farms belonging to the University of Bonn, where they see the results of various experiments and actual farm operations. In this way men who are farmers obtain an insight into the scientific principles of their subject, while the novices receive a grounding which will be of value in later years. The students are allowed to use the excellently equipped laboratories of the University, and at weekly meetings students give their agricultural experiences in various parts of the world, and the discussion at these meetings supplies some valuable information.

THE Ministry of Health Bill passed its third reading in the House of Commons on April 9. When before the Standing Committee dealing with the Bill, the measure was, in opposition to the wish of the Government, amended in such a way as to transfer from the Board of Education to the Ministry of Health the responsibility for the medical inspection and treatment of school children. In the House of Commons on April 9, when the Bill returned for further consideration, Dr. Addison proposed to add to it words to the effect that the Minister of Health may make arrangements with the Board of Education respecting the submission and approval of schemes of local education authorities and the payment of grants to these authorities, so far as such schemes and payment relate to or are in respect of medical inspection and treatment; and the powers and duties of the Minister may under any such arrangements be exercised and performed by the Board on his behalf and with his authority under such conditions as he may think fit. After some discussion, and the insertion of words in the amendment confining its scope to medical inspection and treatment, it was agreed to. In other words, it is now possible for the Minister of Health, should he so desire, to delegate to the Board of Education those of his powers which have hitherto been administered by the Board.

IN *School Hygiene* for November last Dr. James Kerr writes on "Congenital or Developmental Aphasia." He points out that although the bibliography on the subject is fairly large, yet little attention has been paid to the theoretical importance and wide bearings of congenital aphasia, when it exists apart from coarse nervous defects. The cases may be conveniently grouped, according to the leading symptom, as graphic and auditory aphasia, of which auditory aphasia, being more fixed by heredity, is less common. Dr. Kerr reviews and criticises the various theories put forward with regard to these cases, and points out that aphasics are sufficiently numerous to warrant more care than they can receive in the ordinary schools. Children who suffer from word-blindness may be highly intelligent in all other respects, and for their best development require special treatment in a children's institute or psychological observational school. Every school population exceeding 100,000 requires some such institute. If the particular brain defect is diagnosed early, many, though not all, are capable of much educational improvement, and the defect so compensated that for practical purposes the individual may be considered normal. If not treated, such children tend to swell the numbers in prisons and asylums.

THE League for the Promotion of Science in Education, formed by the Committee on the Neglect of Science, which arranged a very successful conference at the Linnean Society in 1916, is organising another conference, to be held at the Central Hall, Westminster, S.W., on April 30, at 2.30 p.m. The following resolutions will be submitted to the conference:—(1) That this conference directs attention to the continued neglect of science in the country, and calls upon the Government to make immediately such changes in all administrative Departments as shall ensure therein an adequate representation of scientific men. (2) That this conference anxiously awaits a statement on the part of the Government as to the measures it proposes to take to carry out the recommendations set forth in the report of Sir J. J. Thomson's Committee on Natural Science in the Educational System of Great Britain. (3) That this conference, whilst fully recognising the value of a literary training, is, nevertheless, of the opinion that the present public school and university system fails to produce that activity of mind and breadth of knowledge which are essential in a liberal education and necessary for dealing satisfactorily with modern problems. It therefore calls for a closer co-operation between education and industry, and for this purpose emphasises the importance of appointing to headmasterships men of high scientific attainments. No tickets of admission are required, and the Council of the League hopes that there will be a large assembly at the conference to support these resolutions, and thus assist in securing action upon them.

SOCIETIES AND ACADEMIES.

LONDON.

Linnean Society, April 3.—Sir David Prain, president, in the chair.—W. B. **Brierley**: An albino mutant of *Botrytis cinerea*, Pers. The fungus *Botrytis cinerea* possesses characteristic black sclerotia, the colouring matter being deposited in the walls of the outer two or three layers of cells. Among the black sclerotia in a pedigree culture a single colourless sclerotium was formed, and on isolation this gave rise to a strain characterised by colourless sclerotia. Morphologically and physiologically the parent and mutant strains are identical, and the only difference is the lack of colouring matter in the latter. A generation of the fungus may be obtained in three days, and the two strains tested over very many generations under the most diverse conditions have proved absolutely constant. As the colourless form arose in a "single-spore" culture, it cannot represent a strain selected out from an original population; and as *Botrytis cinerea* is asexual, the possibility of the new form being a segregant from a heterozygous parent is eliminated. Furthermore, the occurrence of colourless sclerotia in this fungus has heretofore been unknown either in Nature or when the fungus was grown on culture media. There would, therefore, seem no reason to doubt that the colourless form described is an instance of true mutation in the fungus *Botrytis cinerea*.—Dr. J. D. F **Gilchrist**: The post-puerulus stage of *Jasus lalandii* (Milne-Edw.), Ortmann. This paper carried on the investigation already published in the Journal of the Linnean Society, Zoology (vol. xxxiii., 1916, pp. 101–25, pls. 12–17, with 12 text-figures), as "Larval and Post-Larval Stages of *Jasus lalandii*," etc. The New Zealand crayfish is now considered to be identical with this Cape species, and found to be of wide distribution. The stage here described is that immediately following the "puerulus" stage; it represents the transition to the adult form. The specimens were obtained by trawling in Table Bay and taken to the marine laboratory at St. James, near Cape Town, where the observations now recorded were made. The author gives minute descriptions, illustrated by drawings similar to those in his previous paper.—Dr. H. H. **Mann**: Variation in flowers of *Jasminum malabaricum*, Wight. In the forests of the Western Ghats of Bombay, during the month of April, the jungle is covered with flowers of this fragrant and attractive climber. Between April 13 and 20, 1916,

the author had examined 2789 flowers for the corolla, and found from five lobes in 0·33 per cent. to a maximum of eight lobes in 40 per cent., declining to a percentage of 0·04 for those with twelve lobes. Similarly, the teeth of the calyx were examined in 3560 flowers at the same time, and showed with four teeth 2·56 per cent., with five and six lobes the maximum with respective percentages of 46·26 and 47·81, the last being of eight teeth with 0·22 per cent.

Aristotelian Society, April 7.—Prof. Wildon Carr in the chair.—A. F. **Shand**: Emotion and value. Intrinsic value, whether in external things or in the constituents of the mind, is not a simple, statical quality that can be found in some things, but about which nothing further can be said. It is essentially dynamical. It presupposes always something on which it can act, with which it has affinity, and the power of acting on this thing in certain ways. Such value cannot, therefore, be wholly contained in or confined to the thing which possesses it; for a condition of intrinsic value is the power of propagating the same kind of value in the other thing with which it has affinity. But this power, though a part and condition of this value, does not sum it up. For things would not have power to produce excellent effects unless there were something excellent in their own nature. Fear, anger, and hate have one kind of effect; joy, admiration, and love have an opposite kind. The power of each depends on its own nature. The power which is a condition of intrinsic value is therefore also conditioned by it.

Zoological Society, April 8.—Dr. S. F. Harmer, vice-president, in the chair.—Dr. F. E. **Beddard**: Three fœtal sperm whales. Attention was directed to the smallest fœtus exhibited, which measured 4½ in. in length.—L. T. **Hogben**: The progressive reduction of the jugal in the Mammalia.—G. A. **Boulenger**: Two new lizards and a new frog from the Andes of Colombia.—R. I. **Pocock**: Structural characters by which the genera of Felidæ may be distinguished from each other. Special attention was directed to the formation of the feet in the cheetah (Acinonyx), to the modifications of the hyoidean apparatus in the lions, tigers, leopards, and jaguars (Panthera), and to the position of the partition in the auditory bulla in other genera.

BOOKS RECEIVED.

Sands: Considered Geologically and Industrially under War Conditions. By Prof. P. G. H. Boswell. Pp. 38. (Liverpool: At the University Press.) 1*s.* net.

Organic Chemistry; or, Chemistry of the Carbon Compounds. By V. von Richter. Edited by Profs. R. Anschütz and G. Schroeter. Vol. i.: Chemistry of the Aliphatic Series. Translated and revised by Dr. P. E. Spielman. Second (revised) edition. Pp. xvi+719. (London: Kegan Paul and Co., Ltd.) 21*s.* net.

Food (War) Committee, Royal Society. Report on the Composition of Potatoes Grown in the United Kingdom. Pp. 31. (London: Harrison and Sons.) 2*s.*

Yorkshire Type Ammonites. Edited by S. S. Buckman. Part xviii. (London: W. Wesley and Son.)

A Summary of My Theory of the Sun. By Dr. A. Brester. Pp. 62. (The Hague: W. P. Stockum and Son.)

Carburettors, Vaporisers, and Distributing Valves Used in Internal-Combustion Engines. By E. Butler. Second edition. Pp. viii+288. (London: C. Griffin and Co., Ltd.) 12*s.* 6*d.* net.

The Mica Miner's and Prospector's Guide. By A. A. C. Dickson. Pp. viii+50. (London: E. and F. N. Spon, Ltd.) 4*s.* 6*d.* net.

Birds Beneficial to Agriculture. By F. W. Frohawk. Pp. vi+47+22 plates. Economic Series, No. 9, British Museum (Natural History). (London: British Museum, Natural History.) 2*s.*

Report on Cetacea Stranded on the British Coasts during 1918. By Dr. S. F. Harmer. Pp. 24. (London: British Museum, Natural History.) 3*s.* 6*d.*

T.N.T. Trinitrotoluenes and Mono- and Dinitrotoluenes: Their Manufacture and Properties. By G. C. Smith. Pp. vii+133. (London: Constable and Co., Ltd.) 8*s.* 6*d.* net.

The Life of Matter: An Inquiry and Adventure. Edited by A. Turnbull. Pp. xviii+324+iv plates. (London: Williams and Norgate.) 7*s.* 6*d.* net.

Calcul des Valeurs Absolues. By D. Riabouchinsky. Pp. 113. (Copenhague.)

DIARY OF SOCIETIES.

THURSDAY, APRIL 24.

INSTITUTION OF ELECTRICAL ENGINEERS, at 6.—Major A. C. Fuller: The Fullerphone, and its Application to Military and Civil Telegraphy.

TUESDAY, APRIL 29.

ZOOLOGICAL SOCIETY, at 5.30.—Dr. W. T. Calman: Marine Boring Animals.—Noel Tayler: A Unique Case of Asymmetrical Duplicity in the Chick.—Geo. Jennison: A Chimpanzee in the Open Air in England.

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