THURSDAY, JULY 11, 1918.

SIR WILLIAM RAMSAY.

Sir William Ramsay, K.C.B., F.R.S. Memorials of his Life and Work. By Sir W. A. Tilden. Pp. xvi+311. (London: Macmillan and Co., Ltd., 1918.) Price 10*s.* net.

IT has been said that every man has in his own history the making of at least one romance. If by romance is implied not merely a work of fiction, but also a story which is both true and marvellous, this may certainly be asserted of the life-histories of many men of science. A score of illustrations might be cited, if necessary, in proof of it. But it needs no proof to those who are in the least degree familiar with the personal history of science. The life-story of the subject of this memoir, as developed by Sir William Tilden, is further evidence of it. His biography of his eminent friend is one more addition to the already extensive literature of the romance of science.

Ramsay's relation to his epoch and his position in the chronicles of science are established for all time by his share in the discovery of the inert gases of the atmosphere, and by his recognition of helium as a terrestrial element. Most discoveries are based, in greater or less degree, upon antecedent knowledge, and the discoveries upon which Ramsay's fame chiefly rests are no exception to this general rule. Their wonderful succession may be said to take rise from Lord Rayleigh's memorable letter of September 29, 1892, in these columns, in which he first directed public attention to the difference in density between atmospheric and factitious nitrogen, and invited chemists to offer suggestions as to the cause. Ramsay's alert mind was soon at work on the mystery. How he came to associate himself with Lord Rayleigh in attempting to solve it, and how, by independent steps, the two investigators succeeded in completely elucidating it, constitute not the least interesting, and certainly the most historically valuable, chapter in Sir William Tilden's book. Although nearly a quarter of a century has elapsed since the British Association meeting at Oxford at which the epoch-making announcement of the discovery of argon was made, to be followed, a few months later, by the remarkable gathering in the theatre of the University of London in Burlington Gardens, at which a detailed account of the investigation was presented to the Royal Society, the memory of it all is still fresh to those now living who were fortunate enough to be present on those historic occasions. The story is again told in this book, simply and directly, and to a great extent by excerpts from Ramsay's correspondence with his wife and with his co-worker. Indeed, it tells itself by its intrinsic interest and power, and the author, like a true artist, shows a wise restraint in not over-elaborating it.

The formal announcement of the isolation of argon was followed, with an almost dramatic quickness, by Ramsay's detection of helium among the gases which Hillebrand had found to be evolved from the mineral cleveite, and to which Ramsay's attention had been directed by Sir Henry Miers, at that time keeper of the Mineral Department of the British Museum. The identity of the new gas with the solar helium of Lockyer, who first discovered it spectroscopically, was established by Sir William Crookes, to whom Ramsay had sent a sample of the gas.

In June, 1898, Ramsay and Travers announced the existence of krypton in the least volatile portions of liquid air, and a fortnight later they detected the presence of another new gas, neon, followed some little time afterwards by the recognition of a third hitherto unknown substance, xenon—all of them companions of argon and resembling it in chemical inertness. They are, indeed, as an American chemist wittily termed them, the "tramps" among the chemical elements—"useless things which never did an honest day's work in their lives." An examination of the lighter portions and of the residues obtained from the less volatile fractions of about 120 tons of liquid air revealed no other new constituent of the atmosphere.

It is the detection, in such rapid succession, of these extraordinary substances which constitutes the element of romance in Ramsay's career. The gases are not only remarkable in themselves: they open up an entirely new and wholly unlooked-for development in the philosophy of chemistry. Although a score of years have passed since their existence was made known, the mystery of their origin, past history, and functions still remains one of the unsolved riddles of the universe. This epoch-making work was all compressed within less than half a dozen strenuous years. There has been nothing like it in the history of science since Davy's time, now more than a century ago.

On Ramsay's earlier and subsequent scientific work—mainly in inorganic and physical chemistry, for the most part done in collaboration with his demonstrators and students, to whom, like the born leader he was, he sought to impart some of his own unselfish and eager enthusiasm for investigation—there is the less necessity to dilate since it is all admirably summarised in the book under review.

In the space that remains we may indicate some of Ramsay's more obvious personal attributes. He was certainly a very complex character, and probably few outside the family circle could justly claim to know him thoroughly. Not that he was in the least degree unapproachable or retiring. On the contrary, a man of many social gifts and accomplishments, he was invariably at ease and happy in the society of his fellows and capable of strong and enduring friendships, as his biographer abundantly proves from the many letters which have been placed at his disposal. He was, moreover, an excellent conversationalist, with more of the saving grace of humour than we envious Southrons commonly attribute to the generality of his countrymen. An admirable *raconteur*, he had almost as big a fund of good stories as his name-

sake the Dean. He shared with his friend Fitzgerald an Irishman's love of the whimsical and his fondness for paradox. Imagination is an excellent quality in a man of science, but it needs to be disciplined, and it must be admitted that Ramsay's, like the Laird of Dumbiedike's "willyard powny," occasionally ran away with him. But men of his temperament are to be judged not so much by what they say as by what they print, and although there are, no doubt, occasional lapses, there is but little in Ramsay's published scientific work that will not stand the test of time.

It is perhaps useless to speculate on the influences which led Ramsay to adopt a career in science. He himself was inclined to attribute his calling to heredity; many of his forbears for generations on his father's side had been dyers, whilst on his mother's side they were physicians. It must have needed some strong predisposing cause of this kind, as there was little or nothing in the circumstances of his school or college life to determine it. The teaching of chemistry was on a low plane in Glasgow in those days, and mainly as part of the medical curriculum. The University as a school of research lived on the traditions created by Thomas Thomson. Ramsay received little regular instruction in theoretical chemistry in his youth, but he learned to use his fingers in Mr. Tatlock's laboratory. It was only when he went to Tübingen to study under Fittig that he gained some insight into systematic chemistry. Not that Fittig was a particularly inspiring teacher. At all events he seems to have exercised no permanent influence on Ramsay, for the dissertation on toluic and nitrotoluic acids which he presented for his degree is one of his very few papers on organic chemistry.

Nor was he more fortunate in his first appointment as assistant in the newly created department of chemical technology in Anderson's College, where he had few opportunities for research and none for being generally useful. On his removal to the university, as a demonstrator under the late Prof. Ferguson, he had more scope, and availing himself of a collection of Anderson's preparations of bone-oil products, he attacked the chemistry of the pyridine series.

As in the case of other chemists who, in the past, have risen to eminence, it thus happened that Ramsay was largely self-taught. What he became was due almost wholly to his own exertions. The habit of self-reliance thus engendered served to strengthen his independent character and to develop his mental vigour. That with such a training he should have reached the position in the world of science to which he ultimately attained is perhaps the strongest testimony that could be adduced to his innate power and capacity.

On his appointment to University College, Bristol, and especially after his election to the principalship, Ramsay began to take an active part in the educational movements of the time, and he was concerned, with others, in securing some measure of State aid for the poorly endowed and struggling provincial colleges. He held very strong views on university policy and on its relations to original inquiry, and his contempt for the examination system, which a certain section of the governing body in the University of London seems to worship like a fetish, became at length almost an obsession, and occasionally brought him into collision with colleagues who, whatever their private opinions might be, felt themselves bound in loyalty to make the best of a system which had been deliberately sanctioned by those who were ultimately responsible.

Sir William Tilden, with the aid of Lady Ramsay and of many friends, to whom he makes graceful acknowledgment, has put together an eminently readable book, in which he has handled his material with tact and discretion. He has evidently been in thorough sympathy with his subject, and has thus succeeded in presenting a particularly pleasing pen-portrait of his friend, for which those who knew and admired Ramsay will be grateful to him. We trace in his book the lineaments of one who has shed lustre on British science, whose happy life was rich in achievements which will hand down his name to remotest time, who was wholly unspoiled by success, but continued to the end to be the same generous, active-minded man which those who knew him best knew him to be.

T. E. THORPE.

ARTIFICIAL SEASONING OF WOOD.

The Kiln-drying of Lumber. A Practical and Theoretical Treatise. By H. D. Tiemann. Pp. ix+316. (Philadelphia and London: J. B. Lippincott Co., 1917.) Price 18*s.* net.

THE true technique of the artificial seasoning of timber will depend upon a number of factors, as yet unknown, concerning the rate of passage of water in the walls of the constituents in different directions and under various conditions of dryness, also concerning the influence of stresses and rate of drying upon the shrinkage of the constituents and the wood itself. Our knowledge of these fundamental facts is, however, in an embryonic stage, and up to the present only certain elementary facts bearing on these problems have been discovered and partially elucidated. To their discovery Mr. Tiemann has contributed by years of research.

In the work under review, by reference to modern practice in kiln-drying and by discussions of the defects induced by inappropriate methods, conclusions are drawn as to the immediate causes of such defects as case-hardening (in which the external wood, shrinking under tension exerted by the internal wood, acquires a permanent set), lack of strength, brittleness, longitudinal furrowing and collapse, and splits induced by differential shrinkage or "explosion." These phenomena at the same time serve as means of partially gauging the efficiency of the precise treatment adopted. The differences in the treatments to be adopted in connection with various kinds of timber are in some cases correlated with marked structural features, as in the case of the oak, but in other cases are

associated with no such anatomical peculiarities —*e.g. Taxodium distichum*—which opposes great resistance to rapid depletion of water. The result of our ignorance of the basic principles in play is that the modern technique of artificial seasoning is partly empirical.

Timber-drying kilns in which the necessary regulation of the temperature, relative humidity, and movements of the air can be secured belong to two main types.

One type is the tunnel-like "progressive" kiln, in which the timber enters at the moist end and leaves at the drier exit end, so that it encounters different conditions of temperature and moisture as it is moved along the tunnel. The other main type is the "compartment" or "chamber" kiln, in which the timber is stationary, but the conditions are periodically changed. By the use of such kilns, and with the aid of wet-bulb and dry-bulb thermometers and humidity charts, it is possible to discover and standardise methods of rapid seasoning that sufficiently conserve the desired properties of the timber treated, and also to vary the methods in accordance with the use to which the wood will finally be put. Mr. Tiemann gives a general account of various kilns belonging to these main types, but devotes most of his attention to the water-spray kiln with which his own name is associated.

Mr. Tiemann's book is a happy combination of the technico-scientific with the practical. For instance, in dealing with the most economic method of supplying the minimum amount of heat, a scientific discussion of the quantity of heat required is accompanied by practical information as to the methods to be adopted of obtaining, distributing, and conserving the heat required. Accordingly, instructions are given as to the architecture of the kiln, the laying out of several kilns in juxtaposition, the use of exhaust and "live" and superheated steam, the distribution and dimensions of the heating pipes, the aerating devices, and the nature, structure, and thickness of doors, walls, and roof.

In conclusion, this work may be recommended not only as the sole authoritative book of its kind, but also as summarising the author's extensive original scientific and practical investigations on the subject. P. G.

TWO CATALOGUES OF SCIENTIFIC PUBLICATIONS.

(1) *University of Chicago. Publications of the Members of the University.* 1902–1916. Pp. x+518. (Chicago: University of Chicago Press; London: Cambridge Univ. Press, n.d.)

(2) *The "Athenaeum" Subject Index to Periodicals*, 1916. *Science and Technology, including Hygiene and Sport.* Pp. 162. (London: The *Athenaeum*, 1918.) Price 10*s.* net.

DURING the last twenty years there has been an extraordinary increase in the annual output of books and papers on scientific subjects. In the olden time many a quiet student would be content to spend his life upon one piece of work, producing at last one *opus magnum* in the hope that it might remain a permanent addition to human knowledge.

Now that schools, colleges, and universities have spread a knowledge of science abroad among the people, our men of science are no longer allowed to confine their publications to a record of their own researches, but are called upon to write text-books, articles in popular magazines, reviews, lectures, and addresses given at institutions, congresses, and receptions.

Knowing that all this scientific literature exists, anyone wishing to learn the present state of our knowledge on any given subject or of the theoretical views generally held upon it might well despair of ever discovering all that has recently been written on these subjects, if he could not rely upon the labours of bibliographers and compilers of indexes and catalogues to aid him in his search.

(1) A complete catalogue of all scientific publications throughout the world would be, unfortunately, very bulky. Some idea of its size may be gathered from an examination of the Catalogue of "Publications of the Members of the University, 1902–1916, published by the University of Chicago, compiled on the twenty-fifth anniversary of the foundation of the University." This catalogue is very inclusive, giving the titles of all books, articles, reviews, and theses published by members of the Chicago University during these fourteen years. The catalogue runs to 500 pages, and is remarkable as showing how prolific in published work a single university may be.

It is scarcely possible or even desirable to index the world's scientific literature on this scale, so that in any comprehensive catalogue some means must be found by which papers of minor importance may be eliminated.

No doubt a counsel of perfection would be that competent critics should read everything that is published and decide in regard to each book, pamphlet, or article whether it brought to light any new facts or fresh theories. Upon this decision the inclusion of the book or paper among those to be indexed would depend.

This is the method attempted by the International Catalogue of Scientific Literature. It must be confessed that the result depends very largely upon the judgment of the experts engaged upon the work.

(2) An alternative method is to draw up a list of journals of acknowledged character and to confine the catalogue to papers published in these journals. When this plan is adopted it is hoped that authors, finding that certain periodicals are always indexed by bibliographers, will gradually acquire the habit of sending any original paper they wish to publish to one of these periodicals. For the success of this plan it is necessary to publish a list of the periodicals indexed. Unfortunately, in the *Athenaeum* subject index of periodicals the high cost of composition and paper

has compelled the publishers to omit, for the present, the list of periodicals cited. In the section "Science and Technology, including Hygiene and Sport," published in April as part of the *Athenaeum* subject index for 1916, we are told that 311 periodicals are cited. The editors state that more than 500 periodicals have been indexed in their class lists for 1915–16.

The section "Science and Technology" of the "*Athenaeum* Subject Index to Periodicals" should have a wide circulation at the present time, when a knowledge of the best and most economical methods of carrying out a great variety of technical processes is of such importance to the country. The Council of the Library Association is to be congratulated on having brought this index into existence, and it is to be hoped that it will receive such support as will enable the work to be continued.

OUR BOOKSHELF.

Essentials of Practical Geography. By B. C. Wallis. Pp. xv+213. (London: Macmillan and Co., Ltd., 1918.) Price 4*s.* 6*d.* net.

THIS volume, which contains a great deal of original research work, is a valuable contribution to the practical side of the science of geography. It furnishes the teacher of the subject with a representative collection of practical exercises on the essential principles usually included in a four years' course of geography in an average secondary school. The 104 pages of part i. contain what may be regarded as a minimum course of practical geography. Part ii. (50 pages) is devoted to supplementary exercises which may be worked in the geography lessons or in the periods assigned to arithmetic, mathematics, physics, handwork, and drawing. The remainder of the book deals with outdoor work and advanced map-reading, revision exercises, etc. The work is skilfully planned, there being varied exercises for the beginner as well as for the advanced student. The principle of contour lines leads to isotherms, isobars, isohyets, etc. The diagrams showing isopleths for Java and Kew are particularly instructive.

The treatment of raininess is very full, several of the author's sets of monthly raininess maps being reproduced from the *Scottish Geographical Magazine* and from the *Monthly Weather Review* of the United States Weather Bureau. The example on p. 142 shows clearly the method of obtaining the "raininess numbers"; but since the actual monthly rainfall of Algiers for each month is given correct only *to the nearest inch*, it seems scarcely logical to calculate the theoretically evenly distributed rainfall in inches to two decimal places and to infer from the numbers so obtained that February is the rainiest of four months, each of which is credited with 4 in. of rain. If the figures for the monthly rainfall of Bombay had been given to a closer degree of accuracy, the corresponding raininess numbers given on p. 143 could have been made to agree with those assigned to Bombay on p. 43. On p. 143 (sixth line from the bottom) the word "quarter" should be "third."

At the end of the book is a useful glossary, a collection of examples of subjects for debates, and a set of indexes. W. M. C.

Practical Organic and Bio-chemistry. By R. H. A. Plimmer. New and revised edition. Pp. x+636. (London: Longmans, Green, and Co., 1918.) Price 18*s.* net.

THE speedy appearance of a new edition of this work indicates that it has established itself as a trustworthy and useful aid to practical bio-chemistry. The chief characteristics of the previous edition, to which attention was directed in NATURE of January 13, 1916 (vol. xcvi., p. 532), remain quite unaltered, and only slight changes in detail have been introduced. These are comparatively few in number, and take the form of modifications of methods of analysis and preparation rendered necessary by new publications. Thus the new methods of preparation of the bile acids, due to Schryver and to Mair, and the latest method of estimating glucose in blood (MacLean), are fully given. A new plate of absorption spectra forms the frontispiece, and includes the spectra of chlorophyll and other leaf pigments, as well as those of the colouring matters of the blood and urine. Appropriately for the times the remarks on diet have been recast, but the few lines devoted to "vitamines" scarcely do justice to the present state of our information with regard to those important dietary constituents.

A welcome addition to the new edition would have been some account of the methods employed in the estimation of the products of bacterial fermentation, a branch of bio-chemistry which has recently become of considerable importance, both from the scientific and the technical point of view. In particular a description of the processes proposed for the determination of mixtures of the lower fatty acids would have been of great value to many workers, although the problem has not yet been satisfactorily solved. A. HARDEN.

Yorkshire Type Ammonites. Edited by S. S. Buckman. The original descriptions reprinted, and illustrated by figures of the types reproduced from photographs mainly by J. W. Tutcher. Parts ix. to xv. (London: W. Wesley and Son, 1913–18.) Price 3*s.* 6*d.* net each.

ALL students of ammonites will welcome this latest addition to Mr. Buckman's work. It contains nearly fifty excellently reproduced figures of as many different species, accompanied by the original as well as detailed modern descriptions. The whole provides as good a substitute for the actual specimens as can be desired.

Seventeen new genera are instituted, the fate of which may be left to the future. It is unfortunate that no guiding principle has been followed consistently in devising new names. In accordance with common practice the majority end in "iceras"

or "oceras"; but Geyerina is left as a mystifying exception, which is just as likely to refer to a brachiopod as to a cephalopod. Seven are modifications of the name of the species chosen as the type; thus Bifericeras has biferus for its type. The remainder are not so happily devised. Euhoploceras has *A. acanthodes* for its type. Would not Acanthodiceras have conveyed practically the same meaning, and been much more easily assimilated? *A. luridus* is the type for Beaniceras. What is the objection to Luridiceras?

Among the morphological terms introduced those relating to homeomorphy crystallise our knowledge of this phenomenon and will be valuable for the discussion of other groups of fossils; but the series of terms of which "angustumbilicate" is a sample is more cumbersome and confusing than the descriptive phrases it displaces. The use of a formula to express the relative dimensions of the ammonite and its whorls cannot be excelled for conciseness and accuracy; but the omnibus terms devised to convey the same information have an average range of error of 8 per cent., and their use will render ammonite literature still more unintelligible to the average worker.

Taken as a whole, this work is a most valuable contribution to the science of palæontology.

H. H. S.

Naturforskeren Pehr Forsskål. Af Carl Christensen. Pp. 172. (Köbenhavn: H. Hagerup's Forlag, 1918.) Price 8.00 krone = 9*s*.

THE author of this interesting volume is well known to botanists by his valuable bibliographic work, especially his work on ferns. We have now to thank him for a welcome sketch of the naturalist of the ill-fated expedition to Arabia in 1761 to 1767, which was conducted at the expense of Frederick V. of Denmark.

The volume begins with an account of the expedition and the story of the gradual reduction of the six members to one, Christen Niebuhr being the only survivor. Pehr Forsskål was a Swede, born at Helsingfors in 1732. He was inscribed as a student at Upsala University, where he attended the lectures of Linnæus, but showed so strong a bent towards Oriental languages that in 1753 he migrated to Göttingen, where the celebrated J. D. Michaelis was professor. He was thus equipped both as naturalist and interpreter.

The results of his labours in this capacity are well known, as they were published by Niebuhr on his return to Copenhagen, practically unaltered from the original papers. We have accounts of plants observed in the South of France, Malta, Constantinople, Egypt, and Arabia Felix, until Forsskål's death at Jerim on July 11, 1763, in the thirty-second year of his age.

The text of the present volume is in Danish, but the Appendix of letters from the State Archives is more accessible to most readers because thirty-six letters are in German and the remaining four in French.

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.*]

Weeping Forms of Elm.

A REMARKABLE elm of the variety known as *Ulmus serpentina*, apparently about sixty years old, is now vigorously growing in a Croydon garden. It has this peculiarity, that all its permanent branches are curiously contorted and reflexed, while all the shoots from one to three years old are pendulous rods, which, with the beautiful foliage, form an exterior covering reaching to the ground.

To my knowledge no pruning has been done for the last four years by human agency, and it is highly probable that the tree from its beginning as a graft on a stock of *Ulmus montana* has been allowed always to develop itself without human guidance.

Will someone kindly explain how this tree has been able for many years to maintain its contorted character, seeing that all its young shoots, year after year, are not crooked?

I may add that much dead wood of recent growth falls from the tree every winter, and I have seen that more of the same kind remains entangled in the convolutions of the upper branches.

W. H. SHRUBSOLE.

15 Chatsworth Road, Croydon.

WE are informed that there is an interesting reference by the late Prof. Meehan, of Philadelphia, to a weeping form of *Ulmus americana* in Proc. Acad. Nat. Sci. Philad., 1901, p. 356. Like Mr. Shrubsole, however, Prof. Meehan confines himself to describing facts; he does not give any explanation of them.—ED., NATURE.

"HABITAT GROUPS" IN AMERICAN MUSEUMS.

DR. B. W. EVERMANN, Director of the Museum of the California Academy of Sciences, gives an account, in the *Scientific Monthly* (New York) for January last, of some of the "habitat" or ecological exhibits of mammals and birds which have recently been installed in the museum under his charge, and explains his views with regard to the educational functions of museums. With the latter part of his subject we are not at the moment concerned; but as it is possible, owing to the kindness of the publishers of the *Scientific Monthly*, to reproduce here several of the illustrations which accompany Dr. Evermann's paper, advantage may be taken of this opportunity to direct attention to some of the beautiful results which have been achieved in the United States in exhibiting animals in their natural surroundings. Each illustration has had to have its width cut away by about an inch in order to bring it within the width of a page of NATURE, but even with this reduction the mere inspection of the illustrations in question is sufficient to induce a feeling of unqualified admiration for these efforts; and, from my own personal experiences in the United States, I am able to go

further and say that the habitat groups in some of the American museums are fully deserving of the high praise Dr. Evermann claims for them.

FIG. 1.—San Joaquin Valley "Elk" (*Cervus nannodes*). Museum of the California Academy of Sciences.

The system adopted is to illustrate a particular species of animal, or a selection of species living together in the same environment, in a case of sufficient size to include a complete landscape, in which the animals are seen as they actually occur in the field. With this object in view, the museum of the California Academy of Sciences has constructed a large exhibition hall measuring 180 ft. by 60 ft. This is subdivided into two galleries, devoted respectively to mammals and birds. The regulation size for a large case is 25 ft. in width, 12 ft. in depth, and 18 ft. in height, the plate-glass front measuring 15 ft. by 10 ft. The mammal hall contains eleven of these large cases, and the bird hall possesses six, in addition to a series of smaller cases for exhibits on a less ambitious scale.

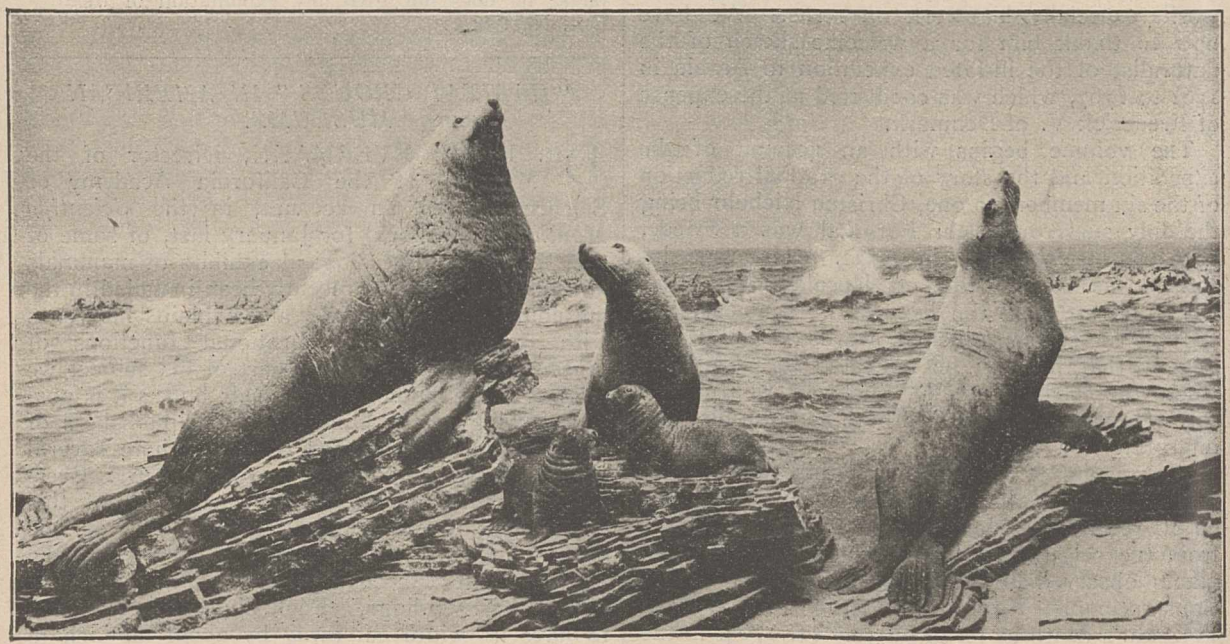

FIG. 2.—Steller's Sea Lion (*Eumetopias stelleri*). Museum of the California Academy of Sciences.

In most museums the visibility of the objects is

interfered with by reflections from the glass fronts of the cases. A window, or a light floor, or a white dress may be reflected so distinctly that these objects appear superposed on the exhibit,

cases for the habitat groups are arranged against the walls and are lighted by large skylights, while the central part of the hall is provided with skylights of a smaller size, so calculated as to reduce

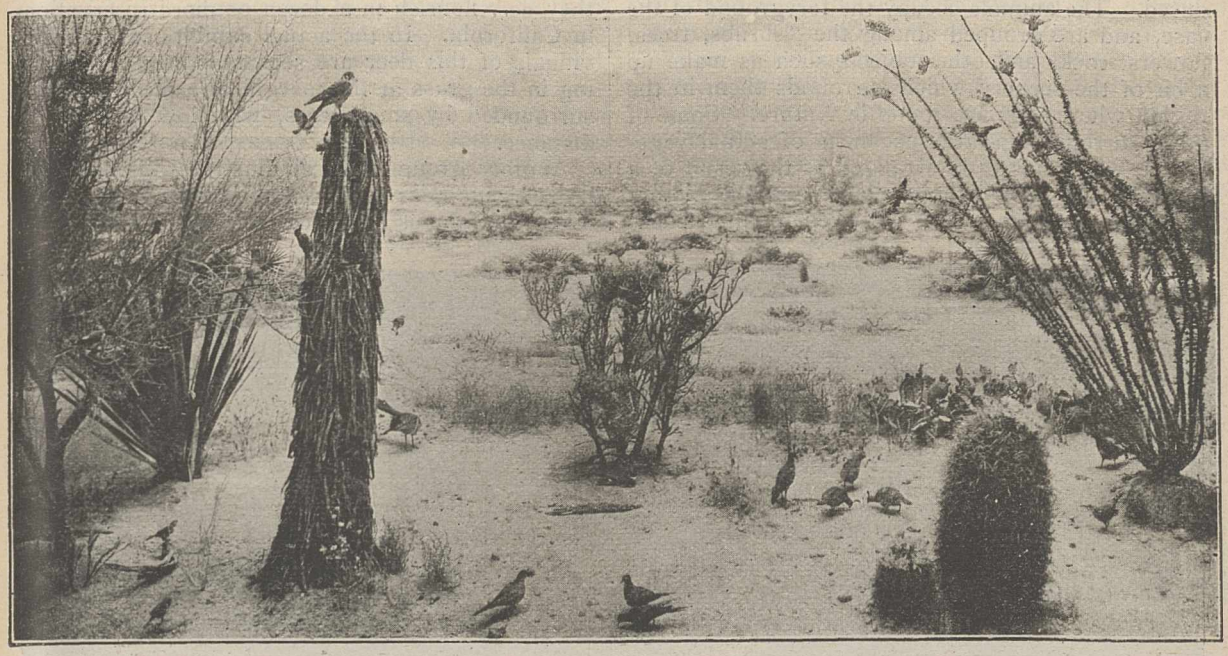

FIG. 3.—Californian Desert Bird Group. Museum of the California Academy of Sciences.

and it is often difficult, or even impossible, to obtain a satisfactory view of the specimens in the case owing to this cause, particularly when the

the illumination of objects in the space frequented by visitors to an amount which will give rise to no reflections strong enough to obscure the ob-

FIG. 4.—Black Bear (*Ursus americanus albifrontalis*). Museum of the California Academy of Sciences.

object inspected has a black surface, which emits so few light-rays that it is overpowered by the stronger reflections seen in the mirror-like front of the case. To avoid these inconveniences, the

jects in the exhibition cases. This is substantially the method which has long been in use for the exhibition of living animals in aquaria. Suitable arrangements are provided for reducing the

light in the central space on bright days, and for illuminating the cases at night or on dark days.

The general results of the system thus employed may be judged from the photographs here reproduced. The animals occupy the foreground of the case, and are grouped among the "shrubs, trees, flowers, rocks and other objects such as make up a bit of the scenery which surrounds them in the region where they are found in Nature." Some of these surroundings are specimens of actual vegetation, which has been arranged as the result of a careful study of a definite place, and the picture is completed by means of a curved, painted background, "which connects so perfectly with the real objects in front as to make it difficult, if not impossible, to tell where the real ends and the painted begins." The best artists are employed for the preparation of these backgrounds, which are so effective as to complete the illusion that a piece of actual country, with its animal population, has been transferred to the museum.

Among the objects shown in the Californian museum attention may be directed to the group (Fig. 1) of the San Joaquin Valley "elk" (*Cervus nannodes*), a species which formerly occurred in vast numbers in the San Joaquin-Sacramento Valley, California. After having been reduced to a few individuals only, the species was saved from extinction by the enlightened action of the late Henry Miller, who in the early 'seventies took measures for protecting the remnant of the herds, which have since increased to such an extent that they now flourish in a dozen or more reservations in California. In the actual exhibit several individuals of this deer are seen standing or crouching in the grass at the margin of a piece of water surrounded by small trees, with low hills in the distance.

Another group (Fig. 2) illustrates Steller's sea lion (*Eumetopias stelleri*), a species which still visits the famous seal-rocks off San Francisco, although it no longer breeds there. The animals are mounted on a ledge of rocks just emerging from the sea, which is represented with a fidelity making it appear like an actual coast-scene. The great difference in size of the two sexes is well brought out by the individuals selected, the adult male being at least twice as large as the adult female. A bird-group (Fig. 3) representing a scene in a desert region of southern California is particularly effective in bringing out the general features of the birds frequenting this region, as well as the aspect of the desert itself. It may be inferred from the descriptive label of the exhibit that the photograph fails to do justice to what is

FIG. 5.—Kentish Plover (*Aegialitis alexandrina*). British Museum (Natural History).

shown in the museum, since stress is laid on the magnificent colours of the birds themselves and of the flowers which blossom in the desert after the spring rains. The last case (Fig. 4) which can be noticed contains a group of black bears (*Ursus americanus*), represented by a rocky scene, containing the entrance to a den occupied by an adult and its cubs, mounted in singularly life-like attitudes.

Without in the least seeking to take away from the American museums the credit which belongs to them for their successful representations of Nature, it may not be out of place to point out that the system adopted by them is merely the amplification of one which has for many years been in use in this country, particularly in the Natural History Branch of the British Museum. By permission of the trustees of the museum, two figures illustrating the nesting groups so familiar to visitors to the bird gallery in the museum at South Kensington are here reproduced, for comparison with the American exhibits. The group of Kentish plovers (*Aegialitis alexandrina*) (Fig. 5) shows adults, nestlings, and eggs among the stones where the species breeds. It requires some care to discover the nestlings (to the left of the case) or the eggs (on the right side), so closely do they resemble the stones among which they were found. The case of the peregrine falcon (*Falco peregrinus*) (Fig. 6) is another very successful illustration of the nesting habits of a species of bird.

The essential features of the natural history of a species are really as well brought out in the relatively small cases employed at the Natural History Museum as in the larger exhibits of the American museums, although they do not aim at representing an entire landscape. It may readily be conceded that both systems have their advantages. But while the selection of a smaller case permits of the illustration of the natural history of a large number of species, it is obvious that the limit in number must soon be reached in a museum, even one of the largest size, which mounts its exhibits on the scale adopted in the American museums.

FIG. 6.—Peregrine Falcon (*Falco peregrinus*). British Museum (Natural History).

The question of cost is, moreover, one which cannot be ignored by any institution which is not provided with the most ample funds, and one would like to have been informed what has been spent in the production of the beautiful exhibits described by Dr. Evermann. It is unfortunately probable that economy in administration will be imposed on museums even after the conclusion of the war. Should it be suggested that it is the duty of museums in this country to imitate the American example, it must be remembered that the expenditure of large sums of money in this way would divert funds from other purposes which might be of more pressing importance.

S. F. HARMER.

THE CEREAL BALANCE.

AS the harvest year of 1917–18 approaches its end the question of the relation between supplies and rate of consumption of bread-corn assumes increased interest and importance. Europe and North America are breaking into their last reserves of home-produced cereals of the 1917 crop. If these prove inadequate to meet requirements from the present time until August next, what is the world reserve available to bridge the gap between the old and the new crop? The reply is given by the International Institute of Agriculture in a valuable analysis of supplies and requirements recently issued.[1] The analysis covers the agricultural season beginning with August, 1917, and ending with July, 1918, and is based upon returns as to production and estimated consumption of cereals in all important countries where international trade has been maintained, including, therefore, all Entente and neutral countries, but excluding Russia and Roumania.

As regards supplies, the relative yields of cereals in 1917 (northern hemisphere) and 1917–18 (southern hemisphere) as compared with the previous season (*a*), and with the average of the three preceding seasons, 1914–16 (*b*), are shown by the following summary:—

	(*a*) per cent.	(*b*) per cent.
Wheat	103·2	90·4
Rye	94·2	91·7
Barley	103·8	101·3
Oats	114·0	110·6
Maize	121·0	113·3

In the aggregate the cereal crops of 1917 show an increase of 223 million quintals over 1916, or 72 million quintals over the average of the three years 1914–16, the increases being mainly due to last summer's abundant crops of oats and maize in the United States. Wheat alone shows an increase of 19 million quintals over 1916, and a decrease of 64½ million quintals as compared with the three-year average.

To these supplies the carry-over from previous crops needs to be added, but very few countries have been able to show any such reserves in excess of the usual carry-over, Australia being the outstanding exception.

When these estimates of supplies are compared with the estimates of requirements up to next harvest supplied to the institute by the various Governments, the following margins of assets over liabilities (in millions of quintals) are shown for the different crops:—

Wheat ...	44½	Oats ...	62½
Rye	2½	Maize ...	157
Barley ...	12½		

or a total reserve of assets beyond requirements of 279 million quintals. The preponderance of oats and maize in this surplus is a factor to be considered in determining its real value. The light natural weight of the oat grain interferes with transport under conditions of shortage of tonnage, and consequently in many countries the consumption must be limited to the home-growth, within a very small margin. The handsome surplus of maize is the result of the very large crop of the United States, but so far it has unfortunately been most difficult to transport owing to the risk of heating consequent on an abnormally high moisture-content.

Earlier forecasts of the situation suggested the probability of an actual deficit of supplies, and it is all the more welcome, therefore, to find, now that more trustworthy data are available, that so far from this being the case the world, taken as a whole, has ample supplies to meet all its requirements.

The real gravity of the situation lies in the fact that the large reserves are in a few countries, such as Australia, Argentina, British India, and North America, while there is a large deficiency in Europe. Transportation is notoriously surrounded with difficulties owing to the scarcity of tonnage and the enormous rise in rates of ocean freight. The cost of carrying a quarter of wheat from Argentina to Great Britain is twenty times what it was before the war, and other freights have advanced in like manner.

It is clear, therefore, that the disclosure of a substantial world reserve of cereals in no way diminishes the need for the utmost effort to extend cereal production and to economise in cereal consumption in the countries where a deficiency exists and in countries nearest to them. The greater the success of this effort the more effective will the world reserve be in augmenting supplies and reducing prices in the future when a greatly increased tonnage becomes again available for the grain trade.

[1] "Statistical Notes on the Cereals," No. 7, pp. 136. (Rome: Internat. Inst. Agric., 1918.)

DR. G. K. GILBERT.

ON May 1 a very notable figure passed away from the field of geological discovery and research. Dr. Grove Karl Gilbert was born in Rochester, N.Y., in 1843, and had thus almost completed his seventy-fifth year. In his "Report on the Geology of the Henry Mountains," issued by the U.S. Geographical and Geological Survey of the Rocky Mountain region in 1877, he developed the theory of the expansion of intrusive igneous sheets into the great cauldron-like masses that he conveniently styled "laccolites" (stone cisterns), and the rapid recognition of laccolites throughout the world bore witness to the cogency of his exposition. From 1879 onwards he was attached to the staff of the U.S. Geological Survey, and it is not too much to say that his reports helped considerably to direct general scientific attention to the earlier publications of that body. His "Contributions to the History of Lake Bonneville" in 1882, and his monograph on "Lake Bonneville" in 1890, became classics for the treatment of vanished lakes in other areas, and also raised important questions as to crustal yielding under load.

An excellent example of Dr. Gilbert's approach to difficult problems may be found in his study of

the origin of the features of "The Moon's Face," in a presidential address to the Philosophical Society of Washington in 1892. In 1890 he had described the history of the Niagara River for the Commissioners of the State Reservation, and in 1907, when schemes for utilising the water-power of the falls threatened the normal continuation of their erosive action, he reported on their rate of recession both on the Canadian and on the American side. Almost simultaneously his unfailing judgment was called on to investigate the disastrous earthquake of 1906 at San Francisco. Among his later work may be cited an experimental study on river-transport (U.S. Geol. Surv., Professional Paper 86, 1914).

Dr. Gilbert was a man of strong build and fine presence, equally considerate to his colleagues and to the younger workers whom his methods and personality inspired. Those who were privileged to meet him in various lands will readily acknowledge that he was and remains one of those who have well deserved the title "great."

GRENVILLE A. J. COLE.

NOTES.

THE report of the council of the British Association was received and adopted at the statutory meeting of the general committee held on Friday last, July 5. Much disappointment was expressed that no ordinary meeting had been held for the second year in succession, and a resolution was adopted unanimously asking the council to arrange for a meeting in London next year if it should not be possible to meet at Bournemouth. It was left to the council to decide whether the meeting should be of the usual kind, with the various sections of the Association in session, or should take the form of a conference at which some of the national aspects of scientific work would be presented. We urged the desirability of a London meeting several months ago, and are glad, therefore, that the general committee has expressed itself so decidedly in favour of it.

SIR EDWARD SCHAFER, professor of physiology in the University of Edinburgh, wishes it to be known that he is adopting the name of Sharpey before the surname of Schafer.

WE regret to see the announcement of the death, on June 29, at sixty-five years of age, of Prof. Alfred Senier, professor of chemistry and lecturer in medical jurisprudence and hygiene in University College, Galway.

PROF. J. N. LANGLEY, professor of physiology in the University of Cambridge; Sir F. W. Dyson, Astronomer Royal; Prof. Horace Lamb, professor of mathematics in the University of Manchester; and Sir E. Rutherford, Langworthy professor of physics in the University of Manchester, have been elected foreign members of the Reale Accademia dei Lincei, Rome.

WE regret to record the death on June 24 of Prof. F. P. Treadwell, professor of analytical chemistry at the Polytechnic Institute, Zurich. Prof. Treadwell was a native of the United States, where he was born in 1857. He came early to Europe, and entered the University of Heidelberg in 1875, graduating three years later. For some time he acted as lecture assistant to Bunsen, and then proceeded to Zurich, where he served in a similar capacity under Victor Meyer. Eventually, in 1894, he received the appointment to a professorship, which he retained until his death. During his long stay of more than thirty years at Zurich Prof. Treadwell became a well-known and respected figure in the town. His name is familiar in this country and abroad by reason of his two-volume treatise on analytical chemistry, of which eight editions have appeared. That he retained an active interest in the branch of chemistry to which he had devoted himself is shown by the fact that not long ago, with a collaborator, he worked out a new method for estimating thiocyanic acid and hydrogen sulphide iodometrically.

AMONG the points discussed by Lord Moulton in his presidential address to the Institute of Gas Engineers on June 4 was the question of replacing the existing statutory illumination standards for coal-gas by standards based upon calorific value. With the use of the incandescent mantle now almost universal, it has become immaterial whether gas possesses illuminating power or not. The effect of the mantle depends on the calorific value of the gas, not on its light-giving properties. Provided that the gas will give out the requisite heat to raise the mantle to its proper degree of incandescence, the illumination obtained is from six to eight times that given by gas of statutory quality when used without the mantle. The illuminating properties, moreover, are conferred upon gas by the heavy hydrocarbons (olefines and benzene), which could be better used in other ways—partly as fuels, partly as a source of the important hydrocarbons which yield us our dyes, explosives, and other chemical products. That a large portion of these valuable substances should be sacrificed in imparting to coal-gas a property which has ceased to be of value is a loss to the community which should not be allowed to continue.

AT a symposium of the Zoological Society of America two addresses (reported in *Science*, May 17, pp. 473–81) were delivered on the value of zoology. In one of these Prof. M. F. Guyer, of Wisconsin University, deals with the utilitarian value, shrewdly premising (1) that widening the intellectual horizon and casting out the twin devils of superstition and ignorance are more useful gains than those which make for material well-being; and (2) that nowhere outside zoology "are there greater opportunities for developing that questioning, impartial, problem-solving attitude of mind which must obtain, if truth and sanity are to rule the world." He then proceeds to give vivid illustrations of the contributions zoology has made to the problems of health and disease, agriculture and animal husbandry, the conservation of natural resources, the utilisation of fisheries, and human eugenics. The other address, by Prof. H. B. Torrey, of Reed College, deals with the value of zoological science to the individual—the mythical average man—as organism, as citizen, and as personality. He justly sets great store on the educative value of getting, or trying to get, a clear view of distinctively biological concepts, such as organism, growth, development, behaviour, adaptability, evolution. These are all vivid, dynamic conceptions, the lack of which has often been a handicap, even to minds of the first rank. He indicates that amelioration of human life must have a scientific foundation (though other than cognitive factors may also be fundamental), and that zoology includes a vast realm of important facts bearing on or directly touching this complex life of ours. On another tack he points out that zoology is rapidly progressive, with problems for all comers to work at, a wholesome stimulation to all intellectual combatants. In bio-

logical science, in part because of its youthfulness, there are great possibilities of a return to "a wholesome apprenticeship as in the days when students were the assistants of their masters, shared their hopes and ambitions, and felt the stimulus of their creative activity." There is here the touch of "The Third Floor Back"—for students as well as for teachers.

IN the Bankfield Museum Notes, second series, No. 10, Mr. H. Ling Roth continues his studies in primitive looms by an account of those of Indonesia. The loom of this region belongs to the Pacific type, of which the most important are the American and the Ainu. Taking the area in a wide sense, there appear to be three forms of loom in Indonesia—the Dusun and Iban (Sea Dayak) looms, the Ilanun and Igorob transition loom, and the Cambodia and Malay loom. Of these the Dusun and Iban loom is the most primitive, consisting of a warp beam attached to two upright posts, a breast beam attached to a back strap, several laze rods, a shed stick, one "single" heddle, a beater-in, a temple, and a spool. The warp is continuous, and the weaver sits on the floor. The monograph is, as with others in the series, provided with several excellent illustrations from drawings.

IN a paper republished from the Proceedings of the British Academy (vol. viii.) under the title of "Cosmic Law in Ancient Thought," Prof. T. W. Rhys-Davids discusses the question of animism as defined by the late Sir E. Tylor. This is merely another name for the soul-theory, but it was a great advance to replace the ambiguous expression "soul" by a new scientific word which could be used in a definite sense. There is, however, a group of facts which cannot be included in this definition—those behind which is a single underlying principle, the belief in a certain rule, order, or law. Thus, among the Chinese, the fact of a boy having a hare-lip was explained to Prof. de Groot as resulting from the child's mother having during her pregnancy accidentally made a cut in an old coat of the father's she was mending. This is a definite law of causation, however absurd it may appear. For cases of this kind Prof. Rhys-Davids proposes the term "normalism," which is convenient, and will probably be included in the nomenclature of comparative religion.

MR. WAINO PEKKOLA, who during the last four years has been engaged in the study of the fish fauna of the Nile, publishes in Sudan Notes and Records, No. 2, April, 1918, a report on the "Seasonal Occurrence and Edibility of Fish at Khartoum." At present nearly 200 species are known to exist in the Nile system, but only a small number of these occur in the rivers near Khartoum, and still fewer are constantly present throughout the year. The most abundant are the Siluridæ or cat-fishes, of which the commonest is Synodontis, Schall. Almost as abundantly represented is the family Mormyridæ, all the members of which are African fish. Of the Cyprinidæ there are four species of Labeo. Of the Cichlidæ *Tilapia nilotica* has a wide distribution from the Sea of Galilee and the River Jordan all over the Nile system. The salting of fish is at present carried out only to a small extent in the Sudan, but many of the small species of the genera Barbus and Alestes would be valuable as food if salted in a proper manner.

THE British Museum (Natural History) has just issued the report on the Arachnida collected during the British Antarctic Expedition of 1910. The few specimens collected were obtained during the voyage out, from a rocky island off South Trinidad, and on the return journey from New Zealand. Mr. H. R. Hogg, to whom the specimens were submitted, remarks that, unfortunately, nearly one-half of the South Trinidad specimens have not reached maturity. This renders their determination uncertain, and consequently precludes any clear indication of the source from which the fauna had its origin. The island is situated in the belt traversed by the south-east trade winds, and the families represented are mostly those the members of which are carried long distances by the wind. Two new species were included in this collection.

TWO papers of considerable interest to ornithologists appear in the *American Museum Journal* for April. In the first of these Messrs. Herbert Lang and James P. Chapin describe the nesting habits of the African hornbills. While confirming much that has already been recorded on this theme, the authors have been enabled to add further details as to the extraordinary nesting habits of these birds. The most striking of these is contained in their assurance that the incarcerated female adds to the thickness of the mud wall used to diminish the entrance to the nesting hole by plastering the inner walls with excrement, containing the chitinous parts of insects and the seeds of forest trees. They also show that the female does not undergo a complete moult during her imprisonment, though this has been generally supposed to be the case. In the second paper Mr. Edward Forbush describes the courtship dances of the heath hen (*Tympanuchus cupida*). The curious sounds emitted by the bird during the display cannot be satisfactorily accounted for, but they are evidently due, in part at any rate, to the inflation of the cervical air-sacs, since no sound is emitted when these are punctured. Some remarkable photographs add considerably to the value of this very careful record.

THE British Museum (Natural History) has recently issued the fifth report on Cetacea stranded on the British coasts. The report, compiled by Dr. S. F. Harmer, keeper of the department of zoology, records the whales stranded during 1917. The most interesting specimens were a white-sided whale, from Lincolnshire, believed to be the first specimen recorded from the English coast; a large sperm whale from Caithness; a Cuvier's whale (*Ziphius cavirostris*) from Co. Clare; and a Risso's Grampus from the south coast of Devon. Examples of the bottle-nose whale (*Hyperoodon rostratus*) were recorded from Caithness, from Cork, and from Dorset, and Dr. Harmer discusses in some detail the occurrence of this whale on the British coasts, which generally takes place during late summer and autumn, the specimens being usually adult females accompanied by a calf. Most of the records have been obtained from information provided by the coastguards, but it is hoped that amateur naturalists will take an interest in this question and see that information as to any Cetacea stranded on the coast is sent to the Natural History Museum. The interesting record of Risso's Grampus on the Devonshire coast would have been lost but for the vigilance and careful examination of Mr. F. Beynon, of Torquay.

WE have recently received the first number of a new periodical, the *South African Journal of Natural History*, which is the official organ of the South African Biological Society. This society was formed in the latter part of 1916, and with it were amalgamated the South African Ornithologists' Union and the Transvaal Biological Society, with the object of making a strong body to advance the study of biological questions in the Union of South Africa. The South African Ornithologists' Union was started in 1904, and has issued twenty-two numbers of its

journal, which contain much valuable information in regard to the avifauna of South Africa; the Transvaal Biological Society, which was founded in 1907, has held a number of meetings in Pretoria, to which many papers and demonstrations have been submitted, but it has not issued any publication of its own. The new journal, which is edited by Messrs. A. K. Haagner, I. B. Pole Evans, and Claude Fuller, contains a number of useful papers, chiefly on ornithological and entomological subjects. Lieut. G. C. Finch-Davies writes on the birds of the districts of Okanjande and Outjo, in the South-West African Protectorate, formerly German South-West Africa, a region much neglected since the days of C. J. Andersson and F. Eriksson, who collected in the sixties and seventies of the last century. Other bird papers are contributed by Messrs. C. F. M. Swynnerton and R. Godfrey. Mr. Haagner describes a new baboon (*Choiropithecus rhodesiae*) based on an animal living in the Zoological Gardens at Pretoria, and illustrated by a photograph—a rather hazardous proceeding, perhaps, while the animal is still alive. Among the entomological papers are one by Mr. R. W. Jack on the larvæ of some Rhodesian Tenebrionidæ, and one by Mr. C. N. Barker, in which attempts are made to explain some irregularities in the phenomenon of seasonal dimorphism among butterflies. Altogether the part, which consists of 122 pages of well-printed text, is a welcome addition to the list of zoological publications, and, we hope, will continue to appear and to maintain the high standard it has set itself.

IN view of the increasing restrictions upon the importation of wheat, the Department of Agriculture for Trinidad and Tobago has issued a leaflet entitled "Our Local Foods and How to Use Them," which urges economy in the use of wheat-flour and the more extensive use of native plants—sweet potatoes, yams, cassavas, dasheens, and others—as human food. The leaflet embodies many of the recommendations of the British Guiana Flour Substitutes Committee, which was appointed in 1917 to investigate the possibility of procuring locally grown products as substitutes for wheat-flour. The report of this Committee, which was published in the Bulletin of the Department of Agriculture for Trinidad and Tobago (vol. xvi., part 2), states that the products of tropical origin which most nearly approach wheat-flour in food value are rice, guinea-corn, and maize, but it is not possible to make bread of these alone; they can be employed only in the preparation of cakes. On the other hand, these products, and, in addition, cassavas, sweet potatoes, and tannias, are useful adjuncts to imported flour, and by their general use in bread-making it was calculated that the amount of wheat-flour imported in 1916–17 might be reduced to half in 1918. The economical feeding of stock is also strongly urged by the Department of Agriculture, as in 1914 oats and cattle-food to the value of 70,000*l.* were imported. As a substitute for oats, farmers are recommended to grind unshelled corn and to supplement it with locally grown peas and beans, as this practice should reduce the imported cattle-fodder to about one-fifth of its present amount. The high price of food has largely increased the area of land under cultivation in Trinidad, and the Government has recently offered rice lands at a nominal rental, so that the colony should become in the future largely self-supporting.

A SEVERE earthquake, of which very few details have as yet reached this country, occurred at about 6 a.m. (G.M.T.) on February 13 in Swatow, on the southern coast of China, by which several hundred persons were killed and more than a thousand injured. An account of the earthquake, written for the most part in Japanese, is given by Mr. K. Hasegawa in a recent issue (March, 1918) of the Journal of the Meteorological Society of Japan. The position of the epicentre, as determined from records obtained in Japanese observatories, is in lat. 24° N., long. 116° E.

THAT the duration of the preliminary tremor of an earthquake varies with the distance of the epicentre has long been known, though, for earthquakes with neighbouring origins, no simple formula has been devised for estimating the distance of the epicentre from the duration of the tremor. From a discussion of forty-one recent earthquakes in Japan, Prof. Omori shows (Bulletin of the Imperial Earthquake Investigation Committee, vol. ix., 1918, pp. 33–39), that, when the distance does not greatly exceed 1000 kilometres, the distance of the epicentre in kilometres is very nearly 7·42 times the number of seconds in the duration of the preliminary tremor. The only exception within the limit mentioned is that if the duration is less than one second the coefficient should be 6·0.

MR. J. B. TYRRELL (Trans. Roy. Soc. Canada, vol. xi., p. 39, 1917) concludes that the deep vegetable deposits known as "muck," resting on permanently frozen gravels in the Klondike district, began to accumulate at the very opening of the Glacial epoch. The supply of gravel through river action was then cut off, and conditions were established which have lasted down to the present day. The permanently frozen substratum furnished an impervious foundation, on which sufficient water gathered in spring to allow of the growth of Sphagnum and Hypnum, while the streams from the hill-slopes washed down into the flats representatives of the forest flora of the district.

MR. P. W. STUART-MONTEATH (*Comptes rendus*, January 7, 1918) gives reasons for assigning a Cretaceous age to a large extent of limestone, once regarded as Carboniferous, in the "Détroit de la Navarre," a transverse band of sediments separating the Pyrenees from the Basque ranges. He concludes that a great series of intrusive ophites and lherzolites is responsible for the local silicification of various rocks, and that the intrusions are posterior to the Hippurite-limestone and to an overlying conglomerate. The conglomerate contains blocks of ophite, which are interestingly regarded as due to volcanic explosions prior to the veins that were finally injected in the mass from the same subterranean cauldron.

ALTHOUGH a number of weakly magnetic minerals such as zinc-blende are known to be attracted by strong magnetic fields, but little is known as to the degree of magnetisation obtainable. Three investigators describe in *Metall und Erz* for January 8 a method of measuring the susceptibility of such minerals. Zinc-blendes of different varieties were found to have widely varying susceptibilities, some being below 10^{-6} and some as high as 500×10^{-6}.

IN the *Revue générale de l'Electricité* for May 18 methods are described to enable electric generating stations to transmit signals over their systems. These signals could be used for such purposes as time-signals, synchronising clocks, or giving any other prearranged signal, such as air-raid warnings, etc. The signals consist of a series of periodic variations of voltage, the magnitude being small compared with the line voltage.

AT the present time, when oils and grease are of so much importance economically and industrially, a writer in *La Nature* for April 27 describes a new process, invented by an Italian (Prof. Lotriónte), that has proved most successful in exterminating the olive-

fly, which annually destroys about 80 per cent. of the crop. Small wooden boxes are fastened to the tree, and beneath the cover of each box is fixed a bunch of straw. The straw is spread with an insecticide, of which the formula is given. The result has been to reduce the losses to 10 per cent.

FOR the past few years Swedish seaweed has been coveted by the Germans, who, by chemical treatment, made it into fodder, and also extracted valuable chemical products from it. A number of experiments have been made at Stockholm, according to the *Svenska Dagbladet* for May 12, and it has been found that by dry distillation of 1 kg. of dried seaweed the following substances can be extracted:—30 to 32 litres of illuminating gas, 43 per cent. of carbon, 45 per cent. of distillates (acetic acid, methylated spirit, formic acid, acetone, etc.), 14 per cent. of salt (sodium sulphate, potassium sulphate, potassium chloride), also iodine, bromine, a very aromatic tar product, and carbolic tar (creosote?), an excellent preservative of timber. A factory is about to be started by the Focus Co. to take up the conversion of seaweed on a large scale.

WHEN a sphere or other solid symmetrical about an axis performs torsional oscillations about that axis in a viscous liquid it is found that the logarithmic decrement of the oscillation is not constant until the oscillation has died down to less than 0·01 radian, and becomes difficult to measure with the necessary accuracy. Determinations of the viscosity of the liquid from the value of the decrement on the assumption that the oscillations died away according to the simple exponential law have generally given too high results. In Communications from the Physical Laboratory of the University of Leyden, No. 151, Dr. Verschaffelt shows both theoretically and experimentally that the oscillations require at least three terms of the form e^{-nkt}, where e is 2·718, t is the time, n has the values 1, 3, 5, etc., and k is a complex quantity involving the viscosity of the liquid. With this theory as a basis he is able to show that the viscosity of liquid hydrogen at 20° Absolute is 0·00011—that is, about one-hundredth part of that of water at 15° C.

UP to ten years ago our knowledge of the distribution of the electric potential in a vacuum tube through which a discharge was passing was derived from observations with an exploring electrode, but in 1909 Sir Joseph Thomson introduced the more trustworthy method of determining the electric field in a tube by discharging cathode rays across it and measuring the deflection of the rays produced by the field. Using this method, Aston in 1910 found the field in the cathode dark space proportional to the distance from the edge of the negative glow, while Harris in 1915 found it increased much more rapidly as the cathode was approached. Messrs. T. Takamine and U. Yoshida, in the October issue of the Science Memoirs of Kyoto University, give the results of their measurements of the field in narrow tubes by the widening or separation of spectral lines photographed across the field, a method due to Lo Surdo. They find that the field at a point distant d from the end of the dark space exceeds the field at the end by a quantity proportional to d^2. The curves given in the paper show that this law is a close approximation to the facts.

THE May issue of the *Lyonian* (the magazine of the Lower School of John Lyon, Harrow) contains the report of a lecture on "Chemical Change" delivered by Mr. O. A. Le Beau at a meeting of the school scientific society. The lecturer commenced by pointing out that chemical change is of universal and never-ending occurrence, and then differentiated it from physical change. The five different types of chemical change, direct union, decomposition, polymerisation, single replacement and double replacement, were defined, and so far as possible illustrated by experiment. The phenomenon of catalytic action was shown experimentally, and also the action of light upon chemical change. Such a recent development of the action of electricity as the production of "active nitrogen" was illustrated by a repetition of Prof. Strutt's original experiment. We think it commendable that the school possesses a science master who evidently keeps abreast of modern research, and that such a lecture, involving much work in its preparation, should be so enthusiastically received.

WE have received a reprint from the Journal of the West of Scotland Iron and Steel Institute of a paper recently read by Dr. Desch on "Attempted Improvements in the Puddling Process." As Dr. Desch points out, the process of manufacturing malleable iron by means of puddling, invented by Henry Cort in 1784, has undergone surprisingly little alteration in the course of its history. It is still performed in units of small size owing to the fact that manual labour is employed for the manipulation of the metal, and the quantity dealt with cannot exceed that which a man can handle without the aid of machinery. Certain details of Cort's original process have been modified, and have produced an important effect on the development and manufacture, but the principle has remained unchanged. The present report does not deal with such improvements as those which have led to the puddling furnace of the present day, but is an attempt to collect information concerning proposals which have aimed at altering the character of the process, either by lessening the manual labour involved or by increasing the thermal efficiency of the furnace. Few of these suggested improvements, however, have been adopted permanently even on a limited scale, and the type of furnace in universal use differs less from that used at the beginning of the nineteenth century than from most of the proposed substitutes for it. Undoubtedly the most important of these modifications was the Danks furnace, which was a practical success, and its failure to maintain its ground was due, not to any inherent defects, but chiefly to the abandonment of iron-making in favour of steel by those firms which had formerly shown the greatest interest in the problem, and had come nearest to solving it. Dr. Desch's paper is an interesting summary of the subject, and should be of great service.

THE assistance which America is rendering to the Allies in the matter of shipbuilding is illustrated by articles in the *Engineer* and *Engineering* for June 28, descriptive of the world's largest shipyard at Hog Island, on the Delaware. The land on which this shipyard stands was virgin on September 20, 1917; the twenty-first slipway is now in use, and twenty-nine other slipways are in course of construction. A shipyard capable of having fifty ships on the stocks at one time was a thing quite undreamt-of until last year, and suggested the visions of Jules Verne rather than the plans of sane business men. Yet it is now in a fair way of accomplishment, and the estimate may be accepted of fifty ships being built simultaneously, while twenty-eight others are being fitted out at seven piers each of a length of 1000 ft. When that stage is reached there will be a launch every other day, either of a 7500-ton cargo ship or of an 8000-ton combined troop and cargo boat. The site covers 846 acres, and extends over two miles of river front. The various parts of the vessels are being "fabri-

cated" all over the States at 3500 different works, some of them so remote that the average journey takes as many as twenty days. Within five months of commencing operations 26,000 men were employed on the construction of the yard. The site is well inland, away from possible enemy attack.

OUR ASTRONOMICAL COLUMN.

THE NEW STAR IN AQUILA.—Further particulars of the observation of Nova Aquilæ by Prof. Laskovski at Geneva on June 7 have been given in Circular No. 25 of the Marseilles Observatory. The star was observed at 9.45 p.m. mid-European time, and was described as being white, and of a brightness greater than that of α Ophiuchi (mag. 2·1), but less than that of Altair (0·9). This would appear to be the earliest observation so far reported. Subsequent observations agree with those made elsewhere in showing that the star was brighter than Vega on June 9, and had dwindled to about 2nd magnitude by June 18. It is added that the region was under observation by M. Dumastberay at Nyon on June 3 and 4, and that nothing abnormal was then noted.

There appears to have been a slight recovery in brightness of the nova at the beginning of the present month. Mr. Denning found that after reaching mag. 3·75 on June 29 there was a decided increase in brightness to mag. 3·5 on July 1. With possibly slight variations the star remained at about this brightness up to July 8. The check in the decline of the nova occurred at about the same interval after maximum as in the case of Nova Persei, and it will be interesting to see if Nova Aquilæ will now similarly assume the characteristics of a variable star. The bright lines of hydrogen have continued to dominate the visible spectrum, and no striking changes in detail were noted by Prof. Fowler between June 29 and July 8 except that the reversal of the hydrogen lines was no longer clearly visible. The band in the blue near λ 464 remained a conspicuous feature during this period, and was possibly increasing in relative brightness. The relative brightness of the line 502, however, did not appear to have notably increased.

Photographs of the spectrum obtained by the Rev. T. E. R. Phillips have shown remarkable changes in the structure of the bright bands of hydrogen. On June 13 and 15 the bands had a bright central stripe, with bright companion lines on both sides; on June 22 they were single, but broad; on June 26, 27, and 29 they were double, as if centrally reversed, and the less refrangible components were the brighter; and on July 2 they were again single, but broad. The band about λ 464 appeared as early as June 13, and has continued to brighten; it passed through changes of structure similar to those exhibited by the hydrogen bands. A new bright band appeared on July 4 on the more refrangible edge of a broad, dark space on the violet side of Hγ.

EPHEMERIS OF WOLF'S PERIODIC COMET.—Attempts to find this comet have hitherto been unsuccessful, but as its distance from the sun and earth is steadily diminishing, the comet is likely to be found before long. The following ephemeris is from Mr. Kamensky's elements:—

G.M.T.	R.A. h. m. s.	N. Decl. ° ′	Log r	Log Δ
July 12·46	20 32 52	24 50	0·3368	0·1376
24·64	20 26 3	26 28	0·3217	0·1017
Aug. 5·49	20 17 1	26 45	0·3073	0·0724
17·01	20 8 27	25 50	0·2936	0·0499
28·17	20 2 27	23 52	0·2803	0·0338

THE NEW SYSTEM OF TIME AT SEA.—Mr. F. Jacob suggests the term "Intermeridian Time" for the new system, with the abbreviation I.M.T., so that 4h. 7m. I.M.(+3)T. would be equivalent to 7h. 7m. G.M.T. The suggestion has met with favourable consideration from the Admiralty Committee on the subject. The term "Intermeridian" is unobjectionable for denoting the regions that keep the same time, but its length will probably hinder its general adoption for this purpose.

CONFERENCE OF CORRESPONDING SOCIETIES OF THE BRITISH ASSOCIATION.

THE annual conference of Delegates of Corresponding Societies of the British Association was held in the Geological Society's rooms, Burlington House, on Thursday, July 4. At the morning session Dr. F. A. Bather gave his presidential address entitled "The Contribution of Local Societies to Adult Education." In this Dr. Bather endeavoured to summarise the membership and estimate the strength of the various scientific societies in Great Britain, show the part they were playing in the adult education of the country, and make suggestions for the further usefulness of these societies. His statistics had been difficult to compile and were admittedly incomplete, but it was demonstrated that while some centres were well provided for in the way of natural history and allied science societies, there were many large areas which appeared not to be served by any societies of the kind. Discussion was invited, which lasted for the remainder of the morning. The general feeling was that, desirable as it is that everything should be done to increase the popularity and work of our scientific societies, the present time was inopportune, seeing that so many of the young and vigorous men were occupied with more important duties. In his reply to the discussion the president attached particular importance to the remarks made by the delegate from Hull, in reference to the excellent work being accomplished in Yorkshire, where there are far more important societies than in any other county. It was pointed out that, notwithstanding the elaborate and systematic instruction in Nature-study in the schools, and the formation of Nature-study societies for teachers, the result was unquestionably that there was less apparent interest taken in natural history by young men and women after leaving school, and even before the war the membership of the societies had shown an apparent decrease. The conference decided to endeavour to prepare a list of all the scientific societies in the country.

At the afternoon session Mr. Martin C. Duchesne read an admirable paper on "Afforestation," Sir Charles Bathurst and many of the delegates taking part in the discussion. The lecturer dealt at length with the urgent question of the increase of our home forests, and made many excellent suggestions towards the accomplishment of this. It was felt that the delegates could get the societies they represented to use their influence to further the growth of timber throughout the country, and one practical proposition was made, namely, to form an Arbor Day throughout the country. Such a suggestion, made on July 4, was also complimentary to our American friends, who have had an Arbor Day for many years. A short note from Mr. P. Westall, who was not present, was read, the gist of which seemed to be that some authority should make grants to local museums, but how and by whom these grants should be made the author did not seem to know, and the delegates did not appear to be able to help him. On behalf of Mr. B. B. Woodward a "typomap" of the British Isles was exhibited, upon

which naturalists may record the distribution of species. This will probably be circulated among the various societies.

More than one member commented on the fact that this year, when the necessity for directing attention to the national value of science seemed so great, the British Association *for the advancement of science* had decided to have no general meeting.

THE FUTURE OF THE ENGINEERING TRADES.

THE Report of the Departmental Committee appointed by the Board of Trade to consider the position of the engineering trades after the war has recently been issued (Cd. 9073, price 6*d*. net).

The report relates to one of the largest and most important of the national activities. It is chiefly concerned with fiscal, commercial, and labour questions. The Committee estimates the annual net value of the output of the engineering trades, excluding the cost of materials, at 84,000,000*l*., and the real value at 144,000,000*l*.

The Committee remarks on the smallness of many individual firms, in consequence of which they manufacture at a cost which could be greatly reduced if they were on a larger scale, well planned and well equipped; also, that adequate departments for research are necessary, but that small firms cannot bear their cost. The Committee regrets the spirit of exclusiveness which has marked the engineering trade, each manufacturer keeping his own secrets and desiring to retain the knowledge of any special processes and methods for himself.

It is urged that standardisation must be extended. For instance, locomotive manufacturers exist almost entirely on foreign trade, the great railways constructing those they require. But, except in the case of India, locomotives are not standardised, and British engineers employed by foreign railways require modifications of their own. German and American manufacturers build to stock with economy of drawings, patterns, templates, etc. The case of imports of watches is curious. The average value of imported watches from Switzerland is 6*s*. each, and the total value more than a million pounds. The British manufacturer does not seem prepared to supply a good, cheap watch.

The Committee decides against the compulsory adoption of the metric system on the grounds that the expense would be great, and that any change should be effected after agreement with the Dominions and the United States. But it recommends that subdivisions of the inch should be decimalised, and the hundredweight and ton replaced by the cental and short ton.

The recommendation that school education between the ages of fifteen and seventeen should be confined to selected boys does not go so far as Mr. Fisher's Education Bill. As to higher education, the views of the Committee are more advanced. But it is pointed out that the monetary results which can be achieved by a graduate of the technical or scientific side of a university are incommensurate with the expense incurred, and that the rewards for higher technical education are still far too small.

As to the much-discussed question of dumping, the Committee expresses a decided view. It thinks that all necessary steps should be taken to prevent dumping wherever practised, and refers with approval to the legislation in the United States and Canada.

An account is given of the German system of cartels, under which a manufacturer is able to maintain a reasonable output in bad times, and in the case of articles for export receives a rebate in price on raw and semi-manufactured materials. Also, in Germany there are reduced railway rates on goods for export. It is urged that the Government should supervise, encourage, and assist the development of the supply of raw materials within the Empire. On the other hand, it is suggested that Government control of industries should end as soon as possible after the war; also that labour must withdraw all restriction of output and hampering definitions of skilled work. It is clear that the Committee regards the statistics of trade available in this country as imperfect.

GENETICS AND EVOLUTION.

THE problems connected with genetics and "species-making" continue to attract the attention, both in the United Kingdom and in America, of many biologists, whose papers should not be neglected by students of heredity and evolution. In the *American Naturalist* for October last (vol. li., No. 610) Dr. R. R. Gates discusses the mutation theory and the species concept. With the help of many illustrative examples he tries to show that "there are two distinct types of variability having different geographical relations." The discontinuous type, "independent of environmental or functional influence, has given rise to many specific and generic characters, notably in plants, but also in higher animals." The continuous type "apparently represents the stress of the environment on the species in its dispersal," and "is notably exemplified in birds and mammals."

An exceptionally valuable study on variation in a group of mammals is furnished by A. C. and A. L. Hagedoorn, who write on "Rats and Evolution" in the *American Naturalist* for July, 1917 (vol. li., No. 607). These authors, who have worked from the economic and systematic point of view on "the rat population of the Dutch East Indies," contend that assemblages definable as "species" or "varieties" can be appreciated only through breeding experiments and field work, the results of which must constantly be invoked to check the descriptive activities of the museum specialist, who deals with dead skins and skulls. In their breeding experiments the authors found no new dominant characters, but "in every instance there appeared new recessive characters," for every one of which, they believe, "crossing, recombination of genes was the cause, not loss-mutation."

In connection with these questions, Prof. T. H. Morgan's discussion on the theory of the gene (*Amer. Nat.*, vol. li., No. 609) is noteworthy; in the course of his argument he refers to Prof. Jennings's important address summarised in NATURE of November 8 and 15, 1917. Prof. Morgan contends for the stability of the gene; if it vary, the variation falls around a mode. This question is further elucidated by Dr. R. Goldschmidt, who describes "Genetic Experiments concerning Evolution" (*Amer. Nat.*, vol. lii., No. 613), carried out on the gipsy moth (*Porthetria dispar*) and other species; from the crossing of races the caterpillars of which show varying amounts of dark pigment Dr. Goldschmidt concludes that the multiple allelomorphs for pigmentation "are different quantities of the substance which we call a gene, which act according to the mass-law of chemical reactions, *i.e.* produce a reaction or accelerate it to a velocity in proportion to their quantity." Insects from various European and Asiatic localities have been used in these experiments, and the author states that "the first step in the differentiation of species which occurs in Nature seems to be the formation of geographic races."

With this paper may be compared the second instalment of J. W. H. Harrison's "Studies in the Hybrid Bistoninæ" (*Journal of Genetics*, vol. vi., No. 4), in which details of the results of crossing several species

of Poccilopsis with wingless females are given. Mr. Harrison lays stress on the importance of these results as affording evidence of the relationships between the species. Another paper on hybrid Lepidoptera worthy of attention is that by Mrs. Merritt Hawkes (*Journal of Genetics*, vol. vii., No. 2) on inheritance in the cross of two Saturniid moths, *Philosamia ricini* and *P. cynthia*, in which special attention is paid to larval characters, such as spots and tubercles; the appearance of abnormal larvæ with reduced tubercles (a recessive character) in the F_2 generation is especially interesting in relation to the existence of a few Saturniid species the larvæ of which are always without tubercles.

Among papers dealing particularly with problems of Mendelian analysis, R. K. Nabours and A. W. Bellamy's "Studies of Inheritance and Evolution in Orthoptera" (*Journal of Genetics*, vol. vii., No. 1) give a vast amount of detail of experimental work on grasshoppers of the Tettix group. The most important theoretical result is the apparent demonstration that while some patterns are allelomorphic to each of a number of others, a certain melanic pattern may be allelomorphic only to its absence. In connection with this subject attention must be directed to H. Terao's short but important paper on "Reversible Transformability of Allelomorphs" (*Amer. Nat.*, vol. li., No. 610), in which he describes cases of the occasional presence of a dominant character in the corresponding recessive homozygote in cultures of the rice plant. The frequency of this abnormal phenomenon is studied, and the author states that "the dominant and recessive types concerned are assumed to be transformed by certain unknown causes into the other allelomorph." He then proceeds to argue that on this view it is impossible to accept the theory that "the dominant allelomorph is due to the real presence of a hereditary material unit which is absent in the recessive allelomorph," and that the two "may be supposed to represent two alternative conditions or phases of a single hereditary substance, somewhat resembling the chemical conception of polymerisation."

In a controversial and stimulating "anti-vitalistic" discussion of biological enigmas, Dr. L. T. Troland (*Amer. Nat.*, vol. li., No. 606) carries the concepts of the chemist far more intimately into life-problems, and makes bold to write: "On the supposition that the actual Mendelian factors are enzymes nearly all . . . general difficulties instantly vanish, and I am not acquainted with any evidence which is inconsistent with this supposition."

The claims of some extreme "geneticists" that no discussions on evolutionary problems not founded on "experimental evidence" can be profitable are trenchantly dealt with by Dr. W. K. Gregory in an article entitled "Genetics *versus* Palæontology" (*Amer. Nat.*, vol. li., No. 610). To many who believe that much may still be done in the elucidation of phylogenetic problems on a large scale from the study of classification and morphology, Dr. Gregory's illustrations and arguments, drawn mainly from the wonderful series of American fossil mammals, furnish a bracing reminiscence of youthful days of controversy.

G. H. C.

THE FUTURE OF PURE AND APPLIED CHEMISTRY.[1]

FOR three years past pure chemical research has been dormant the whole world over, and it would be difficult for the most accomplished essayist to arrest your attention for an hour by an address on a subject of purely academic interest. Our mental point of view and our outlook upon both present and future are entirely different from those of four years ago; although the present is obscure and painful, the future gives promise of brilliant and rapid developments in natural science in general and in chemistry in particular. In this belief I venture to lay before you some reflections upon the growing recognition of the importance of our science and upon the responsibilities with which, owing to this change in public opinion, our shoulders are laden.

I have often heard the statement made by men who have grown old in the service of science that chemistry, and particularly applied organic chemistry, is a subject in which the British nation can never excel: that minute attention to detail, coupled with the power of organisation and co-operation, entails something antipathetic to the British character; the Germans, we know, have often expressed this view. The events of the last three years have sufficed to dissipate this fallacy for ever. The manner in which Great Britain, caught in the autumn of 1914 with scarcely any resources in the shape of equipment for the manufacture of fine organic chemicals, has rapidly become a larger producer of explosive, pharmaceutical, photographic, and other essential chemicals than Germany will remain an enigma to the historian of these present times. The obscurity which surrounds this rapidly executed operation is not diminished by the existence of difficulties which have naturally acted as inhibiting agents. This country enjoys in a greater measure than any other State a representative Government; in spite of the many advantages of such a form of Government, the fact remains that it necessarily admits of no representation of any phase of public opinion which is not loudly and insistently expressed. Science has always been in this latter position; it has been unvocative. During the first few years of the nineteenth century Dalton enunciated the atomic theory, Thomas Young stated the undulatory theory of light, and James Watt's steam engine came into general use. By these events all the amenities of human life have been revolutionised; indeed, they have exercised vastly more influence on the well-being of our race than did the Napoleonic wars. So accustomed are we, however, to routine habits of thought that most of us would probably answer, in reply to a suddenly posed question, that the battle of Trafalgar was the most pregnant event of the first quarter of the nineteenth century.

A brief moment of reflection would lead us to correct this hasty statement. Sodium was discovered by Davy in 1807, and benzene by Faraday in 1823. From sodium we obtain sodamide, the prime agent in making artificial indigo an economic possibility; the separation of benzene from coal-tar led by logical sequence to the production of Perkin's mauve and of thousands of other synthetic colouring matters, and to the manufacture from coal-tar anthracene of synthetic alizarin, the first heavy blow aimed at the position of the Turkish Empire, involving as it did the ruin of the Turkey-red or madder industry. The first practical process for making aluminium depended on the use of Davy's sodium, and with the aid of Davy's safety lamp 250,000,000 tons of coal are mined annually in this country with comparatively slight risk. Faraday's early investigations on the chemical aspects of electrolysis and his studies on magnetic induction led immediately to the invention of the dynamo, and, through Clerk Maxwell, to the introduction of wireless telegraphy; this one branch of Faraday's investigations, in point of fact, constitutes the ground-work of the whole stupendous vista of results of the general introduction of the electric current into modern life which is so familiar to us all. Cavendish's early pro-

[1] Abridged from the presidential address delivered at the annual general meeting of the Chemical Society on March 21 by Prof. W. J. Pope, F.R.S.

duction of nitric acid by the passage of an electric spark through air, reproduced on an enormously larger scale, is now furnishing Central Europe with the nitric acid without which no explosives could be manufactured.

The above-mentioned and multitudes of other fundamental discoveries in physical and chemical science were made almost within a stone's-throw of this room; most of them were made in the Royal Institution, and all of them by an expenditure of money infinitely small as compared with their present-day effects.

Anyone who is in the habit of reading modern historical writers—and they have become quite illuminating since a scientific mode of writing history has been substituted for the older fictional style—knows how political changes, national reforms arising from an effort of the collective conscience, the magnetic influence of some popular demagogue, and the like, are invariably invoked as explanatory of all the vicissitudes of our planet.

The modern historian is here taking a false point of view, and since he is, in general, quite unacquainted with physical science, his methods are inadequate. The whole history of Europe for the last century has been made within a few hundred yards of Burlington House in our scientific laboratories. One of the most potent incentives to political changes resides in the desire to increase the amenities of life, and research in pure science has had for a hundred years past the greatest influence in facilitating the realisation of that desire. Co-operative effort, one of the most striking aspects of modern life, became possible only when science provided the facilities for municipal power schemes, for telegraphic connection over the whole world, and for the concentration of production in definite centres. Chemical science is still furnishing the means for further revolutionary changes; during the last few years we have seen great technical developments of purely scientific discoveries—the work of Dewar on the liquefaction of gases, and that of Cross and Bevan on viscose and artificial silk, both of which have led to the profitable utilisation of vast amounts of capital—and it is as yet impossible to indicate the ameliorations of the conditions of human life which will inevitably result from contemporary chemical investigation.

In a time of crisis like the present, British custom tends towards the replacement of unreal conventions by what is really vital; we have been engaged upon this operation for several years. Whilst previously unheard-of changes have succeeded each other kaleidoscopically in the national constitution, in the political parties in power, in the freedom of the subject, and in hosts of other ways, the nation has recognised that science is the only real maker of history. The whole Empire is now one vast chemical and engineering laboratory, and we even live on a scientific ration of so many calorific units. It is obvious that chemistry, with physics, engineering, preventive medicine, and others of the natural sciences, which previously had no imperialistic position, because powerless to make or break a Government, have become the pivot on which turn all our hopes of retaining an independent national existence; it has been suddenly realised that supremacy in these branches of knowledge is vital to our country.

The time is approaching when this state of affairs will change; neglect of the natural sciences will then no longer put us in danger of sudden extinction, but, as was taking place years ago, will lead to our slow, certain downfall as a nation. The responsibility is placed upon our men of science of taking such measures as will ensure that the old order is not re-established, that Science makes her voice heard in our national councils, and that policies of drift are for ever abandoned.

We have in this country three large and long-established organisations devoted to various phases of chemical science: the Chemical Society, the Society of Chemical Industry, and the Institute of Chemistry. Is it too much to ask that these three representative bodies, with perhaps the newly founded Association of British Chemical Manufacturers, and ultimately all the other cognate but more specialised interests, should set up a watchful and alert joint council with directions to consider national questions in which any of the varied interests of chemistry are concerned, and to make such representations to our administrators as would voice the corporate view of the joint body?

I am inclined to think that, had such a body been in existence several years ago, much that has been accomplished in the interval by somewhat devious methods would have been better done. One instance will occur to everyone: that of the much-debated question of the re-establishment of the coal-tar colour industry in Great Britain. The scheme adopted by the Government for resuscitating this industry in our country, after its past thirty years of profligate productivity on the Continent, was launched without scientific advice; the Cabinet mouthpiece, indeed, declared that the directorate of the company was not to include men of scientific knowledge, on the ground that a director who knew something about the business of the company would have an advantage over his less well-informed colleagues.

Owing largely to the fact that we possess no strong collective council, representing the combined academic, scientific, and industrial aspects of our science and capable of representing them before a representative Government, it may be argued that we chemists are not altogether blameless for the particularly blundering way in which particular errors have been perpetrated by the responsible officials. Whilst we should be thankful that our blunders have not led to our destruction, we should proceed without further delay so to organise the resources of chemistry as to make it possible to enforce the adoption of scientific methods and modes of thought by authorities to whom these are yet strange.

The serious character of the British position in connection with the coal-tar colour industry becomes more evident when one considers that this is a key industry; upon it depend the textile, paper, photographic, and pharmaceutical industries. The total capital employed in the organic dye industry in Great Britain is between four and five million pounds, whilst the capitalisation of the German coal-tar colour firms is of the order of fifty million pounds. The need for greater and more intelligent activity in this direction is obvious; unless national enterprise can be stimulated into providing adequately for the manifold requirements of Great Britain and her Colonies in all those industries which depend on coal-tar colour manufacture, we shall be again in the hands of the foreign producer.

The control of a national dye scheme by business men with no real feeling for the enterprise on which they are engaged renders it fairly certain that the wider aspects of coal-tar colour manufacture will be neglected. The interweaving of the colour interests with those of synthetic pharmaceutical, photographic, and other chemical industries is essential to success. The utilisation and development of the resources of the Empire in natural colouring matters such as indigo are necessary from a national point of view. The careful study of our own and other codes of Patent Law in their bearings upon the fine chemical industry is also important. These weighty questions cannot receive adequate consideration from any purely lay body.

It is mournful, but instructive, to compare our present position in the coal-tar colour industry with the prospects which that branch of applied chemistry exhibited to Great Britain in early days. The first coal-tar colour was made by Perkin in 1856, and in 1862 Prof. A. W. von Hofmann, one of the foremost chemists of the day, a German domiciled in this country, painted an alluring picture of the future in store for us. Said he:—"England will, beyond question, at no distant day, become herself the greatest colour-producing country in the world—nay, by the strangest of revolutions, she may, ere long, send her coal-derived blues to indigo-growing India, her tar-distilled crimsons to cochineal-producing Mexico, etc." When we contrast this dazzling prospect, made by one of the most far-sighted of contemporary German chemists, with the actual situation, we cannot but ask why the event fell so miserably behind the forecast. The reason, in my opinion, lies in the fact that opulent, indolent Great Britain has for the past century permitted all its educational interests to pass into the hands of a particular caste which despises all knowledge difficult to attain, and, to camouflage its own idleness, has always pressed the notion that a first-hand knowledge of the facts of natural science and the conclusions to be drawn therefrom is unimportant, and that the young man or young woman does his or her best in the world if thrown into it entirely destitute of anything but an evanescent acquaintance with certain classics and a decided taste for so-called learned leisure. The greater among the ancients were creators of new knowledge as well as masters of the whole accumulated world's stock of information; their successors, unproductive of positive knowledge and very ignorant of the great changes taking place around them, can but wonder at and comment vaguely on the genius of Archimedes and Aristotle, and necessarily despise the achievements of Newton and Kelvin, their modern prototypes.

I have already directed attention to the frequently expressed opinion that, as a nation, we are incapable of excelling in the fine organic chemical industry; let me quote one instance, small in itself, but large in its consequences, in disproof of this view.

The ordinary photographic plate is sensitive only to a region in the blue of the spectrum, but by incorporating certain rather fugitive organic dyes with the sensitive film, the latter may be rendered sensitive to the green, yellow, and red parts of the spectrum; photographic plates so treated are described as panchromatic. The quantities of the sensitising dyes required for the whole world's consumption in normal times is minute, being, indeed, of the order of a few pounds per annum. Until 1915 these substances had never been made outside Central Europe, and little was known by us of their compositions or of the methods of preparing them, as they were all sold under trade names. The manufacture of these materials, small as was the whole business, had been industriously cultivated by the German colour-works, and, as these colour sensitisers are essential in aerial photography, their scarcity became of serious import quite early in the war.

The experimental investigation of the whole subject was quickly put in hand in this country, and within a few months ample supplies of the usual sensitisers were produced. Further, the newly established Department of Scientific and Industrial Research financed the development of the study of photographic sensitisers; as a result of this action, new sensitising dyes have been produced which are far superior to the older ones. It is safe to assert that the manufacture of panchromatic plates has now attained a degree of perfection in this country such as will long defy competition.

This is but one case that may be quoted from among a host of others, all of which prove conclusively that, given a little encouragement and assistance, British chemistry is capable not only of giving much-needed relief in this time of strain, but also of meeting every demand which can be made on it when the period of reconstruction commences.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

BIRMINGHAM.—Dr. G. N. Watson has been appointed to the chair of mathematics, which is being vacated by Dr. R. S. Heath at the close of the current session.

At a degree congregation held on July 6 the degree of M.Sc. was conferred on the following candidates:—Ernest Coupland, Junquei Su-Kwang Lee, William John Owen, Jui Hui Teng, Sih Ling Ting, and Nai Yone.

IN the latest instalment of the 1916 series of "The *Athenaeum* Subject Index to Periodicals," issued at the request of the Council of the Library Association, the subjects of education and child-welfare are dealt with. Among the periodicals the articles of which are indexed we notice NATURE, the *Times Educational Supplement*, the *School World*, and the *Journal of Education*. This issue of the "Index" makes a special appeal to all persons interested in educational questions; its price is 1*s*. net, and copies may be obtained from the *Athenaeum*, Bream's Buildings, Chancery Lane, E.C.4.

THE Secretary of State for the Royal Air Force announces that the sum of 25,000*l*. has been placed at the disposal of the Government by Sir Basil Zaharoff, G.B.E., for the purpose of endowing a professorship of aviation. This munificent donation is in continuation of donations previously made by Sir Basil Zaharoff for the foundation of chairs of aviation at the Universities of Paris and Petrograd, in order to assist in the progress of aviation among the Allies, and it is his hope that the occupants of the chairs will continuously exchange views. It is proposed that the professorship shall be called the Zaharoff professorship of aviation, and that it shall be a chair of the University of London attached to the Imperial College of Science and Technology.

Scientia for March last contains an interesting paper on "Le Nouvel Humanisme," by Prof. George Sarton, of Harvard University, U.S.A., who points out that the war has shown that science must be given a much more important place in schools and colleges than it has hitherto occupied. In the past, systems of education have been drawn up by classical scholars, who have considered that the study of languages, history, and literature is more likely to train youths to become good citizens than the study of science. Prof. Sarton holds that teachers of science are partly responsible for this opinion. Too often has science been taught as a jumble of isolated facts and theories. Prof. Sarton proposes to introduce, as a reform, instruction upon the history of the development of science in all countries from the earliest time. The more important facts and theories of science would be unfolded to the student in the historical order of actual discovery. He would then find that advances were due not so much to some transcendent genius as to the general state of human knowledge when they were made. The next step forward being fairly obvious, any intelligent and well-educated man might have made the advance. It is believed that instruction on these lines could not fail to stir the minds of the

learners to fruitful activity. Prof. Sarton would have history taught as a story not of the vicissitudes of kings and their wars, but of the growth and organisation of positive knowledge and of its application to the material advancement of the peoples. Such descriptions would be completed by the history of civilisation, including law, religion, fine arts, social economy, and politics. History taught in this way is called "the new humanities." To supply teachers it is proposed to found in the United States an institute for the history of science and civilisation. An account of the proposed institute will be found in *Science* for March 23 and October 26, 1917.

SOCIETIES AND ACADEMIES.

LONDON.

Challenger Society, June 26.—Dr. G. H. Fowler in the chair.—S. F. **Harmer**: Whaling in the Far South. The species hunted and the methods of capture were described; attention was directed to the large numbers killed annually and to the necessity for protective measures; statistical evidence was given to show that the fin whale, the blue whale, and the humpback have definite breeding periods.

PARIS.

Academy of Sciences, June 24.—M. Léon Guignard in the chair.—A. **Lacroix**: The constitution of a salt from plants grown in the Cameroons. The salt is extracted by the natives from the ashes of a plant, probably *Panicum crus Galli*. It is rich in potash salts, containing 83·5 per cent. of potassium chloride, 7·1 per cent. of calcium potassium sulphate (syngenite), 3·9 per cent. of potassium sulphate, with some common salt, magnesium chloride, and silica. The absence of carbonates is remarkable.—J. **Boussinesq**: General equations governing the slow flow of semi-fluid materials, either plastic or pulverulent.—G. **Bigourdan**: The observatories at Paris known as "de la rue des Postes." There were two early observatories bearing this name, which are sometimes confused: that of Picard (1673), and that of Godin, de Fouchy, and Bouguer (1731). The positions of these two observatories are deduced from data in various documents.—C. **Richet**: General anæsthesia by chloralose in cases of traumatic shock and hæmorrhage. The advantages and inconveniences of chloralose as an anæsthetic are summarised. The main advantage is the absence of toxic action on the heart, as there is no lowering of the arterial pressure.—P. **Sabatier** and G. **Gaudion**: The decomposition of glycerol in presence of various catalysts: the formation of ethyl and allyl alcohols. The catalysts studied were alumina, copper powder, and uranous oxide. Alumina gave carbon monoxide, methane, acrolein, and higher aldehydes. With copper the gases evolved contained a high proportion of hydrogen; the liquid products included ethyl and allyl alcohols, propaldehyde and other aldehydes.—M. **Balland**: Bread-making from wheat without previous grinding. An account of various attempts from 1789 to 1916 to make bread from unground wheat. No satisfactory bread has hitherto been made by this method.—J. **Bosler**: The spectrum of the new star in Aquila.—F. de **Roy**: Discovery and observations of Nova Aquilæ.—P. **Brück** and P. **Chofardet**: Observations of the new star.—J. A. **Le Bel**: Catathermic phenomena at 1000° C.—M. **Guerbet**: Bornylenecamphor and a new dicamphor isodicamphor. By the action of sodium methylate upon camphor at temperatures between 100° C. and 180° C., the main product of the reaction is a new isodicamphor, $C_{20}H_{30}O_2$; a small quantity of bornylenecamphor is also obtained.—J. **Amar**: Psychographic observations.—H. **Bierry** and P. **Portier**: The action of symbiotes upon the constituents of fats. It is shown that symbiotes can convert glycerol into dioxyacetone, β-oxybutyric acid into acetone and acetaldehyde, and butyric acid into acetone.—A. **Gauduchcau**: Food preparations from blood and meat by the aid of yeast.—MM. **Folley** and **Leprat**: The blood in exophthalmic goitre. The white and red blood corpuscles in this disease are normal as regards number and shape.

BOOKS RECEIVED.

Rural Water Supplies and their Purification. By Dr. A. C. Houston. Pp. xv+136. (London: John Bale, Ltd.) 7*s*. 6*d*. net.

A Complete Course of Volumetric Analysis for Middle and Higher Forms of Schools. By W. T. Boone. Pp. viii+164. (London: Blackie and Son, Ltd.) 3*s*. 6*d*. net.

A Memoir on British Resources of Sands and Rocks used in Glass-making, with Notes on Certain Crushed Rocks and Refractory Materials. By Prof. P. G. H. Boswell. With Chemical Analysis by Dr. H. F. Harwood and A. A. Eldridge. Second edition complete in one volume. Pp. xi+183. (London: Longmans and Co.)

High Explosives. By Capt. E. de W. S. Colver. Pp. xxix+830. (London: Crosby Lockwood and Son.) 3*l*. 3*s*. net.

56th Annual Report of the Secretary of the State Board of Agriculture of the State of Michigan, and 30th Annual Report of the Experiment Station. Pp. 749. (Lansing, Mich.)

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