

memory may prevent the performance of a measuring experiment, *e.g.* in the recent Cambridge local examination one simple question, to find the area of an ellipse by two methods, is a very admirable question, but presumably one-half the marks allotted are lost should a candidate forget the formula  $\pi ab$ .

And, again, it was required to find the specific heat of a liquid by a non-mixing method. Why should this restriction have been made? The practical exercise is sufficiently difficult without any restrictions as to the process employed.

It is only fair to the science teachers in schools to call attention to this side of the question of knowledge-making power in boys, and, instead of merely saying that few teachers have the necessary inspiring spirit, to point out the hindrances with which they have to contend, as Prof. Macgregor has done.

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#### Echelon Film Gratings.

MANY of your readers will doubtless be interested to learn that Mr. T. Thorp, of Manchester, who has so successfully reproduced copies of Rowland's gratings, has been able to make an "Echelon" grating on the principle suggested by Prof. A. A. Michelson last year, but stated to be well-nigh impossible on account of mechanical difficulties. The success of the operations depends on the shape, depth, and spacing of the grooves, and after many calculations and preliminary trials Mr. Thorp finds he can produce echelon films throwing the *whole* of the light into the first, second, or other requisite order, the direct image being practically suppressed. The first successful films made in this way were obtained in November last, and it is hoped that in a short time several will be available for examination. If permanent, they should be capable of giving star spectra with the same facility as prisms.

Royal College of Science, S.W. CHARLES P. BUTLER.

#### The Stockholm Fisheries Conference and British Fishery Investigations.

IN my letter published in NATURE of January 4, I attributed to the Government a larger grant in aid of the fishery investigations of the Royal Dublin Society than was actually given. My friend Mr. Holt informs me that, of a total sum of 2800*l.* originally provided for the work of the Marine Laboratory for five years, the Government only supplied one-half, viz. 1400*l.*, the remaining 1400*l.* being voted by the Society out of its private funds. It being found impossible to carry out the work satisfactorily with such small funds, the Society has recently voted a further sum of 500*l.* for the purchase and equipment of a fishing boat. My contention that existing institutions should be adequately supported before Government money is employed for starting a new organisation is therefore considerably strengthened.

E. J. ALLEN.

The Laboratory, Plymouth, January 12.

#### THE REPRESENTATION OF THE UNIVERSITY OF LONDON.

IT would seem that the University of London is in some danger of missing a great opportunity in connection with the vacancy created in its representation by the elevation of Sir John Lubbock to the Upper House.

Our readers need not be reminded that the theory on which the representation of academic bodies in Parliament is based is often assailed by politicians and thinkers, and is only tenable on the assumption that those bodies may be trusted to select persons of special eminence in science or learning, and qualified to obtain the confidence of the nation as representatives of its higher educational interests. This principle has been kept in view by Dublin in its choice of Mr. Lecky, by Cambridge and Oxford in the choice of Prof. Jebb and Sir W. Anson, and by the University of London so long as it was represented by Mr. Lowe and Sir John Lubbock. Unless men of higher intellectual rank than mere politicians are sent to the House of Commons by the Universities, there would no longer be any *raison d'être* for

University representation at all, and in a democratic community the privilege would not be likely to survive long.

It appears now that there are two small Committees—the one Liberal and the other Unionist—which seek to control the Parliamentary elections of the University; and that on this occasion, instead of heeding the larger public interests involved in a University election, each caucus has been content to nominate one of its own active members, though wholly unknown to the learned and scientific world, or indeed to the general public.

Dr. Collins, the nominee of the Liberal party, took a very distinguished degree in medicine and surgery; has been prominent in the domestic controversies of Convocation, and has been for a time a member of the Senate. Outside of the University he is known as a man of great ability and promise, who achieved marked success as Chairman of the London County Council. But he is considered very unlikely to secure the adhesion of the medical or the scientific graduates.

Mr. Edward Busk, the Unionist candidate, is less known to the outer world. He has a creditable reputation in his own profession as a solicitor, and also as Sir John Lubbock's election agent. As chairman he has paid assiduous attention to the meetings of Convocation and of the annual committee: and has come to be regarded by a certain section of the members—especially by those who opposed the recommendations of the Royal Commission and the University Act—as in some way a guardian of the interests of the country graduates. But his supporters do not claim for him that either in the departments of scholarship and science, or in general academic or educational politics, he has yet evinced any interest or is known to possess any authority or influence.

The fact that both of the Committees, with their special command of electioneering apparatus, have been able to gain a start in point of time, and in some cases to secure provisional pledges, ought not to conceal from the general body of graduates the gravity of the present crisis, or prevent them from acting with due care and circumspection and a strong sense of responsibility in the choice of their member. The truth is that neither of the candidates selected by the named party organisations is of the *calibre* required to fill the seat of Sir J. Lubbock. The election of either would lower the reputation of the University as a learned body, and bring serious discredit on the principle of University representation itself. This has been pointed out with strong emphasis in letters and a leading article in the *Times*, which it is reasonable to expect that the graduates will not fail to consider with attention.

It is to be hoped that before the seat is actually vacated the name of a distinguished graduate may be submitted to the electors—a name not associated with any party politics, but commanding high and general confidence in the scientific and learned world.

#### ZOOLOGY AND THE AUSTRALIAN MUSEUMS.<sup>1</sup>

ALL who are interested in Mammalian Palæontology and exploration in the Interior of Australia will readily recall the graphic account contributed to our pages in 1894 (NATURE, vol. 1, pp. 184 and 206), by Prof. Stirling, of the work of an exploring party sent out to Lake Callabonna, under the auspices of the South Australian Museum, of which he is the Hon. Director, for the purpose of collecting the remains of the gigantic vertebrates of Pliocene age known to be there entombed.

<sup>1</sup> "Memoirs of Royal Society of South Australia," vol. i., Part 1. By E. C. Stirling, C.M.G., M.A., M.D., F.R.S., and A. H. C. Zietz C.M.Z.S.

"Fossil Remains of Lake Callabonna." Part 1. Description of the Manus and Pes of *Diprotodon australis*. Pp. 40 + 18 photographic plates.

The lake, known as Lake Mulligan until, at Prof. Stirling's instigation, its name was changed (as he himself informed us at the Zoological Society, on the occasion of his last home-coming), presents conditions wholly unfavourable for successful preservation of organic remains, owing to the action of a saline infiltration. The skeletons of the monsters which there lie are found some four feet beneath the surface mud, spread out in positions indicative of "death *in situ* after being bogged," the creatures having crowded down, as the area available for food and water gradually diminished under the influence of climatic change—the whole looking, as Prof. Stirling has aptly remarked, "a veritable necropolis of gigantic extinct marsupials and birds which have apparently died where they lie."

The name *Diprotodon* was applied by Owen in 1838 to a piece of a jaw, discovered in the Wellington Caves, and a considerable accumulation of material from various localities enabled him nearly forty years later (1877), in his "Fossil Mammals of Australia," to diagnose the genus and more fully describe the greater part of its skeleton and dentition, with the exception of the manus and pes. He admitted one good species (*D. australis*), and in the meantime (1862) Huxley had founded another (*D. minor*). Beyond this, our knowledge has been until recently confined to sundry scattered descriptions of odd teeth and bones, some of the latter having been apparently confounded with the limb bones of Chelonians and other reptiles and mammals. Our greatest desideratum therefore concerning these animals has been a knowledge of their pedal skeleton, and it is precisely that which the present memoir makes good. Moreover, the fact that while the living Diprotodont Marsupialia, with the exception of the South American *Coenolestes*, are all Australian, recent exploration in the fossiliferous beds of Patagonia has, according to Moreno (*cf.* NATURE, vol. ix. p. 396), revealed the presence of remains, if not of the genus *Diprotodon* itself, of near allies, invests both this genus and the present memoir with a very special interest, as involving the question of former inter-relationship between the great continents, now a burning topic of the times.

The material, as already stated, was discovered in a state unfit for preservation and removal; and Mr. Zietz, who has been chiefly concerned in its transport and subsequent treatment, by judicious use of glue and isinglass, has succeeded in so successfully preventing its disintegration, that Dr. Stirling was enabled to bring with him in 1897 for exhibition before the Zoological Society some bones of the large extinct bird *Genyornis* which they had then just described; and those who were so fortunate as to see them will recall their condition as a triumph of the preparateur's art. Some idea of the additional difficulties which had to be overcome, and of the tax on the patience and endurance of the authors in the field, may be formed from the description they give of a "Diprotodont skull-mass," which, dried and prepared, with its matrix, weighed close upon 2 cwt., and from the fact that when their booty was packed ready for transport their camels would start operations by getting "bogged to their bellies in crossing the strip of lake-surface which intervened between the working camp and the nearest solid land, unloading being a necessity, before extrication" and resumption of the 200 mile tramp which lay beyond.

These difficulties overcome, five years' continuous work has enabled the authors to make known their results, and so important are these esteemed by the Royal Society of South Australia that they have founded a special series of memoirs (of which that under review is the first) for their publication as the materials are worked out.

Dealing, first, with synonymy, the authors, in a preliminary statement concerning dental characters, admit

Owen's *D. australis*, and incline to the belief that Huxley's *D. minor* may be identical with their smaller species; while, concerning a probable third species, somewhat larger than this, they reserve fuller consideration for a future memoir. Owen's *D. Bennettii* is dismissed with a passing comment.

The main portion of the memoir is devoted to a description of the pedal skeleton, fourteen examples having in all been obtained. The figures and descriptions are based upon dissociated remains, no single member having been found wholly complete in itself. The bones of the right side are for both fore- and hind-limbs, each delineated as a whole in one plate, as here reproduced except for a slight modification in the lettering, the remaining sixteen plates being devoted to the representation of individual bones in aspects necessary for their full study, as described in detail in the text.

Concerning the fore-foot (Fig. 1), the authors state that the radius completely crosses the ulna, and that there is a special radio-ulnar articulation formed, to admit of supination. Typically marsupial are the relationships of the



FIG. 1.—*Diprotodon australis*, skeleton of right fore-foot, dorsal aspect,  $\frac{1}{4}$  natural size.

pisciform (*p.*) and cuneiform (*cn.*), which are massive, and together furnish a deep concavity for the ulnar condyle. Trapezium (*tm.*), trapezoid (*td.*), magnum (*mg.*), and unciform (*un.*) are all present. Interest chiefly centres for the fore-limb in the identification of the pre-axial proximal carpal element (*sc.*) (regarded by Owen as a scapho-lunar) as the scaphoid, the term "scaphoid sesamoid" being applied to a small bone which (*s.s.*) flanks its lower free border with which it is apparently in articulation. Concerning this our authors are very brief, but we venture to think that, in view of the recent researches of Pfitzner and Forsyth-Major, the validity of their interpretation may be open to doubt; and we would recommend to their consideration Emery's memoir on the development of the marsupial limb-skeleton (in Semon's "Forschungsreise")—the best piece of work on the subject during recent years.

Both fore- and hind-limbs are pentadactyle, the digits of all five in front and of all but the hallux behind

terminating in unguis phalanges. Passing to the hind foot (Fig. 2), the most superficial glance at once proclaims it a marsupial limb, begotten, as Huxley has so strongly argued for that of the order (in which he has been recently supported by Dollo), of an arboreal type. The fixation of the sole remaining element of the hallux (1) in extreme abduction, the slenderness of the digits 2-3, suggestive at first sight of syndactyly, are among its most conspicuous features; indeed, our authors believe the latter process to have involved even the fourth digit as well, but of this we do not see the proof. The immense proportions of the calcaneum (*ca.*), and the surmounting of this by the astragalus (*as.*) which alone furnishes the ankle joint, are conspicuous features of this very remarkable limb; but that which is most striking is the enormous expansion of the fifth metatarsal (5) to an extent unparalleled by any other known marsupial form, that element being so modified as to furnish a base of support for the outer border of the limb. *Diprotodon* is further unique among all known marsupials for the like

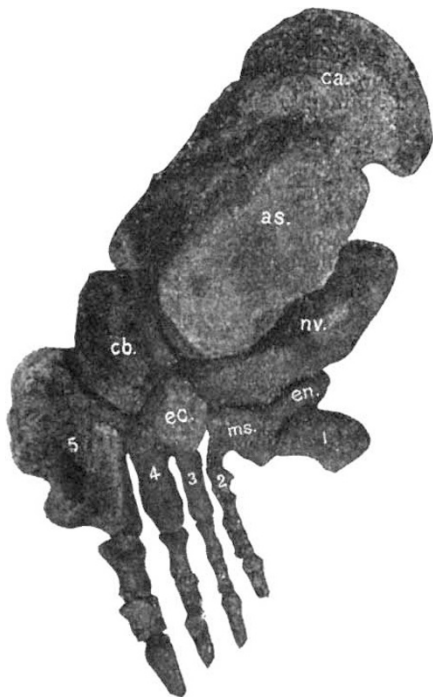


FIG. 2.—*Diprotodon australis*, skeleton of right hind-foot, dorsal aspect,  $\frac{1}{4}$  natural size.

modification of its corresponding metacarpal (5, Fig. 1). As concerning the hind-limb, the inward and upward enlargement of the navicular (*nv.*), which the element termed by the authors entocuneiform (*ms. en.*) is seen to have also undergone, would seem to us to suggest a similar supporting function for the inner border of the limb, and to explain the presence of only the tarsal element of the hallux (1) in its greatly developed form—that bone and the inner lobe of the navicular being apparently together specialised for purposes of support. And we are led to surmise that in this there may lie the clue to the reduction of the middle digits, rather than in a supposed syndactyly.

Considerable interest attaches to the discovery of an *os trigonum*, wedged in between the tibia and fibula and the astragalus. It is unfortunate that our authors term this the “*os pyramidale*,” apparently by comparison with the “*pyramidale*,” discovered by Owen in the Wombat, to which they do not however allude. To it the comment

we have made on the “scaphoid sesamoid” may equally be applied. But two cuneiforms are described as separate elements in the text and indicated in the plates, labelled ecto- and ento-cuneiform respectively, thus leading to the supposition that the meso-cuneiform may be absent. The authors, however, point to details which justify their regarding the latter bone as a compound (as indicated in our revised lettering) of the ento- and meso-cuneiform, in itself a unique feature of the genus; and it is a great pity that this is not rendered evident on the plates, in which the lettering indicative of the ento- is placed on the meso-cuneiform, to an utter confusion of ideas.

Beyond this we have no remarks which are critical, and we reserve comment on the authors' views concerning the position of the genus in the marsupial series until their later memoirs appear. Certain it is that the possession of these magnificent remains will render the South Australian Museum famous, in the manner that the Munich Museum is for its Pterodactyles, the Brussels for its Iguanodons and Mosasaurs, the Yale for its Ungulates and Toothed Birds; and we consider it incumbent on the authors, having so successfully overcome the difficulties of transport and preservation, that they will close their series of memoirs on *Diprotodon* with a careful reconstructional drawing of the entire skeleton, and render it possible, in the interests of science, for others to obtain a corresponding papier-maché restoration, as has been so successfully done with Marsh's *Dinocera*, or a cast, as with Dollo's *Iguanodons*.

Upon the acquisition of these treasures our Australian confrères are to be congratulated; and it is opportune to point out that the event marks but one of a series of recent great advances in our knowledge of the unexplored interior of that continent, in which Prof. Stirling has played a not unimportant part. Chief among those, however, whose names will live in the annals of later Central Australian investigation is his co-explorer, Prof. Baldwin Spencer, of Melbourne. Of his scientific attainments and enterprise, as exhibited in his conduct of and contributions to the Horn Expedition, and his recently published book in conjunction with Mr. Gillen on the Arunta Tribes, no praise can be too high. Not content with this, he has recently accepted office, in succession to the late Sir W. M'Coy, as Director of the Melbourne Museum; and in so doing, to his brilliant reputation as a teacher, scientific investigator and explorer, he has added fame as a Museum Curator, for, fired by a whole-souled enthusiasm which has characterised his previous acts, he has foregone remuneration and taken office as Hon. Director, in order that the money available may be applied to bettering the position of the assistant he found in charge, and the providing of additional aid in the momentous task of reorganisation upon which he has resolved. He thus becomes at once a Trustee and Hon. Director, and using his influence with the Government, he has already obtained a grant of 13,000*l.* for building purposes, and has in course of construction a spacious hall of some 150 + 110 feet in area. The collections, rich both in materials and literature, have been found to include three of du Chaillu's original adult gorillas, an entire *Nestor productus*, a very fine *Aepyornis* egg, a good series of Antelopes, and a ninety-foot Whale's skeleton. Already a considerable rearrangement has been effected; a group of giraffes, a case of lyre birds with nest and dancing ground, another of megapodes, of albatross with the parent on a genuine nest, all mounted after the fashion of the exhibits in our own Natural History Museum (amidst natural surroundings, as was first done for birds in the famous Booth collection at Brighton), are examples foreshadowing a complete transformation, under which a geographical arrangement will give place to a zoological and more scientific. The cases are, however, lacking in Australian

materials. These Prof. Spencer intends to secure with all possible speed, and to that end he is already laying plans for renewed exploration of the Bush and the Interior. It is his intention to make the museum at once a thoroughly representative Australian Collection and a great Educational Institute. In this he has a labour of years; and that he will succeed we have not the slightest doubt, for pluck, endurance, far-sightedness and enthusiasm are in him unusually combined.

The work of the Sydney Museum has rapidly developed in interest and importance during recent years; the introduction of "new blood" there, as more recently at Adelaide and now at Melbourne, has brought to bear upon the investigation of the indigenous fauna and the natural resources of the country, now so largely dying out, a body of earnest students intent on work while yet it is not too late. The present memoir, which is an outcome of this movement, may thus be regarded as a sign of the times; and we sincerely hope that those which are to follow will be pushed forward with all possible speed, it being now five years since the discovery of the remains of which it treats was announced.

#### FLOATING STONES.

**D**URING my recent visit to South-West Patagonia, in 1899, for excavations in the remarkable Glossotherium or Neomytilodon Cave near the farm Puerto Consuelo or Eberhardt, I made, with my fellow traveller, Dr. O. Borge, the following curious observation. Whilst rowing in the long and narrow channel of Ultima Esperansa, to study the plankton, we observed, when the

fragments had a mean weight of 0.3 gram. The fragments contain no air cavities perceptible to the unaided eye. They must, therefore, not be confounded with the volcanic ejections (and perhaps slags from meteors) with its numerous air cavities which are often found drifting on the surface of the ocean.

The following consideration will help to explain the apparently paradoxical fact that stone fragments of a specific gravity of 2.71 and a weight up to 0.8 gram have been observed floating on a fluid of a specific gravity of 1.005. On examining the floating stones one could discern small gaseous bubbles attached to the under surface of them, and at the shore stones can be seen on the very fringe of the beach which are just beginning to float lightened by gaseous bubbles. Unfortunately, I had not occasion to investigate the conditions more closely, as I was busy with other researches; neither had I any apparatus at my disposal for the collection of the gas that had accumulated under the stones. It is probable that the stones were not only provided with gas bubbles, which can be perceived by the eye, but that they were surrounded by an envelope of gas supported by an insignificant coating of algæ, of which the stones are surrounded. At least, traces of diatoms and algæ are discernible on the stones after drying. The greasy surface of the mineral of which the floating stones consisted also prevented the water from adhering to them, and caused the stones to be surrounded with a concave meniscus, which naturally may have contributed to, and perhaps was the main cause of, their floating, which sometimes was further facilitated by a patelliform shape of some of the bigger stones.

The observed phenomenon is not without some geological interest. In the described manner a considerable transport of solid matter takes place, not only in the narrow Patagonian channel, but no doubt also at several other shores of the ocean; and new strata will be built up possibly enclosing mixture of remains from far distant geological periods.

ERLAND NORDENSKIÖLD.

#### DR. ELLIOTT COUES.

**B**Y the death, on Christmas Day, of Dr. Elliott Coues, America loses one of its leading ornithologists; indeed, we may say, without disparagement of others, the most prominent since Spencer Baird was taken from us. Born in 1842, at Portsmouth, in New Hampshire, and

graduating in the Columbian University, Coues entered the medical service of the United States Army in 1862, receiving the brevet rank of Captain for his conduct during the war, after which he held several appointments of various kinds, and especially one in Arizona, which gave him the opportunity of indulging his inborn taste for natural history. Subsequently he held in succession the posts of Professor of Zoology in the University of Norwich, in the State of Vermont, of Anatomy in the National Medical College at Washington, and of Biology in the Virginia Agricultural College, besides being, in the interim, surgeon and naturalist to the United States Northern Boundary Commission, and from 1876 to 1880 secretary and naturalist to the United States Geological and Geographical Survey of the Territories. The duties of these different offices seem only to have stimulated his efforts, and the number of his zoological papers contributed to various scientific journals would alone accord him a high place; but, apart from them, his "Birds of the North-West," his "Fur-bearing Animals," and "Birds



Fragments of slate found floating upon the sea-surface at S.W. Patagonia.

sea was calm or only agitated by a slight swell, small fragments of slate which floated upon the surface packed together in larger or smaller clusters. They drove hither and thither in the neighbourhood of the shore, until they were driven away by the strong current which at intervals swept forward in the channel. The quantity was considerable; for instance, 700 of them were obtained at one cast of the net in a few minutes. The stones had evidently drifted out from the beach, which consisted mainly of similar stone fragments washed off from the cliffs composed of a bituminous mesozoic slate. The surface of the stones was dry, and they sank immediately when it became wet by touching or by the movement of the swell.

The slate fragments collected on the sea-surface had a specific gravity of 2.71. The specific gravity of the water in the channel was only 1.0049 at a temperature of 15° C (59° F). The largest stone which I obtained from the surface (pictured in natural size on the accompanying zincotype) weighed 0.8 gram. Twenty of the smaller