THURSDAY, DECEMBER 12, 1907.

AN UPPER CRETACEOUS FLORA.

The Cretaceous Flora of Southern New York and New England. By Arthur Hollick. Pp. 219, including 40 plates. (Washington: Government Printing Office, 1906.)

THE Cretaceous flora is of extreme interest to botanists, for it was during this period that the great, and, as it appears, sudden, change took place from the ancient type of Mesozoic vegetation, with its predominant Cycadophyta and Conifers, to a flora of an essentially modern *facies*, with the Angiosperms already supreme. The recent remarkable work of Dr. Wieland (NATURE, vol. lxxv., p. 329; vol. lxxvi., p. 113) has intensified the interest of this transformation from the old into the new, by showing that the Cycadophyta of the earlier Mesozoic had themselves evolved a floral organisation comparable to that of an Angiosperm, indicating that the dominant groups of the two floras, different as they appear, may yet prove to have been genetically related.

Dr. Hollick's monograph relates entirely to an Upper Cretaceous flora in which Angiosperms, or at least Dicotyledons, have completely assumed the leading *rôle*, and little trace of their cycad-like predecessors remains. The beds yielding the fossil plants belong to the "Island Series" of Dr. Lester Ward, who thus described their distribution:—

"From Morgan (New Jersey), . . . the formation may be traced northward across Staten Island and the northern shore of Long Island, and it re-appears on Martha's Vineyard in the celebrated cliffs of Gay Head" (p. 13).

The horizon of the beds is mainly that of our Upper Chalk (Senonian), and possibly as old, in some cases, as late Cenomanian, but it is doubtful whether the intermediate Turonian is represented (p. 119). An interesting feature of the deposits is that the concretions containing the plant-remains almost always occur in glacial moraine, or in Cretaceous beds more or less disturbed by glacial action, and scarcely ever in their original positions (p. 26).

Of the 222 species to which a systematic position is assigned, six are referred to the Pteridophyta, 27 to the Gymnosperms, four to the Monocotyledons, and no less than 185 to the Dicotyledons. In spite of the many elements of doubt involved in all determinations of more or less fragmentary impressions, these figures probably give a fair though rough idea of the true proportions, and though further investigation may somewhat add to the relative importance of the Gymnosperms, there can be no doubt that the Dicotyledons had already completely gained the upper hand in the short interval, geologically speaking, since Lower Cretaceous times. The Cycadales, the characteristic plants of the earlier period, are represented by a few doubtful fragments. The fossils referred to Williamsonia by the author are, as he says, of uncertain affinity, and it has been suggested that they may rather be attributed to Magnoliaceæ, an order which, on leaf-evidence, was largely represented in the flora.

The insignificance of the Monocotyledons is another striking point—the four fossils referred to them all seem somewhat dubious. The geological evidence, here and elsewhere, certainly weighs heavily on the side of the opinion, now widely held, that the Dicotyledons constitute the original angiospermous stock, from which the Monocotyledons have diverged.

The author's determinations are, at the present stage of investigation, necessarily based almost wholly on impressions of leaves, for such remains of flowers and fruits as have been found seldom seem to have helped materially in the identification. The botanist can rarely feel confidence in conclusions as to affinity derived from leaf-characters alone, and it is to be regretted that so many of the fossils are referred to recent genera, the evidence for such attribution being scarcely ever adequate. The author's object has apparently been to identify his specimens, generically or specifically, with those described by previous palæobotanists, rather than to determine their botanical affinities for himself. As an ample record of a rich flora the monograph has great value, especially from a stratigraphical point of view; but, as is usually the case with work on Upper Cretaceous or Tertiary plants, the data will need a far more critical treatment before any accurate botanical conclusions can be drawn.

In speaking of the coniferous remains, the author directs attention to the wide and interesting field open for future investigation in the examination of the internal structure of certain specimens. That the structure should so often be preserved is a most hopeful circumstance, and the work already done on some of this invaluable material by Prof. Jeffrey, of Harvard, partly in conjunction with the present author, shows how much may be looked for when the internal, as well as the superficial, characters of these interesting relics have been more widely investigated.

D. H. S.

PAPER MILL-WORKERS AND TECHNOLOGY.

Chapters on Paper-making. Vol. iii., Comprising a Short Practical Treatise in which Boiling, Bleaching, Loading, Colouring, and Similar Questions are discussed. Pp. viii+134; price 5*s*. net. Vol. iv., Containing Discussions upon Water Supplies and the Management of the Paper Machine, and its Influence upon the Qualities of Papers. Pp. vii+156; price 5*s*. net. By Clayton Beadle. (London: Crosby Lockwood and Son, 1907.)

THE author is one of a group of workers who aim at a progressive elevation of the standard of technological education and practice in this still very important branch of our productive industry. The paper-maker in this country has weighty reasons for preferring the "practical man" to, or before, the student of the theoretical basis of his practice. It is not the weighty reasons, however, which determine his attitude. It is the feminine quality or defect of pure prejudice; the argument is introduced *post hoc*

for its justification. The author, aware of this rule of prejudice, but encouraged by distinguished exceptions, adopts the plan of "pegging away." These volumes are the records of a scheme of higher education by correspondence. Questions directed to the elucidation of typical problems arising in the ordinary routine of the mill are set and distributed through the medium of the technical Press amongst the workers, who are invited to transmit their solutions of the problems to be criticised and corrected. A further object is to assist the workers in preparing for the more formal examination test of the City and Guilds Institute. At the same time, the questions propounded are judiciously chosen outside the formal or text-book range of the examinations syllabus of that excellent institution. We give a selection of subjects dealt with:—*Beating*, with sections on the size and speed of beater rolls, the efficiency of refining engines and edge runners; *Sizing, Colouring and Loading*, with special problems; the *Paper Machine*, with sectional treatment of dandy rolls, wire and suction boxes; the *Qualities of Papers* in relation to use, involving practical problems in "bulk," transparency, tenacity and stretch, special printing surfaces and the like.

The chapters follow one another without any attempt at a logical sequence, and each chapter comprises a selection of students' answers, also without any attempt at classification. The author's critical remarks alternate with the matter in inverted commas, and these criticisms are quite as unequal as his students' efforts. The reader is consequently confronted on each page with a species of pictorial puzzle, with the accompanying challenge to "find the policeman."

We say "policeman" taking the accepted symbol of law and order, and the student of technology is of course seeking instruction in these fundamental regulating factors of industrial processes. This defect of form, or want of form, necessarily limits the usefulness of these volumes. As a "causerie" on mill practice they will be found interesting and suggestive, but as a guide to technological instruction the matter should have been much more carefully ordered and edited. An important function of the teacher is to teach his subjects on positive, didactic lines, and the author abdicates this position in not prefacing each chapter with his own model answer to the questions propounded.

These "Chapters on Paper-making" notwithstanding constitute a most useful appeal to the latent intelligence of our mill workers.

Paper-mills are often so situated as to cut them off from tuition classes, and, further, it must not be forgotten that most workers are on night-shifts in alternate weeks, and this is a serious impediment to instruction by classes or lectures.

The author's educational work is therefore particularly deserving of encouragement, and with a little more conviction on his own part as to its solid value, he will probably see fit so to improve the form and style of subsequent "chapters" as more efficiently to supplement and complement the work of the technological institutions.

LOCAL ORNITHOLOGY.

(1) *Bird-Life of the Borders, on Moorland and Sea, with Faunal Notes extending over Forty Years.* By Abel Chapman. Pp. xii+458; map and illustrations. (London: Gurney and Jackson, 1907.) Price 14*s.* net.

(2) *The Birds of Kent.* By William J. Davis. Pp. vi+304; plate and map. (Dartford: J. and W. Davis, 1907.) Price 6*s.* net.

(3) *Notes on the Birds of Rutland.* By C. Reginald Haines. Pp. xlvii+175; 8 plates and map. (London: R. H. Porter, 1907.) Price 7*s.* 6*d.* net.

(1) IN preparing the second edition of his pleasant and valuable account of the birds of the borders, Mr. Chapman has practically re-written on a broader basis the first section of the book, *i.e.* that relating to the Cheviots and the moorlands of the borders. The second part, which treats of the north-eastern sea-board, and, to some extent, may be considered as a treatise on the wild-fowling to be had on that coast, as well as an account of the wild-fowl to be met with there, has been merely revised.

The borderland stretching from Cheviot to the Solway comprises an area of hundreds of square miles of mountain and moor. The author defines the region covered by his observations as that mountain land which remains as it was created, unaltered by the hand of man, bounded by the line where the shepherd's crook supplants the plough; where heather and bracken, whinstone and black-faced sheep repel corn and cultivation; where grouse and blackcock yet retain their ancient domain, excluding partridge and pheasant; and where the ring-ouzel dispossesses the blackbird.

"A region largely of peat as distinguished from soil, of flowe, moss, and crag; of tumbling burns and lonely moorland, glorious in all its primeval beauty."

As on the higher fell-ranges of the borders it takes two to four acres to support each sheep; the hill country is very thinly inhabited. In this edition the author has slightly extended his purview so as to include the subjacent country, namely, the foothills which slope downwards from the higher range, "and which zone might perhaps be termed the sub-alpine region." This is the fringe of the moorland, yet it lies beyond the range of the plough, and its faunal character may be exemplified by the substitution of the blackcock, peewit, and whinchat for the red grouse, golden plover, and wheat-ear of the higher land. Here we come within the outer limit of many of the low-land woodland forms.

Beginning with the earlier months, the bird-life of the moorlands is traced in a succession of chapters throughout the year. The author having had forty years' experience of the district to which he is devotedly attached, and the book being preeminently one of personal observations, and of statements of facts, as seen by him, supplemented and expanded to some extent by theories which he felt justified in founding upon these observations, it follows that in these articles we have a very complete account of the avi-fauna of a district which is little known and visited.

The bird-life of the borders is constantly changing throughout the year, save, perhaps, just during the heart of the breeding season; and among all the 200 species of birds which may roughly be estimated to form its feathered population, the author finds that only fourteen are absolutely stationary.

Interspersed among the regular sequence of the chapters detailing the bird-life at different seasons, we have accounts of the game-fish, migration, grouse-shooting, and grouse-disease; and a chapter of specific bird studies dealing chiefly with some of the rarer birds met with in, or which have recently extended their range to, the district. Among the many bits of stray information there are some very pertinent remarks on the important question of heather burning and the effect upon heather of black-faced sheep, which manage, when forced by sheer necessity, to retain life in them by grubbing down into its roots.

The chapter on the process of migration advances some rather novel ideas. The author suggests, in the first place, that no one has ever seen the process of migration in actual operation, and that migratory birds seen at lightships, &c., are not in the process of migration, but at its termination, making good their landfall; and further, that the few birds one sees at sea are merely waifs and strays. He disbelieves that the journeys which small birds of little wing-power perform are accomplished in the way that is ordinarily accepted, *i.e.* by hard, straightaway flying. He says that birds can reach, high in the air, regions and conditions quite beyond human knowledge; can sustain life in rarefied atmospheres where mammals could not; and may there be able to rest without exertion, or find meteorological or atmospheric forces that mitigate or abolish the labours of ordinary flight, or possibly assist its progress. All this is very suggestive, and facts are brought forward in support of these views; but much of it must remain conjectural, of course, and extreme cold, and the stormy conditions supposed to prevail at high altitudes, would, we think, have to be considered.

In the latter part of the book the wild-fowl of the north-eastern coast, their haunts and habits, and the way to get at them with a big gun, are fully dealt with; but, unfortunately, the impracticable or inaccessible nature of their chosen haunts has left inquirers much in the dark as regards the specific distribution of the grey geese on those shores. As an account of the local habits and distribution of the border birds, this book is chiefly valuable—for the habits and the nature of the haunts of birds differ in different districts. To give one instance of this, speaking (and doubtless drawing on his observations of the bird somewhere or other) of the black-tailed godwit as a former breeding species in Britain, the author says of this country, "Nowadays there are no fens; consequently no godwits." But this is not a necessary consequence. On the Continent, this godwit is known to breed in good drained grass marshes, and its nest has been found in a dry, sandy bean-field in reclaimed lands.

The author holds strong opinions, and perhaps some of his conclusions will not be universally accepted; possibly all the less so from his criticism of others, and a slight reluctance to accept the observations of some others as facts when they clash with his preconceived notions; and his distrust of what has not been seen by himself. But we have no more readable bird-book on our shelves, and the new edition will be welcome to those who have for years been unable to obtain the original one. Some of the author's drawings and pen-and-ink sketches are very pleasing and life-like. But with regard to the plate (not by the author) supposed to represent a coot and two Sclavonian grebes in full winter dress at midsummer, we should certainly say that the heads of the grebes as drawn—the shape and size of the beak, and the white passing over and behind the eye—resemble more closely those of crested grebes in winter plumage. There is a map of the district, and a good index.

(2) Mr. Davis points out that hitherto no book dealing with the birds of the entire county of Kent has been published, although the works of Messrs. Dowker on east Kent, Prentis on the Rainham district, and the present author on Dartford and the north-west, have paved the way for a complete county avifauna. The information to be derived from these sources has now been brought together and supplemented by various records in the periodicals and notes which have been furnished by observers in various parts of the county. A short description of the eggs and nests has been given in most cases, and something about the habits of the birds which are resident in or regular visitors to the county. Unfortunately, the author's personal experience relates only to portions of the county, and the information respecting many of the birds can hardly be said to have been brought down to date.

Kent has given a name to no less than three birds on the British list, and we naturally turn to them in expectation of finding a full account of their history and present status in the county. It is therefore disappointing to find that the account of the Kentish plover consists of little more than a reprint of Mr. Farren's article in *Country Life* (most excellent in itself) on the breeding habits of this little plover; while of the Sandwich tern, discovered at the place of that name in 1784, we are merely informed that "no doubt they still breed on the Kentish coast." As to the Dartford warbler, a perusal of the four and a half pages devoted to this species, "probably more interesting to the inhabitants of the town of Dartford than any other bird," leaves us in doubt whether it is still an inhabitant of Kent or not. Half a page is filled with a quotation as to the discovery of a nest and eggs of this bird in Yorkshire; but this might well have been omitted, since the Yorkshire authorities consider the record is open to the gravest doubt, and refuse to enrol the Dartford warbler on the Yorkshire list.

We can only consider this little book as a further instalment towards the adequate avifauna of Kent which we still await. Iceland, where the chough is said to breed, must be a misprint for Ireland. The appendix includes a useful list of birds observed in east Kent during the past twenty years by Mr. H. S. D. Byron, received by the author too late for

incorporation in the text. A full index and a large map make reference to the species and localities easy.

(3) One by one the English counties are getting their bird-books, and the latest to acquire this distinction is Rutland, by far the smallest of them all. Pre-eminently an agricultural county, its natural features present nothing striking, and do not show any great diversity. Of its 100,000 acres, permanent pasture absorbs more than half; not a hundred acres are waste land or heath, and not 200 acres are water. But Mr. Haines is surely far below the mark when he states that there are scarcely 400 acres of woodland. In these circumstances he has done well in being able to give so large a list as 200 of birds which have occurred in this fruitful and profitable little bit of land. Besides the natural disabilities of Rutland as a bird resort, the historian of its ornithology has to contend with a further drawback in the almost total lack of notes bearing on the subject which date back more than a hundred years.

The one exception is to be found in the notes by Thomas Barker, of Lyndon Hall, Gilbert White's brother-in-law, and two of the earliest of these are initialed by the historian of Selborne. But the notes do not amount to much, and refer chiefly to the arrival and departure, and the opening of song of less than a score of species. The most interesting of them is the wood-lark—a very rare bird now in Rutland. A slip is made in describing the gentleman who brought these notes to light as a *descendant* of Gilbert White! The later printed authorities are very few, and although a work published in 1889 is entitled "The Vertebrates of Leicestershire and Rutland," the Rutland birds are very inadequately treated therein. So that there was quite room for a new and complete work on the subject, in the preparation of which the present author has had the assistance of a large number of observers.

The general condition and character of the avifauna of the county is treated in a lucid and interesting manner in the concluding portion of the introduction, and lists are given of the species which have increased or decreased in recent years. Lists, too, are given of the resident species which are subject to some migration, and of the whole of the species actually enumerated as Rutland birds, showing their status in the county. The references made to the habits and life-histories of birds in the body of the work have been drawn from observations made in Rutland itself. The facts of most importance for British ornithologists in general to be gleaned from the pages of this handy little volume are: the eighth instance of the occurrence of Bonaparte's gull; the unique nesting of the bee-eater; the addition of Rutland to the counties where the pied flycatcher has been seen; the recent appearance of the bearded tit in the county; the acquisition of the redshank as a nesting species; the very early return of the wryneck; and the early nesting of the corncrake and partridge. The author himself seems to feel a little doubtful about the identification of the Bonaparte's gull, and ornithologists in general will be still more so; while as for the nesting of the bee-eater, we cannot help thinking that some mistake or confusion of specimens occurred; the confusion in which the authority for the record seemed to be about the smaller grebes (p. 163) inclines us more strongly to this view.

The plates are pleasing, though they have not all of them much to do with Rutland especially. But there is one which will puzzle most people. As the jack snipe, the principal figure in it, is cut all to pieces by the shot which has apparently been fired, and is obviously dead in the air, we cannot see why the picture should be called "A Narrow Escape"; unless the title refers to the dog, which does not appear to have been hit! We have, however, seen a plate in another book which has a striking resemblance to this one, but there it has another and more appropriate title. A good index and a map complete this nicely got up little volume.

ELECTRICAL ENGINEERING.

(1) *A Text-book of Electrical Engineering.* By Dr. Adolf Thomälen; translated from the German by G. W. O. Howe. Pp. viii+456. (London: Edward Arnold, 1907.) Price 15*s.* net.

(2) *The Elements of Electrical Engineering.* By Profs. W. S. Franklin and Wm. Esty. Vol. i. Direct-Current Machines, Electric Distribution and Lighting. Pp. xiii+517. (New York: The Macmillan Company; London: Macmillan and Co., Ltd., 1906.) Price 18*s.* 6*d.* net.

(1) THIS book is an English translation of the second edition of the "Kurze Lehrbuch der Elektrotechnik," and includes some additional matter which will be introduced into the third edition. It is intended to meet the needs of electrical engineering students who have passed the most elementary stages and are taking a second- and third-year course at the technical colleges.

It is not easy to give a satisfactory definition of electrical engineering, but in default of a better it may be suggested that the subject should comprise the generation, distribution and utilisation of electric energy. This may be interpreted narrowly or broadly according to the judgment of the individual. If this be accepted as a reasonable definition, the book before us is by no means comprehensive enough to be justly called "a text-book of electrical engineering"; it should rather be called "an introduction to the theory of dynamo design." Distribution of electric energy is not considered at all, and its utilisation only in so far as the theories of motors, direct and alternating current, are concerned. The theories of direct-current feeders, of switchgear for controlling generators and motors, of electric traction apparatus, are not abstruse, and a knowledge of these matters is likely to be more useful to the average engineer than the theory of dynamo machinery.

Recognising, however, the limitations of the subject-matter, the book may be safely recommended for what it contains, although it is surprising that there should have been much difficulty in finding books already in existence covering the same range, as stated in the preface. As a brief indication of the

contents it may be stated that the first five chapters deal with fundamental principles of electricity and magnetism, the next four with the theory of direct-current dynamos and motors; these are followed by a single chapter on alternating-current theory, a chapter on transformers, four chapters on alternating-current generators and synchronous motors, and four chapters on induction motors. The book concludes with a few pages devoted to rotary converters, and an appendix on the symbolic method of treating vectors.

The matter is well arranged and clearly set forth. Considerable space is taken up by the various types of direct-current armature windings, illustrated by several good diagrams, and the important question of sparking receives proper attention.

The treatment of alternating-current generators is good, but it seems questionable whether students should be taught to look upon the magnetising current in the field windings of an alternator as a vector quantity. With this exception the section devoted to the behaviour of such machines on loads with various power factors is excellent, and the discussion of parallel running is particularly clear. Induction motors are considered in the light of the semicircle diagram with a good deal of theoretical elaboration, and single-phase commutator motors are mentioned briefly.

Taken as a whole, the book will probably strike electrical engineers as being somewhat too theoretical. It does not claim to go beyond the principles of the subject, leaving aside altogether constructional details. There are, however, many items of information which could be given without any trouble, and which would give a greater reality to the student's ideas. Thus, for instance, it seems a pity that a budding electrical engineer should arrive at the end of the book without ever having been told that electrical apparatus must satisfy the requirements of a temperature specification. There should be no need for a man to go through a course of dynamo design to learn this elementary but important fact.

A word of praise may be given to the translator, who has done his work with marked success; it is sufficient to say that the book does not read like a translation form the German, and all who have done such work will agree that this is high praise.

(2) This is another book for the use of students, but it is intended not only for those taking a special electrical course, but also for others studying general engineering. With this object in view, the authors have endeavoured to differentiate between the two classes of readers, by giving in appendices and in several special sections in small type what they call the more elaborate developments of the subject. This seems a good plan, and it is well carried out.

The authors are professors in Lehigh University, and the book, in consequence, caters especially for the American engineer. Apart from this, the present volume may be thoroughly recommended to students in this country, on account of the practical nature of the information contained therein. For example, the authors are not content with tracing through the preliminary theory of the direct-current generator and then leaving the subject at that point, as so many English text-books do, but they go on to discuss what limits the output of a generator in actual practice, and give a chapter on ratings and guarantees. As a whole, the book is far more in touch with practical conditions than the usual examples of this class of literature.

The present volume is confined to the study of direct currents, their generation, distribution, and utilisation for lighting. The first part is devoted to elementary theory, the theory of dynamo machines, the practical aspect of such machinery, including its rating and performance guarantees, its control by switchgear, and its operation alone and in conjunction with storage batteries. The second half contains chapters on distribution and wiring, on photometry and electric lighting, and four appendices on the magnetisation of iron, on characteristic curves, on armature windings, and on problems illustrating the contents of the whole volume.

The book will no doubt serve its particular purpose admirably, but so far as this country is concerned it is unfortunate that the slight differences between English and American practice are sufficient to deter many students from purchasing a book of considerable value in its own country.

OUR BOOK SHELF.

Modern Lithology, illustrated and defined, for the use of University, Technical, and Civil-Service Students. By E. H. Adye. Pp. 128. (Edinburgh and London: W. and A. K. Johnston, Ltd., 1907.) Price 10s. net.

THE excellent microscopic drawings of rock-sections previously issued by Mr. Adye (see NATURE, vol. lxxi., p. 341), in a work entitled "The Twentieth Century Atlas of Petrography," prepare us for the present series of sixteen smaller plates. With four coloured figures on each, some of them subdivided into two semicircles, we have a wide range of rocks accurately and artistically represented. The drawing and description of thin sections is not strictly "lithology," however "modern" it may be; but Mr. Adye deals with the illustrations clearly in the accompanying text. He also gives a glossary of petrographic terms, which contains many useful references to original papers.

The definitions of the crystallographic systems are, as often happens in elementary books, far too limited, and would exclude copper pyrites, for example, from the tetragonal system, and hemimorphite from the orthorhombic. If, moreover, rhombohedral and hexagonal are to be taken as synonymous, as stated on p. 97, there is no place under the definition given for such common minerals as quartz and calcite. A crystallographic "pyramid" (p. 111) cannot nowadays be regarded as a closed form. The glossary, as a whole, however, is a mine of information, and every geologist may read it with advantage. "Tachylite," here and on p. 18, should be "tachylyte"; but this correction has been made again and again without result in geological literature. Few misprints occur; we notice "Jannetez," "Bôricky," "Radanthal," and *Galionella*.

There is no strict arrangement in the subjects on the plates, and, as we have hinted, no attempt has been made at writing on lithology in the broad sense. But the book, with its complete index, is a really good companion for those who require guidance in studying the characters presented by thin sections. No small

work has hitherto given us so effective a series of coloured petrographic illustrations. We are thus not quite sure about the description of the pyroxene-andesite from Bohemia on plate v., because the drawing so closely resembles the rock of Tichlowitz, with its brown hornblende in the groundmass, its monoclinic pyroxene, and its patches of zeolites as the only pale constituents. Again and again we could name the locality of the rock selected from the accurate details of the illustration; and when we turn to the descriptive text, we find very little room for criticism. G. A. J. C.

Inflammation. An Introduction to the Study of Pathology. Being the reprint (revised and enlarged) of an article in Prof. Allbutt's "System of Medicine." By Prof. J. George Adami. Pp. xvi+240. (London: Macmillan and Co., Ltd., 1907.) Price 5*s.* net.

REPRINTS in book form of articles appearing in larger volumes are not always desirable, but in the present instance so much has been added to the matter as virtually to constitute a new work. We congratulate Prof. Adami heartily on the successful issue of an arduous task; no one knows how difficult until he attempts to write on inflammation. The subject of inflammation, forming, as it does, the fundamental basis of pathology, and it might be said also of the science and practice of medicine, is beset with difficulties. The literature on it is voluminous and bewildering, and pathologists owe a debt of gratitude to Prof. Adami for having the courage to attack it. The matter is divided into sections; the first gives a general survey of the inflammatory process, the second deals with the various factors of the process—the part played by the leucocytes, the exudate, the blood-vessels, the nervous system, cells of the part, and the temperature changes; the third section deals with general considerations, and includes a chapter on the principles of treatment of the inflammatory state. Every statement made is based on published work, to which the reference is appended (and the book therefore forms a valuable bibliography on the subject of inflammation), and critical additions and summaries are liberally interspersed. The book is well and sufficiently illustrated, and no student of pathology can do without it. R. T. HEWLETT.

Notes on Maritime Meteorology. By Commander M. W. Campbell Hepworth, C.B. Pp. viii+90; 7 plates. (London: George Philip and Son, Ltd., 1907.) Price 2*s.* 6*d.* net.

THIS work consists of papers contributed to societies and institutions between 1883 and 1900, compiled while the author was on active service afloat. Two of them, occupying nearly half the book, are of a more general nature than the rest, and deal with meteorology as a factor in naval warfare and with the value of meteorological observations at sea. The author contends that, given two opposing fleets equal in all respects, "the victory in a series of engagements shall be to the fleet in the direction of whose movements meteorology shall have given the greatest aid," and some striking instances are cited of the value of weather knowledge. The other papers are of a more special character, and relate chiefly to the navigation of the Indian and Pacific oceans. Taken in connection with the useful charts dealing with the marine meteorology of those oceans published by the Admiralty and the Meteorological Office, the results of investigations by so experienced a seaman and so keen an observer as the author of the work in question will be of great interest and value to those now afloat.

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.*]

Mu'attos.

MR. H. G. WELLS, in his interesting book "The Future in America" (1906), tells (pp. 269–270) a story at second-hand which apparently, however, he accepts as accurate in perfect good faith. I transcribe the facts as they were given to him:—

"A few years ago a young fellow came to Boston from New Orleans. Looked all right. Dark—but he explained that by an Italian grandmother. Touch of French in him too. Popular. Well, he made advances to a Boston girl—good family. Gave a fairly straight account of himself. Married."

The offspring of the marriage was a son:—

"Black as your hat. Absolutely negroid. Projecting jaw, thick lips, frizzy hair, flat nose—everything."

In this case Mr. Wells observes:—"The taint in the blood surges up so powerfully as to blacken the child at birth beyond even the habit of the pure-blooded negro."

This is, at any rate, ultra-Mendelian. Such a story would hardly be told and repeated unless it corresponded to popular belief. What one would like to have is precise evidence that such cases actually occur. If verifiable, it would be of great importance both on scientific and political grounds. I find, however, nothing resembling it in such authorities as I am able to consult. No such case is mentioned by either Darwin or Delage, though neither would have been likely to pass over such a striking instance of reversion had it been known to him. Sir William Lawrence, in his "Lectures on Physiology, Zoology, and the Natural History of Man" (1822), a book still worth consulting, has industriously collected (pp. 472–484) all the facts available at the time about mulattos, but has no instance of the kind.

The problem involved is thus stated by Galton ("Natural Inheritance," p. 13):—"A solitary peculiarity that blended freely with the characteristics of the parent stock, would disappear in hereditary transmission." He then discusses the case of a European mating in a black population:—"If the whiteness refused to blend with the blackness, some of the offspring of the white man would be wholly white and the rest wholly black. The same event would occur in the grandchildren, mostly, but not exclusively, in the children of the white offspring, and so on in subsequent generations. Therefore, unless the white stock became wholly extinct, some undiluted specimens of it would make their appearance during an indefinite time, giving it repeated chances of holding its own in the struggle for existence." *Mutatis mutandis*, the same law would hold for a black mating in a white population.

Lawrence quotes a single case (p. 279) in which a refusal to blend certainly existed:—"A negress had twins by an Englishman: one was perfectly black, with short, woolly curled hair; the other was light, with long hair." He also points out that in "mixed breeds" "children may be seen like their grandsires, and unlike the father and mother," a fact observed by Lucretius.

"Fit quoque, ut interdum similes existere avorum
Possint, et referant proavorum sæpe figuras."

On the other hand, according to Lawrence, there was a legal process in the Spanish colonies of South America by which a mulatto could claim a declaration that he was, at any rate politically, free from any taint of black blood. Of Quinterons, who were one-sixteenth black, he says:—"It is not credible that any trace of mixed origin can remain in this case," and even of Tercerons, who were one-quarter black, "in colour and habit of body they cannot be distinguished from their European progenitors." He says (p. 274) that Jamaica Quadroons "are not to be distinguished from whites." But "there is still a contamination of dark blood, although no longer visible. It is said to betray itself sometimes in a relic of the peculiar strong smell of the great-grandmother." If these statements can be relied upon, Galton's hypothetical law does not appear

to apply to mulattos, and some doubt is thrown on the case cited by Wells. On the other hand, Lawrence quotes from the Philosophical Transactions ("v., 55") a case of two negroes who had a white child, the paternal grandfather being white. This seems purely Mendelian.

November 25. W. T. THISELTON-DYER.

Specific Stability and Mutation.

THE desire to be as brief as possible has led, I fear, to some obscurity in the sentences quoted by Sir William Thiselton-Dyer (p. 77) from my letter of October 17. The meaning will perhaps be clearer if I explain the precise significance which I attached to the words "appear" and "occurrence."

By the occurrence of a mutation in one of the higher plants I meant the production of a seed capable of germination and containing an embryo with definitely different potentialities from those of its parent. The appearance of a mutation, on the other hand, implies that such a seed has germinated and given rise to a plant recognisably different from other members of the species. My contention is that the conditions of cultivation are such as to allow of the safe germination and growth of plants which would have no chance of survival under natural conditions. It is therefore possible that mutations may *occur* as frequently under natural conditions as under cultivation. This being so, it does not appear to me to be an abuse of language to state that the assumption that cultivation causes the occurrence of mutations is one which requires proof. In support of this assumption Sir William Thiselton-Dyer brings forward certain evidence. With much of this evidence I was already familiar, but it did not appear to me to amount to satisfactory proof of the current position. The authority of eminent breeders is quoted for the fact that, as soon as one new variety of a cultivated species has been obtained, a host of others immediately follow. But the explanation of this may be that the breeder, as soon as he has obtained a single novelty, immediately crosses it—deliberately or by accident—with the original type, thus giving rise to endless new combinations. R. H. LOCK.

Botany School, Cambridge, December 2.

THAT mutations inevitably appear sooner or later under cultural conditions is not an assumption, but a fact. That they do so only casually under natural conditions, and usually fail to perpetuate themselves, equally seems to me not an assumption, but a fact. If, as Mr. Lock seems to argue, there is an equal chance of their *occurrence* in either case, then their *appearance* should be more frequent in nature than in cultivation, because the former has a larger population to work with. But it is not so. I therefore conclude with Darwin that cultivation introduces some provocative condition which is lacking (or latent) in nature. What that condition is seems to me a very important subject for research.

December 5. W. T. THISELTON-DYER.

The Winding of Rivers.

WITH your permission I would like to make a few remarks on the winding of rivers, which is at present being discussed in your pages. My observations were made while fishing, and my remarks refer to the rivers of our own country, and may not apply to rivers of greater volume. But first I would like to point out an objection to Prof. J. Thomson's experiments. In Prof. Thomson's paper in the report of the British Association for 1876 no details of the conditions of the experiment are given, but Sir Oliver Lodge in his letter (NATURE, November 28) says Prof. Thomson's model had a wooden bed. Now it is very evident that we must be careful in drawing conclusions from experiments made under these conditions. That wooden bed, however carefully made, would not be of the shape that nature would have given it, and any deviation from nature's shape would cause unnatural currents. It, however, does seem probable that something of the nature of Prof. Thomson's diagonal under-tow will exist even in river-shaped beds.

The whole question of the flow of water in river beds is extremely complicated. This is evidenced by the contrary results of the observations of your correspondents. But little consideration is sufficient to show that this must be so; the variables are so many. We have, for instance, variations in the curvature of the bend, in the velocity of the water, and in the formation of the bed of the river, which we must remember is dug out and shaped by flood water for flood water, and is but little altered as the river falls in volume. Take, for instance, the case supposed to be represented by Prof. Thomson's model. Here, with a certain curvature and a certain velocity of flow, we can easily imagine the formation of the diagonal under-tow. But if we were to increase the velocity of the flow this cross under-current would decrease and ultimately cease, and when a certain relation of velocity to curvature was arrived at we would get the conditions referred to in Mr. R. D. Oldham's letter in NATURE of November 21, where he says:—"Sand and even pebbles may be thrown up to the surface of the water near the outer bank of the stream, and where the waters have overflowed the banks pebbles may be found lying on the dry ground after the flood has passed away."

In most of the rivers I know which flow in gravel beds, where they are constantly cutting away their banks, the main flow is more sinuous at low level than when in flood. At low level the main stream runs into the pools at the bends on the deep or concave bank, and as the deep sides of the successive pools are on opposite banks of the river, the stream has to cross its bed between the successive pools. While in flood the swiftest flowing part, on the surface at least, is near midstream, but the formation of the bed at the place and the flow above and below may alter this in some cases. After the flood has fallen, the river bed it has shaped has an infinite variety of forms at different places, and the flow of the water at any part must be studied with reference to that particular part, and to the part above which has determined the cross-section and velocity of the water coming to it, and also to the formation of the part below which determines its escape.

There is one very common type of flow which frequently presents itself in varying forms in rivers which alter considerably in volume from time to time. After the flood has fallen the river becomes, so to speak, divided into streams and pools. Over the shallows the water runs rapidly, while in the pools it moves slowly and somewhat irregularly. The streams coming into the pools flow next the concave banks, and come into the pools with some velocity, which is soon lost in the slower movements in the pools. The streams thus lose their kinetic energy, which is converted into potential energy, raising the level of the water at the place where the stream loses its velocity. From this part of the pool, in addition to the stream flowing down the pool, a reverse current is started which flows back on the inner side of the pool, flowing to the upper end of it, where it curves round and flows downwards alongside the main stream. Part of the back current is no doubt due to the inflowing main current causing an induced current, but it seems to be mainly due to the loss of kinetic energy of the stream, causing a rise of the level of the water where its velocity is destroyed.

As to the cutting and wearing away of the banks of rivers, that is mainly the result of eddies formed by the flowing water meeting with obstructions, such as stones, tree roots and stems, inequalities in the banks, &c., or even by water impinging on water. One of the deepest pools in a river I observed was entirely dug out of its gravel bed by eddies produced by the main river meeting a large tributary stream at right angles and mingling their waters in turbulent eddies; and it seems probable that the excavation of the deep pools generally found at the foot of waterfalls have been greatly aided by the eddies formed by the falling water meeting the quieter water of the pools.

The common practice in this country of protecting the banks of rivers by means of little piers or "tooks" to throw the water off them, and into the middle of the bed of the stream, generally results in failure, because the piers cause eddies, and deep pools endangering the banks are frequently dug out by these eddies; and while these piers tend to throw the water to the other side of the channel, yet the sloping bed throws it back and causes it to strike

the bank below the pier, thus in some cases making matters worse. The only place I know of where a knowledge of the bad effects of eddies on river banks has been put in practice is in the river Adda, which drains Lake Como, Italy. There the irregularities of the banks seem to have been smoothed to some extent, and then simply paved with small cobble stones a few inches in diameter. Over this the water flows without eddies, and the banks, so far as one could see, gave little trouble, though one would imagine that if a break in this rather weak surface took place destruction might be rapid.

JOHN AITKEN.

Ardenlea, Falkirk, December 3.

May Gorsedds.

IN my communication to NATURE, May 2 (vol. lxxvi., p. 9), I stated that there was another plan of a Gorsedd among the Iolo MSS. at Llanover. The important difference between it and the plan published in that number is the omission of the solstitial stones. It is a May-November Gorsedd pure and simple, based on the equinox, and for that reason very interesting. Both plans are truer to ancient tradition than the present plan favoured by the bards. The present orientation is exclusively solstitial, against the best traditions in point. In the older plans the May-year is given the preeminence in one, and is the only year given in the other. In both the older plans the circle consists of nineteen stones, leaving open a splayed avenue on the east, the breadth of which corresponds to the sun's course from August to November and from February to May. Though the present plan of a circle of twelve stones at equal distance from each other is antiquarianly sound, one may regard the older plans as still sounder. I have elsewhere shown that the exclusively solstitial arrangement of the stones in the present plan is about the only point in connection with the bardic Gorsedd of doubtful antiquity.

The accompanying tracing (Fig. 1), for which I am indebted to Mr. T. H. Thomas, shows how the original plan was rather carelessly drawn, just the kind of diagram which an old bard would draw to accompany a written description, as in this case, for the benefit probably of an engraver.

In the formal and authentic bardic records very little is said about the significance of the various features of the Gorsedd circle. There is no dabbling in archæology.

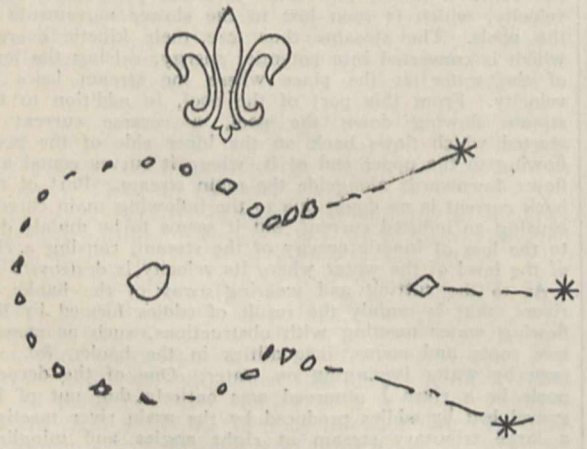


FIG. 1.—Iolo's May Gorsedd.

It is enough for the bard to be able to say that everything he records is sanctioned by immemorial custom.

In the second quarter of the last century a bard arose who claimed also to be a chief bard or archdruid, having the bardic name "Myvyr Morgannwg." He attempted a scientific and philosophical interpretation of the Gorsedd. He insisted upon the absolute identity of the bardic institution with the circles of the Stone age. He made several successful hits at the truth about the Gorsedd, but wild speculations and irrelevant matter have made his various writings hardly readable.

The accompanying diagram (Fig. 2) represents Myvyr's idea of the "most essential elements of the Gorsedd," and is reproduced from one of his controversial pamphlets. It describes a May-November Gorsedd, but with the solstitial signs, except that Virgo is fixed at the equinox. The diagram is true to the best type, but the interpretation is a misfit. It is a forcible illustration of the disturbing effect of a solstitial cult upon sound May-year tradition.

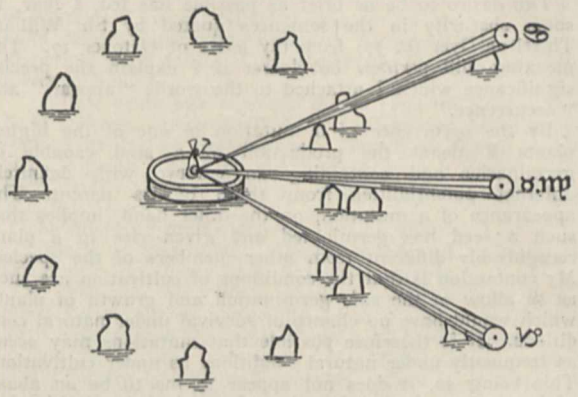


FIG. 2.—Myvyr's May Gorsedd.

Myvyr has also brought his fancy to play on the central stone. A mannikin, holding up something like a bow and arrow, occupies the place of the chief bard, and the three rays look very much like three clubs. Myvyr has nothing to say about the only valuable feature of his Gorsedd, namely, the May-November alignments.

JOHN GRIFFITH.

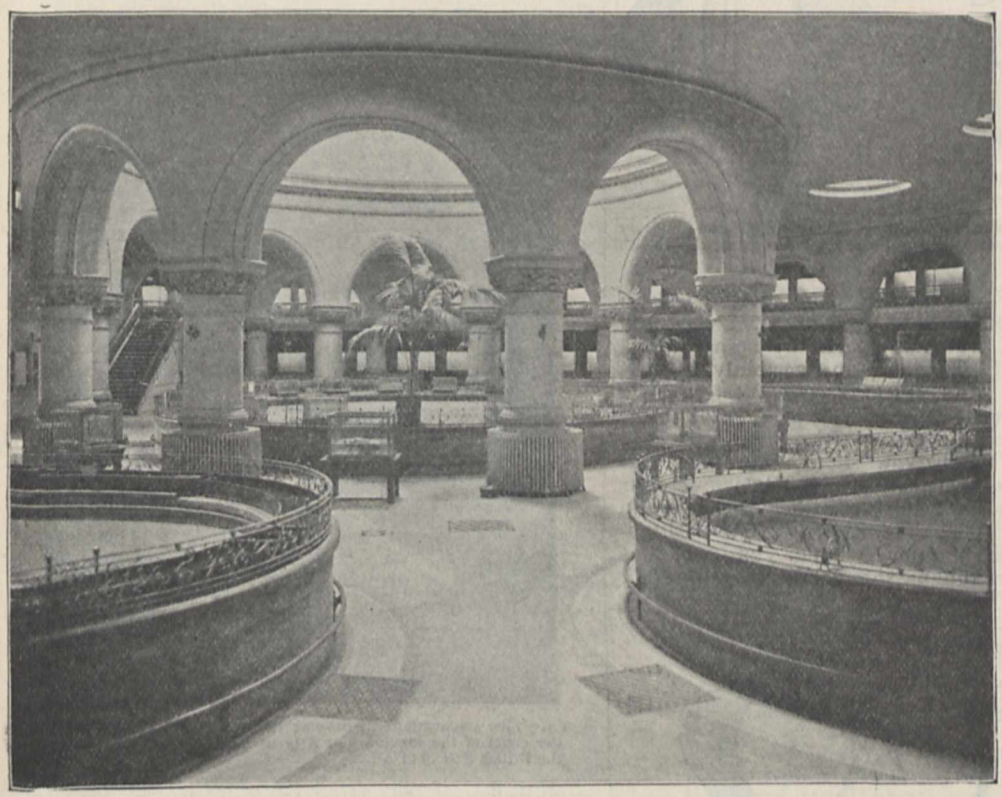
A FISHING TRIP TO THE GULF OF MEXICO.[1]

MR. AFLALO describes a journey to Florida *viâ* New York, a fortnight's tarpon and other fishing in Florida, and the journey home by way of sundry Central American and West Indian ports. The account given by the author of his outward journey differs in no material respect from numerous extant accounts of similar journeys, but is somewhat marred by a style rather reminiscent of that of the traveller who has perforce to provide his daily or weekly quota of copy for some periodical publication. Such sentences as "In the middle of the ship soft-voiced stewardesses gently raise thick curtains and say that dinner will be up in a minute. It usually is. Fore and aft there is neither curtain nor stewardess, but one sufferer leans across a neighbour of a different race and obeys the irresistible. Everything comes up, even the moon at last . . . ." are hardly worthy of a serious volume. There are, however, interesting if slight allusions to and photographs of the Bronx Park Zoological Gardens and New York Aquarium, and a good account of a typical American health and pleasure resort in North Carolina.

Coming as it does from so well-known an authority on sea-fishing as Mr. Aflalo, the second section of the book is naturally by far the most interesting. The account given of tarpon fishing as pursued at Boca Grande is both full and lucid; a sufficiency of detail as to gear, methods of using it, and expenses is given without any needless discursiveness or undue brevity. The whole circumstances of the sport are brought clearly before the reader; the string of boats, each with its armchair fixed athwartships for the angler, towed out to the fishing grounds by a launch in the morning; the fish gaffed long ere they are played to a finish in the fisherman's eagerness to get back to the grounds and kill a larger one; the annoyance resulting

1 "Sunshine and Sport in Florida and the West Indie." By F. G. Aflalo. Pp. xv + 272. (London: T. Werner Laurie, n.d.).

from hooking anything that is not a tarpon, and the homeward journey to the scales, where the fish are weighed and wasted, for, unlike its Asiatic congener, the tarpon is never used for food. Notwithstanding that we are told that luck and brute force count for far more than skill in tarpon fishing, it is curious what a fascination the sport has for its votaries; there is something beyond the surroundings and beyond the huge size and strength of the fish itself (for these latter, great as they are, become insignificant when compared with the power and bulk of the great serranids and sharks, which are but "vermin" to the tarpon fisher) that lends a glamour to the sport. It is curious to find the same author between the same covers dazzled by this glamour, and yet talking of "the semi-artificial sport of deer 'forests' (*sic*)," setting the armchair and brute force of the tarpon fisher higher than the rough hillsides, patience, and skill of the deer-stalker.



Transformation of an old fort into the New York Aquarium. From "Sunshine and Sport in Florida and the West Indies."

A chapter in this otherwise interesting section of the book devoted to speculations upon the early life-history of the tarpon is marred by the author's preliminary assumption that Megalops is a "herring," an assumption the more surprising when it appears from other passages in the book that he is well acquainted with one, if not both, of its real allies, Elops and Albula. Perhaps, however, in the case of one who does not claim to write as a scientific ichthyologist, such an assumption may be pardoned, as may his want of knowledge of Gill's paper (Smithsonian Miscellaneous Collections, 1905) dealing with the early histories of Megalops and its allies, and epitomising our existing knowledge of the singular metamorphosis passed through by the young of these fishes.

The concluding section of the book contains some useful suggestions for the sea-fisherman who may wish to visit the West Indies, and holds out some hope that Jamaica may hereafter find prosperity as a resort for British tourists.

It only remains to add that the printing and appearance of the book are good, and that an excellent index is provided. The book is well illustrated from photographs, and we are enabled by the kindness of the publisher to reproduce an illustration of the New York Aquarium, showing how an old fort has been adapted for this use; the open tanks built into the floor for the reception of large fishes are well shown in the picture, and present a feature which would seem worthy of imitation on this side of the Atlantic.

L. W. B.

GREEK ARCHÆOLOGY.[1]

THE articles in the latest volume of the "Annual of the British School at Athens" which are of most importance are those by Mr. R. C. Bosanquet, the late director of the School, and his assistants, which describe their excavations in the temple and precinct of the goddess Artemis Orthia at Sparta. Thus, for the first time for some years, the main interest of the School's work is transferred from things "Mycenæan" or "Minoan" to antiquities of the "classical" period. The excavations of the School at Palaíkastro, in Crete, which have produced so many interesting monuments of the older civilisation of Greece, have been brought to an end (Mr. Dawkins describes the last flicker of this work last year in the present volume), and a new scene of labour, amid totally different surroundings, and productive of totally different results, has been wisely chosen. This is as it should be. Eventually the present phase of the school's work will also exhaust itself, and then, all in good time, the attention of the school will no doubt again be turned towards Mycenæan matters. Dr. Arthur Evans will by that time have published his great book on Knossos, the Italian results will also be published, and we can start afresh with renewed interest and increased knowledge, derived from the complete study of the results of the previous period of excavation. Then the school will, it is to be hoped, complete the great

[1] "The Annual of the British School at Athens," xii. Pp. xi+523; 12 plates; and illustrations in text. (London: Macmillan and Co., Ltd., 1905-6.) Price 25*s.* net.

work of excavation at Phylakopi, in Melos, which remains unfinished. Meanwhile, the Mycenæologues can discuss the results of the energetic exploring work of the last decade, and books such as Prof. Burrows's recently published "Discoveries in Crete," or articles like that of Dr. Mackenzie on "Cretan Palaces and the Ægean Civilisation," which appears in this volume, will help us to understand these results better.

Dr. Mackenzie's article continues his discussion of the contingent results of the excavations at Knossos and Phaistos, which commenced in last year's "Annual." In the continuation he passes from architectural evidence to a discussion of various theories as to the origins of Ægean culture, in which

FIG. 1.—Cretan seal-impression, showing Minoan civil and military costume; waistcloth and armour. From the "Annual of the British School at Athens."

he rightly criticises and dismisses the revived Carian theory of Dr. Dörpfeld, and urges his own view and that of Dr. Evans, which is shared by many others, apparently by Prof. Burrows, and certainly by myself (see King and Hall, "Egypt and Western Asia in the Light of Recent Discovery," p. 128), that the Ægean civilisation came from Africa, and was akin in origin to that of Egypt. I mention that this view is held by me, because Dr. Mackenzie credits me in his article with believing rather that Ægean culture came from Asia. He says:—"The designations 'kleinasiatisch' and Asianic, as well as other statements in the passage cited (*Journ. Hell.*

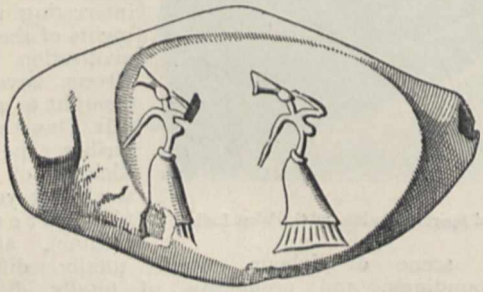


FIG. 2.—Cretan seal-impression, showing Minoan female costume; skirt developed from waistcloth. From the "Annual of the British School at Athens."

Stud., xxv., 323) would seem to indicate an underlying belief on Mr. Hall's part that the primary movement of the Ægeo-Pelasgian people was from an initial centre of departure somewhere in Asia." But, as a matter of fact, I agree entirely with Dr. Mackenzie. The words "kleinasiatisch" and Asianic have been used by me in reference to the pre-Hellenic languages of the Ægean merely because they are so used by the philologists Kretschmer and Fick; and their sole reason for using such terms is that the only later representatives of these languages which are at all well known were spoken in Asia Minor. Prof. Fick may regard these tongues as being of Asiatic origin. Dr. Mackenzie says:—"Even Fick continues to behold one last vestige of the same oriental mirage. The initial racial movement which led to the Ægeo-Pelasgian culture would, according to Fick, have to be assigned a starting-point at some centre in Asia beyond the Hittite country." But I do not, and I think I may reasonably protest against having non-existent "underlying beliefs" assigned to me, in view of the following passage in the same article that Dr. Mackenzie quotes (*J.H.S.*, xxv., p. 337), the meaning of which seems to me perfectly clear:—"If we were to suppose that the prehistoric Greek and the Egyptian civilisations had a common origin back in the darkness of the Age of Stone, that they were twin cultures of the same Mediterranean stock, the one having developed, however, amid the diverse isles and changing seas and skies of the Ægean, the other on the monotonous banks of the Nile, we can see how

FIG. 3.—The Excavations at Sparta; piers of the Roman theatre built in the court of the sanctuary of Artemis Orthia. From the "Annual of the British School at Athens."

the northern culture would naturally show greater freedom and variety, often running off into mere bizarrerie, but as often exhibiting something of that spirit which we, knowing it in the renascent Aryanised civilisation of the later day, call 'Greek.'"

From this I think it is clear that I do not believe in an Asiatic origin for the Ægean culture, and that I do believe in an African origin for it is shown by the passage, already referred to, in Mr. King's and my book (originally published in 1905 as the final volume of an American series), in which I say:—". . . We are gradually being led to perceive the possibility that the Minoan culture of Greece was in its origin an offshoot from that of primeval Egypt, probably in early Neolithic times." One of the things that has always disposed both others and me to believe an African origin for it is the scanty costume worn by the Mycenæans, which has a decidedly southern appearance. Dr. Mackenzie is perhaps the first to direct attention to this point in print, and

rightly insists upon its importance, elaborating it at length in this article. On the other hand, we must not forget that such a south-to-north migration, from a warmer to a colder climate, is an unusual proceeding in the history of mankind.

Returning to the excavations at Sparta, we see from the articles dealing with them how important this phase of the school's work is proving to be. The identification of the site and discovery of the remains of the temple of Artemis Orthia, where the well-known Spartan flagellation of the boys took place in honour of the goddess, is a great feather in the caps of Prof. Bosanquet, Mr. Dawkins, and their assistants. The discovery of a regular stratum of early votive offerings, chiefly archaic bronzes of the Olympia type, but in some ways more interesting than those, is an important event, as it adds considerably to our knowledge of archaic Greek art, especially in that peculiarly inartistic and philistine place, Sparta; and the many inscriptions of Roman date throw light, not only on the flagellation ceremony, but generally on the course of life in Roman Sparta. In publishing these inscriptions, Mr. H. J. W. Tillyard insists in every case on adding a Latin translation, which is perfectly unnecessary, and savours of scholastic pedantry. If we are to have translations, let them be in English if the commentary is English.

We are unable to devote more space to the discussion of the Spartan discoveries, owing to the claims to notice of much other interesting matter in this volume of the "Annual." Also, it is perhaps best to postpone further comment until next year, when the work will have been further advanced.

Of these other articles, all are of interest and many of importance, with the exception of a note on "Boats on the Euphrates and Tigris," which seems hardly appropriate to the "Annual of the British School at Athens," and contains no new information; we have known all about *keleks*, *shahtûrs* and *kûfas*, and have compared them with Herodotus, i., 194, since the days of Rawlinson and Layard.

Of the other articles, perhaps Mr. Droop's and Mr. Dickins's are the most "geistreich." Mr. Droop on Cretan geometric pottery is illuminating, and Mr. Dickins's article on "Damophon of Messene" is an example of good archæological criticism, on which the author may be congratulated. The travel articles by Messrs. Dawkins, Wace, Hasluck and others are interesting, as usual, and we welcome a contribution by a native Cretan archæologist, Dr. Xanthoudídes, who speaks our language, and, apparently, writes it as well. Finally, Mr. Traquair contributes to our knowledge of the deeply interesting period of the Frankish domination in the Morea, with an article on the mediæval fortresses of Laconia, which will interest heralds as well as archæologists. H. R. HALL.

THE FUTURE WATER SUPPLY OF LONDON.

IN an interesting paper on "London's First Conduit System," just published in the Transactions of the London and Middlesex Archæological Society, Dr. A. Morley Davies gives an account of the lines of pipes which were laid in the thirteenth and succeeding centuries to carry water to London from springs in the gravel at Paddington, Marylebone, and other rural districts. At a later date, to meet the growing wants of London, the great engineering effort of the New River was undertaken, and later still deep wells were driven into the chalk, and the Thames was tapped above Teddington Weir by several private companies. The unification of the London waterworks under one comprehensive and representative Board which bought out the old companies is so recent that it is almost surprising to find how soon the organisation of the Board has been perfected and its members set free to consider the tremendous problem of the future water supply of London.

A good many years ago much was heard of the necessity for obtaining a totally new supply of water for London from a pure and distant source which should be beyond the suspicion of impurity and capable of supplying the highest parts of the metropolitan area by gravitation. The sentimental argument that the water companies pumping from the Thames and Lee had to purify a raw material which has sometimes been described as "diluted sewage" is one which cannot fail to appeal to the imagination of every water-drinker, despite the reassuring result of the supreme test—the death-rate of London. But the restrictive activity of the Thames Conservancy and the discovery of the remarkable action on raw water of storage and thorough filtration have robbed the argument of its old force, while the exhaustive bacteriological examination of the raw and filtered water by Dr. Houston and his staff in the Metropolitan Water Board's laboratory has satisfied even those who heartily dislike lowland rivers as a source of water supply that the safeguards in the case of London are adequate to ensure purity.

The sufficiency of the supply is another matter, and on this point the Water Board, after prolonged discussion at two meetings, came to a decision as to their future policy on December 6. The Works and Stores Committee prepared a careful report reviewing the situation which, after amendment, was adopted. The whole subject of London water supply had been gone into by two Royal Commissions in recent years, one under Lord Balfour of Burleigh in 1892, the other under Lord Llandaff in 1897, and the committee's report does not repeat the details elicited by those inquiries. It is noted, however, that the average daily supply to London in 1881 was 143,821,000 gallons, or 33·20 gallons per head for a population of 4,331,600, while in 1906–7 the average daily supply was 225,000,000 gallons, or 32·84 gallons per head for a population of 6,851,000. Of the present daily supply of 225,000,000 gallons, 57 per cent. comes from the Thames, and the remainder in nearly equal proportions from the Lee and from wells or springs, the actual figures being:—

	1906–7	Maximum
From the Thames	128,842,695 ...	300,000,000
,, ,, Lee	44,150,290 ...	52,500,000
,, wells in Lee Valley, Kent, &c.	51,355,797 ...	67,500,000
,, Hanworth gravel beds ...	564,008 ...	—
,, Hampstead and Highgate ponds	87,893 ...	—
Total	225,000,683	420,000,000

The maximum column gives the figures which the Balfour Commission held to be the greatest average daily yield of the whole district.

The total amount of water which the Board can abstract from the Thames in existing conditions is 228,500,000 gallons per day, and even this amount cannot be obtained until additional storage reservoirs have been constructed. The maximum supply to be relied upon from sources other than the Thames is estimated by the chief engineer to the Water Board at 120,000,000 gallons per day, the total available being thus 348,500,000 gallons per day.

It is estimated that by 1941 the population to be supplied by the Board will be 12,000,000, and in 1960 16,286,000, and, assuming a consumption of thirty-five gallons per head, this means 420,000,000

gallons in 1941, and 570,000,000 gallons in 1960. Of the various sources of supply, that from the Thames alone is capable of considerable expansion, and in 1960 it is estimated that 450,000,000 gallons per day may be taken from that river. In order to admit of this expansion, immense storage reservoirs would require to be constructed; the amount of storage necessary in 1916 would be 6,436,000,000 gallons, in 1941 as much as 27,276,000,000 gallons, and in 1960 the prodigious amount of 54,059,000,000 gallons, the necessary storage increasing at a greater rate than the supply. The chief engineer believes that 450,000,000 gallons is the limit which could be taken economically from the Thames in any conditions.

The works at present in existence or authorised will suffice for the supply of London until 1917, and to provide the additional works required at that date it will be necessary to approach Parliament for new powers in 1910. The new scheme which has been definitely adopted as the policy of the board is to develop the supply from the Thames valley, and to trust to that as sufficient for the next fifty years, but at the same time to acquire powers for securing a supplemental source of supply to be utilised when the existing sources can no longer be developed economically. In the report as issued reference is merely made to "a distant source" being necessary fifty years hence, but in the debate the source was referred to plainly as Wales. It is remembered that before the creation of the Metropolitan Water Board the London County Council as water authority developed a scheme for supplying London with water from Wales in competition with the companies, and it was proposed in the debate on the report before the Water Board to proceed forthwith with a Welsh scheme, but a very large majority agreed to endorse the recommendations of the report in this particular. The three important resolutions as amended in another particular and adopted are as follows:—

"(*a*) That in the opinion of the Board it is desirable to seek Parliamentary powers enabling them to provide additional supplies from the Thames for as long a period as is economically practicable.

"(*b*) That as the increase in population will eventually render resort to some other source than the Thames watershed imperative, the Board view with great alarm the increasing tendency of authorities throughout the kingdom to appropriate water-supplying areas for their particular use, and in these circumstances desire to urge upon Parliament the necessity for regulating the appropriation of water-supplying areas, so that the needs of the metropolis as well as of other populous places may receive due consideration.

"That a copy of the foregoing resolution be sent to the President of the Local Government Board, and that he be asked to receive a deputation from the Board on the subject; and further, that in the event of such request being granted, the Works and Stores Committee be authorised to make all necessary arrangements with regard to the deputation.

"(*c*) That it be an instruction to the Works and Stores Committee to prepare and submit to the Board as early as practicable a scheme to give effect to the foregoing resolutions."

The Metropolitan Water Board is the largest and most important water authority in the United Kingdom, being responsible for the supply to one-sixth of the population of the British Isles. The distribution of rainfall, on which water supply depends immediately or ultimately, is, speaking broadly, the inverse of the distribution of population. Taking the part of England and Wales south of the Trent, it may be said that most people live in the Thames valley, while most rain falls in Wales. Much rain falls also on Dartmoor, Exmoor, and in the Lake District, all of them distant and unpeopled places on which the eyes of nearer populations have been turned for some time. It is the custom of Governments to assume control of the distribution of natural treasure and to regulate the pegging-out of claims for hewing out gold or diamonds, and the Water Board now proposes to ask for the extension of this principle to the drawing of water for great communities. The suggestion is not new, but it will none the less meet with keen opposition, for the large towns with great and distant water supplies are usually permitted and sometimes compelled by Parliament to sell surplus water to the communities along the track of their aqueducts, and hence municipal foresight may involve taking thought also for possible interference with spheres of interest.

It is interesting to compare the proposed appeal to Government to keep a place in the struggle for water-yielding grounds for the supply of London half a century hence with the arguments employed by Mr. Urquhart A. Forbes in a paper on "The Water Supply of the United Kingdom" in the October number of the *Quarterly Review*. Mr. Forbes urges the appointment of a central water board for the country with subordinate watershed boards in order to check the depredations of the great towns on the upper reaches of rivers, and to ensure the maintenance of the lower streams in a condition fit for navigation and fishing. It must not be forgotten that rivers not only water the land, but drain it as well, and to the mind detached from all municipal or commercial schemes it appears self-evident that the same channel should not be required to act both as an aqueduct and as a sewer. On the other hand, it is an acknowledged fact that the insertion of a properly proportioned artificial lake in the upper waters of a river benefits that river by checking floods in wet weather and maintaining a good flow in dry weather, while it enables a permanent and pure supply to be drawn for the uses of a distant population. To the scientific mind the surprising thing is that steps have not been taken long ago to gauge the flow of all the rivers in the country and to establish rain gauges in remote and uninhabited places where the treasure of the heavens descends in fullest amount. Not until this has been done can the alliterative dictum of Mr. John Burns—"Rain to the rivers, sewage to the sea"—become an effective mandate.

NOTES.

THE Nobel prizes, of the value of nearly 7700*l.* each, were presented at the Academy of Sciences at Stockholm on Tuesday. In science, the prizes were awarded as follows:—physics, Prof. Michelson, University of Chicago; chemistry, Prof. Buchner, University of Berlin; medicine, Dr. Laveran, Pasteur Institute, Paris.

THE Glasgow Corporation has decided to confer the freedom of the city on Lord Lister.

A TELEGRAM from Largs states that Lord Kelvin has not been well for more than a fortnight, and has been confined to his bed. His condition on Tuesday night had improved.

MR. J. D. ROCKEFELLER has just given an additional sum of more than 520,000*l.* to the Rockefeller Institute for Medical Research in New York, to be held as an endowment the income of which is to be used at the discretion of the management.

THE death is reported, in his seventy-ninth year, of Dr. Asaph Hall, professor of astronomy at Harvard since 1895. Prof. Hall received an elementary-school education in his

boyhood, and worked for some time at farming and carpentry. In 1857 he became an assistant at Harvard Observatory, which he left in 1862 to enter the service of the Naval Observatory of the United States.

AN International Congress of Low Temperature Industries will be held at Paris for the first time in June, 1908. The general effects of low temperatures and their use in connection with food, horticulture, mines, metallurgy, commerce, and transport are to be discussed. Full particulars may be obtained from the secretary to the congress, 10 rue Poisson, Paris.

DR. J. COSSAR EWART, F.R.S., commenced a course of twelve Swiney lectures on geology in connection with the British Museum (Natural History) on Friday last, December 6. The subject of the lectures, which are being delivered on Mondays, Fridays, and Saturdays, at 5 p.m., in the lecture theatre of the Victoria and Albert Museum, South Kensington, is "Horses of the Past and Present." The lecture to-morrow (Friday) will be on the fossil horses of Central Europe compared with Prejvalsky's horse. Admission to the course is free.

THE Duke of Argyll, honorary president of the Franco-British Exhibition, the Earl of Derby, president, the vice-presidents, and the executive and finance committees are this afternoon giving a reception in the exhibition grounds, to be followed by an inspection of the progress of the works.

THE annual conversazione of the Royal College of Science and Royal School of Mines will be held in the new buildings of the college on Wednesday next, December 18. Many interesting exhibits will be shown in the various departments, and Mr. G. S. Newth will deliver a popular lecture on "Coal-mine Explosions."

THE annual meeting of the British Science Guild will be held at the Mansion House on Wednesday, January 15, at 4.15 p.m. The Lord Mayor has consented to preside and to become one of the vice-presidents of the Guild. Mr. Haldane, the president of the Guild, and other gentlemen will address the meeting. Steps are being taken by the Guild to bring the proposals for legislation for the prevention of the pollution of rivers before many societies and local bodies.

WE are requested to make it known that a meeting will be held under the auspices of the Essex Field Club on Saturday, December 14, at the Essex Museum, Stratford, for the discussion of rivers' pollution from the naturalist's point of view. The subject will be opened by Prof. Meldola, F.R.S., and spoken to by Sir William Ramsay, K.C.B., F.R.S., Mr. E. B. Barnard, M.P., Sir Alexander Pedler, F.R.S., Mr. William Whitaker, F.R.S., Dr. Thresh, and other gentlemen well acquainted with the question of water supply. All interested in the matter are invited to attend. Mr. W. Cole, Buckhurst Hill, Essex, will be glad to send cards.

A PROPOSAL made to the Public Control Committee of the London County Council by Signor D. Maggiora to apply the process of discharging cannon of special construction, known in Austria as weather shooting, "to prevent the formation of fog or to disperse it in case it is already formed, and also to disperse and destroy all clouds, and to prevent rain, hailstorms, lightning, and thunder," has been under the consideration of the Council. It was referred to the director of the Meteorological Office for report. The proposal is even more ambitious in its scope than its predecessors of more or less similar character in other countries of the old or new world. As might be expected, Dr. Shaw's report, based largely upon Prof. Pernter's article in the *Meteorologische Zeitschrift* of March last, and on official reports of the Vienna Meteorological Office, is entirely unfavourable, and the County Council has therefore not been asked to vote money for the proposed experiments.

THE Brent Valley Bird Sanctuary consists of a wood, nineteen acres in extent, which comes into the London postal district. About eighty species of birds have been seen in or near the enclosure, while nearly half that number are known to have bred within it; and for four years a number of members of the Selborne Society and other lovers of natural history have with their own hands maintained the fences and brought them into a state of greater efficiency, or have contributed towards the wages of temporary watchers. Much more should be done, and the committee has therefore made an appeal for annual subscriptions from people who are interested in birds, so that a permanent custodian may be appointed. Subscriptions should be sent to Mrs. Webb, Odstock, Hanwell, W., honorary secretary of the committee and of the Brent Valley branch of the Selborne Society.

AT a meeting of the epidemiological section of the Royal Society of Medicine on December 2, papers were contributed by Dr. Haffkine, on the present methods of combating plague, and Dr. Ashburton Thompson, of Sydney, N.S.W., on protection of India from invasion by plague. Dr. Haffkine considers that the following propositions are now more or less generally recognised, viz. that (1) plague is what has been termed, in a general sense, a disease of locality; (2) it is contracted principally at night; and (3) the part which man plays as direct agent in its propagation is a more or less subordinate one. After discussing such measures as desertion of the locality, disinfection, and rat destruction, the conclusion was arrived at that the ultimate method of combating the bubonic plague in the areas in which it becomes endemic is that of conferring on the population immunity from the disease by means of an artificial treatment. Dr. Ashburton Thompson, in his paper, said the fundamental *data* acquired in the investigations at Sydney are that (1) the epidemic spread of plague occurs independently of communication of the infection from the sick, consequently the infection of plague spreads by means which are external to man; (2) the plague-rat is harmless to man, but is, nevertheless, the essential cause of epidemics; and (3) the intermediate agent between rat and man (and between rat and rat) is the flea. The infection of man is most usually contingent on his being within buildings together with plague-rats.

WE learn from the *Lancet* that Prof. Alfonso Sella, professor of experimental physics in the Royal University of Rome, died on November 25 at forty years of age. From an interesting obituary notice by the Italian correspondent of our contemporary, we extract the following particulars of Prof. Sella's scientific career. Prof. Sella inherited from his father, Quintino Sella, one of Italy's greatest statesmen, a love of science, abstract and applied, which carried him with special distinction through the mathematical and physical curriculum of the University of Turin. Like his sire he took his annual holiday in the Alps, where, in his seventeenth year, he was the first to scale the summit of the Dent-du-Midi; and he found another pastime in aëronautic adventure, a field in which he had many followers, in conjunction with whom he founded the "Società Aeronautica Italiana." For the ten years

between 1889 and 1899 he acted as assistant to the Senator Pietro Blaserna in the Roman "Istituto Fisico," after which he was made professor extraordinary of experimental physics in the University. From that post, after a year's success in the class-room and the laboratory, he was promoted ordinary professor of the same subject, giving also post-graduate instruction (the so-called "Corso di Perfezionamento") to those students who were to make pure and applied physics the business of their lives. His scientific papers, read and discussed before various scientific congresses and societies, were numerous and important, always rich in independent speculation and research. Among these may be mentioned his study on "L'Influenza dei Raggi Röntgen e della Luce Ultra-Violetta sulle Scintille" and his "Ricerche sulla Radio-attivita dell' Aria." To him, in concert with Guglielmo Romiti, professor of anatomy and embryology in the University of Pisa, Italy owes her "Association for the Advancement of Science," organised on British lines and convened for the first time in September last at Parma, where it achieved a gratifying success. A committee, composed of Profs. Blaserna, Cerruti, Reina, Volterra, and Tonelli, the Rector of the University, is taking steps to place a memorial of Prof. Sella in the Istituto Fisico in the form of a bust in marble. Subscriptions should be sent to Prof. Reina at the school of applied engineering of the University.

THE second annual general meeting of the National League for Physical Education and Improvement was held on December 6 under the presidency of the Bishop of Ripon. The report of the executive council stated, in regard to the medical inspection of school children, that it will be possible, now a medical department has been established, to advise the Board of Education that under efficient supervision and control the best uniform system may prevail and be carried out under conditions sufficiently elastic to suit the requirements of different districts. The knowledge and experience gained in other countries are sure to have important results in their bearing upon the work of the league. On the question of pure milk, a joint committee of the league and the National Health Society, on which were members of the Infants' Health Society and other similar organisations, the Royal Commission on Tuberculosis, and the Royal Veterinary College, has now been formed, and has drawn up a preliminary report, in which it is recommended that the periodical veterinary inspection of all cows, the milk of which is being offered for sale for human consumption, should be made compulsory throughout the United Kingdom. The Milk Committee is now preparing recommendations with regard to milking and handling, transport and distribution.

AN account of an expedition in the Himalayas, which included the first ascent of Trisul (23,406 feet), has been given to Reuter's representative by Dr. T. H. Longstaff. The party consisted of Major C. G. Bruce, Mr. A. L. Mumm (late hon. secretary to the Alpine Club), Dr. Longstaff, and guides. Originally the object of the journey was to attempt the ascent of Mount Everest from the Tibetan side, but for political reasons this was found to be impossible. It was decided to go to the central Himalayas, to Garhwal, and from that point attempt Trisul. After two marches along the Trisul glacier the party started up the snow slopes of the mountain on June 7, and that evening reached a height of 20,000 feet. During this period Dr. Longstaff had by far the worst experience in his foreign travels. On the third day the party descended to the foot of the mountain, and again camped at 11,600 feet. On June 11 Dr. Longstaff and his guides marched rapidly round his old track, camping the same afternoon at a height of 17,450 feet. On the following morning the party started at 5.30 a.m., and five hours later reached its highest camp of 20,000 feet. As dangerous crevasses half covered with snow and ice were ahead, the explorers roped themselves together, and at noon reached 21,000 feet. The party now followed the narrow N.N.E. ridge of Trisul, which leads straight to the summit. At 4 p.m., after ten hours' continuous climbing, the summit was reached. The cold was so bitter that it was only possible to remain for fifteen minutes. To the west the view was one of extraordinary vastness, as the horizon extended over the whole of the lower Garhwal and the snow peaks beyond. To the north lay the Tibetan frontier, obscured by rolling masses of black cloud. To the east were the frowning cliffs of Nanda Devi and its untrodden glaciers. The party now turned its attention in the direction of the Tibetan frontier, and during July explored glaciers to the east and west of Kamet (25,450 feet), reaching on one occasion an altitude of 20,000 feet on the mountain. In August and September Dr. Longstaff explored the valleys to the south and west of Trisul, while Major Bruce and Mr. Mumm made more ascents in Kashmir.

THE report of the council of the Royal Agricultural Society, presented at the annual general meeting held on Wednesday, December 11, states that the frosty weather in the spring caused injury to white clover, broad beans, and wheat, and the wet summer and autumn led to extensive injuries by parasitic fungi. Many investigations have been made into these diseases. Another unobserved enemy to the potato, *Stylanus capitatus*, has been proved by experiment to attack the living plant. A hawthorn hedge was seriously affected by *Botrytis cinerea*. Bacterial injuries to potatoes, broad beans, and oats have been investigated. Scouring in stock was found to be due to the mould developed on the feeding cake. In the zoological department nothing of special importance was reported, except the recurrence of the pygmy mangold beetle, which is probably a more frequent and serious pest to mangold than has hitherto been supposed. With the abnormally wet summer came a large number of complaints of caterpillar attack, and in many instances the caterpillars were of species not usually seriously troublesome. Later again, certain pests generally associated with particularly dry seasons began to be complained of, as the results of the continued fine weeks of the late summer and autumn. The council, at its last meeting, considered a suggestion that the Board of Agriculture should be urged to schedule tuberculosis, and, after discussion, the following recommendation of the veterinary committee was unanimously adopted:—"That in the event of the promotion of legislation dealing with the question of tuberculosis and other diseases of cattle, the council of the Royal Agricultural Society of England is of opinion that any regulations for dealing with this question should be issued by the Board of Agriculture and not to any other department." A discussion ensued as to the desirability of forming a national representative body to safeguard, so far as possible, the interests of agriculturists in connection with any measures to be adopted for dealing with the question of tuberculosis in cattle, and it was resolved:—"That a committee be formed to communicate with other societies for the purpose of watching the interests of agriculture, in view of possible legislation with regard to the tuberculosis question." The society's show will be held at Newcastle-upon-Tyne in 1908, and at Gloucester in 1909.

THE Hon. Walter Rothschild has recently received half-a-dozen specimens of the Californian elephant-seal (*Macrorhinus leoninus angustirostris*), a race which had for some

time been regarded as extinct. The specimens were obtained from Guadaloupe Island, off the coast of Lower California, and before they were shot the collector was fortunate enough to obtain several photographs of them as they lay on the beach, which consists of huge boulders of volcanic rock, some black and some white, with intervening stretches of sand. Enlargements of these photographs have been presented by Mr. Rothschild to the British Museum (Natural History). The Californian elephant-seal is somewhat smaller than the typical elephant-seal of Heard Island, the Crozets, and other islands in the southern ocean, but can scarcely be regarded as more than a local race. With the exception of a specimen destroyed in the late San Francisco fire, adult male examples of this animal have hitherto been unrepresented in museums. Two of Mr. Rothschild's specimens are being mounted for the museum at Tring by Rowland Ward, Ltd.

AMONG the papers in vol. lxxxviii., part ii., of *Zeitschrift für wissenschaftliche Zoologie* is one by Dr. M. Nowikoff, of Heidelberg, on the dorsal sense-organs of chitons, with remarks on the structure of the shell in those molluscs. Certain tropical chitons, it will be remembered, possess eyes on the dorsal surface of the shell, but all, it appears, have a canal-system within the shell itself which is likewise sensory in function. Both the eyes and the canal-system are described in detail by the author, who also directs attention to the peculiarities presented by the fibrous layer connecting the eyes with the epidermis. The dorsal eyes are of two types, one characteristic of the subfamilies Toniciinæ and Liolophurinæ, and the other restricted to certain species of chiton itself. It is remarkable that in certain species, especially *Tonicia chiloensis*, the dorsal eyes are attacked, and apparently destroyed, by an alga, which develops within the substance of the shell.

THE Health Committee of Liverpool has issued a report (published by C. Tinling and Co., Ltd.) on investigations undertaken by Mr. R. Newstead, of the School of Tropical Medicine, Liverpool University, on the habits, life-history, and breeding-places of the house-fly, as observed in the city. The chief breeding-places were found to be in pits for the store of stable manure, fermenting heaps of hop refuse, and ash-pits containing fermenting vegetable matter, the infection being equally as great in closed as in open receptacles. Although the ordinary disinfectants appear to be of no avail in checking the development, barndoor fowls are of great value in reducing the numbers of grubs and pupæ. The period of development (which in ordinary circumstances may last from three to five weeks) is reduced by the heat of fermentation to a minimum of ten days, and this accounts for the fact that in ash-pits emptied weekly in summer no flies are produced. The emptying of these and other receptacles for refuse at intervals of seven days in summer is therefore recommended; while, in connection with other remedial measures, attention is directed to the importance of early removal of fermentable matter from streets and other public places.

THE Board of Agriculture and Fisheries has issued an order, the short title of which is the "American Gooseberry Mildew (Prohibition of Importation of Bushes) Order of 1907," under which the landing in Great Britain of any gooseberry bush or currant bush brought from any place out of Great Britain is strictly prohibited. The order also provides that if, on any examination, an inspector finds any bush which is affected with American gooseberry mildew, he is forthwith to communicate the fact to the Board, and serve on the occupier of the premises on which the bush is found a notice prohibiting, until the notice is withdrawn by a like notice, the removal of any gooseberry or currant bush from those premises.

AMONG the papers in the September issue of the Proceedings of the Philadelphia Academy, reference may be made to one by Dr. H. A. Pilsbry on the barnacles of the genus Megalasma—a genus established on the evidence of a specimen dredged during the cruise of H.M.S. *Challenger* in the Philippine archipelago. In the author's opinion the genus should, however, be taken to include one sectional group of the numerous species hitherto included in the nearly allied Pœcilasma.

EXTERNAL parasites infesting domesticated animals in India form the subject of a special investigation by the entomological division of the Department of Agriculture. The first results of the investigation, dealing with ticks, are published in Bulletin No. 6 of the department in question. According to the author, Mr. C. Warburton, over the greater part of India the ticks infesting domesticated animals belong for the most part to four species only. Two other species may, however, occur sporadically in some numbers, but the occurrence of any other type is so rare as to be of no economic importance. Means of identifying the six species are given in the paper.

THE current number of the *Annals of Tropical Medicine and Parasitology* contains articles on a variety of matters bearing directly or indirectly on the subjects named in the title. An important memoir by Mr. J. E. Salvin-Moore and Dr. A. Breinl breaks new ground, and will excite much interest, perhaps also some controversy, amongst the many investigators of this important class of parasites. Valuable contributions upon African parasitic protozoa, and upon *Spirochaeta duttoni*, the parasite of African tick fever, are furnished by the late Dr. J. L. Dutton, Dr. J. L. Todd, Dr. E. N. Tobey, and by Dr. A. Breinl respectively. It looks at first curious to see included in this journal two almost purely zoological memoirs on Cyclopidæ from the Gold Coast, by Dr. W. M. Graham and Dr. G. S. Brady, but Cyclops comes into indirect relation to tropical medicine by acting as a host for the guinea-worm. Dr. C. W. Branch writes on yaws. The contents of the journal bear testimony to the broad scientific spirit in which the Liverpool School of Tropical Medicine carries on its work.

PROF. E. DE JANCZEWSKI has rendered a service to the botanical community by the publication in vol. xxxv., part iii., of the *Mémoires de la Société de Physique et d'Histoire naturelle de Géneve* of a valuable monograph on the genus Ribes, embellished by some excellent illustrations. It is particularly interesting to find that the author has examined numerous living specimens, and has cultivated many of the species. Six subgenera are demarcated, of which two are characterised by the production of diœcious flowers. In the subgenus Parilla the flowers bear sterile organs, but in the species of the subgenus Berisia the staminate flowers have no distinct ovary, nor do the pistillate flowers produce pollen. The chief centres of the genus are found in North America and in China, except for the species of the subgenus Parilla, that are almost confined to South America. Eighteen hybrids are described, most of them representing crosses between species in the same subgenus.

FOUR parts, numbered 16 to 19, of the "Materials for a Flora of the Malayan Peninsula," have been published as an extra number of vol. lxxiv. of the Journal of the Asiatic Society of Bengal. Three numbers appeared in

1905; the fourth has recently been issued. Apart from the account of the genus Psychotria, that concludes the Rubiaceæ, these numbers contain the orders—following the sequence of Bentham and Hooker's system—Valerianeæ to Loganiaceæ. The authors, Sir George King and Mr. J. S. Gamble, have assumed responsibility for separate orders in addition to certain others undertaken by Colonel D. Prain. For the twenty-eight orders collated, the species amount to 686, of which 190 are new to science. The additions are numerous in the Myrsinaceæ and Sapotaceæ, notably in the genera Ardisia and Bassia, also in the genus Diospyros. A new genus, Pernettyopsis, and five species of Rhododendron, form an increment to the Ericaceæ. Many of the genera of the Apocynaceæ are very fully represented in Malaya, *e.g.* Urceola, Anodendron, and Willughbeia. The Sapotaceæ and Apocynaceæ are rich in rubber, gutta, and other economic species.

THREE memoirs have recently been issued by Dr. Leather, of the Agricultural Research Institute, Pusa (India). One, on the composition of Indian oil seeds, gives the percentage of oil in eleven different varieties, including cotton-seed, linseed, and others less known here. Among other interesting points, it is stated that Indian linseed contains about 40 per cent. of oil, and is consequently richer than seed grown elsewhere. Further investigations of oil seeds are much needed on account of the commercial value of the oil and the agricultural value of the residue left after extraction. In another memoir a description is given of the pot culture house at Pusa; the only novel point is the method of watering. The soils under investigation cracked and caked if water was poured direct on to the top; it was therefore allowed to diffuse out from a porous pot placed in the soil. This method is commonly employed to irrigate trees in parts of India, a porous spherical vessel being sunk in the ground near the root of the tree and kept full of water. The last memoir deals with experiments on the availability of phosphates and potash. The general result is that Dyer's citric acid method for determining phosphates is likely to be useful in examining Indian soils. This, indeed, might reasonably have been expected.

IN the Journal of the Franklin Institute (vol. clxiv., No. 3) Dr. E. Goldsmith describes a meteoric stone which was seen to fall on April 30, 1906, on the New Jersey shore. On analysis the stone yielded 44·36 per cent. of iron, 42·80 per cent. of silica, 4·18 per cent. of alumina, 2·00 per cent. of nickel oxide, 1·90 per cent. of titanic acid, and 1·84 per cent. of carbon.

WE have received from the author, Mr. J. P. Johnson, a pamphlet (Johannesburg, price 1*s.*) containing two short papers on the auriferous conglomerate of the Witwatersrand and on the antimony deposits of the Murchison range. The former, while containing little that is new, gives a concise review of the geology of the goldfield, and the latter contains a description of some interesting antimony ore deposits which appear to be impregnations of a bed of metamorphosed limestone. The antimony occurs as sulphide, altered at the surface into a yellow oxide and the hydroxide.

IN the Journal of the Franklin Institute (vol. clxiv., No. 5) Mr. L. E. Levy gives an appreciative obituary notice of Prof. Angelo Heilprin, the eminent American geographer and geologist, who died on July 17. In 1876 he studied in London at the Royal School of Mines, where he gained the Edward Forbes medal. He was the author of numerous important works, the most interesting being "The Arctic Problem" (1893), which contains the story of the Peary Relief Expedition, which he organised. He lived but fifty-four years, yet within that brief period he accomplished work that would well suffice the compass of the longest lifetime.

AN important report, compiled by Miss A. M. Anderson and Dr. T. M. Legge, has been issued on dangerous and injurious processes in the coating of metal with lead, or a mixture of lead and tin. The Blue-book also contains the results of an experimental investigation into the conditions of operating tinning workshops, which has been written by Mr. G. E. Duckering, one of His Majesty's inspectors of factories, who carried out the investigation. The most important of the suggested regulations set forth in the report is that no lead shall be used in the tinning of metal hollow-ware.

THE president of the International Aëronautical Committee has sent us a summary of the places that took part in the scientific balloon ascents of July 22–27, and the heights reached, so far as at present known. This series of ascents was made in compliance with a suggestion by the recent Aëronautical Conference at Milan that a special effort should be made to obtain information regarding the conditions obtaining in the upper regions of the atmosphere on consecutive days; the results will be eventually published in detail by the Aëronautical Committee. About fifty places took part in the investigation, the extra-European ascents being at or near the Azores, Spitsbergen, Iceland, China Sea, Cairo, and the United States; at Simla unfavourable weather prevented experiments from being made. Twenty-five balloons were sent up in England and Scotland alone, and (so far as yet known) some of the balloons from Manchester reached the highest altitude attained in any of the ascents, viz. 21,500 metres. From Uccle (Brussels) a height of 21,140 metres was reached, and 20,000 metres near the Azores. We learn that nearly all the English balloons drifted to the eastward, and that the temperature records proved conclusively the existence of isothermal conditions above some 12,000 metres, thus confirming the interesting theory put forward by M. Teisserenc de Bort. We understand that similar special ascents extending over a week will probably be made next year, and that, through the efforts of Prof. Schuster, arrangements have been made by the University of Manchester for the kite station on Glossop Moor to be continued.

A CLEAR and concise statement of our present knowledge of the masses of the electrons which play so important a part in electrical phenomena was presented to the Italian Physical Society in the form of a report on the subject by Prof. Levi-Civita at the recent congress at Parma, and is published in full in the October number of *Nuovo Cimento*.

AFTER careful consideration of the various methods of determining the ratio of the electromagnetic to the electrostatic unit of electricity, Messrs. E. B. Rosa and N. E. Dorsey came to the conclusion, several years ago, that the most accurate were Maxwell's bridge method, in which a condenser rapidly charged and discharged replaces one of the resistances of a resistance bridge, and the method in which the charges or the discharges of a condenser rapidly charged and discharged are sent through one coil of a differential galvanometer, while a steady current from the charging battery is sent through the other coil. The October number of the Bulletin of the U.S. Bureau of

Standards contains an account of a determination they have made by the latter method, according to which the ratio for vacuo is $2{\cdot}9971\times10^{10}$, with an uncertainty not exceeding 1 part in 10,000. It is interesting to compare this result with the most probable value of the velocity of light, which, according to M. Weinberg's recent discussion of the measurements available, appears to be *in vacuo* $2{\cdot}9986\times10^{10}$, with an uncertainty not exceeding 1 part in 10,000.

A METHOD of preserving eggs by dipping them in recently boiled water at a temperature of about 110° F., then into boiling water, and afterwards into cold water, was described in an article in NATURE of November 28 (p. 84). In reply to an inquiry, the writer of the article states that the time during which the eggs are immersed in the water at 110° F. in this method should be about ten seconds.

THE Silica Syndicate, Ltd., of 82 Hatton Garden, has issued a new price-list of chemical apparatus made from transparent vitreous silica by their special process. The apparatus includes evaporating basins, beakers, crucibles, flasks, retorts, and test-tubes; the prices are about 75 per cent. lower than those ruling a year ago, and it is anticipated that as the demand grows for fused silica ware further reductions will become possible. We have had an opportunity of examining the various pieces of apparatus made by the syndicate, and have been struck by their wonderfully clear and homogeneous character as compared with that of silica ware made by other processes. They are, moreover, comparatively thin and light, a fact which makes them useful for many purposes for which coarser vessels would be unsuitable; crucibles of fused silica, for instance, can often be used in place of platinum crucibles. In spite of their thinness, the quartz vessels are very strong and tough, and much less liable to break than either ordinary or Jena glass; even if broken they do not splinter, but merely crack, so that they can easily be repaired by fusing the broken parts together. Such repairs are executed by the syndicate at a trifling cost. To those unacquainted with the properties of fused silica, the following points may be of interest. It does not crack when subjected to the most violent and sudden changes of temperature. It is not attacked by acids, with the exception of hydrofluoric acid, and is harder than ordinary glass. Its melting point is approximately that of platinum, whilst it has a coefficient of expansion of 0·00000059 per degree, that is, about one-seventeenth the value for platinum. So far as is at present known, it shows no tendency to devitrification.

A NEW catalogue of lantern-slides has been received from Mr. C. Baker, 244 High Holborn, W.C. The list contains slides suitable for the illustration of lessons or lectures on natural history, and includes many from photomicrographic negatives, as well as photographs taken from nature with an ordinary camera. Sets of slides have also been arranged to illustrate some leading books on microscopic objects.

MESSRS. J. H. DALLMEYER, LTD., inform us that they have recently appointed several new wholesale agents for their lenses and apparatus abroad. They state that British lens manufacturers, like British dry-plate manufacturers, are able to hold their own in foreign markets in face of high tariffs walls and severe competition. In the United States the duty alone amounts to 45 per cent. of the value of the goods, whilst Germany is the home of the keenest competitors of manufacturing opticians.

WE have received from Messrs. Siemens Brothers and Co., Ltd., two well-produced and conveniently arranged catalogues. One deals with thermoelectric pyrometers and temperature indicators and recorders which can be used for all processes in which the accurate determination of temperature between the limits of about −190° C. and 1600° C. is a necessary factor. The other supplies a descriptive account, with abundant illustrations, of a great variety of electro-medical apparatus. Among these attention may be directed to the patent tantalum X-ray tubes, which can be worked with the anti-kathode at red heat, and the induction coils with variable primary windings. Medical men and others should find the clear diagrams of assistance in understanding the characteristics of the apparatus described.

MESSRS. NEWTON AND CO. have sent us a copy of a descriptive lecture on the moon, illustrated by sixty lantern slides, arranged and prepared by Mr. R. Kerr. The notes upon the characteristic points of the various slides, all of which are from Messrs. Newton's collection, will enable anyone to give an interesting reading on our satellite without possessing special knowledge of astronomy. Another pamphlet containing notes on lantern-slides, intended for purposes of popular lectures, deals with general astronomy. This pamphlet is now in its fifth edition, and has been revised and enlarged. It comprises much information of an old-fashioned type, and can scarcely be considered as representing the work and results of modern astronomy; nevertheless, many instructive notes may be extracted from it. A more careful revision of the pamphlet would have prevented such errors as:—"Of the nature of this ring [of Saturn] . . . we are not acquainted"; 1006 instead of 1066 as the date of an appearance of Halley's comet; "Mr." Huggins for Sir William Huggins; and HB instead of Hβ.

OUR ASTRONOMICAL COLUMN.

PHOTOGRAPHS OF JUPITER'S SATELLITES VI. AND VII.—During the opposition of 1905–6 eighty-six photographs of Jupiter's sixth satellite were secured at the Greenwich Observatory, with the 30-inch reflector, between August 23, 1905, and February 15, 1906. Nineteen photographs of the seventh satellite were taken between October 22, 1905, and January 26, 1906. The opposition of 1906–7 was somewhat marred by bad weather, but on twenty-eight nights, spread over a period of 222 days, fifty-six photographs of the sixth satellite were obtained. Only on seven nights, during a period of eighty-seven days, were photographs of the seventh satellite secured, amounting to twelve in all. From these photographs the positions of the satellites were determined, and the results are shown graphically on two diagrams published in the Monthly Notices for November (vol. lxvii., No. 9, p. 561). The orbits of the four major satellites are shown for comparison, and the difference in the size of the orbits of the four inner and two outer satellites is very striking.

TEMPERATURE CONTROL OF SILVERED MIRRORS.—No. 122 of the Lick Observatory Bulletins contains a short paper by Dr. Heber D. Curtis on the temperature control of silvered specula. The writer discusses first the previous records of changes in the focal lengths of large specula, briefly referring to the experience of Profs. Keeler, Perrine, Hale, and Wright in this matter. He then describes a method of artificial cooling which he has tried, and found to be effective, with the 37-inch Mills reflector, which is being used by the D. O. Mills expedition to the southern hemisphere, of which he now has charge.

The large mirror has a clear aperture of 36·56 inches and a focal length of 17·46 feet, and, during his work with this instrument, Prof. Wright found that a progressive lengthening of the focal length, amounting to from fifteen to twenty-five millimetres, took place during the first four or five hours of each night's work, the drop in temperature being some 5° C. or 6° C. In the first place, Dr.

Curtis increased the ventilation apertures about the mirror so that about one-sixth of the area of the back of the mirror was directly exposed. This, apparently, had little effect, so a refrigerating machine was obtained and put into operation. The machine is of the anhydrous ammonia type, and is automatic in action. To cool the mirror the telescope is placed vertical, and a movable box brought into position to enclose the cooling pipes and the mirror end; two electric fans circulate the cooled air freely around the mirror. This operation is commenced about three hours before sunset, and when the thermometer shows a fall of 5° C. or 6° C. the case is removed, about forty minutes before sunset. No moisture forms on the silvered surface, which may be 3° C. or 4° C. below the temperature of the surrounding atmosphere when observations commence. This method has proved very successful, for focal changes are, as a rule, not noticeable, and scarcely ever exceed five millimetres. Dr. Curtis's account of his experiments also appears in the current number of the *Astrophysical Journal*, and is there illustrated by two photographs, the one showing the telescope and spectrograph, the second showing the wooden cooling chamber in position.

ORBITS OF SPECTROSCOPIC BINARIES.—From plates taken with the Mills reflector, the orbits of the spectroscopic binaries α Carinæ, α Pavonis, and κ Velorum have been determined by Dr. Curtis, and their elements are published in No. 122 of the Lick Observatory Bulletins. α Carinæ is a star of magnitude 3·5, and its spectral type is given as B3A in the Harvard classification. According to the elements now published, its period is 6·744 days, the velocity of the system is +23·3 km., and the length of the semi-major axis of the orbit is 1,960,000 km. For α Pavonis (mag. 2·0) the period is 11·753 days, the velocity of the system is +2·0 km., and the length of the semi-major axis is 1,170,000 km.; the orbit is nearly circular. The period of κ Velorum (mag. 2·6) is 116·65 days, the velocity of the system = +21·9 km., and the length of the semi-major axis = 73,200,000 km. All three stars are of the same type of spectrum.

MELLISH'S COMET, 1907*e*.—A new set of elements and an ephemeris extending to December 31·5 are given in Lick Observatory Bulletin No. 124 for Mellish's comet. The position for December 11·5 is α = 0h. 12m., δ = +27° 2′, about 1½° south-east of α Andromedæ, and the brightness is about one-third that at the time of discovery. The following positions are taken from the ephemeris:—December 23·5 (G.M.T.), α = 23h. 56m., δ = +26° 30′; December 31·5, α = 23h. 52m., δ = +26° 30′ (brightness = 0·09).

SOLAR PROMINENCES IN 1906.—Prof. Ricco's annual summary (1906) of the prominence observations made at Catania appears as an abstract from vol. xxxvi. (1907) of the *Memorie della Società degli Spettroscopisti Italiani*. The following are the mean values for the year:—daily frequency = 2·7, complete extension along the limb = 7°·5, height of prominences = 44″·2. As one would expect near the epoch of maximum, these values are nearly equal to those obtained in 1905. It is interesting to note that whereas the sun-spot frequency curve showed maxima in February and November, 1905, the prominence maximum appears to have been relatively retarded, the second greatest maximum recorded at Catania having occurred in March, 1906. Considering the heliographic latitude of the prominences in 10° zones, the principal maximum took place in ±20° to ±30°, as in 1905, but the secondary maximum was elevated ten degrees from ±60° to ±70° to ±70° to ±80°; this is another characteristic of the maximum epoch. Excepting the fourth trimestre, the number of prominences observed in the northern hemisphere of the sun was greater than that observed in the southern hemisphere, the numbers for the year being 284 and 185 respectively.

SEARCH EPHEMERIS FOR COMET 1907*a* (GIACOBINI).—Believing that comet 1907*a* might still be observed in large instruments or found on long-exposure photographs, Prof. Weiss publishes a search-ephemeris for this object in No. 4218 of the *Astronomische Nachrichten* (p. 300, December 2). The comet is now some 10 m. west of α Persei, and its estimated magnitude is 13·8.

PRIZES AWARDED BY THE PARIS ACADEMY OF SCIENCES.

Geometry.—The Francœur prize is awarded to Émile Lemoine, for the whole of his work in mathematics; the Bordin prize to F. Enriques and F. Severi jointly, the Vaillant prize being divided between J. Hadamard, Arthur Korn, Giuseppe Lauricella, and Tommaso Boggio.

Mechanics.—A Montyon prize is awarded to M. Cuënot, for his experimental studies on the flexure of rails; an exceptionally honourable mention to M. Petot, for his work on the theory of automobiles; the Poncelet prize to Colonel Renard, for his mathematical and experimental researches in mechanics, and for his contributions to aëronautics.

Navigation.—The extraordinary prize of six thousand francs is divided between M. Gayde (two-thirds) and J. Estève (one-third), the Plumey prize not being awarded.

Astronomy.—The Pierre Guzman prize is not awarded. T. Lewis receives the Lalande prize, M. Giacobini the Valz prize, and M. Gaillot the G. de Pontécoulant prize.

Geography.—The Gay prize is awarded to Jean Charcot, for his Antarctic explorations, the Tchihatchef prize being divided between Jacques de Morgan and Paul Crépin Bourdier de Beauregard.

Physics.—Lucien Poincaré receives the Hébert prize, for his book on modern physics; P. Langevin the Hugues prize, for his work on the mobility of gaseous ions and the properties of electrons; M. Mathias the Gaston Planté prize, for his work on terrestrial magnetism; Paul Villard the La Caze prize, for the whole of his researches in physics; and Pierre Weiss the Kastner-Boursault prize, for his experimental and theoretical work in magnetism.

Chemistry.—The Jecker prize is divided between MM. Blaise, Marcel Delépine, and Hamonet, and the Cahours prize between MM. Gain, Mailhe, and Guillemard. A Montyon prize (unhealthy trades) is awarded to M. Bonneville, for his discovery and manufacture of a cement in which metallic zinc replaces the red lead commonly used.

Mineralogy and Geology.—M. Martel is awarded the grand prize of the physical sciences, for his studies on underground waters, and J. J. H. Teall the Delesse prize, for his researches in petrography.

Botany.—The Desmazières prize is awarded to General E. G. Paris, for his "Index Bryologicus"; the Montagne prize to F. Guéguen, for his work on the lower fungi; the De Coincy prize to F. Gagnepain, for his work on the classification of the Zingiberaceæ; the Thore prize to M. Bainier, for his work on the lower fungi; and the de la Fons-Mélicocq prize to C. Houard, for his memoir on the parasitic deformations of plants in northern France.

Anatomy and Zoology.—Charles Alluaud receives the Savigny prize, for his work on the invertebrates of Upper Egypt and the adjacent portions of Africa.

Medicine and Surgery.—Montyon prizes are awarded to J. Henniquin, for his work on the treatment of fractures; C. Levaditi, for his researches on *Treponema pallidum*; and Maurice Villaret, for his researches in connection with urinary secretion. Mentions are accorded to A. Thiroux and M. d'Anfreville, for their memoir on malaria in Senegal; MM. Nicolle and Mesnil, for their memoir on the treatment of trypanosomiasis by the benzidine colours; and René Gaultier, for his memoir on the functional exploration of the intestine by analyses of the fæces. Gustave Martin, Georges Pécaud, Pierre Breteau and Paul Woog, A. Desmoulière, and M. Guisez receive citations in connection with this prize. J. Guiart and L. Grimbert receive the Barbier prize for their book on chemical, microscopical, and pathological diagnosis. The Bréant prize (interest only) is divided between MM. Vaillard and Dopter, for their researches on bacillary dysentery, and J. Ferran, for his work on the cholera bacillus. The Godard prize is given to Victor Nicaise, for his memoir on the indications and therapeutic value of total or partial nephrectomy in the treatment of hydatoid cyst of the kidney; the Baron Larrey prize to G. H. Lemoine, for his work on military hygiene; the Bellion prize to A. Chantemesse and F. Borel, for their memoir on the protection of the country from diseases introduced from abroad; the Mège prize to J. Castaigne and F. Rathery, for their work on the lesions of the convoluted tube of the kidney; and the Chaussier prize to A. Lacassagne, for his work on forensic medicine.

Physiology.—The Montyon prize in experimental physiology is divided between Maurice Nicloux and Denis Brocc-Rousseu, the former for his work on the physiological saponification of fatty substances, and the latter for his researches on the alterations of seeds, cereals, and forage. H. Bierry receives the Philipeaux prize, for his studies in cytoxines; Gaston Seillière the Pourat prize, for his memoir on the utilisation of the pentosans by the animal organism; M. Laulanié the La Caze prize, for the whole of his work in the field of general physiology, the Lallemand prize being divided between E. Régis and Étienne Rabaud.

Statistics.—A memoir on statistical methods and their applications, by Lucien March, is accorded the Montyon prize in statistics. J. A. Fleury receives a very honourable mention for his memoir on the statistics of the city of Rouen, and Dr. Conor an honourable mention for his memoir on hysteria in the army.

History of Science.—Prizes are awarded to Gino Loria and F. Brunet, F. de Mély being accorded a very honourable mention.

General Prizes.—Adolf von Baeyer receives the Lavoisier medal; MM. Blaise, Delépine and Hamonet, Berthelot medals; Charles Frémont, the Trémont prize; J. H. Fabre, the Gegner prize; Mmes. Beclard, Cusco and Ruck, the Lannelongue prize; Charles Nordmann and Jean Brunhes, the Wilde prize; MM. Gonnessiat and de Seguier, the Saintour prize; Pierre Duhem, the Petit D'Ormoy prize (mathematical sciences), J. Künckel d'Herculais, the Petit D'Ormoy prize (natural sciences); A. Cotton, the Pierson-Perrin prize; Léon Daum, the prize founded by Mme. la Marquise de Laplace; and Léon Daum, Georges Jean Painvin, Charles Marie Joseph Cambournac, and Louis Eugène Galatoire Malégarie, the prize founded by Félix Rivot.

The Leconte prize is not awarded this year.

THE JOURNAL OF THE ROYAL ANTHROPOLOGICAL INSTITUTE.

THE new volume of the Journal of the Royal Anthropological Institute is dedicated, on the occasion of his seventy-fifth birthday, to Prof. E. B. Tylor, of whom a fine portrait forms the frontispiece. The dedication dwells on his classical contributions to the science of anthropology—his "Researches into the Early History of Mankind" and "Primitive Culture"—works which enjoy the almost unique distinction of never having been superseded by the studies of later writers; on his career as professor of anthropology at Oxford, where, as the result of his teaching and personal initiative, a diploma course in the science has been established; and on the generous encouragement bestowed by him on the students of a younger generation. This compliment to a scholar who stands in the foremost rank is graceful and well deserved.

The president, Prof. Gowland, in his annual address continues his studies of burial mounds in Japan which were begun by his well-known paper contributed to vol. lv. of "Archæologia." Here he deals with the remarkable structures which cover the remains of the early emperors. Some of these are of enormous extent; one when first erected must have been not less than 1000 feet long and 600 feet broad, while in spite of denudation its summit now rises to the height of 84 feet. It seems certain that several of these mounds are as early as the first or second century of our era, and their construction continued for some five or six centuries after that date. It ceased with the establishment of Buddhism, when the custom of inhumation was replaced by cremation. The examples of metal work found in these monuments—iron armour, swords, horse-trappings of iron covered with thin gilt copper foil—illustrate the national skill in metallurgy in those early times. Terra-cotta figurines mark the transition from the custom of burying attendants with the dead sovereign, a reform which the "Nihongi" Chronicle attributes to the Emperor Suinin, who reigned at the beginning of the Christian era. At many of these monuments the Japanese, ardent worshippers of ancestors, still perform annual rites, and the mounds are protected from desecration.

The most important contribution to physical anthropology is the account, by Prof. Cunningham, of perhaps the most remarkable head of one of the Australian aborigines which has ever reached this country. It is that of a man who died in 1905 in a lunatic asylum, and it was most skilfully prepared by Dr. Ramsay Smith by means of injections of formalin. This head is distinguished by the great prominence of the supraorbital regions of the forehead, which is receding and sloping, by the width of the zygomatic region, and by the retreating chin and almost complete absence of a mental prominence. The type does not, as might have been expected from the reported cause of death—organic disease of the brain—seem to be abnormal.

Mr. H. Balfour contributes a good museum article on what he terms the friction drum, a curious musical instrument consisting of a drum with a single membrane, to the centre of which is attached a string, horsehair, or short stick, which on being rubbed with the moistened or rosined forefinger and thumb creates rapid vibrations communicated to the membrane. The instrument appears in Europe, North and South America, Africa, Japan, and India. It seems impossible to discover the original centre of dispersion; in fact, there appears no reason why it should not have been independently discovered in Africa or India, where it appears earlier than in other regions.

Archæology is represented by an account, by Canon Greenwell, of a remarkable find by Major Sykes of bronze weapons, implements, and vessels at Khinámán, in south-east Persia. "It is impossible," he writes, "to over-estimate the interest and value of this discovery. This arises not only from the nature of the articles themselves, but from the light it throws upon the early metallic stage of cultivation in that country, about which our information is very scanty." The axes are the most important and interesting. They could never have been used in war or for any other useful purpose, but were representative weapons made to be buried with the dead man in place of those which he used in life, or more probably were employed in processional rites, to be carried as a mark of dignity before a personage of rank. In the ornamentation, as in the case of two similar weapons previously discovered within the same Asian area, the lion appears as a prominent feature of the design.

EXPERIMENTS ON WIND-PRESSURE.

FURTHER experiments on wind-pressure were described by Dr. T. E. Stanton before the Institution of Civil Engineers on December 3. The first part of this research, of which the results were communicated to the same institution in December, 1903, was the investigation of the resultant pressure and distribution of pressure on flat plates normal to and inclined to the direction of a uniform current of air. The value of the constant K in the pressure velocity relation $P = KV^2$ was found to be 0·0027, a result somewhat smaller than those found by Dines, Frowde, and Langley. On the completion of this part of the work it was decided to make observations on flat surfaces of areas ranging up to 100 square feet when exposed to the wind, since general experience tended to show that in actual winds the velocity of which was not uniform over time or space, the mean pressure per square foot on a large surface was considerably less than that on a small one. For the purpose of the work a steel windmill tower was erected in the grounds of the National Physical Laboratory at Teddington. The experimental boards and models of structures were attached to a light framework carried by the cap of the tower, the height of the centre of the boards from the ground being 50 feet.

The results of observations on three pressure-boards, one 5 feet by 5 feet, one 5 feet by 10 feet, and one 10 feet by 10 feet, gave practically identical values of the constant in the pressure-velocity relation. In units of pounds per square foot and miles per hour, the mean value of this constant for the three boards was 0·0032. Further observations on the intensity of the pressure at the front and back of the boards appeared to show that the cause of the higher value of the constant compared with that obtained in the case of the small plates of the earlier experiments was the relatively greater intensity of the negative pressure at the

back of the boards compared to that at the back of the small plates. Experiments were also made on a model of a braced girder 29 feet long by 3 feet 7 inches deep, and on a roof model the sides of which were 8 feet by 7 feet. The ratio of the resistance per unit of area of the model girder to that of a square board in the wind was found to be precisely the same as the ratio of the resistance per unit of area of a small model of the girder made to a linear scale of 1 in 42 to a square plate in the experimental channel and uniform current used in the previous experiments. The resultant pressures on the roof were obtained, for both windward and leeward sides, at angles of 30, 45, and 60 degrees inclination to the horizontal, and indicated the considerable suction effects on the leeward side of a roof when the pressure inside the building is augmented from the windward side by open doors or windows. The results lead to the conclusion that the resistance of a complicated structure in the wind can be accurately predicted from a determination of the resistance of a small model of the structure in an experimental channel.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Sir James Dewar has nominated Mr. H. O. Jones, of Clare College, as deputy for the Jacksonian professor of mental philosophy during the Lent term 1908. This nomination has received the consent of the Vice-Chancellor and the Sex Viri.

The sites syndicate recommends that a site on the Downing ground 40 feet wide, situate to the south of the botanical laboratory and parallel to it, be assigned for a building in connection with the Department of Agriculture.

Mr. W. Bateson, F.R.S., has been appointed reader in zoology.

Dr. Baker has been appointed chairman of the examiners for the mathematical tripos, part ii., 1908.

Prof. Nuttall has appointed F. P. Jepson, Pembroke College, to the studentship in medical entomology in place of A. H. Lees, who has resigned the studentship.

The board of agricultural studies is of opinion that the subjects which come under its cognisance are now too wide and too complex to be entrusted to a single professor. The appointment of Mr. T. B. Wood, of Gonville and Caius College, to the Drapers' professorship of agriculture has adequately provided for the teaching of agricultural chemistry, but the board is of opinion that it is urgently necessary that a professor in agricultural botany should be appointed without delay. This proposal has been brought within the range of possibility by the munificence of the Drapers' Company, which has offered a further grant of 200*l.* a year towards the stipend of a professor of agricultural botany. The general board has now put forward a report in which it recommends the establishment of such a professorship. This report will be discussed at an early date next term. The teaching of practical agriculture is entrusted to Mr. K. J. J. Mackenzie, late of the South-Eastern Agricultural College, Wye.

LONDON.—The committee of University College will shortly proceed to appoint a Derby scholar in zoology. The value of the scholarship is 60*l.* per annum, the scholarship being tenable for two years. An examination for the award of the scholarship will be held at University College on December 18. Full particulars can be obtained on application to the secretary, University College, Gower Street, W.C.

MANCHESTER.—The University will eventually benefit under the will of the late Prof. Thomas Barker, who from 1865–1885 was professor of mathematics at Owens College. The legacy, which it is estimated will amount to about 36,000*l.*, is to found a professorship of cryptogamic botany, and to establish scholarships for the assistance of students, especially those of slender means, in the departments of botany and mathematics.

OXFORD.—A portrait of Dr. A. J. Evans, F.R.S., the keeper of the Ashmolean Museum, painted by Sir William B. Richmond, was presented to the University on Saturday, December 7, in the presence of a large and distinguished company. The presentation was made on behalf of the subscribers by the principal of Brasenose, and the Vice-Chancellor accepted the portrait for the University.

MR. HALDANE, M.P., will, on Saturday, December 14, unveil the statue of the King, to be placed over the central entrance of the new buildings of University College School, Hampstead.

THE Melbourne correspondent of the *Daily Chronicle* reports that Mr. T. W. Stanford, brother of the founder of Stanford University, San Francisco, intends to leave by his will 50,000*l.* to found eight annual scholarships at Stanford University for young Australians. All candidates must pledge themselves to return to Australia and use the knowledge gained at the University in developing their native country.

SPEAKING at the Derby Municipal Technical College on December 5, Mr. Victor Cavendish, M.P., said he wished they could send forth from that gathering a message to those engaged in educational controversies that would result in placing education out of the range of controversy. He believed that money spent in extending the operations of institutions of that character was money well spent, and money from which, at no distant date, a most adequate and healthy return would be seen. Another subject was as to what extent we could improve our industrial and commercial position in the world. Upon such a question as foreign competition he felt that, however much they might differ on certain points, at any rate on the question of education they could unite in doing something for the future of the country by seeing that the youth of the nation had the very best technical education that could be given. Any money spent on such objects ought to receive the greatest support and consideration from all parties.

DURING the course of last week the Society of Merchant Venturers concluded the final arrangements for the reconstruction of the main building of their technical college in Bristol, and the work will now proceed with all possible speed. The society has devoted a large sum for additions to and improvements in the equipment of the departments of engineering, chemistry, and applied physics. In order to benefit by the most recent experience gained elsewhere, the principal and other members of the staff have visited some of the best-equipped technical and university colleges in Germany and in the United Kingdom.

To encourage the teaching of facts regarding weather and climate in schools, the council of the Royal Meteorological Society invites elementary teachers and others to send in essays in the form of an original nature-study lesson on weather or climate (not exceeding 1500 words in length), together with a brief synopsis of five other lessons to cover the whole subject of climate and weather. If essays of sufficient merit are received, three prizes will be awarded of 5*l.*, 3*l.*, and 2*l.* respectively. The essays are to be sent in before January 31, 1908, and addressed to Mr. William Marriott, assistant secretary, Royal Meteorological Society, 70 Victoria Street, London, S.W., from whom further information can be obtained.

THE fifth annual prize distribution of the Sir John Cass Technical Institute was held on Tuesday, December 3, when the prizes were distributed and an address given by Dr. R. T. Glazebrook, F.R.S. The chair was taken by Sir Owen Roberts, chairman of Sir John Cass's foundation. Dr. Glazebrook, in reviewing the work of the institute, dwelt upon the importance of the average amount of work done by each student rather than the number of students in attendance as a criterion of the value of the instruction given, and also pointed out the desirability of encouraging students in every possible way to follow grouped courses of study of a continuous character if real advantage is to follow from their labours. Further, it is necessary always to remember that learning and the assimilation of knowledge, admirable though they are in themselves, are not all there is to strive for, but that research or discovery of new laws or of more complete order rests on a higher plane. Dr. Glazebrook then contrasted the lot of the students of the institute with that of men in similar positions a hundred years ago, pointing

out in a review of the early life and struggles of Faraday how difficult it was then to obtain the least help in study compared with the accessible advantages that are so widely distributed over the country to-day. The students accordingly should fully appreciate their opportunities and use them to the best advantage, not merely as a means for the acquisition of knowledge, valuable and important as this is, and, above all, not as something which may lead to material advancement, but as a means of training the powers possessed by each so as to develop them for action beneficial both to themselves and to their fellows. A hundred years ago men like Faraday, Watt, and Arkwright worked at a time when the world was comparatively young in knowledge; they had a clean slate to write upon. But while the difficulties of their pioneer work were enormous, and they started from a position of comparative ignorance of scientific principles, and simple in character as their respective discoveries were, the applications which have followed from them have led to a high general level of scientific knowledge to-day which has become the starting point for modern conditions of study. Accordingly, if the country is to profit by the modern progress of science, the mass of the people must be educated up to this higher plane of knowledge, for it is by intelligent action and patient effort and devotion on the part of the rank and file of workers that general advances come. The work of the Sir John Cass Institute and of similar schools throughout London is exerting a most important influence in securing this higher level of knowledge for those engaged in work associated with the industries of the country.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 20.—"On the presence of Sulphur in some of the Hotter Stars." By Sir Norman **Lockyer**, K.C.B., F.R.S.

In this paper the author gives an account of the discovery of the strongest spark lines of sulphur in the spectrum of Rigel. These lines had not previously been traced in any celestial spectrum. It is also shown that two strong sulphur lines (4253·8, 4285·1), which are of abnormal behaviour in the spark and vacuum-tube spectra, are lacking in the Rigel spectrum. They have been found to occur, however, in the Crucian (Bellatrix) and Alnitamian (ε Orionis) types of stellar spectra, which represent higher stages of temperature than the Rigelian type. In the two types mentioned the Rigel-sulphur lines are either lacking or very weak.

Concisely, the following represents the relative and inverse behaviour of the two sets of lines in stellar spectra :—

Group	Type Star	Sharp Lines (4253·8, 4285·1)	Diffuse lines
Alnitamian	ε Orionis	Well shown	Absent
Crucian ...	γ Orionis	Present, but weaker than in ε Orionis	Strongest lines present, but weaker than in β Orionis
Rigelian ...	β Orionis	Absent	Well shown

November 7.—"Note on the Association of Helium and Thorium in Minerals." By the Hon. R. J. **Strutt**, F.R.S.

The question has been often raised of whether or not helium is a product of thorium radio-activity. The author's view throughout has been that it is (Roy. Soc. Proc., vol. lxxiii., p. 191, 1904, also March 2, 1905). Mr. Boltwood has recently argued that the helium in radio-active minerals may always be attributed to the action of the uranium-radium series of transformations (*Am. Journ. Sci.*, vol. xxiii., February, p. 77). In the present note the author directs attention to a case where that view is clearly untenable.

Prof. Julius Thomsen, of Copenhagen, described, in 1898 (*Zeit. physikalische Chemie*, vol. xxv., part iii.), a helium mineral from Ivitgut, Greenland, similar in some respects to fluor-spar, but containing rare earths. Recently he has determined the quantity of helium liberated on heating as 27 c.c. per kilogram (*Bull. de l'Acad. Royale des Sciences*, Copenhagen, 1904, 53–57).

Prof. Thomsen kindly sent a supply of this mineral to the author, who has carefully tested it for radium, and finds that it contains no more than the traces which are ubiquitous in rocks and minerals. The quantity found was, in fact, about the same as in average rocks, and is insufficient to account for one-hundredth part of the helium present.

On the other hand, a solution of the mineral gave abundant thorium emanation. The author is inclined to think that there is some unknown complication about the thorium-emanating power of solutions which makes it unsafe, in certain cases at least, to infer from it the quantity of thorium present; but enough thorium emanation was given off by the solution to show that thorium was a substantial constituent of the mineral. He regards it as entirely certain that the helium in this mineral has not been generated *in situ* by uranium or radium, and has no hesitation in connecting it with the presence of thorium.

"On the Measurement of Temperatures in the Cylinder of a Gas Engine." by Prof. **Callendar**, F.R.S., and Prof. W. E. **Dalby**.

It is important in the experimental investigation of the internal-combustion engine to be able to measure the temperature at a suitable point in the cycle.

The difficulty of making this direct measurement arises from the fact that during the cycle of operations in the working cylinder the temperature rises above the melting point of platinum or of any thermoelectric couple which can be used for the observation. Also, since the temperature is changing so rapidly, whatever apparatus is used to measure the temperature must have small mass; moreover, its insertion in the cylinder of the engine must not alter the volume or disposition of the clearance space, otherwise there will be danger of pre-ignition.

The authors use a platinum wire 0·01 inch diameter and 1 inch long in conjunction with a compensator of the same diameter and $\frac{3}{8}$-inch long, and the temperature is measured by measuring the change of resistance corresponding to the middle $\frac{3}{8}$-inch of the 1-inch wire. To avoid the difficulty experienced by previous experimenters in this direction, the platinum thermometer is screened from the high temperature by placing it in a valve which allows the thermometer to be exposed during any part of the cycle for a suitable interval of time, and to be perfectly protected from the high temperature when the valve is closed. This valve is contrived in the spindle of the admission valve, and the gear for operating it is clearly shown in the figures in the paper. The advantage of this position is that as the whole charge of air and gas streams into the cylinder around the spindle of the admission valve the temperature of the valve and the thermometer inserted in it are brought continually into approximation during the whole of the suction stroke, so that at the instant when the contact is made for the measurement of the temperature, namely, just after the close of the admission valve, the thermometer and the temperature it is required to measure do not differ widely in temperature; moreover, at this point in the cycle the rate of change of the temperature is nearly a minimum. In measurements of this kind it is essential that there should be no missed explosions, and the authors therefore arranged the engine so that this condition should be exactly fulfilled during the whole of the experiments.

Experiments were made to determine the lag of the platinum thermometer behind the temperature of the fluid it purported to measure, and to determine the effect of the valve carrying the thermometer on the temperature indicated by the thermometer. The conclusion arrived at by the authors is that the method may be used to give the temperature of the charge at the beginning of compression within 1° C.

A few experiments were quoted in the paper, from which it appears that at full load the temperature rises to a point between 2000° C. and 2500° C. when the mixture is rich.

Geological Society, November 6.—Sir Archibald Geikie, K.C.B., Sec.R.S., president, in the chair.—A collection of fossil plants from South Africa; Prof. A. C. **Seward**. The material on which this paper is based was, for the

most part, collected by members of the Geological Survey in Cape Colony from the Molteno and Burghersdorp beds. The Molteno beds are placed at the base of the Upper Karroo, or Stormberg series; the Burghersdorp beds constitute the uppermost strata of the Middle Karroo, or Beaufort series. Mr. A. L. Du Toit, who has contributed accounts of the stratigraphy of the plant-bearing and associated rocks, describes the occurrence of a transitional zone between the Molteno and the Burghersdorp beds. A description is also given of *Schizoneura africana*, Feistmantel, a species originally figured by Hooker in an appendix to Bain's paper, published in 1845. The additional plants recorded from the Molteno beds afford further evidence in favour of assigning this member of the Stormberg series to the Rhætic period. While possessing certain Rhætic species, the Burghersdorp flora as a whole indicates a somewhat lower horizon.—Permo-Carboniferous plants from Vereeniging (South Africa): Prof. A. C. **Seward** and T. N. **Leslie.** The majority of the specimens described in this paper were obtained by Mr. Leslie from a sandstone quarry 1½ miles from Vereeniging, on the banks of the Klip River; the sandstones are associated with shales, coal-seams, and glacial conglomerates. In the opinion of the authors, the plant beds should be included in the Ecca series (Lower Karroo). While recognising certain well-marked differences between the Glossopteris floras and the Upper Carboniferous and Permian floras of the northern hemisphere, they are inclined to think that there are more types common to the two botanical provinces than is generally supposed.—The structure and relations of the Laurentian system of Canada: Prof. F. D. **Adams.** This paper contains an outline of the results of the examination by Dr. Barlow and the author of an area of 4200 square miles, comprised within the Haliburton and Bancroft sheets of the Ontario and Quebec series of maps. The main conclusions reached by the author may be thus summarised:—(1) The Laurentian system of Sir William Logan consists of a very ancient series of sedimentary strata, largely limestones, invaded by great volumes of granite in the form of bathyliths. (2) This sedimentary series is one of the most important developments of the pre-Cambrian rocks in North America, it presents the greatest body of pre-Cambrian limestones on the continent, and it is best designated as the Grenville series. (3) The invading masses of granite are of enormous extent; they possess a more or less distinct gneissose structure, due to the movements of the magma, which developed a fluidal and, in the later stages of intrusion, a protoclastic structure in the rock. (4) The granite gneiss of the bathyliths not only arched up the invaded strata into a series of domes, but "stoped" out portions of the sides and lower surface of the arches, the fragments torn off from walls and roof by the invading granite being found scattered throughout the mass of the invading rock; this "stoping," however, probably developed only a small part of the space which the granite now occupies. (5) The invading granite not only exerted a mechanical action upon the invaded strata, but also gave rise to a variety of metamorphic products, among others amphibolite, produced by its action in the limestone, which accounts for the fact that while the invaded strata are chiefly limestone, the fragments of the latter, where found in the granite, consist of amphibolite. (6) The invading bathyliths and allied intrusions of granite occupy the greater part of the great northern protaxis of Canada, which has an area of approximately 2,000,000 square miles. It has, therefore, been considered advisable to restrict the name Laurentian to this great development of the "fundamental gneiss," which, although intrusive into the Grenville series, nevertheless underlies and supports it. (7) The relation of the Grenville series, which forms the base of the sedimentary portion of the geological column in eastern Canada, to the Huronian and Keewatin series, which are the oldest stratified rocks in the western part of the protaxis, has yet to be determined, the two not having so far been found in contact; nowhere, moreover, either east or west, has the original basement on which the first sediments were laid down been discovered; these are everywhere torn to pieces by the granite intrusions of the Laurentian.

Linnean Society, November 7.—Prof. W. A. Herdman, F.R.S., president, in the chair.—The origin of the ditrimerous floral whorls of certain dicotyledons: Rev. G. **Henslow.** The object of the present paper was to show that the ternary arrangements of monocotyledons are not derived from the same source as those of certain dicotyledons, every verticil of three members in the former being a *single cycle* of the ⅓ divergence, while in the latter the usually *double* verticils are derived from the ⅔. This divergence is unknown in the foliage of monocotyledons, ½ or ⅓ being the natural sequence from a single cotyledon, whereas ⅔ necessarily follows on the two cotyledons or from opposite and decussate leaves.—Eight very remarkable new species of Acari from New Zealand, from the collection of the late E. Bostock, six Oribatidæ and two Gamasidæ: A. D. **Michael.** The species are to be called *Oribata bostocki*, distinguished by the pteromorphæ being attached to the anterior margin of the abdomen instead of its lateral margin; *Notaspis spinulosa*, carrying spinulated hairs of extraordinary size; *Notaspis caudata*, with a posterior projection not hitherto found in the genus; *Hermannia phyllophora*, with great leaf-like processes on the legs; *Nothrus cophinarius* and *N. unguifera*, extreme exaggerations of that section of the genus represented in Europe by *N. spiniger*; *Trachynotus sclerophyllus*, in which the great leaf-like transparent hairs found on many Acari have become opaque, hard, brown chitin; and *T. fimbriatus*, with singular flattened borders to the first pair of legs, much broader than the legs themselves.—*Ænigmatistes africanus*, a new genus and species of Diptera: R. **Shelford.**

November 21.—Prof. W. A. Herdman, F.R.S., president, in the chair.—*Exhibits.*—C. W. **Anderson**: A specimen of a light-giving larva brought by him from near the boundary of British Guiana with Brazil, exhibiting when living a ruby light in its head, and a double row of phosphorescent spots along the body, two on each segment. These lights were not intermittent, but glowed continuously. This presumed coleopterous larva was called "Macadoub" by the natives, and is not uncommon in the region named.—Prof. **Dendy**: Two living specimens of Peripatus from the Cape, which he had succeeded in keeping in excellent health by supplying them with woodlice as food.—*Papers.*—Abnormal structures in leaves and their value in morphology: W. C. **Worsdell.** *Dichotomy*, as in crested fern leaves, is a reversion to a primitive type of frond-branching. In cotyledons it represents a tendency, which in this case is progressive and not reversionary, to increase the number of cotyledons. *Phyllotaxis:* Dichotomy of foliage leaves is, in the author's opinion, a reversion from the opposite, or distichous, arrangement to form a greater number of leaves on the axis; it is probably a step towards the original spiral arrangement. *Spiral torsion* is due to a reversion from the opposite or whorled arrangement of leaves to the spiral arrangement. *Terminal leaves:* This is regarded as a reversion to the primeval structure in which, according to the phyton theory, each leaf terminates each segment of the stem above which it is situated, every leaf being thus essentially a terminal organ and not lateral. *Enations and ascidia:* The foliage leaves of *Saxifraga ligulata* show formation of basal pockets on upper side of leaf and transformation of entire leaf into a cup-shaped structure; also infolding of basal lobes, which infolding may extend right up midrib to apex. This infolding may also occur for a short distance from the apex downwards. A similar structure may be represented merely by slight enations on either side of the midrib. Lobing may occur at the apex; small lobes may become abstricted off as stalked structures, which may either be terminal or carried over on to the dorsal (lower surface) of the leaf in form of small, stalked ascidia. *Virescence:* The various foliar organs of the flower may revert to the condition of foliage leaves, *e.g.* phyllody of the calyx in the rose, phyllody of carpels in Trifolium. *Monocotyledonous seedlings in dicotyledons:* Normal cases of this occur, as in *Ranunculus Ficaria*, L.; here the conditions are regarded as primitive. Abnormal cases occur in which the two cotyledons arise congenitally fused into a single one, as in Umbelliferæ. This is a reversion to the primitive condition.—Two new species of

Amphipoda: Rev. T. R. R. **Stebbing.** The species were described as *Lepechinella chrysotheras*, representing a new genus in the family Paramphithoidæ, and *Rhachotropis palporum* in the family Eusiridæ.—The preservation of specimens in Australian museums: J. G. Otto **Tepper.** The author pointed out that the life-cycle of *Anthrenus musaeorum* involved visits to flowers, and that the presence of their destructive larvæ in museum collections was due to the eggs being laid in proximity to the cases, and the active and minute larvæ subsequently finding their way into the containing cases by cracks or similar apertures.

Mineralogical Society, November 12.—Prof. H. A. Miers, F.R.S., president, in the chair.—Hopeite and other zinc phosphates and associated minerals from Broken Hill mines, north-western Rhodesia: L. J. **Spencer** (see NATURE, vol. lxxvi., p. 215). Hopeite is abundant as brilliant water-clear crystals or as larger white crystals reaching 2 cm. across. The crystals are orthorhombic, with $a:b:c=0{\cdot}5786:1:0{\cdot}4758$. Cleavage flakes parallel to the brachypinacoid show a zonal intergrowth of two substances, distinguished as α-hopeite and β-hopeite; these differ considerably in their optical characters, and slightly in sp. gr. (3·0–3·1) and the temperature at which water is expelled. Associated with the hopeite crystals on the bone-breccia are brown botryoidal masses of vanadinite. The other zinc phosphates occur, not in the bone cave, but with cellular limonite and crystals of descloizite and pyromorphite in connection with the zinc-lead ores (which consist of an intimate mixture of cerussite and hemimorphite with interspersed limonite). The new species, *tarbuttite*, occurs in great abundance, and is a basic zinc phosphate, $Zn_3P_2O_8.Zn(OH)_2$, with sp. gr. 4·15; the crystals are anorthic with $ac=55°\ 50'$, $ab=84°\ 34'$, $bc=76°\ 31'$, c being a direction of perfect cleavage. Pseudomorphs of tarbuttite after calamine ($ZnCO_3$), descloizite, and hemimorphite are not uncommon. Another new species, named *parahopeite*, has the same chemical composition as hopeite, $Zn_3P_2O_8.4H_2O$, but is anorthic, with sp. gr. 3·31. The platy crystals somewhat resemble hemimorphite in appearance; they have one perfect cleavage, approximately perpendicular to the plates, through which emerges one of the optic axes.—The question of a relation between isomorphous miscibility and parallel growths: T. V. **Barker.** A study of the growths on each other of immiscible or slightly miscible pairs of substances has shown that, although miscibility and parallel growths are favoured by the same factor—similarity of molecular volume—yet the two properties do not always go hand in hand, for many immiscible or only slightly miscible substances form parallel growths quite readily. Mixed crystals, therefore, should not be regarded as built up of alternating parallel layers.—Notes on zeolites from Cornwall and Devon: A. **Russell.** The occurrence of zeolites in various localities was described, *e.g.* that of heulandite near Okehampton, stilbite at Botallack and St. Ives, chabazite at Luxullian, apophyllite and analcite at Lostwithiel.—Note on the crystallisation of potassium bichromate: Prof. H. A. **Miers.** Two stages of growth of potassium bichromate crystallising from a drop of solution were described and illustrated by lantern-slides.—Various minerals from the Lengenbach quarry and the Ofenhorn, Binnenthal: R. H. **Solly.** Crystals of binnite, one of them a unique twin, and examples of the regular intergrowth of sartorite and baumhauerite, were described, and the occurrence of brookite and molybdenite on the Ofenhorn was for the first time recorded.—Mr. L. J. Spencer exhibited on behalf of Dr. H. J. **Johnston-Lavis** some minute crystals of hæmatite found in association with chlormanganokalite in blocks ejected from Vesuvius during the eruption of 1906. The crystals have the form of acute scalenohedra $B\{31\bar{3}\}=\{24\bar{6}1\}$.—A fine series of zeolites from the neighbourhood of Belfast was shown by Mr. F. N. A. **Fleischmann**; a new meteoric stone from Simondium, Cape Colony, by Dr. G. T. **Prior**; specimens of reconstructed ruby and blue spinel, and of the new gem, benitoite, by Dr. G. F. Herbert **Smith**; and a specimen of artificial hæmatite by Mr. C. J. **Woodward.**

Royal Anthropological Institute, November 19.—Mr. F. W. Rudler, past-president, in the chair.—Excavation of a barrow at Chapel Carn Brea, Cornwall: H. C. **King** and B. C. **Polkinghorne.** The barrow was opened in August, and was found to contain a cist built of flat-faced irregular stones with capstone. A very fine large urn, ornamented with the characteristic pattern, was found, containing partly calcined bones. Flint flakes were found, but these were of earlier date than the urn, and were probably placed in the kist from traditional motives. The barrow may have been surrounded by standing stones, as one is still in position. Above the cist at the north end another somewhat smaller urn was discovered.—Holed stone at Kerrow, St. Just in Penwith, Cornwall: H. C. **King** and B. C. **Polkinghorne.** This consists of a circular slab of granite with a cylindrical hole in the centre, very well worked, apparently by iron tools. Wood charcoal was discovered underneath. Its purpose is unknown.—Small cist and urn at Tregiffian Vean, St. Just in Penwith: H. C. **King** and B. C. **Polkinghorne.** The cist is a small one with a broken capstone. The urn, which is also small, dates about 400 B.C. No bones or ashes were found.—The wild tribes of the Ulu Plus, Malay Peninsula: F. W. **Knocker.** The tribes dealt with occupy the upper waters of the Plus River in Perak. They are apparently of mixed Semang-Sakai characteristics. The paper dealt with their habits of life, manners, and customs.

Chemical Society, November 21.—Sir William Ramsay, K.C.B., F.R.S., president, in the chair.—Emulsions: S. **Pickering.** Paraffin oil, when churned with solutions of soap, glue, starch, albumen, &c., forms an emulsion, which rises, like cream, to the surface of the excess of water, and contains from 65 per cent. to 82 per cent. by volume of oil. The percentage of oil can be increased to 99 per cent., the emulsion then being practically solid. Emulsification seems to depend on the separation from the liquid of very minute solid particles, which are attracted by and surround the oil globules, thus preventing them from coalescing. Any precipitated substance which is sufficiently finely divided will act as an emulsifying agent, but, after becoming agglomerated by drying, it loses this property.—Aromatic azoimides, part iii., the naphthylazoimides and their nitro-derivatives: M. O. **Forster** and H. E. **Fierz.**—The triazo-group, part i., triazoacetic acid and triazoacetone (acetonylazoimide): M. O. **Forster** and H. E. **Fierz.** The interesting properties displayed by the triazo-group $\begin{matrix}-CH.N_3\\|\\-CO\end{matrix}$ when occurring in the complex have led the authors to prepare the simplest typical compounds of this class, triazoacetic acid and triazoacetone.—Studies of dynamic isomerism, part vii., note on the action of carbonyl chloride as an agent for arresting isomeric change: T. M. **Lowry** and E. H. **Magson.** Labile solutions of nitrocamphor, in which isomeric change has been suspended, have been prepared (1) accidentally by dissolving nitrocamphor in choloroform, and (2) deliberately by adding acid to the solvent chloroform. In the latter case the solutions acquired a powerful odour of carbonyl chloride, and there can be no doubt that this is the efficient agent in arresting isomeric change in chloroform solutions. By means of this new agent it is possible to arrest the isomeric change of nitrocamphor in other solvents.—The electrometric determination of the hydrolysis of salts: H. G. **Denham.**—The interaction of metallic sulphates and caustic alkalis: S. **Pickering.** Alkalis, added to solutions of various metallic sulphates, precipitate a definite basic sulphate, except in the case of manganese and magnesium, where the hydroxide is precipitated. The further addition of alkali converts the basic sulphate either into another, sometimes consecutively into two other, more basic products (for example, copper and nickel), or into the hydroxide.—The chemistry of Bordeaux mixture: S. **Pickering.** The substances formed on the addition of lime to copper sulphate, as in the preparation of Bordeaux mixture, are dependent on the proportions of lime used, and may be either

(1) $4CuO,SO_3,0{\cdot}06CaSO_4$;
(2) $5CuO,SO_3,0{\cdot}25CaSO_4$;
(3) $10CuO,SO_3,1{\cdot}3CaSO_4$;
(4) $10CuO,SO_3,4CaO,SO_3$;
(Possibly 5) $10CuO,SO_3,10CaO,SO_3$; or
(6) $CuO,3CaO$;

that present in most cases probably being (4). The fungicidal action of Bordeaux mixture seems to depend on the liberation of copper sulphate by the action of carbon dioxide on the basic sulphate.—The alcohols of the hydro-aromatic and terpene series, part i., resolution of the alcohols into their optically active components and the preparation of the borneols: R. H. **Pickard** and W. O. **Littlebury.** The alcohol is combined with phthalic or succinic anhydride, and the resulting acid ester resolved by *l*-menthylamine or other strong optically active base.—The electrolytic preparation of disulphides, part i., dibenzyl-disulphide and diethyldisulphide: T. S. **Price** and D. F. **Twiss.**—The influence of solvents on the rotation of optically active compounds, part xi., ethyl tartrate in aliphatic halogen derivatives: T. S. **Patterson** and D. **Thomson.**—The interaction in solution of ferrous sulphate and copper sulphate: H. R. **Ellis** and W. H. **Collier.** No action takes place between ferrous sulphate and copper sulphate solutions in the cold, but on boiling, the copper sulphate slowly oxidises the ferrous hydroxide produced by hydrolysis. An account is also given of the action of ammonia solution on mixtures of ferrous and cupric sulphates in water.—Mercurous hyponitrite: E. **Divers.**—Decomposition of mercurous and silver hyponitrites by heat: E. **Divers.**—Cupric nitrite: E. **Divers.**

DIARY OF SOCIETIES.

THURSDAY, DECEMBER 12.

ROYAL SOCIETY, at 4.30.—Further Consideration of the Stability of the Pear-Shaped Figure of Equilibrium of a Liquid Earth: Sir G. H. Darwin, K.C.B., F.R.S.—Preliminary Note on the Operational Invariants of a Binary Quantic: Major P. MacMahon, F.R.S.—The Action of Ozone on Water-colour Pigments: Sir W. Abney, K.C.B., F.R.S.—On Kinetic Stability: Prof. H. Lamb, F.R.S.—The Absorption Spectra of the Vapours of Benzene and its Homologues at Different Temperatures and Pressures, and likewise of Solutions of Benzene: Prof. W. N. Hartley, F.R.S.—The Spectrum of Magnesium and of the so-called Magnesium Hydride as obtained by Spark Discharges under Reduced Pressure: E. E. Brooks.—Magnetic Declination at Kew Observatory, 1890 to 1900: Dr. C. Chree, F.R.S.—The Effects of Temperature and Pressure on the Thermal Conductivities of Solids. Part ii., The Effect of Low Temperatures on the Thermal Conductivities of Pure Metals and Alloys: Prof. C. H. Lees, F.R.S.—On Exterior Ballistics, No. 2: Prof. G. Forbes, F.R.S.

SOCIETY OF ARTS, at 4.30.—Big Game in India: R. Gilbert.

MATHEMATICAL SOCIETY, at 5.30.—A Formula in Finite Differences and its Application to Mechanical Quadrature: Mr. S. T. Shovelton.—Weierstrass' Excess-function in the Calculus of Variations: Prof. A. E. H. Love.

FRIDAY, DECEMBER 13.

MALACOLOGICAL SOCIETY, at 8.—Additions to the Marine Molluscan Fauna of New Zealand, with Descriptions of New Species: H. Suter.—Alteration to the name of *Mitra recurva*, Sow. (preoccupied): G. B. Sowerby.—Descriptions of New Species of Fresh-water Shells from Central Africa: C. A. Smith.—New Land and Marine Shells from West Africa: H. B. Preston.

SOCIETY OF ARTS, at 8.—Industrial Poisons—Lead and Phosphorus—with Special Reference to the Manufacture of Lucifer Matches: Prof. T. Oliver.

PHYSICAL SOCIETY, at 7-10.—Exhibition of Electrical, Optical, and other Physical Apparatus.

ROYAL ASTRONOMICAL SOCIETY, at 5.—Observations of the Transit of Mercury, November 14, 1907: E. T. Whitelow.—Solar Parallax Papers, No. 6, Construction of a Standard Catalogue of Photographic Star-places: A. R. Hinks.—Observation du Passage de Mercure sur le Soleil, le 14 Novembre, 1907; R. Jonckheere.—Observations of Saturn's Ring at the Time of its Disappearance in 1907, made with the 40-inch Reflector of the Yerkes Observatory: E. E. Barnard.—On the Lunar Inequalities due to Planetary Action: Ernest W. Brown.—The Transit of Mercury, 1907 November 14: R. T. A. Innes.—Occultations of Uranus by the Moon in 1908, Visible at British Observatories: A. M. W. Downing.—On Ancient Eclipses: P. H. Cowell.—On the Mean Distances of the Groombridge Stars: A. S. Eddington.—*Probable Paper*: Note on the Single Equations which comprises the Theory of the Fundamental Astronomical Instruments: Sir R. S. Ball.

SATURDAY, DECEMBER 14.

ESSEX FIELD CLUB (at Essex Museum of Natural History, Stratford), at 6.—Discussion on Rivers Pollution from the Naturalists' Point of View: Opened by Prof. R. Meldola, F.R.S.

MONDAY, DECEMBER 16.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—In Search of an Arctic Continent: A. H. Harrison.

SOCIETY OF ARTS, at 8.—The Theory of the Microscope: Conrad Beck.

SOCIOLOGICAL SOCIETY, at 8.—The Tutelage of Races: J. M. Robertson, M.P.

INSTITUTE OF ACTUARIES, at 5.—On the Method of Dr. Johannes Karup of Valuing in Groups Endowment Assurances, and Policies for the Whole of Life by Premiums Limited in Number: G. King.—Bonus Reserve Valuations: C. R. V. Coutts.

TUESDAY, DECEMBER 17.

SOCIETY OF ARTS, at 8.—How to Make the Most of a Museum: Lewis F. Day.

ROYAL ANTHROPOLOGICAL INSTITUTE, at 8.15.—A Japanese Book of Divination: W. G. Aston, C.M.G.

ROYAL STATISTICAL SOCIETY, at 5.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Keyham Dockyard Extension: Sir Whately Eliot.—Keyham Dockyard Extension; Temporary Works, and Plant and Appliances used in Construction: G. H. Scott.

FARADAY SOCIETY, at 8.—A Physico-chemical Study of the Complex Copper-Glycocoll Sulphates: T. Barker.—The Centenary of the Discovery of the Alkali Metals by Davy; the Industrial Developments of the Discovery: Dr. F. Mollwo Perkin.

WEDNESDAY, DECEMBER 18.

ROYAL METEOROLOGICAL SOCIETY, at 7.30.—The Possibility of a Topography of the Air based on Balloon Observations with Special Theodolites: Captain C. H. Ley.—Indications of Approaching Frost: R. Strachan.

GEOLOGICAL SOCIETY, at 8.—Some Recent Discoveries of Palæolithic Implements: Sir John Evans, K.C.B., F.R.S.—On a Deep Channel of Drift at Hitchin (Hertfordshire): W. Hill.

BRITISH ASTRONOMICAL ASSOCIATION, at 5.

ROYAL MICROSCOPICAL SOCIETY, at 8.—Some African Rotifers: Jas. Murray.—Gregory and Wright's Microscope; and a Correction for a Spectroscope: E. M. Nelson.—Exhibition of Selenite Specimens showing Interesting Features due to Twinning: E. Large.

THURSDAY, DECEMBER 19.

CHEMICAL SOCIETY, at 8.30.—Derivatives of Tetramethyl Glucose: J. C. Irvine and A. M. Moodie.—The Characterisation of Mercerised Cotton; Preliminary Note: J. Hübner.—Attempted Synthesis of Di-β-N-β / β-CH-β naphthacridine; Condensation of Methylene Dichloride and 1-Substituted-2-Naphthylamines: A. Senier and P. C. Austin.

LINNEAN SOCIETY, at 8.

INSTITUTION OF MINING AND METALLURGY, at 8.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Electrical Power in Railway Goods Warehouses: H. Henderson.

FRIDAY, DECEMBER 20.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Mechanical and Thermal Efficiency of a Petrol Engine: L. G. E. Morse.

INSTITUTION OF MECHANICAL ENGINEERS, at 8.—Notes on the Manufacture and Upkeep of Milling Cutters: Dr. H. T. Ashton.

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