THURSDAY, AUGUST 28, 1919.

WAR WOUNDS.

(1) *Traité Clinique de Neurologie de Guerre.* Par Paul Sollier, Chartier, Félix Rose, Villandre. Préface de M. le Médecin-Inspecteur Baratte. Pp. viii+830. (Paris: Librairie Félix Alcan, 1918.) Price 32 francs.

(2) *Annales de la Clinique Chirurgicale du Prof. Pierre Delbet.* No. 6. *Biologie de la Plaie de Guerre.* Par Prof. Pierre Delbet et Noël Fiessinger. Pp. v+460+4 pls. (Paris: Librairie Félix Alcan, 1918.) Price 30 francs.

(1) THE publication of the work carried out in the Neurological Centre of the Fourteenth Region (Lyons) during the period December, 1914, to March, 1918, is a welcome addition to the neurological records of the war. More than 18,000 patients were examined during this time, and nearly half of these were actually in hospital under the care of the staff of the Centre. More than 11,000 cases were followed up, and the statistics of these are available.

The organisation of the Centre, with its many special departments, under one administrative head, has ensured a unity of purpose during the whole time of the patients' treatment. The co-ordination of special medical and surgical departments with those of radiology, electro-therapeutics, re-education, etc., is especially insisted upon. In this country the chief attempt at such co-ordination has come through the establishment of special hospitals for orthopædic cases, and such units have been an unqualified success.

M. Chartier discusses head wounds, and notes that the use of the steel helmet not only reduced the incidence of such wounds, but also diminished the proportion of severe penetrating wounds of the skull. It is emphasised that foreign bodies after lying latent in the brain for months may at length give rise to serious cerebral conditions, such as abscess or apoplexy.

The ordinary facts of cerebral anatomy and physiology are shortly described in relation to lesions of the brain. Reference to the work of Head and Holmes is omitted in the description of the cerebral sensory functions. The classification of aphasia according to Marie and Foix is adopted, although no new facts are mentioned. Traumatic diabetes and polyuria are shortly dealt with, although the influence of the sympathetic nervous system and adrenal glands receives no recognition as playing an important part in the production of this form of glycosuria.

M. Villandre ably deals with the surgical treatment of head wounds, including late repair of the skull by bone and cartilage grafts. A feature of this section is the full description of X-ray diagnosis. This author also gives an account of the surgery of the spinal cord, with details as to technique.

The chief diseases and injuries of the spinal cord and plexuses are described by Dr. Félix Rose. The diagnosis is not very fully discussed, a notable omission being the bulbo-cavernosus reflex in the diagnosis of injuries to the cauda equina. The paragraphs on polyneuritis do not describe cases with symptoms similar to those recently published as "infective polyneuritis" by British observers.

M. Chartier gives an account of the lesions of the cranial nerves and those of the upper extremity. The anatomical arrangement of nerve-fibres in peripheral nerves is mentioned in connection with the work of Dejerine and Mouzon and that of Marie and Meige; no personal experiences are given. Most observers in this country would dispute the statement that in complete lesions of the median nerve the nail pulp of the middle finger remains sensitive to pressure pain. The periarterial sympathetic fibres are suggested as the pathway for this sensation, although no proof of this view is attempted.

In the section on "Causalgia" singularly little personal experience is quoted, and the sympathetic system is again called in to explain the important features of this syndrome. The original suggestions of Weir Mitchell are much more in line with the clinical findings in these cases, and the treatment by removal of the sympathetic nerves as advocated by Leriche has not been a success in this country. The author does not mention the frequent innervation of muscles such as the first dorsal interosseous in the hand by other nerves than those usually described, a fact which may complicate both diagnosis and prognosis.

All observers in this country are much struck with the manner in which the function of paralysed muscles can be taken on by alternative muscles not usually associated with the chief movements of joints. M. Chartier does not emphasise these phenomena in connection with diagnosis and prognosis.

MM. Villandre and Sollier deal with the surgical and medical treatment of nerve injuries respectively. Before operation they insist upon neurological, electrical, and, if necessary, X-ray reports. An interval of two and a half to three months is allowed to elapse after the healing of the wound before nerve suture is undertaken. There is no insistence upon re-examination at regular intervals for signs of regeneration, although this routine is essential to accurate treatment. The section on electro-diagnosis is complete. The ordinary tests by faradism and galvanism have been most used, although the condenser and chronaxie methods are mentioned.

The chapters by P. Sollier on the functional disorders are the most interesting in the whole work. Personal experience is freely quoted in the text, which is also well illustrated by original photographs. The writer objects to the view that the basis of all "functional" disorder is "psychic." The physiological basis of hysteria is stated in full. In common with Roussy,

L'hermitte, and others in France, and Hurst in this country, Sollier declares that the "reflex" or "physiopathic" cases described by Babinski and Froment are easily curable by mobilisation and psychotherapy. The muscular and vaso-motor changes, etc., are believed to be entirely due to immobility, and clear up as soon as the use of the affected limb is restored. A return to Charcot's conception of hysteria is predicted by Sollier as the result of war experiences. Careful distinction is made between true reflex contractures associated with pain, and those called "reflex" by Babinski and Froment. All varieties of functional disorder, including those of the special senses, are described. Treatment by mobilisation and isolation is recommended, while the exclusion of splints, massage, electrotherapy, etc., is urged.

The section which deals with re-education is instructive. The organisation of the re-education treatment seems to have been excellent. The early individual treatment by the physician is succeeded by exercises under a masseur, who is himself carefully supervised by the physician. The next stage is that of gymnastic drill under medical supervision, in which chosen N.C.O.'s and patients assist. Finally, uncontrolled military drill completes the "hardening process" to fit the soldier for military duty. The use of carefully supervised physical work, as in our own "curative workshops," and of games, also forms part of the routine.

The value of mechano-therapy is contrasted with that of motor re-education, to the great advantage of the latter, which is found to be an active, living mode of treatment when crowned by curative work.

(2) The authors publish in this volume the results of their careful studies of tissues damaged by war wounds. They have been able to make parallel observations upon the tissue cells and the bacterial flora of wounds, so that much useful information is available. The deductions that they have drawn from the various changes found are clearly expressed, and a fearless criticism of the recent antiseptic methods of wound treatment is made.

The opening section is devoted to a description of the lesions, emphasis being laid upon the important part played by damaged muscle as a culture medium for bacteria. The process of myolysis by ferments is described, and stress is laid upon the fact that the simple protein bodies resulting from the process, viz. peptones and amino-acids, favour bacterial growth to a greater degree than do the albumins. During the first four to twelve hours after the trauma the infection is little marked, and at this period such a wound might be capable of transformation into a surgical wound with union by first intention.

In the nature of the infection an important place is given to the anaerobes. The bacillus of malignant œdema (*vibrion septique*), bacillus aerogenes capsulatus (*B. welchii*), with the whole series of anaerobes, obtain the expected recognition in the description of the infection. The aerobic organisms appear in wounds after the anaerobic series has been observed for some hours previously. The streptococcus is found to be the most dangerous of the aerobic series, especially in the usual state of mixed infection, when proteolytic changes greatly favour its growth. The defence in all its aspects is fully and clearly discussed.

Leucocytic changes as seen by vital staining methods, serum reactions, antitoxins, and ferment actions are all included in the study of the defence mechanism. The changes which result in the breakdown of the defence, and the production of gas gangrene, are fully dealt with, and emphasis is laid upon the fact that the nature of the infection rather than bacterial quantity is the important factor with which the tissue cells have to deal.

The section on therapeutics mentions every known means of meeting infection, and each measure is fully criticised. As a result of their wide researches, especially those directed to the study of infected excised tissues, the authors urge that the best treatment for war wounds is the early excision of all damaged tissue, followed by primary suture. The authors insist upon the early work of Gaudier in October, 1915, in connection with wound incision, and they claim that, as 85 per cent. of the wounds can be safely excised and sutured, other treatment, such as irrigation with antiseptics, is superfluous.

The action of chemical agents is carefully analysed until their futility is obvious. The Carrel-Dakin technique is severely handled by the authors, the solution itself being characterised as a "chemical bistoury which acts by proteolysis of mortified tissue." The general therapeutic conclusions are that damaged tissues and their infection play the most important part in war wounds. Excision of lacerated muscle, etc., and the conversion of the wound into an ordinary surgical wound, are the greatest advances in wound treatment. Local treatment is most important, although general measures, such as vaccines and sera, may help in selected cases.

J. LE FLEMING BURROW.

THE FACE OF THE EARTH.

La Face de la Terre (*Das Antlitz der Erde*). Par Prof. Ed. Suess. Traduit de l'Allemand avec l'Autorisation de l'Auteur et Annoté sous la Direction de Emm. de Margerie. Tome iii., 4e Partie. (Fin.) Avec un Epilogue par P. Termier. Pp. xvi+1361–1724. Tables Générales de l'Ouvrage. Tomes i., ii., iii. (1re, 2e, 3e et 4e Parties.) (Paris: Librairie Armand Colin, 1918.) Price 25 francs.

THIS is a noble ending to a noble work. On the merits of the original it is scarcely necessary to enlarge; since they were first recognised in these pages they have become familiar

to all English geologists, and the fame of "Das Antlitz" has spread over the whole world. Yet time has increased, rather than diminished, our appreciation of its great qualities, and we take advantage of this opportunity to express our admiration for its superb mastery over detail and the acute vision which have combined to give us in true perspective so many faithful pictures of terrestrial structure; for its power of synthesis, discovering in the midst of the most diverse phenomena an underlying unity; for its freshness of explanation, always surprising us with novel theories and hypotheses; and for many bold conceptions, which, whether we accept them or not, are always valuable for what they suggest if for nothing else. The delight with which we follow the author through the most complicated descriptions or discussions is increased by the vigour of his language, with its occasional ascent into spontaneous eloquence under the inspiration of great ideas. As we read, we are conscious of a new spirit which has broken loose from ancient dogmas and leads us forth to fresh conquests of the unknown.

It was the French geologists who were the first to welcome the appearance of the new geology and undertook the translation of "Das Antlitz" into their language under the direction of M. Emmanuel de Margerie. The first volume of "La Face de la Terre" appeared in 1897; it opens with a thoughtful and appreciative preface by Marcel Bertrand. The last part was published last year (1918). It fitly concludes with an eloquent eulogy by M. Pierre Termier.

"La Face de la Terre" is an improvement on the original. As a translation it is absolutely faithful, and in the hands of masters of French prose like M. de Margerie and his colleagues, it gains by the added grace and lucidity which are inseparable from the French language. But it is much more than a translation; by the addition of numerous footnotes and illustrations it becomes a new edition.

The added illustrations are particularly welcome, those of the original work being wholly inadequate. Suess, when he wrote his masterly descriptions, had a mass of material, maps, sections, and drawings before his eyes, but, limited probably by considerations of expense, he introduced only 168 figures into the text. The French have given us more than thrice this number (in all 552 figures), and yet without greatly increasing the price. Even with this wealth of illustration we are not content, and still ask for more, especially for a few simple diagrams which would enable us to grasp with greater facility some of the new conceptions with which the work abounds.

The added notes, which are distinguished from those in the original by square brackets, are of great value; they bring the bibliographical references up to date, and when necessary point out how far the author's conclusions must be modified in the light of later knowledge.

The English translation, which was commenced (in 1904) much later than the French, and completed, so far as the body of the work is concerned, much earlier (in 1908), contains no new matter. We may hope that it will be supplemented by an atlas at some future date; meanwhile the student must have recourse to the French edition. That the English translation does not yet possess an index is a consequence of the war; the MS. has been in the hands of the printers for many years past.

The last part of the third volume of "La Face de la Terre," which is the immediate subject of this review, fully maintains the high standard of its predecessors. The first chapter, entitled "Analysis," presents us with an admirable survey of the structural features of mountain chains as revealed by a long series of brilliant investigations, which, begun long ago by Lapworth, were continued by Peach and Horne at home, and by numerous observers abroad, among whom Bertrand and Lugeon are pre-eminent. What a surprising revolution has been accomplished in our knowledge will be understood at a glance if we turn to the section across the Alps represented in Fig. 340 on p. 1448, where we are shown how the accumulated sediments of ancient seas have been transported in successive flows which have carried them many miles from their source and repeatedly doubled them one over the other in long, flat-lying folds. A satisfactory explanation of this phenomenon is still to seek; theory is completely outdistanced by observation.

The next chapter, entitled "The Depths," casts a penetrating glance into the interior of the earth and throws light on the various forms of igneous activity within the crust. A chapter on "The Origin and Distribution of Volcanoes" follows; it includes a brief account of the diamond pipes of South Africa. Then comes a chapter on "The Moon: Various Hypotheses and a Retrospect." In this we meet with some valuable suggestions on the question of isostasy. The illustrations added in the French edition are nowhere more welcome than in this place. The discussion of isostasy involves, however, mathematical treatment with which Suess does not seem to have been familiar, otherwise he would have scarcely proposed to neglect that factor in the reduction of observations which is commonly known as the Bourgeur correction, for, as Col. Lenox Conyngham has remarked, such a proposal is equivalent to asserting that it makes no difference whether the pendulum observations were made on a lofty tableland or in a balloon poised at the same altitude over a plain at sea-level.

The last chapter, "La Vie," is devoted to many interesting reflections on sundry problems concerned with the history of life on the globe, the migrations of faunas, and the preservation, amidst the revolutions of land and sea, of living beings in places of refuge or "asylums," the situation of which and their geological characters afford interesting material for discussion.

In concluding, we would ally ourselves with M. Termier in his admiration for this monumental treatise and, adopting as nearly as possible his own words, we may say: "Such a work is destined to endure, not for an age, but for all time. If it grows old it does so only very slowly, and preserves in its old age the majesty and beauty of things imperishable." W. J. SOLLAS.

PHYSIOLOGICAL CHEMISTRY.

(1) *Fats and Fatty Degeneration: A Physico-Chemical Study of Emulsions and the Normal and Abnormal Distribution of Fat in Protoplasm.* By Prof. Martin H. Fischer and Dr. Marian O. Hooker. Pp. ix+155. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1917.) Price 9*s.* 6*d.* net.

(2) *Practical Physiological Chemistry.* By Sydney W. Cole. Fifth edition. With an introduction by Prof. F. G. Hopkins. Pp. xvi+401. (Cambridge: W. Heffer and Sons, Ltd.; London: Simpkin, Marshall, Hamilton, Kent, and Co., Ltd., 1919.) Price 15*s.* net.

(1) LIKE Prof. Fischer's earlier studies on œdema and nephritis, this work on fatty degeneration and allied topics is suggestive and stimulating, but unsatisfactory. As before, we have, in the first place, a study of phenomena produced *in vitro*, in this case on the formation of various types of emulsion and on the factors leading to their stabilisation or "breaking." The observations are of no particular novelty, but they are well arranged from the point of view of popular demonstration. Passing to the condition in which fat is held in the protoplasm of the normal cell, and of that which has become the subject of fatty degeneration, the authors emphasise, with justice, the fact that the latter may contain actually no more fat than the former. This consideration gives an opening to Prof. Fischer's predilection for facile analogy. The comparison between the appearance in obvious droplets of fat previously invisible, and the "breaking" of a fine emulsion, is obvious and suggestive. But the recognition of a superficial similarity is a long way from a scientific demonstration of identity. On the authors' own showing, it is difficult to see why the post-mortem development of acidity, which is far in excess of any which can occur during life, does not produce the appearance of extreme fatty infiltration in every cell submitted to histological examination.

The mimicry of mucous secretion, by the effect of water on an emulsion of powdered gum in oil, has about the same scientific value. But the method surely leads the authors beyond all permissible limits in the chapter on "The Mimicry of Some Anatomical Structures." The suggestion that a soap solution beaten to fine foam with air looks, under the microscope, "not unlike a microscopic section of lung," or that the figures produced in the drying of an oil-in-soap emulsion "remind one of the rods and cones of the retina," seems to be much on the same level as a child's discovery of trees in a frosted window-pane, or of animal forms in the clouds. Are the authors trying to play Hamlet to the reader's Polonius, or do they wish to be taken seriously?

(2) Mr. Cole's valuable book, after being out of print for more than a year, now reappears in a fifth edition, with extensive revision and additions. The new chapter on the properties of solutions contains a full account of the method of determining hydrogen-ion concentrations by means of standard solutions and the range of indicators now available. This, like many other items in the book, will be of value to workers in many departments of biological science in which quantitative chemical methods are required. The instructions for preparing collodion sacs for dialysis, in the same chapter, could be improved by including some of the technical advances made in recent years by Walpole and by Brown. A properly made membrane of this kind surely becomes impermeable rather than porous on drying.

A large part of the book is still devoted to quantitative methods, and these are described with admirable clarity of detail. While the range of alternative methods in some instances might be thought to overburden a student's course, it greatly enhances the value of the book to the worker in a clinical or research laboratory. There is internal evidence, in almost every description of a method, that the working has been confirmed by personal experience; the book abounds in those valuable hints and practical details which come only from actual trial, and the absence of which renders many a laborious compilation so unsatisfactory. The directions for preparing certain amino-acids may be mentioned as remarkably good in this way; and, since this chapter is admittedly beyond the scope of ordinary class-work, it may be hoped that Mr. Cole, in a future edition, will increase the obligation of those needing pure amino-acids for bacteriological and other work, by extending the list of preparations. H. H. D.

OUR BOOKSHELF.

L'Insidia Sottomarina e Come fu Debellata, con Notizie sul Recupero delle Navi affondate. By Rear-Admiral E. Bravetta. Pp. vii+461. (Milan: Ulrico Hoepli, 1919.)

OF the hundreds of war-books published purporting to explain in a popular manner the work of the Allied Navies in tracking down and destroying U-boats, there are few, if any, which tell the public of the means adopted. Most books of the kind are merely suggestive, and much is left to the imagination. The present volume, by Admiral Bravetta, who is probably Italy's most distinguished writer on naval affairs, is far in advance of existing works of a similar kind.

So far as is permitted by reasons of military secrecy, Admiral Bravetta explains first of all the functions of the submarine, how this type of craft

is built, the kind of engines used to propel it when cruising on the surface and when submerged, the armament, and many other details. All his explanations are well illustrated. After a brief discussion of the tactics of the submarine, the book goes on to describe and illustrate a great number of devices employed—not all successfully—to track and destroy the U-boat. There are many American devices the value of which has probably been exaggerated—indeed, some of them are merely fantastical suggestions—and these, with others, are given to render the work complete. The concluding portion of the book deals with the many plans that have been put forward from time to time for salving sunken ships or their cargoes. Here, again, it remains for experience to show whether any of them are of value. It is not claimed that Admiral Bravetta's work can be of practical technical value, but as a well written and illustrated record of the achievements of human ingenuity in combating a menace to the world's safety it is well worth perusal by all who are able to follow semi-technical Italian. In fact, an English translation might well fill a want until some similar work is compiled in our own language. E. S. H.

Birdland's Little People: Twelve Nature Studies for Children. By Capt. Oliver G. Pike. Pp. 123. (London: The Religious Tract Society, 1919.) Price 4*s.* 6*d.* net.

THE author of this volume is well known as a popular writer on natural history, and presents in the work before us an excellent series of essays, written in an interesting style, on the habits and haunts of several of the most attractive members of the British avifauna. The subjects are well chosen, and include certain feathered denizens of our gardens, lanes and copses, the reedy lake and the breezy moorland. In each case the love-making, nest-building, and subsequent care of eggs and young nestlings are described graphically from personal observation, so that the book is not a mere compilation, but a vivid account of bird-life written with the enthusiasm of a true lover of feathered creatures and their entrancing ways. The book will interest any boy or girl possessing a fondness for animal life (and this, we fancy, includes the majority of young people), while at the same time the various phenomena are so accurately and carefully described that persons of maturer years may read its pages with advantage. The birds selected include two species of grebe, two of warbler, the kingfisher, dipper, brown owl, lapwing, wren, cuckoo, whitethroat, great tit, and buzzard. The parasitic habits of the cuckoo, the cannibalistic propensities of a young buzzard, and the mysteries of migration are among the more interesting phenomena touched upon in a book which is well printed and illustrated by a series of twenty-four excellent reproductions of photographs taken from Nature by the author himself.

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.*]

Velocity of Electric Currents.

WHILE the velocity of electric waves is well known, as Maxwell and Heaviside have pointed out, we know absolutely nothing of the velocity with which electricity travels in a wire. As Heaviside says ("Papers," vol. ii., p. 3, line 4):—"It may be an inch an hour or it may be immensely great."

Mr. Aston's extremely interesting discovery (NATURE, June 5, p. 275), that the striæ in capillary tubes containing neon or helium travel with approximately the same velocity as that of sound in the gas, is of interest in connection with the fact pointed out by the writer in *Science* for July 22, 1892, and more fully in the *Physical Review* for March, 1900, that "resistances of equi-molecular wires of pure metals are proportional to their transmission times for sound-waves" (to an accuracy of about 3 per cent.), and is in line with the suggestion made in the *Physical Review* paper referred to (March, 1900), that the time of travel of electricity in wires is the same as that of sound.

The double coincidence for metals and gases is at least suggestive, and further work along these lines might give results of interest.

If cohesion depends on the electrons in the outer rings, the tensile strength of the lead isotopes should be the same; but might not their electrical resistance and sound velocities (easily determined for small quantities of material by resonance methods) afford a means of distinguishing them?

REGINALD A. FESSENDEN.

185 Franklin Street, Boston, Mass., U.S.A., August 5.

The Magnetic Storm of August 11–12, 1919.

THE earlier months of 1919 showed a great deal of magnetic disturbance, but for some two months past conditions have been unusually quiet. On the morning of August 11, at about 7h. G.M.T., there was a "sudden commencement," followed by the largest magnetic storm experienced for some years at Kew Observatory. Conditions remained highly disturbed until near 10h. on August 12, when the photographic sheets were changed. The range in declination was 2° 5′, and that in vertical force 935 γ. The horizontal-force trace was twice beyond the limits of registration, on each occasion for more than ten minutes; thus the range shown, 840 γ, may have been considerably exceeded. Many of the movements were too rapid to be shown clearly in the trace. Rapid oscillations were especially in evidence between 7h. and 10h., and again between 14h. and 18h., on August 11. The declination curve also showed smaller but very rapid oscillations from midnight to 9h. of August 12. The extreme easterly reading, 13° 44′ W., was recorded at about 8h. of August 11, and the extreme westerly reading, 15° 49′ W., at about 16h. 32m.

The commencing movements near 7h. of August 11

were of an unusual character. In declination swings of 10′ to west, 20′ to east, and again 62′ to west followed in immediate succession. In horizontal force there was, as usual at the start, a rapid rise, amounting to 75γ; but in less than a minute the movement was reversed, and a fall exceeding 450γ in less than twelve minutes took the trace off the sheet. Horizontal force remained depressed for nearly 1½ hours, but then for a few minutes it was above the normal value. Another large fall then ensued, which carried the trace off the sheet from 9h. 15m. to 9h. 25m. Between 14h. and 17h. of August 11 horizontal force was usually above the normal. The maximum, which appeared synchronously with that in vertical force at about 16h. 2m., exceeded the value prior to the sudden commencement by 460γ. The disturbance in vertical force, though exceptionally large, was of the usual type. During the afternoon of August 11, from 14h. to 18h., the curve was of a pyramidal shape, the value of the element being much enhanced. By 23h. the curve had resumed its normal level, and a depression then set in, the minimum being reached just after 2h. on August 12.

The ranges recorded during this storm have seldom been approached at Kew Observatory. In fact, it is unlikely that so large a range has ever been recorded there before in vertical force. But for the great reduction in sensitiveness made of late years to meet the conditions caused by electric trains and trams, the maximum would have been far beyond the limits of registration.

C. CHREE.

Kew Observatory, Richmond, Surrey,
August 13.

THE magnetic storm which began on the morning of August 11 was one of the largest recorded in recent years, and was probably of world-wide distribution. It attracted public attention chiefly through the notable—though not unusual—extent to which it interfered with telegraphic work. On account of its somewhat exceptional features, the following statement of results of observations at Eskdalemuir Observatory may be of some interest, and is communicated by permission of the Director, Meteorological Office.

The times given below are Greenwich mean times. The unit of 1γ is 0·00001 C.G.S. It should also be mentioned that the principal magnetographs at Eskdalemuir are so arranged as to give directly the vertical (V), north (N), and west (W) components of terrestrial force; a declination magnetograph is also in operation.

The conditions prior to the advent of the storm were those of a magnetically quiet day. Very slight disturbance was recorded between 20h. and 21h. on August 10, and pulsations of about three minutes' period were observed on N about an hour after midnight. The beginning of the storm as observed at Eskdalemuir may be taken as having occurred at 6h. 58m. on August 11. But this beginning differed very considerably in its character from the usual type of what is known as a "sudden commencement." Ordinarily, this phenomenon exhibits a rise in the value of the horizontal force; a rise also, though usually smaller, in declination; and in some instances a fall in the value of the downward directed vertical force. So far as is known, these abrupt changes take place simultaneously at any one place, and (in spite of attempts to prove the contrary) there is no trustworthy evidence to show that they are not synchronous at all observatories. In the case of the storm now considered, however, a minor disturbance of somewhat unusual type began on the north component thirty-two minutes before the other components experienced the sudden commencement of the storm. There is nothing to show that this minor disturbance had any relation to subsequent events or was other than "accidental," but it is mentioned for what it may be worth, and as being the cause of a doubtful estimate as to the time of the sudden commencement on the north component. At all events, the disturbance began at 6h. 58m. so suddenly as to send the light spot completely off the recording sheet, and did so with such rapidity that it is impossible to state whether the change was one of increase or decrease in force. But while there is no photographic trace immediately after 6h. 58m. on the + side of the undisturbed value, there is distinct evidence of its being *below* that value within a minute after that time. In another respect, the beginning of the storm was altogether exceptional in that the sudden commencement on the vertical-force magnetograph showed but the faintest trace of any decrease in value, and in reality was followed by a large increase. On the west component record there is shown a sudden rise and fall, the difference between the extremes being 172γ.

After the rapid changes associated with the sudden commencement of the storm, the first minimum value of N occurred at some time between 7h. and 7h. 30m., the trace being off the sheet in that interval. The first maximum value of W after the sudden commencement was at 7h. 10m., when it reached 188γ above the undisturbed value. The declination at this time was 1° 18′ to westward of its amount before the storm began. The vertical force rose to a maximum at 7h. 13m., it being then 44γ above its undisturbed value. Then followed a fall, on which were superposed numerous pulsations, to a minimum at 7h. 39m., and a recovery to a maximum 66γ above the undisturbed value at 7h. 58m. Such changes in V during the early part of the storm are entirely unusual, both in character and amount.

During a magnetic storm the value of the vertical force usually rises to a maximum about 17h., the rise occupying about four hours, and being gradual though irregular. In the present instance, after the first few hours of the storm had passed, during which time the oscillations in V were unusually rapid, the value rose suddenly at 14h. 28m., the trace leaving the sheet at 14h. 55m., having risen 250γ in this interval of twenty-seven minutes.

Other unusual features of the storm may be referred to, and one of these is the early hour at which the fall, after the maximum, in V took place. Usually this occurs about midnight, and includes two sudden drops in value. In the present case both occurred at unusually early hours, the first beginning at 19h. 22m., the second at 23h. 9m. The gradual recovery of the vertical force to its normal value is occasionally accompanied by pulsations. These were prominent on the morning of August 12. For example, during half an hour after 5h. thirteen oscillations were recorded with a mean amplitude of 4γ. Another noteworthy feature of the storm was the intense agitation ("internal activity") in the horizontal components, especially after 2h. on August 12. As a rule, this is more prominent during the daylight hours of a storm; here it occurred during the night hours. Lastly, the disturbance was peculiar in the suddenness with which it ended about 19h. on August 12, and in the magnetically quiet conditions which succeeded it.

A. CRICHTON MITCHELL.

Eskdalemuir Observatory, August 14.

THE JAMES WATT CENTENARY COMMEMORATION AT BIRMINGHAM.

THE arrangements for the James Watt centenary commemoration are now practically complete, the general scheme being set forth in a pamphlet issued by the Centenary Committee. The form which the memorial is to take is threefold:—(1) To endow a professorship of engineering, to be known as the James Watt chair, at the University of Birmingham, for the promotion of research in the fundamental principles underlying the production of power, and the study of the conservation of the natural sources of energy; (2) to erect a James Watt memorial building to serve as a museum for collecting together examples of the work of James Watt and his contemporaries, Boulton and Murdock, as a meeting place and library for scientific and technical societies, and as a centre from which engineers could co-operate in spreading scientific knowledge; and (3) to publish a memorial volume.

The success of the memorial will depend upon the response to the appeal for funds, and we are glad to note that assurances of support have come not only from all parts of the British Isles, but also from France and America. As indicated in our issue of May 15, we attach special importance to the foundation of the James Watt chair of engineering, and we can imagine no better memorial to the great engineer than the creation of a school of research so endowed as to attract both a professor of exceptional ability and also the most brilliant students, of whatever class. Such a scheme would require an endowment on a scale altogether greater than that which is usually associated with chairs in universities, but it should be possible to raise the necessary money—especially with the sympathetic help of America, which of recent years has shown not only a ready appreciation of the value of scientific research, but also a generosity in its endowment which has been more admired than imitated in this country. It must always be remembered that the vital factor in research is the *man*, and every possible inducement should be offered to secure the best men, both as directors and students.

The commemoration ceremonies are to extend over the three days, September 16–18, and the official programme includes a garden-party at Watt's house (where his workshop can be seen in the state in which he left it in 1819), and visits to Soho Foundry and to two of his engines (one of which, the first pumping engine built for sale by Boulton and Watt in 1776, will be seen at work). A degree congregation is to be held by the University at which honorary degrees will be conferred on distinguished engineers and men of science.

The committee has issued a short pamphlet (by Prof. F. W. Burstall) in which an appreciation is given of the salient facts in the life of Watt, and of his epoch-making association with his colleagues Boulton and Murdock.

All who desire to attend the commemoration are asked to communicate not later than August 31 with the Hon. Sec., James Watt Centenary Committee, Chamber of Commerce, Birmingham.

ANDREW CARNEGIE.

MR. ANDREW CARNEGIE, the munificent benefactor of popular education in this country and in America, died on August 11, at Lenox, Massachusetts, in his eighty-fourth year. The son of a Chartist weaver in Dunfermline, Mr. Carnegie emigrated to the United States in 1848. From the humblest beginnings he rose during the Civil War to an important charge in the department of military transport and telegraphs. Then, by way of subserving his railroad and bridge-building plans, he created vast iron and steel works at Pittsburgh, carried on by means of a company the capital of which reached 25 millions, and which employed 40,000 men. He was bought out for some 50,000,000*l.* by the Steel Trust in the early 'nineties.

Mr. Carnegie thenceforward retired from business, and gave himself up to the wise disposal for public objects of his immense fortune. He was a convinced democrat; he proclaimed his conviction that "to die rich is to die disgraced"; and he consistently set himself to discover ways of applying his wealth for the uplifting of the people. In Pittsburgh he founded institutions for higher education, art and music, and popular culture, on a princely scale. To his native Dunfermline he gave libraries, parks, baths, and schools of hygiene and domestic science. For the Universities of Scotland he founded a Trust with a capital of two millions, the income, in equal shares, being assigned respectively to their better equipment in all modern subjects (he characteristically excluded classics, theology, and law), and to the payment of class-fees for all Scottish students of any faculty who asked for this help and were qualified to profit by it. The fund has provided not only for great extensions in the university staffs and buildings, but also for an endowment of advanced study and research in science, economics, modern languages, and history, which has largely transformed Scottish university activities. The well-meant fee-fund has doubtless been of great benefit to individual students, but as Scottish fees are not high, and never really deterrent, the direct effect in increasing the student population has not been striking. The indirect effect on the schools, due to the requirement that beneficiaries shall have completed a sound secondary education before entering the university, has been wholly advantageous.

Shortly before the war Mr. Carnegie established a United Kingdom Trust with an endowment of two millions, the income to be expended in providing public libraries, encouraging popular music, and generally in aiding or initiating schemes for the welfare of the "masses of the people." The Trustees took over the numerous promises pro-

visionally made by the founder as regards library buildings and church organs; but while they are fulfilling these they are starting on their own initiative inquiries and operations in other directions that are likely to bear good fruit. The elaborate investigations and reports they have subsidised and published on the library system, urban and rural, on plans for the physical well-being of mothers and children, on public play-centres and playgrounds, on municipal baths and wash-houses, etc., have been real contributions to knowledge. During this time of reconstruction a Trust that is thus accurately informed as to public needs, and able to aid in meeting them, is bound to render valuable service to the community. In this country already something like 700 Carnegie libraries, costing some 2½ millions, have been provided.

In the United States and Canada Mr. Carnegie's benefactions have been even more generous and more wide-reaching. Altogether they are more than 60,000,000*l.* One endowment provides pensions and retiring allowances for professors in approved American colleges and universities. Here again the indirect effect has been more important than the direct. To be "approved," an institution has to fulfil conditions as to government, efficiency, and standing laid down by the Trustees, with the result that many radical reforms in organisation have been induced, and a general raising of the educational standard has taken place. Another endowment—that of the Carnegie Institution of Washington—is professedly for the encouragement of scientific research in the widest sense of the term. Elaborate institutions in all parts of the United States, and for all branches of scientific inquiry, have grown up under its fosterage. Expeditions have been subsidised, equipment of a costly kind has been supplied for observatories, laboratories, and biological and other experimental stations, and also for individual workers everywhere who prove their competence to use it fruitfully. The Mount Wilson Observatory, of which Dr. G. E. Hale is director, is one of the most notable of these institutions. The grant to this observatory last year exceeded 30,000*l.*, and the total amount expended upon the observatory since its foundation is more than 250,000*l.* There is also in New York a central Carnegie Trust, charged to assist the others as need arises, and generally to do for America what the United Kingdom Trust does for this country.

The difficulty of so applying his wealth as to avoid doing harm was always present to Mr. Carnegie's mind. Critics of his schemes did not let him forget it. In establishing here, and in other countries, Hero Funds for the recognition of individual deeds of self-sacrifice in the saving of life, and in founding a wealthy organisation for the express purpose of propagating peace and international goodwill, he thought that he had succeeded in safeguarding the principle of *nil nocere*. The war caused him to forgo some of his most cherished prepossessions, particularly as regards Germany and the ex-German Emperor, and the prospect of building up a world-wide peace based upon democratic solidarity. In spite of his hatred of warfare and the spirit associated with it, he came to see that only by the military victory of the Allies could the future of true civilisation be assured, and he willingly assented to a large grant from the Peace Fund for the relief of Belgian distress. In general, it may truly be said that Mr. Carnegie's ideas were based on sane visions of human progress, that he backed them lavishly, and that he enlisted the best men of his time in their working out. Their fruition, if it comes more tardily than in his eagerness he hoped, will come surely in some fashion, even if it be other than he pictured. He "builded better than he knew."

WALTER GOULD DAVIS.

MR. WALTER GOULD DAVIS, director of the Meteorological Bureau of Argentina for many years, died at his birthplace, Danville, Vermont, U.S.A., on April 30 in his sixty-eighth year. His early training was that of a civil engineer, especially in railroad surveying through the White Mountains. When in his early twenties, he went to Argentina as assistant to his uncle, Dr. B. A. Gould, founder of the Cordoba Astronomical Observatory. On the resignation of Dr. Gould in 1885, the National Meteorological Service, which was then a branch of the Cordoba Observatory, was reconstituted and Mr. Davis appointed director at the early age of thirty-four.

The organisation of such a service in a new country where voluntary observers are few was a matter calling for great energy, tact, and perseverance, but so successful was Mr. Davis in his efforts that by 1901 the seventeen meteorological stations to which he fell heir in 1885 had increased to eighty-eight, and 240 extra rainfall stations had been established. Thereafter the service developed with ever increasing rapidity, and on his retirement in 1915 there were forty-two stations of the first order, 152 of the second order, while rainfall was being observed at 1930 other places. The removal of the central office from Cordoba to Buenos Aires in 1901 enabled the long-cherished scheme of a daily weather map to be realised, and effective co-operation with other South American Republics resulted in the production of a daily weather map which covers 53° of latitude from Para, near the Equator, to Punta Arenas, in Magellan Strait. Mr. Davis established the hydrometric branch of his service in 1902 and was responsible for the dispatch of expeditions to investigate conditions in the Rio Parana, Paraguay and Pilcomayo, and other rivers in Matto Grosso and near the eastern Bolivian boundary. In 1904 he established a magnetic section with a central observatory at Pilar, near Cordoba, from which magnetic surveys of the whole country were organised in 1908 and 1912. In the latter year the systematic measurement of the level of the subterranean waters by means of gauges at twenty-three places was initiated. In February,

1904, Mr. Davis took over, on behalf of his service, from the *Scotia* Antarctic Expedition their sub-Antarctic station on Laurie Island, S. Orkneys, where an unbroken series of hourly meteorological and magnetical observations has since been maintained and upper air research undertaken.

The results of the labours of Mr. Davis are contained in thirteen large quarto volumes of the "Anales" of the Argentine Meteorological Office. Mr. Davis also wrote three works on the climate of the Republic, which appeared at intervals of about ten years from 1889 to 1910, and in 1914 he published his "History and Organisation," which gave a condensed summary of the work carried on during his thirty years of office. Whatever the changes of Government might be, Mr. Davis was always *persona grata* at Government House, and but for the economic crises that set in during 1912 his schemes for the setting up of a solar physics observatory in N.W. Argentina and the establishment of another Antarctic station on the west coast of Graham Land would have materialised. Mr. Davis at the time of his death was the oldest member of the International Meteorological Committee, to which he was elected in 1894. His last appearance at an international meeting was at Berlin in 1910, when he brought forward a recommendation for the introduction of a standard evaporimeter, the subject of evaporation being one to which he had always given great attention. He was elected an Honorary Fellow of the Royal Meteorological Society in 1898, and among other honours received many medals and diplomas from scientific institutions.

In official life, as in private life, he commanded the personal respect and admiration of all with whom he came in contact, and those who had the privilege to work under him could not help being impressed with his untiring industry and the calmness with which he invariably met the exasperating situations that so often arose in a land where the conduct of a large up-to-date scientific organisation is beset with many difficulties. R. C. M.

Obituary.

PROF. WILLIAM GILSON FARLOW.

AMONG the leading botanists of America the name of Prof. Farlow, whose death was announced in NATURE for June 26, stood out, by seniority, by personal influence, and by scientific attainment. Prof. Farlow died on June 3 after an illness of three weeks. He was born in Boston, December 17, 1844, and graduated from Harvard College in the class of 1866, obtaining the degree of A.M. in 1869, and of M.D. in 1870. Doubtless he was one of those who followed the wise advice of Asa Gray: "Graduate in medicine; you never know how it will come in useful afterwards."

After graduation Farlow came to Europe and pursued his botanical studies in Strassburg. The old French Académie had been replaced shortly after the conclusion of the peace of 1871 by a German university, staffed by professors carefully selected for their eminence. De Bary, an Alsatian by birth, was the professor of botany. The study of fungi was a speciality of his laboratory, which was carried on in the cramped rooms of the old Académie. There no doubt the foundations were securely laid for that special study of fungi which Farlow pursued throughout his life. His most notable work at that time was, however, on the ferns; for he was the first to describe the direct origin of the sporophyte from the prothallus by vegetative outgrowth without the ordinary sexual fusion. This phenomenon of "apogamy," though familiar enough to all students now, was in 1874 the first notable digression from the regular alternation described by Hofmeister. Ten years elapsed before the observation of "apospory" by Druery. The discovery of these two cognate innovations has given a fresh impetus to inquiry into the nature of alternation, though alternation itself still remains an unsolved enigma.

After his return to America Farlow was for a time assistant to Prof. Asa Gray; but in 1874 he was appointed assistant professor in Harvard, and in 1879 he received the title of professor of cryptogamic botany, an appointment which he held for a period of forty years. His position became gradually stronger as years passed by, and there was probably among the botanists of America none whose opinion was held in greater esteem than his, while his published work touched a much wider circle than that in his own country.

In America Farlow was a pioneer in cryptogamic botany. His work was largely floristic and systematic. But experimental work was also conducted in his laboratory, and a school was founded, of which a brilliant example is seen in Prof. Roland Thaxter, the monographer of the Laboulbeniaceæ.

Personally Farlow was of small build, active, and most vivacious, with a constant ripple of quiet humour, a capital raconteur, and a charming host. In 1900 he married Miss Lilian Horsford. Together they made their house at Harvard, and their country home at Chocorua in the White Mountains of New Hampshire, places of happy memory to those who were fortunate enough to be their guests. Keenly alive to the duties and aspirations of the Allies, they both worked hard for the cause during the war.

Farlow was the recipient of many honours, being LL.D. of Harvard (1896), of Glasgow (1901), and of Wisconsin (1904), and Ph.D. of Upsala (1907). He was a member of the National Academy of Sciences and of the American Philosophical Society, and was president of the American Association for the Advancement of Science in 1906. He was Foreign Fellow of the Linnean Society of London (1892) and of the Academy of Sciences of Paris, as well as of many other scientific bodies in his own country and abroad. For the first twenty years of its existence he was co-editor of the *Annals of Botany*. Personally he was well known in this country by reason of repeated visits, and was heartily appreciated both for his social and his scientific qualities.

F. O. B.

NOTES.

PARTICULARS respecting the Government competition for the construction of aeroplanes and seaplanes on the lines of increased safety, to which allusion was made in NATURE of August 21, have now been published, and are obtainable from the Air Ministry. The following prizes are offered:—For aeroplanes of small type: First prize, 10,000*l.*; second prize, 4000*l.*; and third prize, 2000*l.* For large-type aeroplanes: First prize, 20,000*l.*; second prize, 8000*l.*; and third prize, 4000*l.* For seaplanes: First prize, 10,000*l.*; second prize, 4000*l.*; and third prize, 2000*l.* The latest date for entries is December 31 next. Sir H. H. Shephard has instituted a memorial to his son, the late Brig.-Gen. G. S. Shephard, in the shape of prizes for members of the Royal Air Force for essays relating to aviation. This year the prizes are to be awarded for essays on "Sea and Fleet Reconnaissance" and "Aerial Navigation and Pilotage." The administration of the annual competitions is to be carried out by the Air Council.

AN International Exhibition of Aeronautics is to be held in Paris from December 19 to January 4 next. There will be eleven groups of exhibits as follow:—Aerostatics; heavier-than-air apparatus; motors and propellers; sciences; art; structural materials; transport and shelters; cartography and bibliography; commerce; motor navigation; and various industries.

THE annual general meeting of the Institution of Mining Engineers will be held at the University, Birmingham, on September 10–12, when the following papers will be read, or taken as read:—"Report of the Committee on the Control of Atmospheric Conditions in Hot and Deep Mines"; "Training of Officers and Men of the Tunnelling Companies of the Royal Engineers in Mine-rescue Work on Active Service in France," G. F. F. Eagar; "A New Method of Working Thick Seams of Coal at Baggeridge Colliery," D. S. Newey; "Protractors," T. G. Bocking; and "Magnetic Meridian Observations: A Method of Utilising the Kew Observatory Records," T. G. Bocking. The following papers will be open for discussion:—"The Difficulties and Dangers of Mine-rescue Work on the Western Front, and Mining Operations carried out by Men wearing Rescue-apparatus," Lt.-Col. D. Dale Logan; "Accidents due to Structural Defects of Apparatus or Injury to Apparatus, and the Future of the Proto Apparatus," Lt.-Col. D. Dale Logan; "The Examination of Coal in Relation to Coal-washing," M. W. Blyth and L. T. O'Shea; and "The Education of Colliery Managers for Administrative and Social Responsibilities," W. Maurice.

THE seventh congress of the Spanish Association for the Advancement of the Sciences is to be held at Bilbao on September 7–12.

A SUMMER meeting of the Royal English Arboricultural Society is to be held at Bournemouth on September 16–18.

WE learn from the *Museums Journal* that it is proposed by the British Cotton Industry Research Association, Manchester, to establish a Cotton Industries Museum, having for its object the illustration of the production of cotton and its utilisation in industry.

WE much regret to have to announce the death on August 23, in his eighty-fifth year, of Dr. A. G. Vernon Harcourt, F.R.S., lately Lee's reader in chemistry at Christ Church, Oxford.

WE announce with regret the death on August 20, in his fiftieth year, of Dr. L. W. King, assistant keeper of Egyptian and Assyrian antiquities in the British Museum, and professor of Assyrian and Babylonian archæology in the University of London.

BY the death at the age of sixty-five of Sir W. H. St. John Hope has been lost one of the greatest authorities on British archæology the present generation has known. When in 1885 he was appointed assistant secretary of the Society of Antiquaries, a post which he held for twenty-five years, his life-work as an archæologist began. Soon after leaving Cambridge Sir W. St. John Hope took up the study of ecclesiastical architecture, monumental brasses, and heraldry, and he communicated numerous papers on these subjects to *Archaeologia*, the *Archaeological Journal*, and the Proceedings of local societies. His monograph on Fountains Abbey and those on the cathedral church and monastic buildings of Rochester are noteworthy examples of research and exposition. His chief work, however, was the description of Windsor Castle, undertaken under royal patronage, which was published in 1912. He was closely associated with the leading archæologists of his time, to whom his loss is irreparable, and he leaves no successor so well equipped in many fields of learning.

THE gold medal of the Hyderabad Archæological Society, which was instituted as a memorial to Sir A. Fleetwood Pinhey, the founder and first president of the society, has been awarded to Mr. H. Cousens for his work, "Bijapur and its Architectural Remains."

ACCORDING to *Science*, Mr. D. B. MacMillan, the leader of the Crocker Land Expedition, is to leave next summer on an exploring expedition to the Arctic regions, and will be provided with a small schooner, to be named the *Bowdoin*, with auxiliary power, built to withstand the pressure of ice-floes. The expedition party will probably number ten, and be absent for two or three years, engaged in work for the National Geographic Society.

AN expedition to Africa under the auspices of the Smithsonian Institution is in progress. Its main object is to supplement the collections of African animals and plants and ethnographical specimens already possessed by the U.S. National Museum, particularly the collections made by Col. Roosevelt. Although the museum has considerable collections from various parts of the West Coast of Africa, it is very deficient in specimens from the interior and South Africa, and these it is hoped to supply by the present expedition, which is under the leadership of Mr. E. Heller, and will be abroad for at least a year. It is proposed to utilise the kinematograph for taking pictures of the animals and primitive peoples met with.

THE report for 1918 on experiments on animals in Great Britain and Ireland has just been published (price 2*d.*). There is a marked increase over 1917 in the total number of experiments; this increase is due partly to the great development of Army hospitals and Army laboratories, and partly to the ever-growing demand that the whole study of national health and efficiency shall be advanced and maintained by all the resources of science. Twenty-three new places, mostly for Army work or for municipal work, were registered in 1918; and eight places, having served their purpose, were removed from the register. The vast majority of the experiments were inoculations, or of that class of experiments, made on behalf of Government

Departments and public health authorities, and for the preparation, testing, and standardising of sera, vaccines, and drugs. Much of this bacteriological and pharmaceutical work has been done by women; there was great need of their help, so many of the men being away on active service. In the administration of the Act relating to experiments on animals (39 & 40 Vic. c. 77) the Home Secretary is assisted by a permanent advisory body—Lord Moulton, Sir Anthony Bowlby, Sir John Rose Bradford, Sir Horatio Donkin, Sir Alfred Pearce Gould, Sir Seymour Sharkey, and Sir Charters Symonds.

A BRITISH munition dump exploded near Bailleul on August 8, causing the destruction of the recently built part of the town, and being, perhaps, responsible for the series of air-waves the effects of which were widely observed in the south-east of England on that day. Mr. R. B. Marston, writing to us from 160 Denmark Hill, S.E., noticed a sudden and prolonged shaking of an open window at about 1.10 p.m. G.M.T., followed after a minute or two by another and less pronounced shaking. At Caterham windows were shaken shortly after 1 p.m. At Norwich unfastened windows rattled violently at 1.10, 1.11½, 1.12, 1.12½, and again at 7.5 p.m.; and similar effects were observed at Wymondham, Attleborough, and other places in the neighbourhood. Bailleul is 11 miles south-west of Ypres, and about 135 miles from London and 140 miles from Norwich.

IN the *Museum Journal* (vol. ix., Nos. 3–4) for September–December, 1918, Mr. Theodoor De Booy gives an interesting account of explorations in Venezuela. He shows that the tribes known as Tucucus, Irapenos, Pariris, Macoas, Rio Negro and Rio Yasa Indians all belong to the great Motilone family, deriving their names from the rivers to the south of Machiques, the head-waters of which they frequent. Up to the present little has been known of the Motilones, who are to this day regarded with great dread by the Venezuelans, who are unwilling to penetrate into their forest retreats. Their nomadic habits are due to the fact that they are constantly at war with neighbouring tribes, but they received Mr. De Booy with great hospitality. They differ from the majority of South American aborigines in possessing a strong sense of humour, and they have attained a higher standard of culture than might have been expected, as is shown by his full account of their customs, arts, and industries.

DR. A. M. MEERWARTH, assistant curator of the Ethnographical Museum, Petrograd, has compiled for the Government of India a useful guide-book to the collections in the Indian Museum, Calcutta, of objects collected from the Andamanese, Nicobarese, and hill tribes of Assam. Though the museum contains much valuable material, this was collected only in a casual way, and there are many gaps in the series of the Mishmis, Manipuris, and Kukis, while those of the Nicobarese, Abor, Mikir, Khasi, and Garo are far from complete. It is a matter of regret that in the course of the Ethnographical Survey now in progress arrangements were not made to supplement the monographs by a representative collection of illustrative objects. Dr. Meerwarth gives lists of desiderata under the catalogue of each tribe, and now that attention has been directed to the matter the Indian Government should take active measures, before it is too late, to fill up the gaps in the museum collections.

DR. H. J. HANSEN has published, in Monograph xxxviii. (June, 1919) of the *Siboga* Expedition, a systematic account, with analytical keys to the species, of the rich collection made during the expedition of Decapod Crustacea belonging to the family Sergestidæ. Four genera are represented—Sergestes by eight species (three of which are new) Sicyonella by two species (one new), Acetes, and Lucifer. In his account of the hitherto imperfectly known genus Acetes, seven new species of which are described, the author has included descriptions and figures of other examples, chiefly from Indo-Chinese seas, not collected by the expedition. The *Siboga* gathered enormous quantities of sub-adult and adult specimens of the genus Lucifer, so that with these and the good collection at his disposal in the Zoological Museum in Copenhagen, the author has had ample material on which to carry out a revision of the genus. He concludes that of the twelve species previously described only three can be accepted as valid. Details of these three and descriptions of three new species are given.

IT is well known that the various species of Euglena are very sensitive to external influences, such as light, gravity, oxygen, and a supply of organic food material. *Euglena deses* is a sluggish form which is often found on the surface of mud containing a large percentage of organic matter, and Miss Rose Bracher has given in the *Annals of Botany* for January last, an excerpt from which has just been received, an account of the behaviour of this organism as it occurs on the mud along the banks of the River Avon within its tidal region. The Euglenæ are visible on the surface of the mud during the daytime as green patches, but they burrow under the surface during the night, or when placed at any time in the darkness. When covered by the tide they also disappear, but reappear again when the tide goes down if the light is strong enough. This tidal periodicity persists even when the organisms are removed from the tidal influence, for it was found that when placed in a dish in the laboratory they still continued to burrow into the mud at the time of high tide, and this power of response was maintained under these conditions for about three days.

THE Medical Research Committee has issued a report (Special Report Series, No. 34) by Dr. H. M. Vernon, with contributions from Dr. W. C. Sullivan, Capt. M. Greenwood, and N. B. Dreyer, on the influence of alcohol on manual work and neuro-muscular co-ordination. Accuracy and speed in typewriting and in using an adding machine, and accuracy in hitting spots on a target, were used as tests, and both pure alcohol and alcohol in the form of wine and spirit were employed. There was no distinct difference between the two forms of alcohol, and when very dilute (5 per cent.) the effect was about three-fourths as great as when taken strong (37–40 per cent.) for the same amount of alcohol. Alcohol produced some effect in all individuals tested. The degree of effect depended largely on whether the alcohol was taken on an empty stomach or with food; on an average it was twice as toxic under the former condition. In the foodless experiments two subjects respectively made 88 per cent. and 156 per cent. more mistakes after consuming claret (19·4 c.c. of alcohol) and sherry (22 c.c. of alcohol). In the same subjects a similar amount of alcoholic liquid, taken with food, produced no measurable effect, but when the amount was increased to 35 c.c. of alcohol and more, deterioration in results obtained with the tests became apparent.

A STRONG plea for the establishment of a national institute of industrial biology was put forward by Mr. A. Chaston Chapman at a recent conference held under the auspices of the Society of Chemical Industry. There is very inadequate provision made in this country for systematic instruction in industrial

microbiology and for the study of the innumerable problems on which it bears. The first object of such an institute would be to provide for the systematic prosecution of research in connection with any industry in which micro-organisms or enzymes play an important part. Such industries—not to mention brewing and distilling—are, for example, the dairy industry, particularly cheese-making; the bread-making and pressed-yeast industry; tanning; lactic acid making; the treatment of sewage; wine- and vinegar-making, and agriculture generally. Another function would be the specialised training of teachers of microbiology and biochemistry, and the practical instruction of technical employees. A further object would be the provision of organisms in pure culture for use in industry and the housing of as complete a collection of technical micro-organisms as could be got together. No such collection exists in the United Kingdom; scientific and other workers in want of a particular organism are compelled to apply to their friends on the chance that someone may happen to have a specimen, or else must send abroad for it. Whilst much valuable work in microbiology is done in this country, the institutions are scattered and there is lack of co-ordination. Far better results would be obtained if the many closely related problems connected with the activity of micro-organisms and enzymes could be studied in a single institution, adequately provided with all the necessary appliances and specimens, where the various workers would have the opportunity of discussing their problems with one another.

IN a paper on the growth of crystals under controlled conditions (Journ. Washington Acad. Sci., vol. ix., p. 85, 1919), Mr. J. C. Hostetter shows how the faces developed on a crystal may result from a cessation of growth, incipient solution, and then renewed deposition of crystalline material. An octahedral crystal of alum may thus have its edges rounded by solution, and planes of the rhombic dodecahedron appear in place of these edges during renewed growth. These planes maintain themselves, and the original edge never becomes restored.

A COMMITTEE appointed by the council of the Institution of Electrical Engineers to consider the question of patent law amendment has recently presented a report to that body containing the outline of a scheme relating to a proposed Empire patent law; the intention of the scheme is that inventors shall, by means of a single application, be put in a position to secure a patent which shall possess validity in as many parts of the Empire, where patent protection receives recognition, as they may select in each particular case. Adhesion to this scheme should, it is suggested, be left optional to the various parts of the Empire, as also the decision on the question whether changes shall immediately be made in the existing patent laws having force therein. The undesirability of there being two classes of patents in force simultaneously in the same region is appreciated in the report, and it is, in consequence, suggested that the local Act or Ordinance, which it would be necessary to pass to give validity to the Empire patents in any particular region, should provide for such patents being treated in every respect as though they had been granted under the territorial patent law. It is proposed that the Empire patents should, in the first place, be issued in the same way as an English patent, the examination being made at, and the grant sealed in, the Patent Office in London. However, thereafter the Empire patents should, it is suggested, be assimilated with the domestic patents severally in each part of the Empire covered by the grant, questions of validity, infringement, revocation, etc., in relation thereto being dealt with and determined under the local patent laws. It is further recommended that the Empire patents should rest in each region on their own foundation—that is to say, any judgment given in an infringement or revocation action or like proceedings in the United Kingdom, or in any Dominion, etc., should alone operate in that part of the Empire in which the legal proceedings were taken giving rise to such judgment, and should in no way affect the patent in any other part of the Empire to which the grant extended.

READERS interested in the decimal system of weights and measures will remember that, in addition to his pioneer work in steam engineering, James Watt has another claim to the gratitude of posterity in having originated, towards the close of the eighteenth century, that demand for decimalisation and for co-ordination between the units of measure and weight which led in a few years to the conception of the metric system.

Symons's Meteorological Magazine for July shows the exceptionally dry character of the weather over England during the early part of June, and it was not until June 19 or 20 that the prevailing drought was brought to an end. In London the partial drought, which had lasted seven weeks, broke up on June 19, and was followed by cool and showery weather. The map giving the Thames Valley rainfall for June shows that the driest weather occurred in Hampshire and Sussex in the south, and in the central Midlands, where the total rainfall for the month was less than 1 in. At Tenterden, in Kent, the rain measurement was only 0·47 in., and at Hailsham 0·48 in. The August issue of the magazine gives an account of the transfer of the British Rainfall Organisation to the Meteorological Office. The rainfall work will, however, still be carried on at Camden Square by Mr. Salter, who, acting under the Meteorological Office, will be superintendent in charge of the rainfall work. As stated in NATURE of July 24 (p. 409), Dr. H. R. Mill has retired from the directorship of the British Rainfall Organisation and from the editorship of *Symons's Meteorological Magazine*. The Thames Valley rainfall map for July shows that the rainfall over the area was smallest in parts of Berkshire and Hampshire, where the total measurement for the month was less than 1·5 in.

THE *Monthly Meteorological Chart of East Indian Seas* for September contains, as usual, the winds and ocean currents and other meteorological information for the guidance of seamen, which are now of great value for airmen. At the back a chart is given showing the drift of ocean current-papers, issued under the authority of Mr. H. A. Hunt, Commonwealth Meteorologist. The tracks followed by the several bottle-papers are entered on the chart, and some details of each current-paper are given in a tabular form. Fifty bottle-papers are thus dealt with during the years 1908–14, and they show a general drift to the north-eastward from the Southern Indian Ocean towards South Australia and New Zealand. A current is also shown from Western Australia to North-East Africa. These drifts give the resultant direction in the special cases dealt with, but the rate of flow is, for various reasons, untrustworthy. The current-papers secured are only a small fraction of those thrown overboard. To obtain the fifty drifts, without doubt many hundreds of bottles would have been thrown overboard. Some captains make it a system to throw overboard at least one bottle a day. The tracks charted would be more valuable if the numbers of the drifts were given at start and finish, and if month and year were noted along the track.

IN the *Times* of August 15 there is an account of an excursion to the forests of Belgium under the guidance of M. H. Vendelmans, an expert in land reclamation. The historic forest of Soignes has not been seriously injured by the Germans, who were induced by M. Crahay, Director of Forests, to accept double the normal output, about 650,000 cubic ft. of timber in all annually. Promiscuous felling was thus avoided, and the forest retains its former aspect, to all appearances unimpaired. During the war some valuable researches were carried out by the Belgian foresters. The ravages of the fungus (*Peridermium strobi*) which had stopped the planting of the valuable white pine have been arrested by the spraying of the seedlings. Ash seed gathered early and sown immediately, *e.g.* on August 16, has been found to germinate freely in the following season, while seed gathered in October and sown in spring does not come up until the second year. This discovery of hastening the germination of ash, hawthorn, etc., which "lie over" ordinarily for a season, is not new, but has seldom been acted upon, as foresters feared that early gathered seed, being immature, would produce feeble seedlings. Worthless sandy tracks in the Campine are successfully afforested after preliminary cultivation, mainly with yellow lupine, which adds humus to the soil. Japanese larch and Sitka spruce have proved very successful in such soil, being as valuable species in Belgium as they are in England.

THE fundamental importance of a knowledge of the properties of the refractory materials used in high-temperature furnaces has been for some time recognised by the United States Government, and the Bureau of Standards has for the last two or three years been engaged in researches on the subject. The quartz or ganister bricks used for furnace work in the States are made mainly in Pennsylvania from crushed and ground quartzite rock. About 2·5 per cent. of lime is added, and the mixture moulded in steel moulds, dried and burnt in kilns at 2500°–3000° F. The best procedure to be followed in these processes, and the effects of variations of the procedure, are discussed in Technologic Paper No. 116 of the Bureau by Mr. D. W. Ross, and the effects of repeated burnings on the constitution and microstructure of the bricks by Messrs. H. Insley and A. A. Klein in No. 124. It appears that the quartz is converted on heating into cristobalite and tridymite, which are both of lower density. Unless this conversion is completed during the original burning, the resulting brick will expand on further heating, with serious results to the structures of which they form a part.

THE June issue of the Proceedings of the National Academy of Sciences of the United States contains a paper on the temperature of the human skin by Messrs. F. G. Benedict and W. R. Miles and Miss A. Johnson which throws a considerable amount of light on the conduction of heat from the interior of the human body to the skin. One of the most instructive of the observations made is that of the temperature of different points on the skin of a nude person exposed for 2½ hours to a temperature of 14·6° C. While the internal temperature remained 36·7° C., the temperature of the skin became high up on the chest 29·5°, at the nipple 22°, at the waist 30°, groin 24°, knee 22°, ankle 21°, shoulder 29°, and buttock 21°. A person clothed in the usual way has skin temperatures which differ from each other by 5° C. only, the chest and waist being hottest (34° C.), the buttock and calf coldest (29° C.). The skin temperatures were taken by means of a copper constantan couple in series with a string galvanometer giving a photographic record as the junction was moved slowly over the skin.

MESSRS. ILFORD, LTD., have recently introduced what they call "photographic vision" (or P.V.) colour-filters for use in connection with their various plates. Each transmits just that light to which the plate that it matches is sensitive, so that by looking at any object through either of them the colours of the object will appear of the same relative tone-values as they will be represented if photographed by the plate with which the filter corresponds. The improvement that will be effected by the use of colour-sensitive or panchromatic plates can thus be easily investigated. By adding to the "P.V." filter any colour-filter available for use in conjunction with the plate, the effect of photographing on the given plate and using the given colour-filter is seen at once, so that by trying one after another it is possible to find the colour-filter as well as the plate that will best give the desired result. The convenience of such a method of selecting plates and colour-filters is obvious, especially, perhaps, with artificially coloured objects, such as pictures and stained sections in photomicrography, though this method of trial must be of advantage in all photography except where pure black-and-white is concerned. An account of these with "micro-filters," other colour-filters, and the nature and use of their colour-sensitised, and especially panchromatic, plates will be found in a pamphlet entitled "Panchromatism" that has just been issued by Messrs. Ilford, Ltd. The pamphlet is illustrated with many examples that show the advantages of panchromatic plates in scientific, commercial, and pictorial photography, and gives technical details as to exposure and development that will very much facilitate the use of them and of the colour-filters.

A RECENT issue of the *Organiser* contains a special section dealing with industrial lighting. An article by Mr. Leon Gaster summarises the advantages of good illumination from the point of view of health, freedom from accidents, and efficiency of work, and quotations are made from the report of the Departmental Committee on Lighting in Factories and Workshops in order to indicate the main principles to be complied with. Artificial lighting is also dealt with in an article by M. H. C. Wheat on the lighting of machine-shops. The author attaches importance to the use of gas-filled lamps on the overhead system of lighting, and some effective illustrations of this method are shown. The modern tendency is strongly towards general lighting of this type, which leaves the room clear, enables lights to be well out of the range of vision, and permits rearrangement of machinery without the necessity of disturbing the lighting system. Mr. E. G. W. Souster deals with natural lighting in factories. It is not too much to say that the shape of a modern factory is determined mainly by access of daylight. Expenditure in this direction is fully justified, both by its direct influence on work and by the fact of its enabling an economy to be made in the use of artificial light.

MESSRS. H. K. LEWIS AND CO., LTD., 136 Gower Street, W.C.1, have sent us their July list of additions to their medical and scientific library during the months April–June. The catalogue is one that should be of interest and service to all readers of NATURE desirous of keeping abreast of scientific literature, giving, as it does, particulars of all important books dealing with the sciences published recently in this country and the United States. The list will be sent free to any address upon application.

OUR ASTRONOMICAL COLUMN.

KOPFF'S COMET 1906 IV. = 1919*a*.—Observations of this comet made at Nice and elsewhere early in the month have been published in the *Comptes rendus*, which show the correction of $-7'$ to M. Ebell's ephemeris already noted. This correction is included in the following positions of the comet:—

For Greenwich Midnight.

	R.A. h. m. s.	S. Decl. ° ′
August 29	19 33 45	8 7·3
September 2 ...	19 36 38	8 4·5
6 ...	19 39 58	8 2·5
10 ...	19 43 42	8 0·8
14 ...	19 47 49	7 59·0

A NEW COMET.—A telegram received from Harvard through Paris, which is now the channel for astronomical information, states that a comet of the 8th magnitude was discovered in the constellation Pegasus by Mr. Metcalf on the night of August 20. A second message gives particulars of an observation made by M. Giacobini at Nice on August 22 at 11h. 45m., Paris time. The observed right ascension was then 22h. 46m. 49·5s., declination 28° 22′ 53″ N. Comparison of this with the approximate place given in the first message shows that the R.A. is decreasing 39s., and that the comet is going northward at the rate of 110′ per day. M. Giacobini considers the comet to be of 9th magnitude.

DISTRIBUTION OF GLOBULAR CLUSTERS AND SPIRAL NEBULÆ.—Dr. Harlow Shapley continues his ingenious researches into the structure of the universe in Contributions from the Mount Wilson Observatory Nos. 160 and 161. He here concerns himself largely with the distance of the clusters, and makes the point that if there is obscuring matter in the equatorial segment of our system which blocks out these clusters, all the clusters within a conical space should be so blocked out. But his diagram of the positions of these clusters drawn to scale shows that many of them are seen which are within this cone, so that the argument for the obscuring matter fails.

A PLANET BEYOND NEPTUNE.—Prof. W. H. Pickering points out (Harvard Circular, No. 215) that, according to measures of Harvard plates made by Prof. Russell, Neptune has recently begun to deviate from its computed position, as it would if perturbed by an unknown outer body, as shown by him in Harvard Annals (vol. lxi.) in 1909. The deviation is slight, being at present only 2″, and this, according to the investigation cited, was not expected until 1924. At its next opposition, December 30, 1919, this hypothetical planet should be located in R.A. 6h. 35m., dec. 23° N., and it is suggested that not only should search be made for this—though it will be difficult, for the place is in the Milky Way, where there are countless stars brighter than the object looked for—but rather that the position of Neptune should be observed as completely as possible.

PHOTOPHORESIS.

THE ratio of the surface area to the volume of a spherical body varies inversely as its radius. This fact led F. Ehrenhaft (*Ann. d. Phys.*, lvi., 81, 1918; cf. *Phys. Zeit.*, xv., 608, 1914; and xviii., 352, 1917) to use small spherical particles of various substances, produced either by volatilisation or by burning an electric arc between electrodes of the substance in an inert atmosphere, in his examination of the forces exerted by stationary light radiation on matter. Such particles, suspended in argon or nitrogen, were introduced into a small observation chamber, which was strongly illuminated from the side, the observations being made with a microscope placed perpendicular to the illuminating pencil of light. Ehrenhaft concentrated the light from an arc—with exclusion of the ultra-violet and infra-red rays—to a small conical pencil, with a diameter of only 1/10 mm. at its narrowest part. The behaviour of the small spherical particles in and near the region of most intense illumination was studied.

Outside the illuminating pencil all particles fall under gravity, but within it some travel in the direction of the light ("light-positive"), and others in the opposite ("light-negative") direction. To this phenomenon of the movement of material particles produced by light radiation Ehrenhaft has given the name "photophoresis." Particles of some substances (*e.g.* water) remain practically uninfluenced by the light; they are "light-neutral."

By the use of an electric field between the plates of the condenser in which a charged particle is observed, it can be kept suspended, and a second symmetrical illuminating system enables one to project light into the chamber from the opposite side. In this way, and with suitable light stops, long-continued observations of a single particle can be made.

The movement of any one particle is quite uniform in a homogeneous field of light; the force exerted on it is thus proportional to its velocity, and inversely proportional to its mobility. Since the velocity of the particle can be determined experimentally, and the mobility by use of the law of Stokes-Cunningham, it is a simple matter to calculate the force of photophoresis on the particle. In Ehrenhaft's experiments these forces were of the order of magnitude 10^{-11} to 10^{-9} dyne.

The force of photophoresis on particles of the same colour[1] and hence of the same size is independent of the pressure of the gas in which they are suspended, even when the mean free-path of the gas molecules is large compared with the size of the particles. Irene Parankiewicz (*Ann. d. Phys.*, lvii., 489, 1918) made observations on a single particle in an inert gas at different pressures, and found the force exerted on the particle to be independent of the pressure.

Particles of any one substance (*e.g.* selenium) of the same size attain different velocities in the gases hydrogen, nitrogen, and argon, but the photophoretical force $\left(=\frac{\text{velocity}}{\text{mobility}}\right)$ is found to be completely independent of the nature of the gas, though it increases with the intensity of the incident radiation. Photophoresis thus depends solely on the nature of the substance of which the particles are composed.

Of the elements so far examined, Na, K, Cu, Ag, Au, Mg, Zn, Cd, and Hg have been found to be light-positive, whilst Tl, Sn, Pb, P, Bi, S, and I are light-negative. The behaviour of the elements As, Sb, Se, and Te is noteworthy. When they are volatilised in pure, dry, inert gases, two kinds of particles result, one kind moving in the direction of the light and the other in the opposite direction. They are thus separable by light in exactly the same way as a mixture of light-negative sulphur and light-positive silver particles would be.

The photophoresis of light-negative selenium particles is constant and independent of time. Light-positive selenium particles are remarkable, however, in

[1] When the dimensions of the particle are less than the average wave-length of visible light, the natural colour of the substance examined is replaced by the colour of the light scattered by the particle. Particles of a blue colour are smaller than those of a colour corresponding with the less refrangible rays of the spectrum, and Ehrenhaft has been able to use the colour of such particles as a means of estimating their size.

Radiation

that the force exerted on them appears to diminish with time. Now the electrical conductivity of grey, crystalline selenium, cooled suddenly from above 200° C., rises to a maximum and then steadily decreases with time. In the condition of maximum conductivity the selenium has pronounced metallic properties, and this suggests that the strongly light-positive selenium is of this kind, and becomes gradually transformed into a more stable and less light-positive modification as time proceeds. Tellurium appears to behave similarly.

In continuation of Arrhenius's work on comets' tails, Schwarzschild applied the theory of light pressure to objects of the order of magnitude of the wave-length of light, and showed that a scattering of the incident energy occurs on such particles. For any one kind of matter there is, as a consequence, a definite size of particle for which the ratio of the impressed force to the incident energy is a maximum. It is interesting to note that Ehrenhaft found a maximum velocity for particles of a substance of a particular size, the critical radius for silver (light-positive) being in accord with the demands of theory, viz. $9{\cdot}8 \cdot 10^{-6}$ cm. But a maximum velocity exists also for light-negative particles, the critical radius being $26 \cdot 10^{-6}$ cm. for sulphur and $15 \cdot 10^{-6}$ cm. for light-negative selenium particles. In the interpretation of light-negative photophoresis, for which no theory at present exists, it must not be overlooked, however, that spherical particles, say, of sulphur or selenium are apparently attracted by the light, even when their dimensions correspond with several wave-lengths of light.

An interesting astronomical application of the phenomenon of photophoresis has been suggested by F. Zerner (*Phys. Zeit.*, xx., 93, 1919) to explain those anomalous comets' tails, which are directed towards the sun. He refers to the observations by I. Schmidt (Athens) of the 1882 comet, and suggests that whereas normal comets' tails may be composed of light-positive matter, it seems equally probable that anomalous comets' tails are made up of light-negative material. Ehrenhaft's laboratory separation of elements by photophoresis would thus seem to have an analogon in astronomy, and doubtless this point will form the subject of much interesting research in the future.

ROBERT W. LAWSON.

STANDARDS OF MASS.

A CIRCULAR recently issued by the United States Bureau of Standards[1] furnishes information concerning the verification of standards of mass and the most suitable forms of such standards for different purposes. An account is first given of the fundamental and national standards of mass of the United States. The standard is the kilogram, from which the pound is derived by the relation 1 lb. avoirdupois = 0·4535924277 kilogram, a relation which shows that the avoirdupois pound of the United States is the same as the British pound. The distinction between mass and weight is then considered, and it is explained that weight is measured in units of force, and that, as it is not feasible for the purposes of metrology to base the unit of force on some concrete standard force, the unit is derived from the established units of mass and acceleration.

The next section of the Circular is a convenient classification of weights, describing the forms recommended for particular classes of work. Weights intended to be of high precision, such as the primary standards of the various States of the Union or reference standards used by first-class manufacturers, are only accepted for verification at the Bureau if they comply with a certain specification as to material, form, and structure. Unless they are made of platinum or a metal which resists atmospheric corrosion, they must be protected by a plating of gold or platinum. Nickel-plating is not allowed. The material and plating must be such that no discoloration appears on the surface of the weights when they are placed in boiling water or when dried at a temperature of 110° C., as is done in preparing them for test. Manufacturers are advised that in machining such weights the knob, top, and sides should be finished first, next the outer rim of the bottom, and then the central portion of the bottom hollowed out by an amount approximately equal to the volume of the knob. The preliminary adjustment should be completed in the last operation.

As regards the adjustment of commercial test-weights, it is of great practical importance that the means of closing the adjusting hole shall be such that the weights can be readily readjusted, but that the operation shall necessarily involve the defacement of the stamp. Various forms of adjusting plugs suitable for such weights are illustrated and described.

The second half of the Circular is devoted to the verification of weights and the reduction of observations. The different methods of weighing are described and the particular purposes are indicated for which each method is most appropriately applicable. Illustrations are given of the various weighing forms in use at the Bureau, and examples of the methods of comparison, as well as of the computations, are set out in a very explicit manner. The important question of the correction for the buoyancy of the air is very fully treated. As regards the determination of humidity, it is pointed out that the hair hygrometer is almost the only form of instrument that can be used inside a closed balance-case. Such hygrometers should not be verified by placing them in saturated vapour, as this leaves them almost worthless for some time. Brief tables for use in the reduction of observations are appended, and the work is concluded by two very convenient tables giving the equivalents of avoirdupois pounds in kilograms, and *vice versa*, from 1 to 999 in each case.

In its present extended form this Circular is a typical example of the useful publications issued by the Bureau, the aim of which is not only to aid scientific investigation, but also to encourage and facilitate the employment of scientific methods in the commercial world.

[1] "Design and Test of Standards of Mass." Circular of the Bureau of Standards. No. 3, 3rd edition, pp. 89. (Washington, 1918.)

THE FOLK-SONGS OF THE TETON SIOUX.[1]

THE tribe of American Indians selected by Dr. Densmore for the researches now published is the Teton division of the Dakota Sioux tribe, to which the United States Government in 1868 assigned the portion of territory known as the Standing Rock Reservation, comprising some twenty million acres of the provinces of North and South Dakota. Strictly speaking, "Dakota" is the name applicable to the natives rather than to the region, and the largest division of the tribe or nation was known as Ti'tonwaŋ, whence the contraction Teton.

The author, who had previously published two volumes on Chippewa music, has now transcribed, with the help of the phonograph, more than six

[1] "Teton Sioux Music." By Frances Densmore. Pp. xxviii+561+82 plates. Smithsonian Institution, Bureau of American Ethnology, Bulletin 61. (Washington: Government Printing Office, 1918.)

hundred songs, which are recorded and analysed in the present volume. It will thus be seen that the tribe possesses a very elaborate system of folk-songs, mostly associated each with a particular object, and it is to be noted with interest that, with the advent of civilising influences, phonographs have become much sought after by the Sioux themselves.

The distinctly tribal life of the Teton Sioux practically ceased with the suppression of the Sun Dance, the last of which was held in 1881, the final buffalo hunts occurring in the two following years. The sun dance was a most elaborate religious ceremony, in which the sun symbolised the Divine Power. It lasted several days, and, besides the complex ritual involved in the raising of the Sacred Pole and other observances, the leading feature was the self-infliction of bodily torture by the participants as a sacrifice to their deity. In the most severe forms this involved suspending the bodies of the willing victims by skewers and thongs driven through their flesh in the fierce heat of the sun until the victims tore themselves down, lacerating their flesh in the process. In addition, the whole of the assembly would go without food and drink for several days during this period. Each phase of the ritual had its special song. The natives even now deplore the substitution of the white man's religion and education for what they regarded as a discipline in heroism and bravery. It is stated that boys used to go through a miniature copy of the ritual in which they aspired to participate when of adult age.

Another group of songs is associated with certain societies existing in the tribe. Some of these, called Dream Societies, are constituted of individuals who are distinguished by the particular animals which appeared to them in dreams, such as the badger, buffalo, or elk; others were of a military character.

The only musical instrument which figures in most of these songs was the drum, which was of the usual type, but in the sun dance a stiff rawhide was also beaten. The author also refers very briefly to two whistles, one of bone used in the sun dance, the other of wood used in grass dances, which latter is capable of emitting a series of harmonics.

The tone-scale of the songs approximates to the well-known five-tone scale represented by the black keys of the piano, but the intervals are in reality a little different. A noticeable feature is a more or less marked resemblance to some of our present "modern" music, both in the absence of well-defined melody and in the irregularity of the rhythm. A few of the songs, indeed, do appear to possess something in the nature of a tune in them; in others the sequence of notes is very much of the same chaotic character that is so conspicuous at modern recitals. Again, in the rhythm one bar is often in three-time and the next in four—an artifice which Brahms knew how to use with good effect, but which is now commonly employed in order to render music unlovely, and therefore what is described as "thrilling." Again, the voice part is frequently independent of the drum rhythm, the latter being usually in more regular time. It might thus be possible that if suitable harmonics, or rather discords, were added, these songs might appeal to the class of present-day concert-goers who appreciate the attempts of modern pianists to represent "Le Raid des Zéppelins."

What, however, is much more important is the glimpse which this unique collection affords of the highly complex system of primitive poetic and musical art that this tribe of American Indians had built up, which is fast becoming obsolete under the social and educational influences brought into force by the white races.

G. H. BRYAN.

ELECTRICAL PURIFICATION OF CLAYS.

THE phenomena known as electrical endosmose and cataphoresis, whereby matter in a very finely divided or colloidal state is capable of being influenced by an electrical potential, have been extensively investigated. For instance, when a colloidal solution of arsenious sulphide is placed in a cell and a direct current at a potential of 100 volts passed from suitable electrodes through the solution, the colloidal particles tend after a time to collect round the positive pole, leaving a clear zone round the negative pole.

It is found that nearly all substances, if in a sufficiently fine state of division, are attracted either to one pole or the other. It has also been observed that aggregates of certain fine particles can be dispersed and separated by adding to the fluid in which they are suspended minute quantities of alkali in the case of those particles attracted to the positive pole, and of acid to those which are attracted to the negative pole. Moreover, if the particles are not sufficiently susceptible to the dispersive effect of the added electrolyte, they can be made so by being allowed to adsorb some colloid, such as colloidal silicic acid.

This latter discovery has a most important bearing on the clay industry. China clay and ball clay are examples of such aggregates of fine particles, and if a thick slip is made up of the clay and water the addition of small amounts of alkali causes the clay particles to disperse, and the slip, as a consequence, to become much thinner and more mobile, the clay particles remaining in suspension a considerable time and exhibiting vigorous Brownian movement. On passing a current of electricity through such a suspension, the clay particles collect and adhere closely to the anode plate, the water collecting in a zone, substantially free from clay, round the cathode. Impurities in the original clay, such as mica, quartz, felspar, and iron compounds, are either unaffected by the electrical potential and settle out, or attracted to the cathode. A means of purifying clay on a commercial scale can thus be evolved from a consideration of the above phenomena, as was shown by the exhibit of raw and purified clays of the Osmosis Co., Ltd., at the recent British Scientific Products Exhibition.

The commercial equipment for such a process consists of a blunger, settling tanks to allow the coarse impurities to settle out of the suspension, and an Osmosis machine composed of a rectangular trough in which is arranged horizontally a cylindrical metal anode surrounded beneath the surface of the slip and at a short distance away from it by a cathode through which, by paddles or other means of circulation, the clay slip is driven. The cylinder is made to revolve slowly, and by means of a scraper the dried purified clay, containing 20–30 per cent. of water, is collected.

The machine not merely collects the suspended clay and frees it from water, but subjects the suspension to an electrical purification as well, for should there still be in suspension with the clay minute particles of mica, iron, and silica that have not had time to settle out in the tank, these are not attracted to the anode, but for the most part remain in the effluent leaving the trough. Consequently, electrically osmosed clay is a purer product than can be obtained by any method of settling or centrifuging.

The improvements effected by the process are:—(1) Pyritic and other forms of uncombined iron are removed. (2) The sintering temperature of the clay is lowered so that a lower kiln-temperature can be employed, with consequent saving of fuel. (3) Clay can be graded into different degrees of fineness.

(4) Fireclays can be rendered more plastic and more refractory by this treatment.

Another very important application of cataphoresis is the electrical filter-press. In this press the electrical potential is utilised as a means of driving out the water from suspensions of fine particles; thus, instead of needing pressures running up to 20 atmospheres in some cases where ordinary filtration is used, a head of 14 ft. is ample for the purpose in the electrical filter-press. As an instance of the efficiency and speed with which filtering can be accomplished by such a press, a cake of china clay 4½ in. thick containing 25 per cent. of water can be made in less than two hours.

The applications of electrical endosmose or electrical dialysis in various industries is of importance. Gelatine can be freed from all inorganic mineral matter, so that an ashless gelatine can be obtained of a purity which should be suitable for photographic purposes. There is clear experimental evidence that pure colloidal silicic acid can be prepared from sodium silicate and alumina from sodium aluminate by subjecting their solutions to an electrical potential in cells with suitable diaphragms through which the alkali can migrate. These are a few examples of useful developments, but it is evident that an increasing number of important commercial processes may be expected to arise out of the application of the principles underlying the above phenomena.

EVOLUTION IN POTATO-BEETLES.[1]

DR. W. L. TOWER has continued his attack on the "evolution problem" by a further study of Chrysomelid beetles of the genus Leptinotarsa. He first gives an account of the material as it occurs in natural conditions; he then describes the emergence of new attributes and qualities, discovering the relation of these to old characters and their interaction when brought into combination or into competition with existing characters; and, thirdly, he has experimented in Nature, chiefly in the Arizona deserts, with the new forms to see how newly arisen characters, or their combination into specific forms, behave as they meet the conditions of the environment into which they are thrust by the processes of their origination. His most general result is the demonstration that the methods of evolution are heterogeneous, even in these beetles, but "the basis of all methods of change is found to be directly the product of the nature of the genetic factors of composition and their capacity for diverse modes of reaction, especially with factors of the environing complex. Purpose, utility, and kindred concepts have found no support, every change appearing as the chance mechanistic product of the reacting agents; while the product of the reaction either was able or not able to operate under the conditions of origination, so that survival is decided at once, and not after long and faltering trials."

The characters of organisms are usefully grouped under three chief categories:—(1) The *specific properties* or *qualities* which cannot be altered without change in the identity of the kind; (2) *attributes* belonging to and distinguishing members of the same species or kind from one another; and (3) *conditions* or "states of being or activity which can be changed or removed without altering the identity of the body or its kind in any way." The central problem of evolution is the origin of diversity or heterogeneity, and Dr. Tower distinguishes two main possibilities: "first, transmutation in the qualities with subsequent adjustments in the attributes and conditions of organisms; and, second, diversity resulting from recombinations (metathesis)." The gametic constitution or hereditary make-up of the organism consists of a number of factors (neither "carriers" of anything, nor fixed units, nor necessarily substances, but agents or centres of activity which make certain results possible) and of a number of determiners which settle which of several possible reactions will come off. "In Nature there is constant and unlimited mixing of these factors and determiners in all kinds of combinations; but out of this complex of interacting agencies certain definite patterns always come, so that the net result is a rather stable population as far as the patterns presented in any given location. The heterogeneity presented, however, is not one of quantity nor of directions of departure, but is at least analogous to the diversity found in many chemical operations where nearly related compounds are easily transmuted into some other through the presence or absence of something whose presence determines a different configuration of the system, and whose absence permits of another and diverse arrangement." The pattern on the beetle's pronotum is, in its way, an intricate system, and the presence of certain form-determiners decides the type. Thus, if we generalise from the beetles, variation is not so much the origin of something distinctively new as a shuffling of the pre-existing cards. It is recombination or metathesis. "The phenomena must be viewed as purely physical in character and of chance occurrence, dependent upon chance gametic agents, combinations, and conditions present, as far as their appearance and frequency in Nature are concerned." But the system in question (or any analogous set of characters), "although complex and the product of many interacting agents, nevertheless acts as a unit in many reactions, passing through the operations of reproduction and crossing in its entirety, or at other times emerging from the reactions changed in relations and arrangements of the elemental simplest characters, indicating altered relations between the conditioning agents." But when the further question is asked how the populations of beetles in different locations have become different, Dr. Tower confesses his inability to give any answer. "I have most earnestly, in this investigation, in numerous instances made effort to certainly discover the productive agents of conditions found in Nature . . . but in no instance thus far have I been able to attain to the desired end of a proof of the actual cause of the conditions observed."

We have not found the memoir very easy to read (and our quotations will in part show why). We think that the author might have focused more clearly the new conclusions he has arrived at. But the volume is the outcome of laborious investigations and careful critical analysis; it is a fine example of the modern transition from plausible speculations to the verifiable experiments. We are not so sure as the author is that science is shut up to mechanistic formulation; and we should like to know how he comes to be so sure that his beetles have no purposes. We notice a few misprints like "Cuèrrot," but they have, no doubt, arisen mechanically.

[1] "The Mechanism of Evolution in Leptinotarsa." By William Lawrence Tower. (Publication No. 263.) Pp. 340+19 pls.+156 figs. (Carnegie Institution of Washington, 1918.)

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

MME. CURIE has been appointed professor of radiology in the Warsaw University.

A SCHOLARSHIP of the value of 1200 rupees has been given to the Madras Medical College by Lt.-Col. W. D. Smith for the benefit of students in chemistry and drugs.

Colorado potato beetle

CAPT. F. DOWNIE, of the South Wales School of Mines, has been appointed head of the new electrical engineering department of Rutherford Technical College, Newcastle-upon-Tyne.

DR. J. K. WOOD, principal assistant in the chemistry department of University College, Dundee, has been appointed lecturer in physical chemistry at the Manchester Municipal College of Technology.

A DEPARTMENT of Italian studies has been established in the University of Manchester, and Dr. E. G. Gardner, of the University of London, has been appointed to the newly instituted chair of Italian.

AN Agricultural History Society has been established in Washington, having for its object the stimulation of interest, the promotion of study, and the facilitation of publication of researches in agricultural history. The president is Dr. R. H. True, and the secretary-treasurer Mr. L. Carrier, both of the Bureau of Plant Industry, Washington.

THE new prospectus of the Merchant Venturers' Technical College, which provides and maintains the faculty of engineering of the University of Bristol, has been received. We note that the courses include schemes of study for persons intending to engage in civil, mechanical, electrical, or automobile engineering. These schemes comprise not only the usual engineering subjects, but also instruction in French and German for scientific purposes, as well as in book-keeping, accountancy, works administration and organisation, commercial law, and estimating and writing specifications.

AN interesting and useful piece of work has been inaugurated by the Staffordshire Education Committee, viz. the placing of an exhibit in flower-shows throughout the county embodying the life-histories of some of the most troublesome insect pests which infest gardens and orchards; a prepared collection of potato diseases which are prevalent in the county, with instructions how to control them; varieties of potatoes grown on the county demonstration plots, all of which varieties are resistant to black scab or wart disease; early varieties of culinary and dessert apples; samples of bottled fruit and vegetables, fowl and rabbit; bees, with model hives and full complement of apparatus; and diagrams and charts demonstrating the best methods of planting, pruning, and training fruit-trees. Pamphlets on the subjects are also distributed. An expert pruner and propagator of fruit-trees is to be appointed for the purpose of furthering fruit-growing in the county.

THE London County Council has issued its "Handbook of Classes and Lectures for Teachers" for the session 1919–20. The lectures are available to all teachers actually employed in teaching within the administrative County of London, irrespective of the particular institution at which they may be engaged. Teachers employed in teaching elsewhere than within the administrative county may be admitted where accommodation permits. Among the courses of lectures in science the following may be mentioned:—Five lectures on practical astronomy for schools, by Prof. T. Percy Nunn, at the London Day Training College, on Wednesdays at 6 p.m., beginning on September 24; ten lectures on the history of the development of fundamental principles of physics, by Prof. Bragg and Mr. Orson Wood, at University College, on Tuesdays at 5.30 p.m., beginning on March 16, 1920; ten lectures on modern views of electricity and matter, by Prof. O. W. Richardson, at King's College, on Saturdays at 10.30 a.m., beginning on October 4. There will also be courses of lectures on experimental psychology, the experimental study of children, psycho-analysis, and psychological problems in special schools. Copies of the handbook can be obtained on application to the Education Officer, L.C.C. Education Offices, Victoria Embankment, W.C.2.

AN interesting address delivered at Manchester to the newly formed Association for the Scientific Development of Industry by Mr. E. C. Reed, of London, on "Education for Genius," has been published in pamphlet form (The Abbey Press, Westminster, 31 pp., price 6*d*.). Mr. Reed propounds the theory that it is possible, given the necessary facilities, to educate for genius, and thereby increase largely the world's supply of geniuses in every department of productive life. It is argued that by developing natural aptitude, by training and deepening the intuitive and allied faculties of the superconscious mind, the supply of genius can be much enlarged. Talent is defined by the author as labour *plus* aptitude, and genius as labour *plus* natural aptitude *plus* intuition, and the latter, it is contended, can equally be made the subject of training. But this is surely to beg the whole question. Speaking of the genius which produces great art, Ruskin truly and forcibly says in "Modern Painters" that every system of teaching is false which holds forth "great art" as in any wise to be taught to students. Great art is precisely that which never was, and never will be, taught; it is pre-eminently and finally the expression of the spirits of great men. And in his "Joy for Ever" he further remarks:—"You have always to find your artist (your man of genius), not to make him; you can't manufacture him, any more than you can manufacture gold. You can find him and refine him; you dig him out as he lies nugget-fashion in the mountain stream; you bring him home, and you make him into current coin or household plate, but not one grain of him can you originally produce." That "genius must frequently waste its years and dissipate its efforts in trying to make headway against an indifferent or hostile atmosphere" may be freely admitted, and it must therefore be the business of the nation to create for its nurture a sympathetic and appreciative environment, "in which all phases," as the author of the address observes, "of intellectual and cultural activity, mechanical, literary, æsthetic, are each highly developed and equally honoured." The address is well worthy of thoughtful study.

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, August 4.—M. Léon Guignard in the chair.—G. **Humbert**: The formation of a fundamental domain of an automorph group.—P. **Marchal**: The evolutive cycle of the woolly Aphis of the apple-tree (*Eriosoma lanigera*). It has been proved that in America the American elm harbours the sexual generation of American blight, whilst the apple and some other trees of the same group act as intermediate hosts. In Europe the cycle would appear to be different; the sexual generation does not occur, and the species is continued during the winter by hibernation on the apple-tree, the reproduction being parthenogenetic.—E. **Ariès**: The density of the saturated vapour of propyl acetate and the density of the liquid emitting this vapour.—A. **Denjoy**: Riemannian integration.—N. E. **Nörlund**: The polynomials of Euler.—R. **Garnier**: The irregular singularities of linear differential equations.—E. **Kogbetliantz**: The integral of Angelesco.—C. **Trémont**: New methods for the mechanical testing of metals. Description and diagrams of two simple pieces of

apparatus for measuring the tensile strength and resistance to shock of metal test-pieces of very small dimensions.—E. **Esclangon**: The mechanical transformation of sidereal time into mean time. Calculations of simple gears show that with four wheels having 119, 330, 317, and 314 teeth the conversion can be made with the loss of only one second in eight years; with wheels having 188, 465, 563, and 227 teeth the error can be reduced to one second in 249 years.—P. **Roubertie** and A. **Nemirovsky**: Some new fluorescent screens for use in radioscopy. As a substitute for platinocyanides in radioscopic screens, cadmium tungstate has given good results. This material forms screens which are stable in air, and unaffected by prolonged exposure to X-rays. —R. **Levaillant** and L. J. **Simon**: The action of chlorosulphonic acid on methyl sulphate. The preparation of methyl chlorosulphonate.—G. **Mignonac**: The synthesis of ketimines by the catalytic method. A mixture of ammonia and the vapour of a ketone passed over thoria at 300°–400° gives a ketimine of the type R.C(NH).R′. The method fails with fatty ketones, condensation products of the ketimines being produced. The preparation and properties of methylphenyl-, ethylphenyl-, *cyclo*hexyl-, and diphenylketimines are described.—L. **Daniel** and M. **Thoulet**: Shell deposits in the neighbourhood of Erquy (Côtes-du-Nord).—H. **Coupin**: The absorption of mineral salts by the root-tip. The root-tip can absorb mineral salts in solution, and these are freely utilised by the growing plant.—P. **Vayssière**: Some methods for the destruction of crickets and their application. Trials were made of flame projectors, poison gas, and arsenical pastes, and all of these can be used with success under certain conditions. Sprays of chloropicrin (50 per cent.) can be used where a flame is inadvisable, and arsenical pastes in places where there are no animals at pasture. Special organisations under direct State control will be necessary if these measures are to be carried out effectively.—H. **Violle**: The peroxydases in milk. The peroxydase reaction cannot be used to judge the quality of a milk; normal milk from a healthy cow may contain very little peroxydase, whilst milk from a diseased udder may contain peroxydase in quantity.—W. **Kopaczevski** and A. **Vahram**: The suppression of anaphylactic shock. The injection of solutions of sodium oleate, sodium taurocholate, sodium glycocholate, or of saponin five minutes before the second injection of serum completely suppresses the anaphylactic shock in guinea-pigs.—J. **Amar**: The elastic force of diseased lungs.—V. **Galippe**: New researches on the presence of living organisms in the cells of the male genital glands (microbiosis, normal or accidental parasitism).

August 11.—M. Léon Guignard in the chair.—A. **Lacroix**: A scapolite from the Madagascar pegmatites, constituting a precious stone.—G. **Bigourdan**: The observatory of the Mazarin College. —M. **Portevin**: Certain defective fractures of test pieces taken across the steel bar.—A. **Cornu-Thénard**: Tests of flexure by shock on notched bars.—A. **Schaumasse**: Observations of the periodic Kopff comet made with the bent equatorial at Nice Observatory. Positions for August 4, 6, and 7 are given, together with positions of the comparison stars. On August 4 the comet was of the 10th magnitude, the nebulosity being about 3′, showing a diffuse central condensation.—J. **Guillaume**: Observation of the periodic Kopff comet (1919*a*) made with the bent equatorial at Lyons Observatory. Position given for August 7. —D. **Faucher**: Contribution to the study of the lacustrial levels and fluviatile levels of the lower valley of the Vardar.—F. R **du Caillaud**: The Baixo dâ Judia.—M. **Marti**: A measurement of the velocity of sound-waves in sea-water. Direct-measurements in Cherbourg harbour gave the velocity of sound in sea-water at 14·5° C. (density 1·024) as 1503·5 metres per second, a figure notably higher than those obtained by other experimenters.—H. **Abraham** and E. **Bloch**: The application of amplifiers to the mechanical recording of wireless telegraphy signals. —G. **Chavanne** and L. J. **Simon**: The composition of some Asiatic petrols. The method of critical solution temperatures in aniline described in earlier communications has been applied to various fractions of petrol arising from Persian, Sumatran, and Borneo petroleums.—P. **Bonnet**: The relations between the Otoceras layers of Armenia and those of the Himalayas. The Armenian Otoceras-bearing strata have been usually considered as being older than the Himalayan deposits. Fresh observations are given controverting this view, and tending to prove that the strata are of the same age.—L. **Gentil**: The origin and morphological characters of the *rideaux* in chalk districts.—J. **Rouch**: The diurnal variation of the wind velocity in the atmosphere. Tabulation of the results of a series of experiments with balloons.—G. **Guilbert**: The scientific prediction of the weather. —L. **Blaringhem**: The heredity of the facies of *Capsella viguieri*.—A. **Guilliermond**: The chondriome and the ergastoplasmic formations of the embryonic sac of the Liliaceæ.—F. **Vlès**: Remarks on the absorption spectra of the hæmoglobins from Annelids. The spectra of the hæmoglobins of certain invertebrates and those of mammals present small, but distinct, differences.—L. **Vialleton**: The epiphyses and cartilage of conjugation of the Sauropsidæ.

SYDNEY.

Linnean Society of New South Wales, May 28.—Mr. J. J. Fletcher, president, in the chair.—Dr. R. J. **Tillyard**: A fossil insect wing belonging to the new order Paramecoptera, ancestral to the Trichoptera and Lepidoptera, from the Upper Coal Measures of Newcastle, New South Wales. This wing, which is perfect except for a small piece missing at the apex and a very small area of the base covered over by rock, was discovered in February, 1919, by Mr. John Mitchell at Belmont, N.S.W., and is named *Belmontia mitchelli*, n.g. et sp. It is clearly related to both the Mecoptera and Protomecoptera, but is definitely of the type found in the most archaic Lepidoptera and Trichoptera, though with a greater number of branches to both the radial sector (seven) and the media (five). The posterior arculus is remarkably well developed, and is shown to be a true branch of M, which should be denoted by M_5. The wing can be easily restored, the only points in doubt being the shape of the jugal lobe and the position of vein 3A. In discussing its affinities the author compares it very fully with the forewing of the genus Rhyacophila, and shows that the latter is derivable from it in every single detail by reduction. The same is true of the Micropterygidæ within the order Lepidoptera. Reasons are also given why the Megaloptera and Planipennia may also, very probably, be derived from this type of wing; but its relationships with the Diptera are doubtful, and with the Mecoptera they are definitely *collateral*, not ancestral. The wing shows that at least two Holometabolous orders were present in Upper Permian times, the Mecoptera having been already discovered in the same locality.—Prof. T. H. **Johnston** and O. W. **Tiegs**: Pseudobonellia, a new Echiuroid genus from the Great Barrier Reef. The outstanding features of the animal are:—(1) The Bonellia-like form of the body of the female; (2) the presence of two uteri; (3) numerous simple anal glands opening directly into

the rectum instead of into anal vesicles; (4) the ovary is restricted to the extreme posterior end, and is transversely situated; (5) presence of a well-defined siphon associated with the anterior part of the intestine, with which it communicates by means of a greatly folded region; (6) the presence of a distinct invagination of the body-wall between uterine openings (in this invagination, which the authors call the male tube or androecium, a tiny degenerate male is lodged); (7) though the female possesses from two to four ventral hooks, the male is devoid of them; (8) the presence of two vesiculæ seminales; and (9) the partial fusion of the male with the female, its posterior end being more or less enveloped by the tissues of the androecium, so that there is a very pronounced parasitism. The differences between the species under review and those belonging to other genera of Echiuroidea have led the authors to propose a new genus, Pseudobonellia (*P. biuterina*, n.sp.), for this remarkable worm. Various stages in parasitism in sex relationship are referred to in the paper.—Dr. R. J. **Tillyard**: Mesozoic insects of Queensland. Part v. Mecoptera, the new order Paratrichoptera, and additions to the Planipennia. This part deals with six specimens, of which four are named. A new family, genus, and species of Mecoptera are described from the Upper Trias of Ipswich, having a six-branched media, but with the first cubitus cut off short in a peculiar manner. Two very fine wings from the same horizon belong to Trichopterous-like insects, but have certain important differences in the venation, viz. the anal veins primitive and separate and the first cubitus without any apical fork. Together with the two allied genera already described, these are removed to a new order Paratrichoptera. In the Planipennia the same horizon yields a portion of a fine wing closely resembling that of the recent *Megapsychops illidgei*; this is placed in a new genus within the family Prohemerobiidæ. The recent Psychopsidæ are shown to be the direct descendants of these. Some interesting evidence is forthcoming as to the nature of the vein called by Comstock the "posterior arculus," which is shown almost certainly to be a true posterior dichotomic branch of M, and should, therefore, merit the notation M5.

Royal Society of New South Wales, July 2.—Prof. C. E. Fawsitt, president, in the chair.—Miss Marguerite **Henry**: Some Australian fresh-water Copepoda and Ostracoda. The present paper arose out of an investigation of the transmission of worm-nodules in cattle. In this investigation it was necessary to examine all the Crustacea that might have acted as intermediate hosts. Besides material collected at Kendall, where the work was principally carried on, some was collected at Lett River, Blue Mountains, Waterfall, Botany, Dorrigo, Byron Bay, Casino, Bangalow, Orange, Cumbalum, and Corowa. Amongst the sixteen species collected, four were found to be new.—Rev. W. W. **Watts**: Some notes on *Neurosoria pteroides*. Results of an investigation into the structure and systematic position of a very rare fern from tropical Queensland. It was first published by Robert Brown as an Acrostichum, but Mettenius had created for it the new genus Neurosoria. The paper reviewed the work of previous students, and submitted careful notes of an independent examination of the material available in Australia.—J. H. **Maiden**: Notes on Eucalyptus, No. vii., with descriptions of new species. Four species are proposed as new, viz. the "Morrel" of the eastern goldfields of Western Australia, which has hitherto been looked upon as a large-growing form of the red mallee (*Eucalyptus oleosa*); a narrow-leaved mallee from Comet Vale, in the same State; a tree from Bathurst Island, Northern Territory; and a mallee-like species from the summit of the Barren Mountain, Bellinger-Clarence district. Discovery of *E. bakeri* in Queensland, together with additional notes of a technical character in regard to other eucalypts occurring in some of the other States.

BOOKS RECEIVED.

The Occlusion of Gases by Metals: A General Discussion held by the Faraday Society, November, 1918. (Reprinted from the Transactions of the Faraday Society, vol. xiv., parts 2 and 3, 1919.) Pp. 93. (London: The Faraday Society, n.d.) 8*s*. 6*d*.

Fevers in the Tropics. By Sir Leonard Rogers. Third edition. (Oxford Medical Publications.) Pp. xii+404. (London: Henry Frowde and Hodder and Stoughton, 1919.) 30*s*. net.

Menders of the Maimed: The Anatomical and Physiological Principles Underlying the Treatment of Injuries to Muscles, Nerves, Bones, and Joints. By Prof. A. Keith. (Oxford Medical Publications.) Pp. xii+335. (London: Henry Frowde and Hodder and Stoughton, 1919.) 16*s*. net.

Fossil Plants: A Text-book for Students of Botany and Geology. By Prof. A. C. Seward. Vol. iv.: Ginkgoales, Coniferales, Gnetales. Pp. xvi+543. (Cambridge: At the University Press, 1919.) 1*l*. 1*s*. net.

CONTENTS.

	PAGE
War Wounds. By Dr. J. le Fleming Burrow	501
The Face of the Earth. By Prof. W. J. Sollas, F.R.S.	502
Physiological Chemistry. By H. H. D.	504
Our Bookshelf	504
Letters to the Editor:—	
Velocity of Electric Currents.—Prof. Reginald A. Fessenden	505
The Magnetic Storm of August 11–12, 1919.—Dr. C. Chree, F.R.S.; Dr. A. Crichton Mitchell	505
The James Watt Centenary Commemoration at Birmingham	507
Andrew Carnegie	507
Walter Gould Davis. By R. C. M.	508
Prof. William Gilson Farlow. By F. O. B.	509
Notes	510
Our Astronomical Column:—	
Kopff's Comet 1906 IV. = 1919*a*	514
A New Comet	514
Distribution of Globular Clusters and Spiral Nebulæ	514
A Planet beyond Neptune	514
Photophoresis. By Robert W. Lawson	514
Standards of Mass	515
The Folk-songs of the Teton Sioux. By Prof. G. H. Bryan, F.R.S.	515
Electrical Purification of Clays	516
Evolution in Potato-Beetles	517
University and Educational Intelligence	517
Societies and Academies	518
Books Received	520

Editorial and Publishing Offices:
MACMILLAN AND CO., LTD.,
ST. MARTIN'S STREET, LONDON, W.C.2.

Advertisements and business letters to be addressed to the Publishers.

Editorial Communications to the Editor.
Telegraphic Address: PHUSIS, LONDON.
Telephone Number: GERRARD 8830.