THURSDAY, SEPTEMBER 27, 1917.

EDUCATION REFORM.

Education Reform: being the Report of the Education Reform Council inaugurated by the Teachers' Guild. Pp. xxxii+215. (London: P. S. King and Son, Ltd., 1917.) Price 5*s*.

IT would be impossible to say much that is new on the subject of education. For three hundred years, at any rate, the objects, methods, and conditions of education from the nursery to the highest places at the university have been the topic of an unbroken and ever-increasing stream of essays, treatises, and newspaper articles. But here is a book in which everything of importance which has been spoken or written about education is reviewed and put into a new order. A national stocktaking is begun, and the Teachers' Guild has got to work with praiseworthy promptitude to provide for the systematic study of the present state of education in England and of the reforms which are needed. The result is the creation of a council to carry out its business. At the initiatory meeting in April, 1916, it was determined that this body should consist of a president (the first president is Sir Henry A. Miers), vice-president, treasurer, honorary secretary, and not fewer than thirty, nor more than fifty, additional members. But the council was given power to co-opt new members, and this power has been exercised so freely that the council is more than double the size originally contemplated. The wonder is that with so many cooks the broth has not been completely spoiled. The reports of the nine committees afford, however, quite interesting and instructive reading.

Readers of NATURE will naturally turn to the reports on university education and the secondary schools, and will look to the position which it is proposed to assign to natural science. Universities and schools have now got past the stage at which it is necessary to discuss the advisability of admitting natural science to a place in the curriculum, and, of course, there is no committee appointed by the Education Reform Council specially to consider what is admitted by the most conservative of "humanists." With regard to universities, it strikes one that while there is much that is admirable in the report, the committee is not strong enough in representatives of the old universities and of the provincial modern universities. It speaks too much from the London point of view. The report points out the desirability of a large increase in the number of students resorting to the universities, so that education of this type may become more commonly a normal part of the preparation for life, and that graduates should find their way more frequently not only into the professions, but also into active life in every direction. With regard to the view, hitherto so common among men of business in this country, that the "university man" has been by his very training at school and university unfitted for business, the report properly points out that graduates differ among themselves perhaps more than any other body of men with a common status. The universities attract a large proportion of the best ability of the country, and much of this ought to be utilised in directing industry and commerce. It should be added that the whole of it ought to be turned to account in one direction or another for the benefit of the country. The sporting landowner who knows nothing about agriculture and does not understand the management of his estate ought to disappear. In the direction of the definite application of science to industry there can be no doubt that there has been a great improvement of late years in the employment of university-trained chemists and engineers, and there is hope that the interests of agriculture will continue to get help in increasing degree from the universities.

As to school curricula, it seems as though the Committee on Secondary Schools had been too much under the influence of tradition or did not possess the boldness necessary to assign a due proportion of time to natural science in the time-table; for in the scheme suggested on p. 69 four hours a week is the maximum. Referring to the correlation of studies, the committee says:—"Training in expression, oral and written, should be given in connection with almost every subject in the curriculum, while the *methods of science* should permeate the whole course of study." The meaning of the words italicised here is far from clear. Correlation between literature and history, between physics and geographical phenomena, one can understand, but science here seems to mean logic, or at least common sense, which is obvious.

In all these discussions it is not sufficiently kept in mind that from the young student's point of view subjects are divisible broadly into—not literary and scientific, the usual antithesis—but "booky" and "non-booky." The former includes even mathematics, the latter means the study of things. There are minds which revel in the former, while there are others which the printed page seems to repel. Even among the latter it must not be forgotten that tastes differ. A young artist has been heard to say, "I enjoy looking at a flower, but when you begin explaining the uses of its different parts I lose interest in it." Young boys also, as a rule, love experiments of all kinds, but hate explanations, and, notwithstanding what has been said to the contrary, the curiosity of most children is soon satisfied, and it is only in later years that explanation of a fact or phenomenon has an interest equal to that of the fact itself. From all these considerations it follows that pupils should be classified not only according to age or as clever or stupid, but also according to the constitution of the mind and its inclination towards thinking or towards doing. The great principle for the teacher to remember is that, before all things, it is necessary to be interesting to the majority of the class. Without this neither rewards nor punishments will secure real attention. Now to be interesting requires that the subject should be well chosen and the teacher himself filled with the enjoyment of it. To secure this condition more commonly, teachers must be not only better qualified, but also better paid.

Dr. Garnett, chairman of the council, has written an interesting "Foreword" to this book of reports. He directs attention, among other things, to the fact that in some of the most important schools boys on the classical side still learn no science, and to the statements in the report he adds the remark that "the fate of a nation is not likely to depend on the appreciation of music, art, or literature by its rulers, but it may well hang on their appreciation of science." It is to be hoped that the British people, who seem for the present to be fairly well convinced of this truth, will act in conformity with it in demanding that the Government of the country shall no longer be officered exclusively from non-scientific sources.

These reports deal with a great variety of questions, among others with specialisation in schools and universities. In universities the specialisation should not be carried to such an extent as to sever all association with other studies, and especially is it important that science students should not abandon literary studies. Most students, it may be supposed, would shrink from doing so, if only for the sake of the mental refreshment which comes from history, fiction, or poetry in familiar use.

The subject of examinations is dealt with in a report all to itself. We do not now hear so much from the few enthusiasts who, at one time, were for doing away with examinations altogether. The committee says that the evils arising from examinations have been the subject of widespread complaint for half a century. That is true, but it is also shown that this is largely attributable to abuse or defects of the system which admit of remedy. And it is remarked that "in so far as examinations check initiative, it should be noted that candidates for professions whose initiative cannot survive the exact acquirement of the necessary knowledge are not well fitted by nature for such careers." The fact is that where initiative exists it will not be killed so easily. A comparison was made a few years ago between the D.Sc.'s of London University graduated under the original system of pure examination and those who from 1887 onward obtained their degrees on presentation of a thesis and were practically exempt from examination. Contrary to the expectations of those who advocated the change, greatly increased activity in the direction of research has not become manifest as a consequence (see NATURE for November 3, 1910, p. 30). W. A. T.

EXPERIMENTAL EMBRYOLOGY.

(1) *Three Lectures on Experimental Embryology.* By Dr. J. W. Jenkinson. With a Biographical Note by Dr. R. R. Marett. Pp. xvi+130. (Oxford: At the Clarendon Press, 1917.) Price 7*s.* 6*d.* net.

(2) *L'Œuf et les Facteurs de l'Ontogénèse.* Par Prof. A. Brachet. Pp. viii+349+xii. (Paris: O. Doin et Fils, 1917.) Price 6 francs.

THESE two volumes, although they deal with the same subject, are of very different character. Dr. Jenkinson's work aims at being a condensed compendium of the most recent results obtained in this division of zoology. Prof. Brachet's primer, on the other hand, gives a fascinating account of the gradual building up of our knowledge of the mechanisms underlying the development of the egg. He rigidly limits himself in this case to the instances necessary to illustrate his points. The substance of Dr. Jenkinson's book was delivered as three lectures in University College, London, and all zoologists will be grateful to Mrs. Jenkinson for publishing these lectures. Dr. Jenkinson was one of the many men of science who have sacrificed their lives on behalf of their country, but in the division of science which he represented his loss was felt as a peculiarly cruel blow, for experimental embryology has few representatives in England, and amongst those few Dr. Jenkinson was one of the most prominent. From the account of his life by his friend, Dr. Marett, which is contained in this volume, we learn that Dr. Jenkinson began his career in the university by the study of classics and of ancient philosophy, and that he was drawn to the study of biology, not primarily through the love of natural history, but because he regarded the study of the laws of life as the modern counterpart of the questions which had occupied the minds of the ancient philosophers. We can now understand a feature which puzzled many admirers of Jenkinson's "Experimental Embryology," published some years ago, viz. the disproportionate space allotted to the discussion of the views of Aristotle, a subject which to most biologists has only a meagre academic interest.

The volume before us suffers somewhat from being too much crammed with insufficiently digested details to form a text-book of the subject, and must be rather regarded as a sequel to the "Experimental Embryology" referred to above. The first lecture gives a general sketch of some types of embryonic development in order to illustrate the fact that growth, cell-division, and differentiation are the three cardinal facts in embryology which demand explanation. In the discussion of growth Dr. Jenkinson indicates his leaning towards Loeb's theory that growth is due to a chemical reaction, one of the products of which acts as a catalyser to expedite the reaction. This theory, like so many of Loeb's hypotheses, is at first sight attractive, but its entire value lies in its power to be applied in detail. Loeb used it to explain the supposed increase in nuclear matter, which he regarded as the most striking phenomenon of early development, but he measured the increased quantity of this material by counting the number of nuclei without taking into account the fact that the volume of the individual nucleus diminishes as development proceeds. This point is well brought out in a series of figures which Dr. Jenkinson gives.

The second lecture deals with the question of cleavage. A *résumé* is given of some of the more striking results of separating individual blastomeres from each other in different types of egg and allowing them to develop independently

of each other. It is pointed out that this separation gives rise to partial larvæ only, when, owing to the direction of the cleavage planes, different cytoplasmic substances are thereby separated from each other. We may note in passing that an error has been committed by Dr. Jenkinson in dealing with eggs showing the spiral type of cleavage. He states that the nephridia of the earthworm are derived from descendants of 2*d* (an ectodermal cell), but those of the leech from cells which are daughters of 4*d* (the mother-cell of the cœlomic mesoderm). The fact is that it was in the development of the leech that Whitman first demonstrated the ectodermal origin of the nephridia, and this was proved to be true for a near relative of the earthworm (Criodrilus) by Staff. In both cases 2*d* or its homologue is the mother of the nephridia.

The third lecture has as its title "Differentiation," but it really overlaps to a large extent the second, and is occupied to a considerable degree with the potentialities of isolated blastomeres. The subject of the development of polyspermic eggs is then taken up, and the conclusion is reached that normal development is only possible if each blastomere into which the egg divides receives a full set of the reduced number of chromosomes. Dr. Jenkinson then considers the results of the cross-fertilisation of eggs of sea-urchins with the sperm of forms belonging to distinct genera, orders, and even classes, and arrives at the conclusion that the broad outlines of structure are inherited through the female, and that the male only hands on specific characters. This idea rests on the fact that the foreign sperm is unable to transmute the maternal cytoplasm into a being belonging to a totally different class. But although the cytoplasm has had its properties determined by the maternal nucleus during the ripening of the egg, yet the hybrid organism, which in most features conforms to the maternal type, never survives the early larval stage, at which period the "main features" of its adult organisation are not even indicated. There are also instances, such as the cross between Echinocardium and Echinus, where paternal influence can be detected at a very early period of development.

Dr. Jenkinson allows only a few pages for the most interesting department of experimental embryology, viz. the interaction of parts on one another—or formative stimuli. We can only heartily agree with his conclusion that this is a factor in development of the utmost importance, on which more work is urgently demanded.

(2) Prof. Brachet's little primer is one of the most fascinating volumes which we have ever read. The author was professor at the University of Brussels when the war broke out, but whether or not he is a Frenchman by race, he writes with all the clarity of thought and expression characteristic of the best French scientific men. He succeeds within moderate compass in giving a bird's-eye view of the principal results which have been obtained by the experimental method in embryology, without launching into unnecessary detail. His object is to answer, so far as our knowledge permits, two questions, viz. (1) How does the spermatozoon start the development of the egg? and (2) How is the development guided when it has begun?

With most of his conclusions we should be inclined to agree, and if we must demur to one or two of his deductions it is only fair to add that again and again he reminds us how imperfect is our knowledge in this department of zoology, how few are the types of eggs that have been experimented with, and therefore how provisional must be our theories. For this reason he will not even dignify them with the name of theories, preferring the more modest appellation "hypothèses."

It is natural that each writer on experimental embryology should give a large place to the results obtained from the type of egg with which he is familiar, and just as Driesch's thought has always centred in the sea-urchin's egg, so Brachet in this volume dwells principally on the frog's egg, with the development of which he has chiefly occupied himself. He arrives at the conclusion that the influence of the spermatozoon can be analysed into four separate actions. (1) It brings into the egg a centrosome which initiates the division of the egg nucleus. (2) By its union with the egg nucleus it restores the proper nucleoplasmic relation, and so enables the incipient tendency to divide to be carried through to a successful conclusion. (3) It causes a rearrangement of the organ-forming materials, and so determines the axes of symmetry of the embryo. (4) It transmits the special hereditary qualities of the father. Brachet holds the view, which, as we have seen, Dr. Jenkinson is also inclined to favour, that the main features of the embryo are determined by the cytoplasm of the egg, and are therefore purely maternal, all that is transmitted from the father being the smaller details which characterise his individuality. We have already indicated the reasons which compel us to dissent from this view.

Limits of space unfortunately forbid us to touch on many of the interesting points contained in the volume, such as the resolution of Driesch's entelechy into the results of surface tension, or the demonstration of the means by which polyspermy is prevented in normal development—which differ widely from Loeb's view on the same subject. We can only say, in conclusion, that a rich treat awaits the reader of this volume.

E. W. M.

OUR BOOKSHELF.

La Force et le Droit. Le Prétendu Droit Biologique. Par Prof. R. Anthony. Pp. 194. (Paris: Félix Alcan, 1917.) Price 2.50 francs.

PROF. R. ANTHONY, well known for his fine studies of arboricolous animals, and for his insistence on the evolutionary importance of an arboreal apprenticeship in the case of man's ancestors, has made an elaborate criticism of the view that there is biological justification for

the "Might is Right" doctrine. The argument against which the author advances somewhat heavy guns has been previously shattered by Dr. Chalmers Mitchell and others, but it is interesting to see it crumble under French fire.

According to the theory, the power of conquering in battle is the biological basis of Right, for does not evolution mean progress, and has not selection by means of struggle been the essential factor in evolution? To this Prof. Anthony replies: (1) that evolution is not necessarily a march in the direction of progress; (2) that the selection which results from intra-specific and inter-specific struggle does not appear to have more than an accessory *rôle* in evolution; (3) that the selection resulting from intra-specific struggle, even when this is competitive without actual combat, tends to accelerate processes leading to extinction (progressive specialisation and progressive increase in size), and does not necessarily increase the chances of victory in inter-specific struggle; and (4) that only that form of selection which results from vital competition without combat can help a species to a more complete realisation of its intrinsic tendencies, and that what gives the victory is not superiority in the power of destroying, but superiority in utilising the resources of life.

Prof. Anthony has not taken advantage, as he might have done, of some previous analyses of the various modes of selection, nor even of Darwin's insistence on the subtlety of the concept of the struggle for existence; but his own line of argument is interesting. As it seems to us, however, he pulls his bow far too tightly in his refusal to recognise the quality of "progress" in animate evolution, in his depreciation of the importance of natural selection, and in his theory that intra-specific struggle tends to accelerate processes that make for extinction. He exaggerates elements of truth until they become positively fallacious. J. A. T.

Founders' Day in War Time. By Sir Adolphus W. Ward. Pp. 55. (Manchester: At the University Press; London: Longmans, Green and Co., 1917.) Price 1*s.* 6*d.* net.

MANY readers will be glad to have in this convenient and permanent form the address delivered by Sir A. W. Ward, formerly Vice-Chancellor of the University of Manchester, on March 23 last, at a memorial service for members of the University who have fallen in the war. After explaining the high office of education as "the drawing out, and bringing to a beneficent growth and increase, what has been implanted by nature, aided by circumstance," the address outlines the growth and development of Manchester University from the time when, in the year before that of the outbreak of the Great Civil War, Henry Fairfax petitioned the Long Parliament for the establishment of a northern university, down to the present day. The members of the University who study the address will value increasingly the privilege of their association with so worthy an institution.

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.]*

Shell-shock and its Lessons.

IN NATURE of September 6 there appeared, under the enigmatic title, "The Psychopathy of the Barbed Wire," an exceptionally lengthy review of our little book on "Shell-shock and its Lessons." In it Sir Robert Armstrong-Jones makes no reference whatsoever to the main themes to which practically the whole of the book is devoted. These are, first, the vital importance, in dealing with cases of illness due primarily to specific anxieties and mental conflicts (whether these are caused by the terrifying experiences of warfare or the worries of civil life), of discovering the real nature and causes of these anxieties and conflicts; and, secondly, the urgent need for the establishment of clinics in which patients afflicted with mental disturbance can be treated while they are still sane.

This omission of all reference to the real substance of our book, to the topics with which it is primarily concerned from the first page to the last, is a curious commentary on the fairness of his review.

Instead of giving a real account of the scope of the book, he seizes upon a series of relatively unimportant points—so far as their bearing upon the aims of the work is concerned—and with almost unfailing regularity attributes to us statements which we have never made. As NATURE has given currency to these misrepresentations, we feel bound to ask for the opportunity of correcting them seriatim.

So far as the scientific readers of NATURE are concerned, we could confidently leave the inconsistencies of the review to tell their own tale; but the points at issue relate to far-reaching questions of public policy upon which action has to be taken by men who might perhaps be influenced and confirmed in their inertia by this review.

When we are accused of tending to dwell unduly upon the value of suggestion, hypnotism, and "psycho-analysis," we are forced to doubt whether your reviewer has read what we have said upon these subjects. For we took particular care to emphasise the strict limitations to the usefulness of hypnotism. Only two pages of our book deal with "psycho-analysis," and most of what we have written on the subject consists of a discussion of the various meanings of this term.

But why is no reference made by your reviewer to the vitally important subject of psychological analysis and re-education, to which a whole chapter is devoted?

As regards the question of dream-analysis, which we have also been accused of unduly emphasising, with the experience gained during the last three years in many hundreds of cases of "shell-shock" it is safe to say that the physician who does not analyse his patient's dreams in certain cases must inevitably fail to diagnose the real cause that is at the root of all the trouble. A typical instance has been reported in detail by Dr. W. H. R. Rivers in the *Lancet* of August 18, p. 237, and we could cite scores of similar cases from our own experience. Your reviewer's charge that we have dwelt unduly on dream-analysis can only mean that he is not acquainted with the important work that has been done in this field, and the extensive use that has been made of a measure proved to be quite invaluable for diagnosis and rational treatment.

We regret that Sir Robert Armstrong-Jones has so forgotten the amenities of discussion as to make the unwarranted statement that, "as stated in the introduction, the object of the volume is to rouse a feeling against the British attitude towards the treatment of mental disorder." We are living in busy times, but cannot a reviewer be expected to read at least the first three pages of a book with some care?

From the last-quoted statements the reviewer proceeds:—"Naturally, therefore, and also avowedly, the work is written for the general reader *and not for the medical practitioner*" (our italics). There is no excuse for this statement of your reviewer's, which is in direct conflict with the first paragraph of the introduction. There it is clearly stated that we were asked by members of the medical profession to write the book, for whom it is obviously and primarily intended. But if your reviewer is inclined to say on behalf of his professional brethren, "Lord, we thank Thee that we are not as other men," we might refer him to a leading article in the *Lancet* of September 1, pp. 352–53, in which the opposite point of view is expressed in no uncertain way.

Again, reference is made to our "constant effort . . . to convince the public of the necessity for reform in the treatment of the insane . . . which does not appear to follow as a corollary from a disquisition on shell-shock." As we have already pointed out, the main purpose of the book is to appeal for the reform in the treatment (or, perhaps it would be more correct to say quite frankly, an *appeal for the treatment*) of incipient mental disorder in patients *while they are still sane*. Further, on the first page of our book we explained why we used the popular and official term "shell-shock," and directed specific attention to its inadequacy; moreover, on the second page of the introduction we pointed out that "the problems of shell-shock are the everyday problems of nervous breakdown."

What we have already mentioned in this letter, and urged again and again throughout the book, is that the war has forced us to adopt measures for the treatment of such troubles, and that the lessons so learned ought to compel those in authority to provide for civilians afflicted with nervous breakdown facilities such as have been proved to be so eminently successful in the case of soldiers.

Your reviewer's disquisition on heredity, viewed even from the purely logical point of view, is so self-destructive that we are sorely tempted to leave it as it stands; but as he once more imputes to us statements which we did not make, we are forced to direct attention to them.

In our discussion of the bearing of the question of heredity upon the problems of insanity (chap. iv.) we did not compare the heredity of tuberculosis with that of insanity, as your reviewer claims, but the *attitude of the public towards* this question—a vastly different matter. We speak also (p. 78) of "an attempt justly to appreciate the relative influence of heredity and environment in the case of tuberculosis." Your reviewer's paraphrase of this is, "the authors are men of science who deny that there can be a true inheritance of any microbic disease"! This is a not unfair sample of the methods he has adopted consistently throughout his truly remarkable review.

Arguing in favour of the hereditary factor in the production of shell-shock, he claims that, after digging into the family histories of his patients three generations back for a history of "insanity, epilepsy, paralysis, neurasthenia, or parental alcoholism," he got a positive result in 33 per cent. Might we ask Sir Robert whether it has occurred to him that this implies a negative result in 67 per cent.? Moreover, among his 33 per cent. does he ask us wholly to eliminate, as a causal factor in producing neurasthenia, the influence of the worries and emotional disturbances produced by the social environment upon those who have to live with a drunkard, an irritable neurasthenic, or a lunatic?

"In the absence of this information" (of some neurotic affection in three generations), he says, "it would be incorrect to state that shell-shock cases presented no neurotic family history." We agree, but who made so strange a statement?

If your reviewer's statements on this point have any meaning, it must be the unworthy insinuation that shell-shock is in some way due to heredity. It is true that in 67 per cent. of his cases he was unable to bring into his widely spread net of hereditary influences (assumed to be contributory) any trace of the causal factors to which he quite gratuitously pins his faith. Every reader of NATURE must be personally acquainted with some soldiers suffering from shell-shock, and among them men who before the war were the strongest, bravest, most daring, yet level-headed, members of the community, and with a clean and untainted family history. These are the men against whom Sir Robert Armstrong-Jones makes his unfounded insinuations. These are the men who are said to belong to those psychopathic breeds with "some deeply ingrained defect only curable by extinction of the stock or by its repeated crossing with other more stable stocks"!

What possible justification can there be for branding with this wholly undeserved stigma some of the best and noblest members of our race?

Yet these dogmatic claims are made by your reviewer just after he had confessed that "we have no definite knowledge of what is inherited"!

There are still, however, some more statements "to nail to the counter."

The writers of the book did not claim, as your reviewer says they did, that "there is no anatomical evidence . . . in the cases of psychoneuroses *which they had treated*" (our italics). Our reference (p. 87) was to those cases of psychoneurosis *which yield to psychical treatment*—an entirely different matter.

We fully agree with the remark:—"That shell-shock is entirely of psychic origin and can be overcome by psycho-therapeutics is too sweeping a statement." We do not know who is responsible for this statement, but we certainly did not make it.

If we "appear to underrate . . . the implications connected with physical changes," we hasten to remove such a mistaken impression. But we suspect that your reviewer somehow omitted to read pp. 7 and 8 of our book, in which we not only mention these matters, but also refer our readers for further information to Prof. Cannon's important book on "Bodily Changes produced by Fear, Pain, Hunger, and Rage."

In thus reviewing the review on "Shell-shock and its Lessons," we have confined ourselves (except in the first paragraph) to the issues raised by the critic, who has succeeded in misrepresenting our book with such consistency.

In conclusion, however, may we be permitted once more to repeat that the chief plea of our book has been entirely ignored in this lengthy review? That plea is for the institution of clinics (attached to general hospitals and medical schools) in which sufferers from the milder and early stages of mental disorder may be studied and treated, and thus be helped *before, and not only when*, they have become so deranged that internment in an asylum is necessary

Our book is a real attempt to suggest a remedy for a grave social evil, and measures for the advancement of knowledge and for scientific research. Whether our suggestions are wise or the reverse, at any rate the problems they deal with are of vast importance and worthy of serious consideration. The evil we are

attacking is inertia, the acceptance of theoretical views which in practice mean doing little or nothing, either to cure patients or to add to knowledge. According to the reports of the Commissioners in Lunacy, the recovery-rate of mental diseases in this country is to-day no higher than it was in the seventies of last century. Are we then to rest satisfied with the pessimistic appeal to "heredity," when even those who use this as an excuse for their inertia admit that "we have no definite knowledge of what is inherited"?

G. ELLIOT SMITH.
T. H. PEAR.

The University of Manchester, September 12.

THROUGH the courtesy of the editor of NATURE I have had the opportunity of reading the long comment made by Prof. Elliot Smith, the distinguished anatomist, and by Mr. T. H. Pear, the equally able psychologist, upon my review of their little volume entitled "Shell-shock." As was pointed out, the authors show a lack of practical knowledge of the law as applied to the insane, yet they assert that the main object of the essay is to secure a change in the statutes in order to provide the establishment of clinics in which, to use their own words, patients "afflicted with mental disturbances can be treated while still sane," a problem with contradictory implications, but which is interpreted in the introduction to be "the painful probing of the public wound, the British attitude towards the treatment of mental disorder." As has been stated in the review, this was a corollary that did not seem to follow from the essay, a view also shared by the *Spectator* (September 1), which says that "the authors' assumption, by the way, especially after the statements quoted from the first chapter that the unfavourable termination of shell-shock will be insanity, seems to us somewhat gratuitous." One of the reasons given by the authors for seeking a change in the law is the fact that doctors in British asylums have no adequate knowledge of psychiatry to enable them "to co-operate with the medical schools and the teaching staffs of general hospitals." I claim to be fairly intimate with the knowledge of mental diseases possessed by asylum physicians in this country, and I agree with the two authors' view of their own criticism, viz. that it is well open to the charge of being "superficial, uninformed, and even spiteful" (p. 115), although it is graciously allowed that "there are exceptions to this general statement."

The first pre-requisite in a review is to ascertain the author's opinions upon fundamental facts, and the treatment described in this volume is based upon the authors' views of the hereditary transmission of disease and of the relationship between mind and matter; and because they regard the psychic as the predominant partner, they practically ignore the physical treatment of shell-shock and dwell at length upon the psychic remedies; no adequate place is given in etiology to physical weariness, fatigue, exposure, exhaustion, and the various forms of toxæmia, but an almost exclusive place is given to psychic trauma. The reviewer is criticised for not referring at length to psychological analysis and re-education, but as these are the acknowledged methods employed by all investigators into mental disturbances and are not original, they needed no special elaboration. The reviewer has long taught in his clinical class that the elementary procedure in the treatment of mental cases has been along the lines of the three "E's," viz. explanation, education, and encouragement. In regard to dreams, all psychiatrists realise the occasional help obtained from the latent dream, but the key of interpretation of the manifest dream depends upon the varying code vocabularies employed, and at the moment a certain school is inclined to lay inordinate stress (in the reviewer's opinion) upon the interpretation of dreams, yet it is the vogue, and this, like other fashions, is entitled to its day.

The authors quote with some surprise my record of 33 per cent. of shell-shock cases with a neurotic family history, and erroneously conclude that the remaining 67 per cent. furnish negative evidence of heredity. As the reviewer pointed out, it would be necessary to ascertain the full family history in each of the remaining cases for at least three generations—which would be impossible—before these percentages could be considered to be trustworthy negative evidence; and at best the pedigrees obtained by the clinician are of the most brief and meagre kind. The authors consider it to be a social stigma to belong to a neurotic family, heedless of the fact that the neurotic people do the work of the world, and in startling contrast to the quip of a leading psychiatrist that he would rather be the offspring of a lunatic than of a churchwarden! The authors are eager to proclaim that the essay was written for the medical as well as the lay reader, and the reviewer accepts the correction whilst adhering to the view expressed that it will be most interesting reading for the latter, although rather "thin" stuff for the former.

When critics are at bay and without missiles of offence, a favourite device is the *ignoratio elenchi*, or the fallacy of the irrelevant, which then becomes a welcome weapon, and the authors conclude their comment by endeavouring to hold up the reviewer to obloquy because he had ventured to suggest a *locus resistentiae minoris* in the victims of shell-shock.

ROBERT ARMSTRONG-JONES.

The Convolvulus Hawk-moth.

HITHERTO *Sphinx convolvuli* has been reckoned one of the rarer insects in Scotland. In the last fifty years I know of only two authentic records of its occurrence in Wigtownshire; but this autumn it is abundant. One came into my house on September 7; a correspondent in Perth, a well-known entomologist, tells me that he has examined eight specimens taken in that neighbourhood, and a lady in this county, also a trustworthy observer, counted seven of these fine insects hovering round tobacco plants in her garden and darting their long probosces into the flowers. It is difficult to imagine the cause of the appearance of these moths in such numbers after many years of absence.

The immensely increased area now under potatoes might be expected to result in a corresponding increase in the number of death's-head moths. Unfortunately, however, the habit of all the Sphingidæ is to pass the pupa stage buried in the ground, which, in the case of the death's-head, is cultivated land, and the great majority of pupæ are destroyed in the course of tillage.

HERBERT MAXWELL.

Monreith, September 22.

Vitality of Lice.

I HAD occasion recently to examine microscopically some head-lice (*Pediculus capitis*) under water, and I noticed a phenomenon to which I have been unable to find any reference in standard works.

On first being placed into water contained in a watch-glass the lice struggled, but after a short time there was no activity visible, and life appeared to be extinct. After three-quarters of an hour I poured out the water from the watch-glass and dried the lice. In a few seconds they showed manifestations of life, and within a minute resumed their normal activity, internal metamorphosis and metabolism being visible. This led me to further experiments, and I find that after

being submersed completely for fifteen hours in a beaker of distilled water free from air, they regain their normal activity within a quarter of an hour of their removal from water. I have not yet tried submersion for longer periods, but the subject is of great interest, and I should be obliged if any of your readers are able to throw any light upon it.

HENRY COHEN.
"Avenue House," Petworth Street, Cheetham, Manchester, September 2.

THE AUTUMN MOON.

LUNAR theory has become recently an engrossing study for all, and is not to be classed such a useless abstraction as before. The peculiar behaviour of the autumn full moon in our high latitudes has always attracted the attention of the hunter and farmer, and given it the name of harvest or hunter's moon, according as it comes next before or after the equinox.

This behaviour, which has attracted attention and given the name, will be on view at this full moon; it will be noticed how the time of moonrise will be very nearly the same during the inside of a week, the full moon coming up at sunset, or a little before or after.

The full moon on this September 30 is, then, strictly speaking, the hunter's moon, but may also be called the harvest moon in this backward season. The previous full moon of September 1, coming a month before the equinox, did not show up so clearly to a noticeable extent the peculiarity of a successive rising at sunset, with little or no delay.

The astronomical explanation is simple. At the autumnal equinox the full moon is passing through the ascending node of the ecliptic at the vernal equinox, and its motion from south to north of the ecliptic is quickest.

The usual retardation of rising due to the moon's motion along the ecliptic is diminished by the rapidly northing motion, and the effect is to reduce the retardation from an average forty-eight minutes daily in a month of thirty days to something considerably less, especially in high latitudes, where the retardation may sometimes be wiped out altogether, and the moon will rise earlier for a night or two. The same effect of diminished retardation takes place every month, while the moon is moving through the vernal equinox; but the effect passes unnoticed, as the moon is not full.

We begin by taking the moon to move in the ecliptic, but her orbit is really inclined at about five degrees, and the nodes of the orbit revolve in eighteen years. The effect is not the same, then, every year, but greater or less; and the modification can be investigated on astronomical theory from the numerical data of the Nautical Almanac. In some conjunctions it will be possible to see the full moon travel round the horizon, in a latitude five degrees short of the Arctic Circle, as in the northern parts of Sweden.

The effect is reversed and the retardation of rising is greatest when the moon passes through the autumnal equinox and is receding most rapidly from the pole star, as in the last old and new moon a fortnight ago.

The full moon at the vernal equinox will rise, or set, from an hour to an hour and a half, or two hours, later each night, and advantage can be taken if moonlight is to be avoided.

The words in "Macbeth," "The moon is down . . . And she goes down at twelve. I take 't, 'tis later, sir," would imply a moon about a week old, and moving through the autumnal equinox, making midsummer the time of the play. Shakespeare's education has been called in question, but he can always be relied upon for accurate observation, and is not content to take his natural philosophy out of a book, second-hand and unverified.

The moon is full in passing through the autumnal equinox when the sun is opposite in the vernal equinox—that is, in spring. This full moon will be observed to be very late in getting up and in setting again; but it has not attracted attention, as unconnected with any influence on human life.

It may be called Endymion's moon, from the legend of Mount Latmos, where we may suppose Endymion, an astronomer, had built his observatory within reach of Miletus. In the legend he drew the moon goddess down by the arts of a Thessalian witch, and in the springtime would not let the goddess go in a hurry. The scene has been utilised by Hardy in "Two on a Tower."

Mount Hamilton, with the Lick Observatory on it, resembles Latmos in being within reach of San Francisco. The journey there is a favourite pilgrimage and, in contrast to our Greenwich, visitors are encouraged to cheer up the solitude of the staff, and provide merriment after they are gone by their innocent questions. One Lund divinity visitor was reported to take a great interest in the life of young Endymion, and curious of his habits, she asked, "What do you do all night?" "We take the observations." "What do you do all day, then?" "We reduce the observations." "But why cannot you take your observations the right size once for all?"

The erratic behaviour of the moon in the sky has been a pitfall for artist and poet; the mistakes have provided much amusement to the astronomer. Turner, the artist, has painted the sun setting in the east in his picture of the old *Téméraire*. Hogarth's picture of "The Lady's Last Stake," now gone to America, in which Mrs. Thrale claimed to have sat for the lady's model, is intended to draw a moral on sitting up gambling all night, with the moon looking in reproachfully at the window. But the astronomer recognises a winter new moon, and the hour is about five o'clock tea time, so we may imagine the other members will be knocking at the door and asking, "When are you two coming in to tea?"

We still speak of new moon and old, and so perpetuate the ancient theory of Pythagoras that the moon is not a celestial body coming round every month, but a sort of magic lantern shown on the sky. This doctrine of Pythagoras is still

the orthodox theory in Turkey to-day, and to prove it, the national emblem of the Crescent shows a star shining through the moon; and Coleridge, in the first draft of "Christabel," is reported to have seated a star in the horns of the crescent.

The sun and moon go round like the hands of a clock, hour and minute, on the old Chaldæan estimate of a year of twelve lunations of thirty days. Full moon would occur when the two hands are in lines directly opposite.

A sundial, marked to serve as a moondial, like the old dial at Queens' College, Cambridge, will give forty-eight minutes added to moonlight time for every day of the moon's age, to give the corresponding sun time on the average.

A moon clock of greater accuracy and variation is required to mark the time when the moon is down longer than usual, drawn down in the legend by Thessalian arts, when the witch loves to ride through the air in the dark.

In "All for Love; or, The World Well Lost," Dryden writes:

> Her eyes have power beyond Thessalian charm
> To draw the moon from heaven,

and this was considered just the time for us to be most on our guard, during the coming winter; although this expectation has not been realised of late.

In ancient astronomical lore as well as in poetry, the sun and moon were pictured as living bodies, and an eclipse could be described as drawing them down to earth, the moon and sun.

Prior information of an eclipse was of great service to counteract superstitious fear, and to claim the magic power as on your own side; as in the case of the solar eclipse predicted by Thales, related by Herodotus, occurring in the middle of an important battle.

A lunar eclipse is so common as to attract little attention to-day; the frequent occurrence compared with a solar eclipse attracted the attention of Aristotle. But the lunar theory involved could be utilised by the Thessalian magician, and would have proved valuable to the Athenian general Nicias in his disastrous retreat from Syracuse.

G. GREENHILL.

THE RESOURCES AND PRODUCTION OF IRON AND OTHER METALLIFEROUS ORES.

IN order to meet what has apparently been a want both to those engaged in the iron and steel industry and to those who are interested in obtaining knowledge of the mineral resources on which the industry mainly depends, the Advisory Council for Scientific and Industrial Research has thought it desirable that a report[1] should be compiled summarising the latest information available regarding the iron-ore resources of the United Kingdom, as well as those of other countries. Although a vast amount of information has been published from time to time, it exists mostly in the form of reports and monographs scattered throughout the Proceedings of technical and scientific societies and in the very valuable publications of the Geological Surveys and Mines Departments of this country and of the principal Dominions of the British Empire; also in those of other countries, particularly the United States. Consequently much time and labour have to be spent in searching for the literature on the subject.

The aim of the report, therefore, has been to collect and present in a summarised form the main facts concerning the resources of iron ores and of other metalliferous ores accessory to the metallurgy of iron and steel, and to indicate their composition and character, giving as many analyses as possible of the minerals in every locality, with indications as to their geographical position and accessibility. The report is the work of Mr. G. C. Lloyd, the secretary of the Iron and Steel Institute, and it has been revised and added to by Prof. Henry Louis, of the Armstrong College, Newcastle-upon-Tyne.

The report is divided into three main parts, of which Part i. deals with the iron ores of Great Britain and Ireland and of the British Dominions. It is known that large resources of iron ores exist in the United Kingdom, but in certain districts, owing to their mode of occurrence, as well as the low percentage of iron which the ores contain, it has been difficult to work some of them profitably. Foreign ores, especially those of Scandinavia, which are of high-grade quality, have been imported so cheaply into this country that the native lean ores could no longer compete with them. Native ores have therefore to a great extent been disregarded, and expenditure upon their development has not been worth while on account of the ease with which cheap supplies of much superior ore could be obtained from abroad. The ores of the United Kingdom are described in approximately the following order:—

(*a*) Red and brown hæmatites and magnetites (Cumberland, Lancashire, Cornwall, Devonshire, and the Forest of Dean), and the aluminous ores of Co. Antrim, Ireland. These are estimated at about 500 million tons.

(*b*) Carbonate ores or ironstones (Cleveland, Northamptonshire, Rutlandshire, and Leicestershire), and the calcareous ores of the Lower and Middle Lias (Lincolnshire, Oxfordshire, Wiltshire, and Somerset). Reserves of these are estimated at about 5000 million tons, but it is thought that probably this figure is too low. Both in Cumberland and Northamptonshire new developments in iron-mining are now taking place on a considerable scale. Some attention has also been lately directed to the Cornish iron ores, but it is extremely doubtful whether these can be worked again upon any important scale.

(*c*) Stratified iron ores of the Coal Measures (Scotland, Northumberland, Staffordshire, Derbyshire, Shropshire, and South Wales). Reserves of these are estimated at about 34,000 million tons. In normal times by far the largest proportion of the above quantities cannot be worked with profit.

[1] Department of Scientific and Industrial Research. Advisory Council. (London: H.M. Stationery Office.) Price 2*s.* net.

As regards the production of iron ore, the total amount raised in 1913 was just under 16 million tons, to which Cleveland contributed nearly 6, Northamptonshire 3, Lincolnshire 2·6, and Cumberland 1·3 million tons. The above total compares unfavourably with the output in 1880, which was above 18 million tons. Scotland, which then contributed 2·66 million tons, only produced 0·59 million tons in 1913. Staffordshire also shows a big decline. On the other hand, imported ores had risen from 3 million tons in 1880 to 8 million in 1913, of which 4·7 came from Spain. Thus some 24 million tons of iron ore were raised and smelted in 1913, of which slightly above one-third came from abroad. A total of 10·26 million tons of pig iron was produced, representing an average iron content of 42·7 per cent. in the ore.

The resources of the British Dominions are then referred to, the principal deposits at present known being those of Newfoundland, Canada, India, and Australia. Two of the largest iron mines in the world are situated on the north-western shore of Bell Island, Newfoundland, and from them the Canadian iron industry has drawn its chief ore supplies. Immense resources of iron ore are known to exist in India, but no definite estimate of the quantities available for exploitation has ever been made.

Part ii. gives information of the same kind and so far as it is available with regard to most of the other countries of Europe, Africa, Asia, and North and South America. As regards the iron-ore deposits of the United States, the economic and industrial conditions render it unlikely that those ores will ever be imported into this country. So far as the iron industry of the United Kingdom is dependent on the iron resources of other countries, any supplies drawn from the United States will probably always be in the form of pig iron or semi-finished and finished iron goods.

In Part iii. notes are given of the principal uses, occurrence, and composition of the ores of metals other than iron but used in the iron industry—viz. chromium, cobalt, manganese, molybdenum, nickel, titanium, tungsten, vanadium, and zirconium, including references to the composition of ferro-alloys manufactured from some of these ores.

THE EFFORTS OF FRENCH INDUSTRY DURING THE WAR.

WHILE the various Allied countries are busily occupied in discussing elaborate after-war programmes, there is evidence that France at least has passed the domain of mere theoretical speculation. The Société d'Encouragement pour l'Industrie Nationale recently organised at its headquarters in Paris an exhibition of national industries, the exhibits comprising: (*a*) products manufactured in France since the outbreak of the war, and which prior to the war were all—or nearly all—obtained from abroad; (*b*) products which before the war were manufactured principally in the regions now in enemy occupation and are now manufactured beyond the French Army zone. A description of the exhibits is given in the July-August number of the society's *Bulletin*, and the following brief notes refer to the products of a more or less scientific character.

Quartz and Glass Goods.—MM. Adnet and Poulenc Frères exhibited a comprehensive series of glass and quartz vessels used in chemical and bacteriological work, including some specimens of "tuboserum" glass which M. Adnet has manufactured to replace the neutral Jena glass. Other exhibits included Dewar bottles, nitrometers, gas determination apparatus, clinical thermometers, and a microscope the optical and mechanical parts of which were made entirely in France. Special interest attached to the exhibit of a Coolidge tube, which has now assumed importance in connection with the radiography of metals.

Chemistry.—At the outbreak of war France was practically entirely dependent on Germany or on German-owned companies for her supplies of chemicals necessary for the manufacture of high explosives. The war has changed all that, as is evident from the long list of organic compounds shown at the exhibition now under discussion. A comprehensive series of samples of the coal-tar derivatives was shown, as well as samples of synthetic nitric acid and nitrates obtained from French works. Again, the French have taken up in earnest the manufacture of pharmaceutical products which were essentially German specialities before the war (aspirin, local anæsthetics, hypnotics, etc.), as the list of exhibits shows. Many compounds used in the manufacture of dyes, varnishes, etc., and in connection with photography and radiology were shown. Progress has also been made in the manufacture of compounds of the rare earths, which in peace time were obtained exclusively from Germany, while pure cerium, ferro-cerium, and magnesium (manufactured for the first time in France) have now passed the experimental stage. Three novelties in the way of chemicals were represented in synthetic acetic acid, synthetic acetic anhydride, and synthetic alcohol.

Miscellaneous.—Ebonite, so largely used in scientific instruments of all kinds—especially electrical—had to be obtained from German firms by France at the outbreak of war. Many samples of ebonite goods were included in the present exhibition, and it is hoped that France may after the war be self-supporting in this respect. The French are also taking up actively (as we are in this country) the manufacture of magnetos, and it is hoped, with the advent of better labour conditions, to replace foreign-made goods by the French article.

It would be highly interesting and instructive from the economic point of view if British manufacturers of articles similar to those described organised a comprehensive exhibit on the lines indicated above. The country would then at least know that serious attempts were being made to take action rather than spend time in abstruse arguments which have little value except for the theoretical economist.

E. S. HODGSON.

France — Industries & Resources

NOTES.

MUCH has been said lately about the commercial possibilities of aircraft after the war, and the question of an aerial post has been discussed by a responsible committee; yet to the man in the street such a proposition seemed to be rather far-fetched. The splendid flight made on September 24 by Capt. Giulio Laureati from Turin to London was a most practical and striking demonstration of the possibilities of the use of aircraft, and could scarcely have come at a more appropriate time. Capt. Laureati flew the whole distance of 650 miles without descending in seven hours and twenty minutes, a speed of eighty-nine miles per hour. The wind was adverse, so that the actual flight speed was above this figure. Letters were carried, including one from the King of Italy to our own King; and the Italian morning papers were delivered in London in the afternoon. A more direct proof of the practicability of the rapid delivery of light articles over long distances by means of aircraft could scarcely be imagined. The machine flown was one built by the Società Italiana Aeroplani, fitted with a Fiat engine, a similar machine to that on which the same pilot previously flew 920 miles without stopping—from Turin to Naples and back. The present flight is the longest "international" flight yet made, and the pilot met with a very warm reception at Hounslow, where he landed, and where he was met by representatives of the Air Board, the Admiralty, and the War Office. Capt. Laureati deserves the highest congratulations on his splendid feat, and it is to be hoped that this flight marks the commencement of a new epoch of rapid transit from country to country by means of aircraft, with a corresponding benefit to international trade.

THE August issue of the Proceedings of the U.S. National Academy of Sciences contains reports of the meetings of the Executive Committee of the National Research Council since April 4 last. At the meeting on June 21 it was announced that the Carnegie Corporation of New York had authorised a grant of 10,000*l.* to the Carnegie Institution of Washington for purposes of the National Research Council, with the understanding that disbursements on account of this donation should be made at the discretion of the president of the institution. The committee appointed to consider the question of the organisation of State research committees and their relation to the National Research Council recommended that a letter offering the complete co-operation and assistance of the National Research Council be sent to those State councils which have already organised research committees, and that a letter be sent to the proper officer of all the State councils of defence which have not already organised research committees pointing out that the National Research Council has carefully considered the question of the general organisation of State committees or councils of research, and has come to the conclusion that such organisation should be determined by local needs and conditions. Local causes, such as the development or investigation of natural resources or the proper development of the use of research methods in industries, or the correlation of industries with research laboratories already existing at educational institutions, may make it very desirable to organise such State research committees. In fact, the present emergency offers, in some respects, an unusual opportunity for improving the correlation of industry and research, and it is highly desirable that those concerned with this development should not only consider it with reference to the emergency, but should also plan for the permanent continuance of any research committees which may be formed.

A REPORT presented at the Newcastle meeting of the British Association last year directed attention to the lack of organisation and general neglect of higher geodesy in the United Kingdom. The discussion upon this report led to the extension of the terms of reference of the committee so as to include, in addition to geodesy, other departments of geophysics, such as terrestrial magnetism, tides, atmospheric electricity, and seismology. It was felt that steps should be taken to constitute a committee or association to promote the advance of the various branches of science which deal with the physical, metrical, and dynamical properties of the earth, on both their theoretical and observational sides. We are glad to learn that such a committee has been appointed by the British Association and has arranged meetings for the discussion of geophysical subjects. The first meeting will be held in the apartments of the Royal Astronomical Society on Wednesday, November 7, at 5 p.m., and will be presided over by the chairman of the committee, Sir Frank W. Dyson, the Astronomer Royal, who will make a brief statement concerning the objects and future programme of the meetings. The subject of magnetic surveys will be introduced by Dr. S. Chapman, who will make a report on magnetic surveys and charts by land and sea throughout the world. Dr. G. W. Walker will give an account of the recent magnetic survey of the United Kingdom made under the auspices of the Royal Society and the British Association. Major Lyons will exhibit and describe two of Gauss's heliotropes, on loan to the Science Museum. At the second meeting, which has been provisionally appointed to take place on December 5, Prof. A. Schuster will preside, and Sir Napier Shaw will open a discussion on the general constitution and condition of the atmosphere, which will be continued by Mr. J. H. Jeans and others. Among the subjects which the committee has under consideration for report and discussion at later meetings may be mentioned seiches and tides; atmospheric electricity; British earthquakes; observatories; methods and instruments in connection with the various branches of geophysics; geodetic and gravity surveys; and the constitution, temperature, and other physical conditions, motions, and secular changes of the interior of the earth. Papers on these and other geophysical subjects for reading and discussion at the meetings, as approved by the committee, should be addressed to Dr. S. Chapman, secretary of the committee, Royal Observatory, Greenwich, S.E.10.

THE post of Director of Food Economy at the Ministry of Food has been undertaken by Sir Arthur Yapp, the national secretary of the Y.M.C.A.

THE seventh Norman Kerr lecture of the Society for the Study of Inebriety will be delivered by Major W. McAdam Eccles, on Tuesday, October 9, at 5.30 p.m., in the Robert Barnes Hall, 1 Wimpole Street, Cavendish Square, London, W.1. The subject will be "War and Alcohol."

DR. G. T. WALKER, Director-General of Observatories, India, informs us that in view of the uncertainty of postal arrangements, and in order to save space on shipping, it has been decided to discontinue sending the publications of his department out of India during the continuation of the war.

THE death is announced, at fifty-six years of age, of Mr. R. D. Pullar, president of the Society of Dyers and Colourists in 1914, and chairman of the well-known firm of Messrs. J. Pullar and Sons, dyers and cleaners, of Perth. Mr. Pullar was a life fellow of the Chemical Society of London.

THE Geological Physics Society has arranged a museum demonstration on "Pseudo-Fossils, or Lusus Naturæ," at the British (Natural History) Museum,

South Kensington, in the Geological and Mineral Galleries, on Saturday, September 29, at 3 p.m. The demonstration will be conducted by the acting honorary secretary of the society, Mr. W. F. Gwinnell.

WE regret to record the death of Mr. F. O. Erichsen, which is reported by cable from Buenos Aires. A brief account of his career appears in *Engineering* for September 21. He was educated at Rugby School, and after pupilage with Messrs. James Simpson and Co., of London, became chief of their outdoor erection department, in which capacity he was responsible for the erection and duty trials of many large pumping plants, both at home and abroad. Mr. Erichsen was appointed a director of his firm in 1914, and was an associate member of the Institution of Civil Engineers, and a member of the Institution of Mechanical Engineers.

WE regret to note that *Engineering* for September 21 records the death of Mr. B. W. Head, on September 12, in Orange River Colony, at the early age of forty-two. After serving an apprenticeship to engineering, Mr. Head went to Cambridge, where he took a double first-class in the Mechanical Science Tripos. The work of his firm, Messrs Jeremiah Head and Son, was chiefly connected with steel-works plant, and Mr. Head took an active part in developing this work, both in this country and in America. He was a member of the Institution of Civil Engineers and of the Iron and Steel Institute.

DR. ADDISON, Minister of Reconstruction, delivered an address on September 22, in the Town Hall, Huddersfield, on "Social Reconstruction after the War." He insisted that in the past this country has not made enough use of brains. How highly trained, scientific men have overcome the difficulties of supplying our armies can never be sufficiently described, and yet before the war those men had been paid salaries, in some cases by people who ought to have known better, that were a disgrace to the community. One lesson of the war has been that it pays to employ brains and to pay for them properly. Later Dr. Addison emphasised the need for a closer association between the laboratory and the factory. Science must be brought more into industry. One of the chief reasons why the Germans invaded our markets is that they organised their buying and selling on comprehensive lines. We must do the same. The steps being taken will remove some of the difficulties in respect of our commercial intelligence. As a whole, we get what we pay for. When men in this work are paid about the wages of clerks we get value for what we pay, but we do not get what we want. Dr. Addison went on to explain that he had had prepared a precise and scientific examination of great groups of factories in this country which shows how efficient plant, method, and management yield striking results as compared with places where those conditions do not prevail. In one case, although wages had increased 20 per cent., the cost of production had fallen by 29 per cent.

DR. A. W. BISHOP, who died at Nottingham on September 9, was born at Highgate on November 25, 1867. He received his early education at Highgate Grammar School, and later, at the Royal School of Mines, showed a distinct ability in chemistry. From 1887 to 1890 Dr. Bishop worked in the laboratory of the late Prof. A. von Baeyer in Munich, and obtained the degree of Ph.D. "magna cum laude." At Munich he worked chiefly under the direction of Claisen, with whom he investigated the preparation and reactions of *d*-oxymethylenecamphor, and his thesis, "Ueber den Formylcamfer," was the result of work carried out with extreme care and ability. In 1890 he became assistant to Prof. W. H. Perkin at the Heriot-Watt College, Edinburgh; and in February, 1894, he took up the appointment of professor of chemistry in H.H. the Maharaja's College, Trivandrum, Travancore, S. India. He later became principal of the college, and in 1911 was appointed Director of Public Instruction, from which post he retired in 1915 on account of ill-health, having completed rather more than the ordinary full-time service. On returning to England, he worked under Prof. W. J. Pope in the Cambridge University Chemical Laboratory, and later joined the research department of Sir Jesse Boot at Nottingham. It was always a great disappointment to Dr. Bishop that his position in Travancore did not give him any facilities for continuing research work, and he looked forward to taking up chemical investigation again after his retirement. For the greater part of his time in India his work largely consisted in directing first collegiate education, and later the whole of the Education Department in Travancore was under his control. He also did a considerable amount of work for the University of Madras, of which he was a fellow, a member of the Senate, and a member of the Board of Studies in Physics and Chemistry. During the short time that remained to him after leaving India, Dr. Bishop was engaged in the research which he so greatly loved, and less than a week before his death, in a letter to the present writer, he expressed unabated enthusiasm for his work. His connection with India brought him many friends, and whilst they regret his sudden death, they will always remember him with sincere affection and esteem.

IN *Folk-Lore* (vol. xxviii., No. 2) Sir James Frazer tells how, on Christmas Day, 1916, a solemn act of anathema was pronounced against the Greek statesman, M. Venizelos. In this case the victim was represented by a bull's head, at which stones were thrown and curses uttered. Sir James Frazer produces many instances in which stones are flung as a form of cursing, as in the well-known case of Shimei and King David. The bull's head finds a parallel in the ritual of ancient Egypt, where, according to Herodotus, black oxen were sacrificed, and then the head of the victim was laden with curses. After this rite it was sold to Greeks, if any happened to be present; if not, it was flung into the river.

IN the September issue of *Man* Mr. A. C. Breton, describing the Tsimhian Crest Poles at Hazelton and Kishpiox, British Columbia, remarks that these interesting totemistic objects are now decaying, and are not likely to be replaced. The principal post at Kishpiox had the form of a flagstaff, 80 ft. high, painted with a long black stripe proceeding from a black head with white eyes, at the base of the staff, and this represented a snake. On a small enclosed platform in front of this were two carved wooden figures—one the "Grizzly Bear under the sea," the other a finback whale. A good specimen of a similar pole is preserved at the Pitt Rivers Museum, Oxford. Now that attention has been directed to the few remaining examples it may be hoped that the Government of British Columbia will arrange for the removal of these interesting objects to some place of safety.

PROF. ELLIOT SMITH has reprinted from vol. vii. of the Proceedings of the British Academy his lecture on "Primitive Man." He gives an interesting review of the problem as it stands at present, and makes some suggestions which deserve attention. Thus he lays emphasis on the proposition that "man's mental and moral attitude is, in a large measure, determined by those primitive instincts and customs which he shares with his simian ancestors, but also by the influence, conscious and unconscious, of the atmosphere of traditions amidst which he has grown up. At no stage of

his career has he acquired highly complex and specialised instincts which impelled him, without any prompting from other peoples, to build megalithic monuments or to invent the story of the deluge independently of other people who do the same arbitrary things, as modern speculations would have us believe." Again, Prof. Elliot Smith urges that "these facts seem to emphasise how confusing is this use of the word 'age.' They also reveal how devoid of foundation is the misnamed 'evolutionary' theory that claims all these phases of culture as so many natural stages through which every people has passed in virtue of the operation of the blind forces of an arbitrary and inevitable process of evolution."

THE altitudinal distribution of birds in Europe represents an almost unworked field. Hence we welcome a most interesting and suggestive paper by Mr. C. J. Alexander in *British Birds* for August. Mr. Alexander confines himself to "Notes on Zonal Distribution in the Mountains of Latium, Italy." He divides this area into five zones, ranging from the Mediterranean, which extends from the sea-level up to between 300 and 500 m., to the Alpine, represented by exposed mountain peaks from 2000 to 2150 m. The only bird which runs the whole gamut is the black redstart. The wren, Alpine pipit, chough, wheatear, and linnet are, save the black redstart, the only residents of the sub-Alpine zone. The montane zone he finds the best characterised ornithologically of the three woodland zones. The dipper and the grey wagtail scarcely range out of the sub-montane zone. As might be expected, there is a vertical migration of the several inhabitants of these zones in accordance with the seasons, as well as a horizontal migration during the spring and autumn of birds passing to and from their breeding quarters further westward.

MOLES in captivity are notoriously difficult to manage. But Miss Frances Pitt has been remarkably successful in this undertaking, which she describes in the *Scottish Naturalist* for September. The extraordinary voracity of this animal is well known, but yet it is probably not generally realised that it will eat more than its own weight of earthworms in twenty-four hours. One of Miss Pitt's captives, weighing no more than 4 oz., ate during one month 7½ lb. of worms. Finding it difficult to maintain a supply for her captives, she experimented with raw beef, mutton, fowls' heads, and the livers of rabbits, with varying success. Cheese always seemed to be acceptable. Placed in glass boxes, she was able to watch them at nest building and excavating. When burrowing, the earth dug by the hands was thrown out by the hind feet, which were also used in cleaning the fur and the hands. But this paper, which has not yet reached its completion, is too full of interesting matter to be briefly summarised; it must be read at length by all who are engaged in the study of animal behaviour.

IN his account of the Echinoderms other than Holothurians obtained by the British Antarctic (*Terra Nova*) Expedition, 1910, and recently published by the British Museum, Mr. Jeffrey Bell lays great stress on the extraordinary variety in the characters of most of the Echinoderms collected in the Antarctic regions, although the conditions of depth and temperature are practically uniform. So astounding are the variations of the starfish, *Cycethra verrucosa*, that "if a mystic wanted a type of human life he might well take this species." A whole plate is devoted to these variations, and another to the variations of the brittle-star, Ophiosteira. The most interesting forms described are perhaps the three new species of Astroporpa, Astroschema, and Astrotoma, and it is rather strange that neither these nor the new starfish, *Luidia scotti*, should have been accorded any illustration. The course followed by Mr. Bell runs counter to that now strongly advocated by many systematists, but there is something to be said for it all the same. We note that Mr. Bell refers to his three new brittle-stars as "Astrophiurids." His original term was "Astrophiuræ, or Cladophiuræ." His present term implies that they belong to the same family as Astrophiura, which, as he well knows, is a totally different thing.

IN *Naturen* for May and June Hr. Jan Petersen describes and illustrates a number of newly discovered figures of animals incised by Stone-age artists on rock-surfaces in southern Norway.

THE vexed question of the age of the Borrowdale volcanic rocks, which add so much to the picturesque scenery of Cumberland, rises again in a paper by Mr. J. F. N. Green on "The Age of the Chief Intrusions of the Lake District" (Proc. Geol. Assoc., vol. xxviii., p. 1, 1917). The Borrowdale lavas are placed in the Llanvirn series. The Carrick Fell complex is shown, on the evidence of pebbles in the Watch Hill beds, to be older than the Bala rocks, and, with the Eskdale granite, it is regarded as belonging to a late phase of the Borrowdale activity.

IN a short paper on "The Geology of the Fiji Islands" (Proc. Nat. Acad. Sci., vol. iii., p. 305, 1917), Mr. W. G. Foye, of Middlebury College, Vermont, indicates that the present coral-reefs of the Fijis depend for their form on Pleistocene and recent movements, and that the growth of atolls and barrier reefs in this region is due to local and not to widespread subsidence. The submergence is more recent than the return of the waters to the ocean after the Glacial epoch. The author's paper on the same subject in the *American Journal of Science* has already been noticed (NATURE, vol. xcix., p. 471).

PROF. J. W. GREGORY'S lecture on "The Flowing Wells of Western Queensland," delivered in Australia in 1914, has been printed in the Queensland *Geographical Journal*, vol. xxx., p. 1 (1916). The vital question of the duration of these wells and the progressive diminution in their output is seen to be unanswerable at present. The discussion on the resolutions which followed the lecture shows that the diminution in supply may be due to escape in the bore-holes and choking of the inlets, and that there is a tendency to regard with favour Prof. Gregory's view as to the plutonic nature of the water-bodies.

IN the issue of *Scientia* for August, Mr. W. B. Wright, of the Geological Survey of Ireland, furnishes a useful review of "The Interglacial Problem," in which, following and extending the views of Penck, he shows that interglacial deposits indicate a woodland phase, followed by a steppe phase. He urges that the latter points to the oncoming of a glacial epoch, but extends well back into interglacial time. The single interglacial episode recorded in many northern areas, such as North America, may be explained by the fact that the longer of the Alpine interglacial epochs alone had any marked effect on the larger and more stable ice-sheets.

A REPORT published by the Royal Cornwall Polytechnic Society gives meteorological tables for Falmouth Observatory for the year 1916 and lustrum tables for sea temperatures, 1911–15. Mean sea temperatures are also given for the period of thirty-six years for each month. The lowest mean is 47·1° F., in February, and the highest 59·7° F., in August, the mean for the several seasons ranging 12·6° F. during the year. Detailed values for the several elements are given in the meteorological tables, and comparisons are made with the averages for a long period of years. The new units of millibars for the barometer, millimetres for rainfall,

and metres per second for wind velocity are systematically used, but temperature values are given in Fahrenheit. Falmouth Observatory is one of the Meteorological Office weather stations, and the records are of a high standard.

Symons's Meteorological Magazine for September deals tentatively with the rainfall of August and the summer of 1917. It promises later to utilise more fully the ample details supplied by numerous observers. The south and south-east of England, which felt the full influence of a partial drought in the middle of last June, have since experienced rainstorms of considerable magnitude. In August large portions of the country had more than 6 in. of rain, the fall exceeding 10 in. over the elevated parts of Devon and Somerset. In the normally rainy portions of England and Wales the rains exceeded 20 in. during the month, and in parts of Ireland the measurements exceeded 10 in., in many places constituting an extreme record for the month over a long series of years. In Scotland the rainfall was generally less remarkable, but the mean atmospheric pressure for the month was the lowest recorded in August for at least fifty years. For England and Wales the August rainfall was 192 per cent. of the average, for Scotland 121 per cent., and for Ireland 192 per cent. During the wet August of 1912 the rainfall in England and Wales was 198 per cent. of the average, but in Scotland it was only 119 per cent., and in Ireland 129 per cent. For the three summer months, June to August, the rainfall was more than 40 per cent. above the average over the greater part of the south of Ireland, south-west Wales, and south-east of England. Portions of Middlesex, Surrey, Sussex, and Kent had an excess of more than 80 per cent. of rain, rising in patches to double the average. Less than the average rain fell in the north and west of Scotland, and as far south as Morecambe Bay. In the northern midlands of England the rainfall was only slightly above the average.

SCIENTIFIC PAPER 300 of the Bureau of Standards contains a summary of the results obtained by Mr. W. W. Coblentz in his researches on the emissivity of the tungsten filaments of incandescent electric lamps filled with nitrogen. Both straight and coiled filaments have been investigated, the latter being the more efficient owing to the diminution of the heat convection and conduction losses for them. The coils had an inside diameter and a pitch twice the diameter of the filament. The radiation from an element of surface within the coil was found to be 90 per cent. greater and relatively redder than that from an outside element. The difference between the two was found to be in agreement with that calculated on the assumption of multiple reflections within the coil. Neither the internal nor external radiation E can be expressed in terms of the wave-length λ, and the absolute temperature T by any formula of the Wien type, *i.e.* $E \propto \lambda^{-c_1} e^{-c_2/\lambda T}$, in which c_1 and c_2 are constants.

La Nature for September 1 contains an article on recent improvements in wireless telegraphy by M. H. Volta. Fifty lines of it have been censored by the French authorities, but enough of the article remains to show how well the importance of the subject is appreciated in France. After describing the principles on which the earlier detectors—the iron or nickel filings coherer, the electrolytic, the thermoelectric, and the magnetic detector operated—the author shows how these have been superseded by the electronic or "valve" detector, and describes several of the forms and circuits at present used. By coupling a number of these detectors in series a high degree of sensitiveness may be secured, but Pratt, of the University of California, has introduced a combined electronic and thermoelectric detector, by means of which he has detected signals from stations 10,000 kilometres away. The General Electric Co. of Schenectady has shown how electronic "valves" may be used as sources of wireless waves, and it is not too much to say that the "valve" has revolutionised wireless telegraphy. The problem of diminishing the disturbances which so seriously interfere with the use of these sensitive pieces of apparatus has to some extent been solved by dividing the antenna into sections separated by inductances and connected to earth by inductances which give the parasitic currents a frequency differing from that of the signalling current.

THE greater part of the roof of the Library of Congress, Washington, U.S.A., is covered with tinned sheet copper, all of which is from the same manufacturer, and was installed at the time of the completion of the building in 1893–94. This has undergone a curious corrosion process which presents some unusual features, and has been investigated by P. Merica and reported on in Technologic Paper No. 90 of the Bureau of Standards. The roof is situated in a district uncommonly free from smoke, and it is not near any power station or factory producing smoke, so that atmospheric conditions may be regarded as most unfavourable for corrosion. Nevertheless, the sheet has become badly pitted on the upper side, and the pits occur in general along the line of surface scratches. They are apparently unrelated to the service conditions and to the direction of the rolling of the sheet. When the copper became exposed, as in the present case, at the bottom of the scratches on the surface, it formed a galvanic couple with the alloy layer, electrolytic action set in, and the copper at these points was corroded, forming the pits described. This publication gives the results of a study of the structure of the tin coatings on copper, and it is shown that this coating consists of at least three layers, viz. a thin layer of Cu_3Sn immediately next the copper, then a layer of the constituent "H," containing about 60 per cent. by weight of tin, and finally a layer of the eutectic of tin with copper. These alloy layers are electronegative, both to the tin and the copper base.

THE seventh and concluding article of a series on the evolution of the chain-track tractor appears in the *Engineer* for September 21. In these articles, which are fully illustrated, will be found a connected narrative showing the steps by which workable machines were produced. No mention is made of any work done in Germany or Austria, since, so far as our contemporary is aware, these countries have played no part whatever in the actual evolution of vehicles of this type. Nor has France added materially to the development of the chain-track mechanism. The system appears to have been evolved gradually by a great many workers, who have carried on their investigations independently, though for the most part on similar lines. An exception is Mr. Diplock, who alone pointed to the necessity for having the roller chain flexible, and each foot of the chain track absolutely free to move in any direction and within certain limits with respect to the other feet immediately adjacent to it, if the best results as regards friction and freedom from wear-and-tear are to be looked for.

THE latest catalogue of second-hand books (No. 169) of Messrs. W. Heffer and Sons, Ltd., Cambridge, is mainly devoted to school books, but there are sections relating to works in botany, chemistry, geology, biology, mathematics, medicine, and education, which should make it useful to readers of NATURE. Copies of the catalogue are obtainable from the publishers upon written application.

OUR ASTRONOMICAL COLUMN.

A NEW COMET.—A Copenhagen telegram announced an observation of Encke's comet by Dr. Max Wolf on September 14. At 13h. 51·3m., Königstuhl Mean Time, the position of the comet was R.A. 6° 24′, declination +13° 16′. The *Morning Post* of September 26 states that an observation made on September 21 proves the object to be a new comet, and not Encke's comet, as first supposed.

AN EMPIRICAL LAW OF PLANETARY DISTANCES.—An interesting empirical law connecting the distances of the planets from the sun is discussed by G. Armellini in the *Observatory* for September. The law is expressed by the simple formula $x_n = 1{\cdot}53^n$, where 1·53 represents the distance of Mars from the sun, and n takes the values −2, −1, 0, 1 . . . for the planets Mercury, Venus, Earth, Mars . . . The numerical values given by the formula are compared with the true values, and with those given by Bode's law, in the appended table :—

	Formula	True distances	Bode
Mercury ...	$1{\cdot}53^{-2} = 0{\cdot}427$ ...	0·387 ...	0·4
Venus ...	$1{\cdot}53^{-1} = 0{\cdot}654$ ...	0·723 ...	0·7
Earth ...	$1{\cdot}53^{0} = 1{\cdot}00$ ...	1·00 ...	1·0
Mars ...	$1{\cdot}53^{1} = 1{\cdot}53$ ...	1·52 ...	1·6
Asteroids ...	$1{\cdot}53^{2} = 2{\cdot}34$ ...	...	2·8
	$1{\cdot}53^{3} = 3{\cdot}58$ ...	...	
Jupiter ...	$1{\cdot}53^{4} = 5{\cdot}48$ ...	5·20 ...	5·2
Saturn ...	$1{\cdot}53^{5} = 8{\cdot}38$ ...	9·54 ...	10·0
(Vacant place).			
Uranus ...	$1{\cdot}53^{7} = 19{\cdot}46$ ...	19·2 ...	19·6
Neptune ...	$1{\cdot}53^{8} = 29{\cdot}76$ ...	30·1 ...	38·8

It will be seen that the formula has a marked advantage over Bode's law in the representation of Neptune. Moreover, since the two distances given for the asteroids are comprised within the limits of the asteroidal zone, there is only one vacant place, whereas Bode's law, if written in the form $x_n = 0{\cdot}4 + (0{\cdot}3 \times 2^n)$, presumes the existence of an infinite number of small planets between Mercury and Venus. It is considered possible that the vacant place between Saturn and Uranus may be occupied by small planets which have not been detected on account of their great distances.

ECLIPSING VARIABLES.—Photographic light-curves of the eclipsing variables, TT Lyræ and Y Camelopardalis, obtained at Harvard, have been utilised in a discussion of the orbits of these stars by Martha B. Shapley (*Astrophysical Journal*, vol. xlvi., p. 56). The periods derived from the new observations are respectively 5·243708 days and 3·305568 days. In the case of TT Lyræ the observations give positive evidence of a shallow secondary minimum and of a variation of light due to the ellipsoidal form of the components. There is also an unusually large "reflection" effect, which is attributed to inter-radiation, and on this interpretation the hemisphere of the faint star which faces the bright component is eleven times as bright as the other. Since only a small part of the light of the bright star remains visible at principal minimum (the variation being 2½ magnitudes), a large proportion of the total loss of light at that time is due merely to rotation of the unequally illuminated faint companion. Y Camelopardalis has also a large range of variation, losing 78 per cent. of its light at principal eclipse. The two systems are closely similar in many respects, and are estimated to be more than 3000 light-years distant from the earth.

Similar observations and determinations of orbital elements have been made at the Laws Observatory in the case of the eclipsing variables Z Vulpeculæ, TV Cassiopeiæ, and *u* Herculis (Laws Observatory Bulletin, 26, 27, 28). The elements of the eclipsing systems TV, TW, TX Cassiopeiæ, and T Leonis Minoris have been investigated by R. J. McDiarmid (Dissertation, Princeton University). The brightness of TX Cassiopeiæ is estimated to be 1400 times that of the sun.

THE EGYPTIAN OIL FIELD.[1]

THE Egyptian oilfield occurs along the western coast of the southern end of the Gulf of Suez, and, being beside a great ocean highway, is in a most convenient position for an oilfield, and where mining operations should throw light on some interesting geological problems. Dr. Hume writes on this field with high authority and intimate knowledge; his information and conclusions are, however, often indefinite, and his report has that air of detachment from practical applications which has been responsible for much of the distrust of geology felt among mining engineers. The author is no doubt wise to avoid unnecessary trespass on the field of the engineer, and his report is on the region and not on the oilfield alone. It would, however, have been even more useful if it had included statistics of the oil yields and information as to the quality of the oil, and if the author had not declined to express any opinion on the future of the field.

His geology is also cautious. He states that the oil is mostly derived from a cavernous dolomitic limestone, which he regards, however, as merely a reservoir. He attributes the source of the oil to deeper beds of Globigerina marl. This suggestion may be due to the influence of Prof. Mrazec, who accompanied Dr. Hume on a visit to the field, has contributed the cross sections to the report, and is probably responsible for the suggested comparisons with the Rumanian oilfields. The Egyptian oilfield appears to have much more in common with that of Persia than with that of Rumania. In the fields beside both the Gulfs of Persia and Suez the chief oil horizon is a thick series of gypsum beds which Dr. Hume regards, doubtless correctly, as lagoon deposits; they overlie a Mid-Miocene (Helvetian) coral limestone, and lie below a limestone containing a fossil oyster, *Alectryonia virleti*, which is characteristic of the Upper Miocene (Tortonian). Dr. Hume refers this bed to an indefinite "Mio-Pliocene" horizon, which he places above the Lower Pliocene. The remarkable resemblance in the general succession of the Egyptian and Persian oilfields favours the correlation of the virleti beds with the Upper Miocene, and the origin of the oil from the gypsiferous deposits.

The Egyptian oilfield structurally consists of a band of sedimentary rocks which has sunk between the granitic masses of Sinai and south-eastern Egypt. It thus resembles the Alsatian oilfield which has been lowered between the Archean masses of the Vosges and the Black Forest. By this movement the beds have naturally been folded and faulted. But it is not clear from Dr. Hume's account whether, in the Egyptian field, the folding was the primary movement, or, as in the Alsatian field, was secondary to the faulting. He attaches most stress to folding, but he includes therein movements that would generally be regarded as faulting; for the upraising of a mass of old granite into overlying sediments, which are thereby disturbed and brecciated along the contact, he includes as folding.

The report is well illustrated by numerous photographs and an excellent map by Dr. Ball, and though the text leaves us wishing that the author out of the fullness of his knowledge had given more information on some branches of the subject, we are grateful for a valuable addition to both Egyptian and economic geology. J. W. G.

[1] Ministry of Finance, Egypt. Report on the Oilfields Region of Egypt. By W. F. Hume, Director of the Geological Survey of Egypt. Pp. viii+103+23 plates. (Cairo: Government Press, 1916.)

THE STATISTICS OF THE DAIRY.

DR. RAYMOND PEARL is one of the younger generation of American biologists. He belongs to that school of naturalists who pursue, to begin with, the critical study of evolution, dealing not with its results alone but with its actual phenomena, who inquire into the essential facts and ways of working of selection, and who investigate accordingly all the problems, mathematical and other (especially those relating to "probability"), which are associated with variation and heredity. He belongs, that is to say, to the twin brotherhood of the experimentalists and statisticians, and like others of his school he has of late turned his investigations into very practical lines. A batch of Dr. Pearl's recent papers has come to hand, mostly on work done in connection with the Agricultural Experiment Station of the State of Maine. One—a very interesting one—is a general review of "The Selection Problem." Others deal with statistical and biometric methods—for instance with class-frequencies, with the gamma function, and with other matters connected with "curve-fitting." The rest of the batch are for the most part experimental studies, on egg-production or "inheritance of fecundity" in the common fowl, and on various problems of productiveness and of race-inheritance in cattle. Let us consider one only of these papers (or rather a part of one), which deals with "Animal Husbandry Investigations," and in particular with the "Study and Analysis of Milk Records."[1] This is a very practical subject indeed, and all the more so at present, when questions of efficiency in food production are of the highest and most obvious importance.

The essential problem before us is the comparison of two dairies, or two herds, with regard to milk production; how are we to say, or to discover, which herd is the better of the two? Simple as the case at first sight seems to be, it really involves a curious and puzzling statistical problem; for the yield of each individual cow not only depends on its own intrinsic "quality," but is very largely influenced by two distinct factors, namely by the animal's age and by the time which has elapsed since calving. The cow is at her best when about five to six years old; her yield of milk increases up to that age, and slowly falls away afterwards. Whether she be old or young, her yield is at a maximum shortly after calving, and month by month it gradually and slowly diminishes. We must find some means of *equating* our two sets of data for the two herds, when none of the individual data are directly comparable, for the cows in our two herds will differ, at haphazard, in age and in the period elapsed since parturition. We must, in other words, discover some system of "weighting" for these factors, or (what comes to the same thing) some way of adjusting the actual yield to a *standard condition* of age and period. It is obvious, then, that any such calculation must be preceded by a long and comprehensive experimental investigation. After this experimental basis is obtained (and for practical purposes Dr. Pearl has now sufficiently achieved it—unless, perchance, there turn out to be significant differences in the case of Jerseys or other special breeds), the rest is easy; but I have tried (with Dr. Pearl's approval) to simplify his own very lucid account still further, and to employ for this purpose a simple chart or diagram.

As the outcome of all his previous investigations, Dr. Pearl gives us a table of percentage efficiencies in dairy cattle, of which the following is an abbreviation or abstract. We shall not, by the way, carry our discussion beyond the period of ten or eleven months after calving, after which time (provided the cow does not calve again) the yield may still continue a long while, diminishing very slowly in quantity; we must also remember that, for cows ending their lactation in earlier months, the curve will drop somewhat abruptly to zero; and we must not forget that this is a quantitative study only, and that the quality or richness of the milk must be dealt with separately.

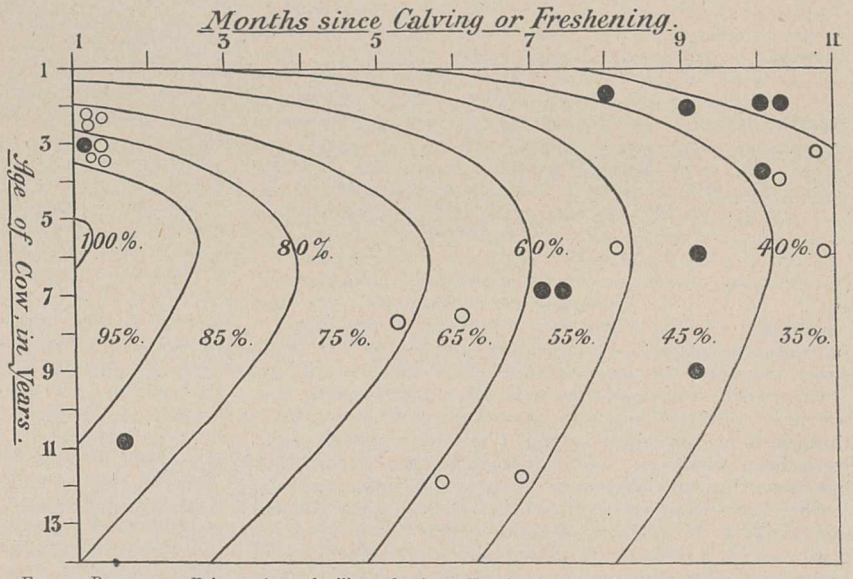

FIG. 1.—Percentage-efficiency chart of milk production. Two herds, A and B, are supposed to have been plotted on the blank chart ●, cows of Herd A; ○, cows of Herd B.

Table of Percentage Efficiencies.

Age of cow, in years	Stage of lactation, in months					
	1	3	5	7	9	11
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1½	58	51	44	37	30	27
3½	93	81	69	56	44	38
5½	100	86	72	59	46	38
7½	99	85	71	57	44	37
9½	94	82	69	55	43	36
11½	88	76	65	53	41	35
13½	82	71	61	50	39	34

From this, or from the full table, we may now prepare our diagram, in which the several contour-lines denote percentages of the maximum or ideal efficiency, 90 per cent., 80 per cent., etc., and the spaces or zones between them represent, therefore, *average* percentage efficiencies of 95 per cent., 85 per cent., etc., as compared with the standard of maximum—this latter being what we should expect were the cow five to six

[1] Report of Progress on Animal Husbandry Investigations in 1915; Maine Agricultural Experiment Station, Orono, Maine. (Papers from the Biological Laboratory, No. 92.)

years old and in her first month of lactation. In order to make use of this chart, then, we proceed to make a mark upon it for each individual cow, each mark corresponding (vertically) to a particular age, and (horizontally) to a particular month of lactation; and this has been done in our figure for two distinct and separate herds, one of fourteen, the other of eleven cows. In short we note upon the chart the cow's age and period, and are then able to read off the corresponding "efficiency" which we are entitled to expect of her. It only remains for us to add up the number of cows (of each separate herd) in each zone or "efficiency class," and then to proceed as follows, by the simplest arithmetic:—

Comparison of Herds A and B.

Efficiency class Per cent.	Herd A: No. of cows	Herd A: Total efficiency Per cent.	Herd B: No. of cows	Herd B: Total efficiency Per cent.
85	2	170	3	255
75	—	0	4	300
65	—	0	1	65
55	2	110	3	165
45	2	90	—	0
35	3	105	3	105
25	2	50	—	0
	11	525	14	890
Average efficiency per cow,	47·7 p.c.			63·6 p.c.
Total yield of milk per day,	260 lb.			290 lb.
Average " " per cow,	23·6 "			20·7 "
Standard yield at maximum efficiency	$\frac{100}{47·7} \times 23·6 = 49·4$ "		$\frac{100}{63·6} \times 20·7 = 32·5$ "	

The value which we obtain as our final arithmetical result, viz. 49·4 lb. and 32·5 lb. respectively, for our two herds, may be called the "standard of efficiency," or "standard yield at maximum efficiency," or (for short) the "specific standard" of the herd.

In practice we should have to take into account (as we have not here done) cows that have gone dry, though of an age and period when they should still have been milking; this would introduce a further, but very slight, complexity. Apart from this, and as our broad and simple result, we see (1) that Herd B was operating at a higher efficiency than Herd A, *i.e.* the cows in B were in the better state as regards age and period; but nevertheless (2) Herd A was actually yielding 23·6/20·7, or 14 per cent. more milk per cow; and (3) the most important thing, that Herd A was giving a yield which, when reduced to standard (as though every cow were five years old and newly calved), would be equivalent to 49·4/32·5, or no less than 52 per cent. more milk than Herd B under similar standard conditions. Herd A was one of the best herds of pure-bred Holstein-Frisian cattle in the State, while B was only a fair average or dairy herd.

It is obvious that we may use the same method (with the help of equally easy arithmetic) to determine the value or "efficiency," in comparison with the herd as a whole, of any individual cow. For instance, after we have determined the standard efficiency, or standard yield at maximum efficiency, of Herd A to be 49·4 lb. of milk daily, then a cow the age and period of which place it in the 55 per cent. zone should be yielding something between 50 per cent. and 60 per cent. of that amount, say from 25 lb. to 30 lb. of milk daily. She is not doing her duty by the rest of the herd, and may be weeded out accordingly, if her daily yield of milk be found to be below this quantity.

D'ARCY W. THOMPSON.

AGRICULTURE IN MADRAS.

FEW aspects of Indian administration have manifested more satisfactory advancements than that of agriculture. Since the date of reorganisation of the department into provincial sections (acting under effective Imperial control), since the date when the bulk of the officials under these became expert agriculturists, the improvement has been both substantial and far-reaching. The keynote, moreover, seems to have been the separation of agriculture from revenue. But one can imagine the old Bengal civilian turning in his grave with horror at the abolition of his "Revenue and Agricultural Department," the "et cetera" of former times. To-day the people of India can receive the agricultural official as a friend, free from suspicion of mercenary (revenue) alternatives. No better manifestation of this improved relationship could be given than the appearance of the Madras Agricultural Calendar.

A double page is devoted to each month, from April to March (the official year), and these twelve tables set forth the phases of the moon, the constellations of the stars, the feasts, fasts, festivals, the fairs, shows, exhibitions—all matters of more than ordinary interest to the Indian cultivator. Between the pages of monthly records are interspersed instructive, brief, but practical, chapters on various useful subjects, written by the director, the assistant director, the various deputy directors, and other officials of the department.

The purpose of the Agricultural Department is lucidly set forth; the importance of water to the farmer fully expounded; the merits of the specially selected and improved cotton-seed (here called Sircar cotton) explained and offered for sale; the properties of the Monsoon plough exemplified; the value of superphosphate as a manure for rice explained; then follow suggestive and instructive essays on agricultural engineering; on the conditions under which agricultural loans can be made by the Government; on special crops, such as ground-nuts, guinea-grass, indigo, senna, etc. Next there are given chapters on the improvement of pasture lands, on the Veterinary Department, and on the diseases and pests of crops. The Calendar then supplies particulars of the Agricultural College, the Research Institute, etc., and finally gives a complete enumeration of the departmental and other publications likely to be of value to the farmers.

We commend this excellent little publication (78 pages) as a model of public utility, the more so since it is offered for sale at the humble price of one anna (one penny), and is printed both in English and in the chief vernaculars of the province.

SCIENCE AND INDUSTRY IN SOUTH AFRICA.[1]

OUR Government, I am afraid, has not always fully realised in the past the powerful aid of science and scientific research in general and industrial development. It has been following too much the lead of Great Britain, and has been perhaps too much inclined to regard the scientific departments of the Government as not of primary importance, since they are not immediately productive in the commercial sense. The totally inadequate salaries paid to the *personnel* of Government scientific departments is perhaps an indication of the place which their work has occupied in the general plan of the nation. Only recently a protest was made

[1] From the Presidential Address delivered at the Stellenbosch Meeting of the South African Association for the Advancement of Science, on July 2, by Prof. John Orr.

in connection with an advertisement for a mycologist —who had to be a university graduate—at the princely remuneration of 180*l.* per annum. Science may be its own reward, but even the poor man of science must live.

But all this is going to be changed. Science has gained immensely in prestige since the war began. The consequences of the neglect of science and technical training have been brought home to such an extent that, terrible as that conflict is, there can be no question that it has served to vitalise, as nothing else could have done, the British nation; and, perhaps, the greatest lesson of the war has been the realisation of the necessity for greater scientific methods in relation to industry. The appeals of scientific and technical men, which have so often been disregarded by apathetic, self-satisfied, and conservative manufacturers, pursuing rule-of-thumb and obsolete methods, and, by their inaction, allowing so often the fruits of British brains to be exploited in Germany, would now appear to be falling on receptive ears, and we welcome the prospect of a new era for science and scientific methods. We must realise that the whole fabric of industry is based on science, and Governments are now recognising it as their duty to embark on a more enlightened policy by promoting scientific research on a national scale. It is for associations such as this to see that the new ideals are maintained.

The Union Government established, about a year ago, an Industrial Advisory Board of business men, to which a technical member was at a later date added. But as a result of the representations of the Central Committee of the Scientific and Technical Societies of South Africa, on which this association was fully represented, the Government agreed in March of this year to the appointment of a Scientific and Technical Research Committee to assist the Industries Section of the Department of Mines and Industries in providing for industrial research, co-ordinating, so far as possible, all industrial investigation and research in South Africa, and collecting and disseminating all data obtained; in co-operating with other Government departments and with similar departments in the United Kingdom and Dominions to obtain information already available, so as to avoid overlapping, to take advantage of facilities for research not available in this country, and to acquire and utilise in the arts and manufactures knowledge already existent in countries which are more highly developed industrially than South Africa; in carrying out an economic survey of the natural resources of South Africa, and in furnishing advice in regard to the best methods of utilising such resources; in furnishing advice with regard to the best method of attacking industrial problems; in inducing industrial improvements and facilitating and encouraging manufactures in suitable localities; in co-ordinating various industries to obtain the best combined results and exchanging between user and manufacturer manufacturing improvements and operating experience; and generally in advancing the work of the department on the scientific and technical side.

The action of the Government in advertising for a technical adviser, at a salary commensurate with the importance of the position, is one which must be cordially welcomed as an indication that it realises the importance of the present movement.

The Scientific and Technical Committee held its first meeting at Capetown in April of this year. The published list of fifty-two subjects on which it is proposed to obtain the earliest and fullest existing information from the most competent authorities available gives some idea of the programme which the committee has outlined apart from an indication of the latent potentialities of the Union as a manufacturing country. Time forbids detailed reference, but it will be observed that the investigation of raw materials and products from the agricultural and pastoral industries, together with various valuable by-products, hitherto neglected, bulks largely amongst the subjects.

It is not my intention to attempt to deal fully with the many problems with which South Africa teems, even those which bear on the development of our great country. Unfortunately, many of our problems have, for some reason or other, been converted into political questions, and at this non-political gathering anything savouring of politics must be rigidly excluded. Mr. Merriman has said that there is too much politics in this country; those who belong to no political party will, I think, agree with him. Almost every man and woman in South Africa is a politician, and we send forty-one lawyers to Parliament. One of our members who combines the pastime of ardent sociology with the professional pursuit of science advocates government by function, according to which the only reason for sending a man or woman to Parliament would be special fitness as an expert on some particular subject, or as a representative of some particular interest. Political cleavages are not doing this country any good. Let the advice of the Administrator of the Orange Free State be taken in the spirit in which it has been offered. "Last year," he is reported to have said, "the Union imported leather goods to an amount almost equal to that which farmers got for their wool. Whilst they were quarrelling about small matters, they were really forgetting the things that mattered. Each year grain to the value of 1,500,000*l.* was imported, although the South African climate was excellently suited for grain production. When it was dry they prayed for rain, but when the rain came, millions of tons of water were allowed to run to waste to the sea. . . . Europeans were only comparatively few in South Africa. Why, then, should they continue quarrelling instead of developing their country?"

The whole land abounds with examples of neglected opportunities. The Government has repeatedly made the statement that it cannot start industries; it can only give advice. And when we consider for a moment what has been done through its Agricultural and Lands Departments, unbiased observers must admit that advice has been showered upon the farmer in such profusion that it has come to be a source of irritation to those engaged in other industries, who accuse the agricultural interests of receiving undue preference. Frankly, we must admit that the farmer in many instances has not made the most of his opportunities. The recently issued reports of the Dominions Commission direct attention to the way in which Canada and Australia have been developed into great producing and exporting countries—it dwells on the wonderful external trade expansion of Canada, which increased 190 per cent. between the years 1900 and 1913—and emphasises the need for greater population, which, of course, means throwing open the land to the newcomer. As the Member for Stellenbosch has somewhat caustically said, we have "stoep-sitters at one end and poor whites at the other, and that state of affairs is not in the interests of the country. . . . Here the farmer waited for an Act of Parliament, and then often kicked at it." No one can object to the Government assisting in every possible way those who are honestly endeavouring to increase the productiveness of the country, and even to assist financially the victims of misfortune, but the manifestation of a spirit of greater self-reliance and progressiveness on the part of many would be greatly welcome by those who frequently complain that there is too much pandering to the agricultural interests. Unwillingness on the part of South Africans, by nativity and adoption, to meet the situation and exert their utmost endeavours in well-directed channels can only lead to the surrendering of their

opportunities to those more amply qualified by energy and initiative.

While the war has had the effect of stimulating, and in some cases initiating, production, it has also served to direct attention to products, hitherto neglected, which could be used as substitutes. But think how little has been done to manufacture the valuable products from maize—alcohol, starch, glucose, dextrine, glycerine, corn oil, etc., apart from the valuable feeding stuffs and other by-products obtained from these industries. At the last annual meeting of the S.A. Maize Growers' Association the president complained that practically nothing had been done to develop maize products in this country, and urged the appointment of a whole-time officer of the Agricultural Department to devote his energies to the maize-growing industry and its many products. A new future is opened up for the maize-grower by the possibility of the extended use of alcohol for power purposes. An investigation carried out two years ago demonstrated the practicability of alcohol as a motor fuel, so that now it is entirely a matter of commercial manufacture. In America the greater part of the industrial alcohol produced is made from maize. A factory, costing more than 50,000l., is in course of completion at Durban to produce alcohol from molasses, a by-product in sugar manufacture, but, as that is limited in amount, recourse must be had at no distant date to maize or other cereals, potatoes, etc. The agrimotor, of which hundreds are now at work day and night in Great Britain and France, is a product of the war, and with cheap alcohol motor fuel, derived from maize which he himself grows, to drive his mechanical cultivators, who shall say that the lot of the farmer of the future will not be a happy one? It will be seen that the subject of maize—its products and by-products—is receiving the attention of the Scientific and Technical Committee.

We also want a vigorous afforestation policy. Timber is used as a material in practically every industry, and its increasing use has for some years caused no little anxiety as to the world's supply; certain varieties are even now practically unobtainable. Attention is therefore being frequently directed to the value of afforestation as a State asset. But afforestation is of national importance, apart from the value of the timber produced. It has served for some years as a means of alleviating the poor white problem. It is a potent agent in the conservation of water, which is of all the more importance in a country like South Africa, so subject to periods of drought, and where soil erosion is becoming a national problem. All over the country we can see large areas absolutely ruined by a network of huge dongas, developed from small sluits, which originated probably in a cattle track. The Railway Department has been blamed, so have the Government road contractors, the Irrigation Department has been accused of negligence, while the older inhabitants blame the Government and say that soil erosion is entirely due to the denudation of trees and vegetation without a policy of replacement. The Minister of Lands blames the farmers! He has said that the first step towards a remedy is "to rouse public opinion and get the agriculturist interested in the matter." The remedies are said to include filling up the small sluits when they begin to form; increased afforestation and grass planting, which assist in conserving the rainfall instead of allowing it to carry millions of tons of valuable soil to the sea; and, of course, dam building and irrigation, which are claimed to herald the agricultural salvation of South Africa. The Government has repeatedly stated that it is alive to the importance of afforestation, and the Union can scarcely be charged with negligence, since 6300 acres were afforested in 1914, and although the acreage fell for obvious reasons to 3900 in 1915, and was slightly under 2400 in 1916, to-day the total area of forest reserves under the Forestry Department is more than 1,000,000 morgen. The State cannot be expected to do everything. Surely the farmer, who, in the majority of cases, is the landowner, realises that it is in his own interests, from the water conservation and the other points of view, to prosecute a vigorous scheme of afforestation, and, much as the State might assist in fighting soil erosion, individual effort must be strenuously exerted, if the problem is going to be solved.

These are subjects which, I am glad to say, are receiving the attention of the Scientific and Technical Committee.

The first work of this committee has been to arrange for a survey of the raw materials of the country, so as to ascertain what is available for active industrial exploitation. The Government is paving the way by investigation and research to show the world what the prospects of industry are, but the Minister of Mines and Industries has said that "the Government can only see that general conditions as regards tariff and legislation are reasonable and representative."

It is claimed that a country which imports annually thirty-eight million pounds' worth of merchandise must have great manufacturing possibilities. But manufacturing industries have languished in South Africa, and industrial failures have been many, due to a variety of causes. As one writer plaintively remarks, there has been "the usual dissipation of energies; the usual record of a few successes and many failures; and the usual discouragement, which seems the natural inheritance of the few people who try to bring South Africa to a realisation of her unique opportunities."

No industry can be welcomed as a permanent industry which does not utilise the raw products of the country. In this connection the absence of a "primary" iron and steel industry is most keenly felt. All manufacturers using metal are dependent upon the imported article, and although machinery is now being manufactured in South Africa, especially on the Rand, to an extent hitherto considered impossible, this has largely been due to the protection offered by the war, and must necessarily be transient. The importance of the establishment of an iron and steel industry in South Africa transcends that of every other industry; South Africa can never hope to become a machinery manufacturing country without it. We have the raw materials in coal and ore, but markets will have to be created to keep such an industry going continuously, as it must of necessity do. The Government can help by assisting in the initial stages, and it is to be feared that without some direct special assistance the prospects are remote. But it can also help indirectly through the railways. A guarantee of Government contracts, at any rate in the initial stages, should surely induce a flow of capital for such an important national industry. A glance at the imports for 1916 shows that, during that year, iron and steel to the value of nearly one and a quarter millions sterling, and machinery to the value of two and one-eighth millions sterling, were imported into the Union.

How colossal an iron and steel industry may become is shown by the fact that the output of the United States Steel Corporation reached in 1916 the huge total of nearly fifteen and a half million tons.

A successful experimental plant, constituting the first electric furnace in South Africa, was erected by the Chamber of Mines during the past year for making steel castings (shoes and dies) from scrap metal, and the manufacture of bar iron, etc., from scrap metal has been carried on for some years in the Transvaal. Such industries have been referred to as "bastard" industries; primary industries utilising the raw materials

are essential. A start was made in June in electro-chemical industries, when a factory for the manufacture of carbide was inaugurated on the Rand; but electro-chemical industries in other parts of the world rely mainly upon cheap electricity derived from water power, and it is of the utmost importance in the industrial development of this country that the Government should spare no expense in having the water-power resources of South Africa immediately investigated.

The great mistake in South Africa has been to look too much to the mines. Just as the discovery of the diamond mines saved the Cape Colony from dire financial distress, so we have the President of the Transvaal Chamber of Mines saying, at the last annual meeting of that body, that "the prosperity, and, indeed, the whole fabric, of the Union are largely based on the mining industry." But the mineral wealth of the Transvaal will not last for ever—the gold mines are a diminishing asset. Transvaal dividends amounted in 1916 to more than nine million pounds, but the Rand cannot go on indefinitely contributing more than 50 per cent. of the total revenue of the Union. We have examples from history to show that, where enlightened action has prevailed, the revenues derived from mineral wealth, instead of being utilised to lighten the burdens of the general taxpayer, have, to a liberal extent, been devoted to the general development of the country, and the establishment of industries to take the place of the worked-out mines, including of necessity ample provision for education and technical training and research.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

A CHAIR of tuberculosis was instituted by the Edinburgh University Court on Monday, September 24, and Sir Robert Philip was appointed as the first professor of the subject.

ON Wednesday, October 17, at 5.30 p.m., Prof. J. A. Fleming will deliver at University College (University of London) a public lecture on "The Work of a Telephone Exchange." The lecture is open to the public without fee or ticket.

THE inaugural address of the new session of the School of Pharmacy of the Pharmaceutical Society of Great Britain will be delivered by Lt.-Col. E. F. Harrison on Wednesday, October 3, on which day the Hanbury gold medal will be presented to Prof. H. G. Greenish.

THE annual meeting of the Library Association will be held at Caxton Hall, Westminster, on October 3 to 5. The subjects to be discussed on the opening day are "The Relation of Libraries to Education" and "Work with Children," and the speakers will include Dr. Addison and Lord Bryce. On the other days "Commercial Libraries," "Technical Libraries," "Municipal Reference Libraries," and "The Education and Training of Librarians" will be discussed.

IT is reported in *Science* that provision has been made by the Texas Legislature for establishing a third agricultural college, to be known as the North-East Texas Agricultural College. A grant of 50,000*l.* has been made for its establishment and maintenance. The board of directors of the State Agricultural and Mechanical College is given control over the institution. State grants have also been made for the station and sub-stations amounting to 45,000*l.* for the year beginning September 1, and 36,300*l.* for the following year.

A SERIES of popular lectures on "The Countries of the Empire and their Resources," illustrated by the collections of the Imperial Institute, is being delivered by Miss Edith A. Browne, on Wednesdays in September, October, November, and December, at the Imperial Institute at 3 o'clock, commencing yesterday. Admission to the series of lectures is free by ticket, for which application should be made to the director of the Imperial Institute, South Kensington, S.W.7. A special course of lectures of the same character has again been arranged this autumn for public schools in and near London, in connection with the teaching of the commercial geography of the Empire.

SEVERAL large bequests and gifts for higher education in the United States have been announced this year in *Science*. Among these may be mentioned the addition of 100,000*l.* to the permanent endowment fund of Washburn College, Topeka, Kansas, 40,000*l.* of which was contributed by the citizens of Topeka, and 40,000*l.* from outside contributors. Bequests of 40,000*l.* have been received by Princeton University and by the University of California, in the latter case for the maintenance of professorships in law. Gifts of 30,000*l.* have been made to Muskingum College, New Concord, Ohio, to Columbia University, and to the University of Michigan. The most recently announced bequest, one of 20,000*l.* to Middlebury College, by Dr. H. F. Walker, is to provide full salary for a professor on Sabbatical leave, any balance to be used as an emergency fund.

WITH two minor alterations, parts i.–iii. and v. of the Regulations for Technical Schools in England and Wales (Cd. 7996) will continue in force for the school year 1917–18. The Board of Education withdrew part iv. of the Regulations in August, 1916. The alterations referred to came into force on August 1 last, and provide that institutions giving instruction in preparation for a trade for students formerly in attendance at special schools will in future be aided under the new regulations for such institutions, and will not receive grants under the regulations for technical schools. The second alteration concerns a few schools of the junior technical school or nautical school type, which, owing to the exigencies of war, have been unable to conform to their appropriate regulations; but the Board of Education proposes for the present to continue to recognise these schools.

IT is announced in the *Times* that Lord Lovat, Mr. Otto Beit, and Mr. Rudyard Kipling have accepted the positions of trustees under the will of the late Mr. Cecil Rhodes in succession to Lord Rosebery and Sir Lewis Mitchell, who resigned recently, and of the late Earl Grey, who had resigned shortly before his death. The trustees have decided to allot the four new scholarships created in substitution for the scholarships formerly held by Germans to the provinces of Alberta and Saskatchewan, to the Transvaal, to the Orange Free State, and alternately to the towns of Kimberley and Port Elizabeth in the Cape Province. As Alberta and Saskatchewan have hitherto had one scholarship between them, the effect of this decision will be that each of these provinces will now have a scholarship. The trustees have decided not to make any appointments to any scholarships this year, either in the United States or in any part of the British Empire, although the qualifying examinations in the United States will be held as already arranged. This decision is based upon the fact that as all candidates must be men of military age it would not be in accordance with the spirit of the testator's design if young men who first responded to the call of patriotism were to be penalised for having done so. Any candidate who is eligible this year will be equally qualified for election next year.

We learn from the *Times* that the members appointed in India to the Calcutta University Commission are Sir Ashutosh Mukharji, Vice-Chancellor of the Calcutta University; Mr. W. W. Hornell, Director of Public Instruction, Bengal; and Dr. Zia-ud-din-Ahmed, of the Mohammedan Anglo-Oriental College, Aligarh. The chairman of the commission will be Dr. Michael E. Sadler, who will be associated with three other members appointed in the United Kingdom, viz. Mr. P. J. Hartog, Prof. Ramsay Muir, and Prof. J. W. Gregory. The general terms of reference to the commission are to inquire into the working of the present organisation of the Calcutta University and its affiliated colleges, the standards, the examinations, and the distribution of teachers; to consider at what places and in what manner provision should be made in Bengal for teaching and research for persons above the secondary-school age; to examine the suitability of the present situation and constitution of the University and make such suggestions as may be necessary for their modification; to make recommendations as to the qualifications to be demanded of students on their admission to the University, as to the value to be attached outside the University to the degrees conferred by it, and as to the relations which should exist between the University and its colleges or departments and between the University and the Government; and to recommend any change of constitution, of administration, and of educational policy which may appear desirable.

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, September 10.—M. Paul Appell in the chair.—H. Le **Chatelier** and E. L. **Dupuy**: The heterogeneity of steels. A modification of Stead's etching reagent is suggested, with full details of use. The macroscopic structure is well brought out by this reagent.—P. **Termier**: The posthumous notes of Albert Cochain.—H. **Duport**: Orthogonal systems.—P. **Humbert**: The piriform surface.—M. **Fréchet**: The notion of neighbourhood in abstract ensembles.—L. **Launoy**: The delicacy of the general method of extracting alkaloids from water. Working on 200 c.c. of solution, making alkaline with sodium carbonate, and with chloroform as the extracting solvent, 0·0001 gram of alkaloid (7 in 2,000,000) can be detected. With aconitine one-half of this proportion has been detected.—M. **Travers**: A new volumetric method for the estimation of molybdenum and vanadium in steels. The molybdic acid is reduced with titanous chloride, the excess being determined by means of a ferric salt in the usual way. The same reagent is applied to the estimation of vanadium.—L. **Gentil** and L. **Joleaud**: The existence of transported strata in the region of Bizerte (Tunis).—M. **Baudouin**: The wisdom tooth, which varies with the nature of the food, is not tending to disappear.—P. **Wintrebert**: The automatism of the first movements of the body in *Scyllium canicula*.—H. J. **Hamburger** and D. J. de **Waard**: The influence of radio-active substances on the permeability of the kidneys to glycose. The retention of some glycose in the kidney has been found to depend on the presence of small proportions of potassium salts. In the absence of a salt of potassium, under the conditions of the experiment, no glycose is retained by the kidney. As potassium is the only radio-active element normally present in the body fluids, other radio-active substances were tried in the place of the potassium. It was found that uranium nitrate, radium bromide, and mesothorium could replace the potassium, if the strengths of the solutions were correctly adjusted.—F. **d'Herelle**: An invisible micro-organism antagonistic to the dysenteric bacilli.—A. **Lumière**: The use of iodide of starch in the treatment of infected wounds. In the treatment of infected wounds the problem is to find a substance which, sufficiently stable and active, must not be immediately destroyed by the tissues, and of which the action ought to persist for several hours, or even days. Iodide of starch appears to meet all these requirements, and in the strengths suggested is not an irritant.—J. **Danysz**: The origin of the specific affinities between pathogenic microbial products and the animal organism.

BOOKS RECEIVED.

Gravitation: Discovery of its Cause and Mechanism. By H. Jamyn Brooks. Pp. 48. (Bristol: J. W. Arrowsmith, Ltd.) 1s. net.

Allen's Commercial Organic Analysis. Fourth edition. Vol. ix. Edited by W. A. Davis. Pp. xviii+836. (London: J. and A. Churchill.) 30s. net.

Carnegie Institution. Researches of the Department of Terrestrial Magnetism. Vol. iii. Ocean Magnetic Observations, 1905–16, and Reports on Special Researches. By L. A. Bauer and others. Pp. vii+445. (Washington: Carnegie Institution.)

A German-English Dictionary for Chemists. By Dr. A. M. Patterson. Pp. xvi+316. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 9s. 6d. net.

DIARY OF SOCIETIES.

MONDAY, OCTOBER 1.

SOCIETY OF ENGINEERS, at 5.30.—Sewage and its Precipitation; Further Experiments: R. Brown.

WEDNESDAY, OCTOBER 3.

ENTOMOLOGICAL SOCIETY, at 8.—Further Notes on Recapitulatory Attitudes in Lepidoptera: Dr. T. A. Chapman.

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