College. Mr. Cozens-Hardy has already made some interesting journeys in Montenegro and the neighbouring little-known parts of the west coast of the Balkan Peninsula which he intends to study further.

THE expedition of M. Delcommune by Lake Tanganyika appears to have been the most successful of all those sent out by the Katanga Company, as its leader has returned to Leopoldville, and will soon reach Europe to recount his experiences. The expeditions of Captain Stairs and Captain Bia, although successful in reaching their destination, were unfortunate in losing their leaders, and all the parties suffered terribly from sickness and famine. One of the interesting circumstances of these expeditions is the fact that a bronze tablet commemorating the death of Livingstone has been fixed to the tree at Old Chitambo's, where the great traveller died. This tablet was sent out in duplicate by Mr. A. L. Bruce of Edinburgh, son-in-law of Dr. Livingstone, through Mr. Arnot, who being unable to reach Chitambo's himself, entrusted one of the tablets to Captain Bia, by whose party it was placed in position.

MR. MACKINDER'S educational lectures, of which the eighth was delivered in the hall of the University of London on Friday night, continue to be well attended. The subject of the lecture was the Alps as a factor in European history, and the series of fine maps specially prepared for projection by the lantern enabled the development of the historical argument to be followed from point to point.

THE March number of the *Scottish Geographical Magazine* contains a valuable note by Prof. Mohn on the climate of Greenland, in which he epitomises his discussion of Dr. Nansen's results, published in a recent Ergänzungsheft of *Petermann's Mitteilungen*, and corrects it by the record of Peary's work. The isotherms (reduced to sea-level) run parallel to the coast, the interior being coldest at all seasons; 30° F. compared with 26° on the coast for January, 30° as compared with 50° for July, and on the average for the year the centre of the land is probably about −10°, while the coast has the temperature of 30°.

THE CHATHAM ISLANDS AND AN ANTARCTIC CONTINENT.

AT the last meeting of the Royal Geographical Society Mr. H. O. Forbes discussed the question of the former extension of an Antarctic continent in relation to certain observations made during a recent visit to the Chatham Islands. The whole surface of these islands, especially Wharekauri and Rangiauria, is covered with a bed of peat in places over forty feet in depth—deeper in the northern part than in the southern—traversable in safety only by those acquainted with the country; for to the inexperienced eye there seems in most places no difference in the surface which can carry with safety both horse and rider, and that on which the lightest-footed pedestrian cannot venture without being engulfed. The surface of some of the larger and wetter depressions in the ground was covered with a brilliant-coloured carpet of luxuriant mosses, emitting an aromatic fragrance, spread out in artless undesigned parterres of rich commingled green, yellow, and purple, and endless shades of these, warning the traveller of the existence of dangerous bogs beneath, and brightening miles of treeless moorland, which, but for those floating gardens, would be uninviting and uninteresting. In many places all over the island this great peat-moss is on fire, and has for years been smouldering underground, or burning in the exposed faces of the great pits which have now been burnt out. Dr. Dieffenbach mentions these fires at his visit in 1840, and states that the combustion had begun before 1834. They appear to have been burning in one part or another of the island ever since Dieffenbach's visit. A peculiarity in the main island that strikes the visitor very early is the occurrence of many lakes and tarns. These lakes are, for the most part, on the eastern side, at the back of the low hills facing Petre Bay. The largest is fifteen miles long, over forty miles in circumference, and about ten and a half miles broad at its widest part.

Mr. Forbes's object in visiting the islands was to look for the remains of a fossil bird, fragments of which had been sent to him in New Zealand. These he discovered in considerable numbers, and found that the bird was no other than a species of *Aphanapteryx*, a large and remarkable member of the rail family, which lived contemporary with the celebrated dodo in the Island of Mauritius, and was very similar to one of the extinct flightless birds of that island. Here was the only place in the world where it was known to exist, and where it had with the dodo preserved its fading race down to about two hundred years ago, when both of them passed away and perished for ever from among living things. In the Chatham Islands the remains of the *Aphanapteryx* were found in kitchen middens of the Morioris, showing that in this region of the world also it had survived down to comparatively recent date, just as the moa had in New Zealand.

In the Chatham Islands there still live several types of flightless birds scarcely represented elsewhere, except in widely separated oceanic islands. To account for their distribution it is necessary to reason backwards to former distributions of land and sea. The occurrence of similar forms in the three southern continents and in the islands which lie between them is most easily explained by a former Austral continent of considerable northern extension. The outlines of this continent it is of course impossible to trace with anything approaching to accuracy till we are in possession of a larger number of soundings. But it is not unlikely that the great meridional masses of land—or world ridges—which are probably of primeval antiquity extended to meet prolongations northward of the Antarctic continent. There is some evidence that the direct union of South Africa with the other continents was not for so prolonged a period as the others. The presence of the *Aphanapteryx* and other ocydromine birds both in the Mascarene and in the New Zealand continental Islands supports other evidence pointing to an extension of that area south by Marion and Kerguelen Islands, and of New Zealand south, or of the Antarctic land north, by way of the Macquarrie, Auckland, and Antipodes Islands. It is interesting to observe that the great Pacific trough to the east of the longitude of New Zealand extends far south into the Antarctic region.

It is not necessary to suppose that all the southerly extending arms were connected contemporaneously with an Antarctic continent. It is impossible to account for the presence, for instance, of some South American forms in Australia and not in New Zealand; of Mascarene forms in the New Zealand region and not in Australia, or in Africa, or elsewhere, while we are unacquainted with the orography, the rivers and mountain barriers, of the submerged southern continent; and its various commissures may have been open at one time and closed at another. As there are, moreover, abundant evidences of great volcanic action over all the region, in New Zealand, South America, Mascarenia, and the Antarctic Islands, the permutations and combinations of the ups and downs of these lands, the openings and closings of the gates, paths, or stepping-stones, are beyond our computation.

The deductions as to an Antarctic continent, made on biological grounds, are supported by the depth of the circumpolar sea, so far as it is known. The submarine plateau of the Austral land slopes northward all round the shores of the known lands more gently than is the case along any other coast, and this would seem to indicate that, if elevated, the land would form in great extent a continuation of the three primal ridges of the globe southward, coalesced and spread out round the Pole, with, between these arms, the terminations of the great and permanent ocean troughs. How far these hypotheses—which are but a restatement, in great measure, of the investigations and conclusions of many distinguished naturalists, geologists, and geographers may be substantiated or refuted by future discoveries it is difficult to say; but the discovery of these interesting *Aphanapteryx* bones on the Chatham Islands must always remain an important factor in the solution of this question.

There was an animated discussion.

ARCHÆOLOGICAL WORK IN AMERICA.

IN his report, just issued, on the Peabody Museum of American Archæology and Ethnology, Prof. Putnam is able to record the results of a very exceptional amount of useful work. This is due to the fact that while the officers of the Museum have discharged their usual duties many special archæological and ethnological researches have also been carried on with a view to the collection of material for the Chicago Exhibition. Prof. Putnam says:—

Never before has such an extensive field of anthropological research been covered in two years' time, and it is desirable to place on record what has been accomplished. In the north,

Lieutenant Peary's expedition to Greenland has brought back a valuable collection from the little known tribe of Eskimo at Whale Sound, including their summer houses of skins, their boats, sledges, weapons, implements, utensils, ornaments; full sets of garments and carvings in ivory, as well as several hundred photographs of individuals of the tribe and of scenes illustrating their daily life; also several crania, and a complete census of the tribe with a full set of anthropometrical measurements and observations. In Labrador, the Skiles expedition (upon which I obtained positions for two Harvard students, one as a naturalist and the other as astronomer) has brought back 57 of the Labrador Eskimo,—men, women, and children with all their belongings,—making an Eskimo village now on the Fair grounds in Chicago, where it will remain until the Fair is over. On the Pacific side Dr. Sheldon Jackson has made ethnological collections in Alaska, and also among the coast tribes of Siberia. Mr. Cherry has collected from the tribes of Yucon valley; and by seven other assistants a systematic collection has been made on the northwest coast, between the Columbia River and Alaska, particularly from northern Vancouver and the Queen Charlotte Islands. On the Saskatchawan Mr. Cowie has made a complete collection to illustrate the life and customs of the tribes of the valley.

Arrangements have been made with the Canadian Commissioner of Indian affairs by which the interior tribes of Canada will be represented living on the Fair grounds; and by the cooperation of the Canadian Government World's Fair Commission a representation of the archæology of Canada has been secured. In the eastern portion of Canada Mr. Tisdale and Mr. Fenollosa, both Harvard students, have collected anthropological data, and much of ethnological importance. Nearly all the Indian tribes of the United States have been visited by students from Harvard and other universities for the purpose of obtaining anthropological data relating to the physical characteristic of the various tribes and of collecting ethnological material. . . .

The State of New York through its World's Fair Commission has also been brought into this work. The Commissioners are earnestly cooperating with me in securing a large archæological collection, and also a thorough representation of the Iroquis tribes. Families from these tribes will be living on the Exposition grounds in bark houses such as were in use when this powerful nation first came in contact with our race.

South of the United States, the Bureau of Latin-American Republics in connection with the State Department has been working with the Ethnological Department of the Exposition, of which its forms a section, and a number of officers of the army and navy were detailed to visit the various republics and arouse an interest in the Exposition, and also to make collections in ethnology and archæology under instructions which I furnished for their guidance. These gentlemen have accomplished much ethnological importance, and have secured several collections from the native peoples of Central and South America. Mr. Frederic Ober was sent to the West Indies and made a special research among the Caribs.

In relation to Mexican archæology, Mrs. Zelia Nuttal, acting in her double capacity as honorary assistant in the Museum and in the Ethnological Department of the Exposition, has been engaged in a search for objects in Europe, brought there at the time of the Spanish conquest, and has found several interesting things, connected with the period of Cortez, of which she has had facsimiles made both for the Exposition and for the Museum.

Further South in Mexico, Consul E. H. Thompson has continued the work in connection with his explorations for the Museum among the ancient ruins of Yucatan. During this time he has made about 10,000 square feet of moulds of portions of the ruined buildings, showing the façades, parts of corners of structures, doorways, and the great recess with its pointed arch of the so-named "House of the Governor" at Uxmal. He has also moulded both sides of the famous Portal at Labna. Casts are to be made from these moulds in Chicago, and there will be seen on the Exposition grounds facsimiles of these elaborately carved stone structures of Yucatan, over and around which will be the tropical plants native to the region of the ruins. As this work by Mr. Thompson was in connection with his explorations for the museum, we can secure such casts from the moulds as we may desire at the cost of making the casts, which, however, will be several thousand dollars.

The Museum Expedition to Honduras, which is an important part of the work of the year, will be specially mentioned further on, but as it forms a link in the chain of explorations it is referred to in this geographical review. Farther south, Mr. G. A. Dorsey, a graduate student in this department of the University, working as a special assistant for the Exposition, has made extensive and important explorations on the Island of La Plata, Ecuador, and in Peru and Bolivia, where he collected a large amount of material. Lieutenants Safford and Welles have secured series of garments, weapons, and other objects illustrating the tribes of portions of the interior of South America. Other officers sent out by the Latin-American Bureau have been farther south, and Patagonia and Tierra del Fuego have been drawn upon for representations of their ethnology.

Returning to the United States, archæological work has been carried on in Ohio by Dr. Metz, Mr. Saville, Mr. Moorhead, Mr. H. I. Smith and Mr. Allan Cook. In the Delaware valley, Mr. Ernest Volk, who in previous years was in the field with me, has been engaged in making a careful exploration of several ancient village sites, burial places, and workshops or quarries, where stone implements were made. Mr. Allan Cook of the University also made a brief study of a small burial-place on Cape Cod. Mr. M. H. Saville, a student assistant in the Museum, examined an ancient soapstone quarry in Connecticut from which interesting specimens were obtained both for the Museum and Exposition; and several gentlemen, particularly Dr. F. H. Williams, Mr. Wm. C. Richards and Mr. James Shepard, who showed him much courtesy, gave to the Museum a number of stone implements found on and near the old quarry. In Maine, Mr. C. C. Willoughby working entirely for the Museum, explored two singular burial-places in the Androscoggin valley in which the graves were so old that the skeletons had entirely disappeared, leaving in the graves only masses of red ochre and numerous implements and other objects of stone. This exploration was conducted in a careful manner and the notes, drawings, and photographs of the objects in place show how thoroughly the work was done. A fine lot of implements in perfect condition was found by Mr. Willoughby, and several others obtained in former years from the same place were given to the Museum by Mr. Elijah Emerson of Bucksport. This remarkable collection will be exhibited in Chicago as part of the Peabody Museum exhibit and will afterwards be arranged in the Museum. At the request of Mr. T. H. B. Pierce of Dexter, Me., Mr. Willoughby also made a partial examination of a mound near Dexter which may be a burial mound. Further exploration should be made, for if it prove to be a burial mound it would be the only one known in New England.

Important researches in physical anthropology have also been carried on. These were in part based on the observations made by the assistants among the native tribes, and in part upon collections. In this connection Dr. Franz Boas, aided by Dr. G. M. West and two clerical assistants, has been engaged in the museum in classifying the anthropological data and in preparing charts, tables, and diagrams to illustrate this subject at the Exposition. Thus for the first time there is being prepared a presentation of the physical characteristics of the native American peoples. Measurements have also been taken, and observations made, on more than fifty thousand children in the public schools in different parts of the United States and Canada, as well as on those in the Indian schools, and on many negro children. In this connection we have secured the cooperation of the authorities of the Japanese schools, and of those of the Hawaiian Islands. We shall thus have the measurements of a number of Japanese and Kanaka children for comparison. To this series of physical measurements has been added a series of tests relating to the mental development of children. These observations and deductions will not only furnish data of importance to educators, but there is reason to believe, from what has already been accomplished in this direction, that they will also give the basis upon which decided reforms in certain directions will be established. It is almost needless to say that the details of this part of the work are entrusted to Dr. Franz Boas, who is my earnest collaborator in connection with the Exposition.

This brief review of the work of about 100 assistants shows how much has been done during the year; and as the Peabody Museum is the place from which it has all been directed, and as much of the work has been done by my regular assistants and students, it is eminently proper to refer to it in this report as showing the relation of the Museum to anthropological research in America. It must also be remembered that the directors of the World's Columbian Exposition have not only given to me this grand opportunity for research, but that it has been largely paid for by the funds subscribed by the citizens of Chicago. Never before has there been a year when so much money has

been expended for pure research in anthropology under one direction as during the past year; and praise and honour are due to the business men forming the directory of the Exposition in Chicago, who have so cordially met my proposals and furnished the means for carrying them out on so grand a scale. Notwithstanding the vast material interests involved in the Columbian Exposition, it must be admitted that Chicago has nobly supported pure science in this connection and has shown an appreciation of its high aims.

On the Honduras Expedition Prof. Putnam reports as follows:—

It was stated in the last report that an expedition had just started to make the preliminary explorations for the ancient ruins of Copan, and in that report is given a brief outline of the origin and plans of this undertaking on the part of the Museum to be carried on by the assistance of patrons of archæological research. It is indeed a pleasurable duty to announce that the first season's work of the expedition has proved a decided success; and that although the party had many trials and difficulties to overcome, no serious accidents or sickness occurred. Messrs. Saville and Owens returned in safety, in May last, bringing with them a large number of most interesting and important objects illustrating the wonderful carvings in stone; several vessels and many fragments of pottery; numerous ornaments made of stone, shells and bone; stone implements; and portions of human skeletons. Among the latter are several incisor teeth, each of which contains a small piece of green stone, presumbly jadeite, set in a cavity drilled on the front surface of the tooth. We had before received from very ancient graves in Yucatan human teeth filed in a peculiar manner, and now we have teeth from the ancient graves in Copan ornamented in another way. This is of particular interest in adding one more to the several facts pointing to Asiatic arts and customs as the origin of those of the early peoples of Central America. A most striking resemblance to Asiatic art is noticed in several of the heads carved in stone,—one in particular, if seen in any collection and not labelled as to its origin, would probably pass almost unchallenged as from Southern Asia. These may prove to be simply coincidences of expression of peoples of corresponding mental development brought about by corresponding natural surroundings and conditions. At present we must admit that there are many resemblances in architecture, sculpture, ornament, and religious symbolism, between Central America and portions of Asia. The true meaning of these resemblances will be made known as authentic materials for study are obtained by such thorough and exhaustive field work as the Museum has been carrying on; and none is so important for this special subject as that of the Honduras expedition. For this work, however, a large sum of money is required. The ten years allowed for the work in Honduras by the edict of that government must be utilised to the fullest extent; and each year must find the Museum ready to put its party in the field well equipped and provided with money for the very expensive work to be performed.

It is not my intention to give an abstract of the results of last year's explorations at Copan. It is far better that the report should be carefully prepared by those engaged in the actual field work from year to year. After sufficient information has been obtained about the ruins themselves, and the architectural and chronological relationship of the various structures; and after a thorough knowledge of the different modes of burial has been acquired, and all possible objects have been collected, then conclusions can be drawn which will be of scientific value, since they will be based on a thorough knowledge of all the facts. An important beginning was made by the expedition last year, plans of the plaza and of the principal structures forming the great mass of the ruins having been made, many photographs taken, and paper moulds of important sculptures, lines of hieroglyphs and several of the large idols or carved monoliths secured. Considering the difficulties of transportation (wholly by mules to the coast—a seven days' journey), both Messrs. Saville and Owens, and all associated with them must be congratulated on what they accomplished. Since the return of the expedition the photographs have been printed, preliminary reports have been prepared, and casts have been made from the moulds. These casts are now being placed in the Museum, and a series has also been made for the Boston Art Museum, and another for the Columbian Exposition.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Prof. Liveing announces a course of demonstrations in spectroscopic chemistry, to be given during the first three weeks of the Easter term, daily (except on Saturdays) at 11, beginning on April 24.

The examination in Sanitary Science for the Diploma in Public Health will be held from April 4 to April 8.

The honorary degree of Doctor in Science will be conferred on Prof. Virchow, at a special congregation on Tuesday, March 21.

A grant of £65 has been made from the Worts Travelling Scholars' Fund to H. Woods, of St. John's College, for the purpose of palæontological research in Saxony and Bohemia.

Lawrence Crawford, B.A., Fifth Wrangler, 1890, has been elected to a Fellowship at King's College.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, February 16.—"The Value of the Mechanical Equivalent of Heat, deduced from some Experiments performed with the view of establishing the Relation between the Electrical and Mechanical Units, together with an Investigation into the Capacity for Heat of Water at different Temperatures." By E. H. Griffiths, M.A., Assistant Lecturer, Sidney Sussex College, Cambridge, assisted by G. M. Clark, B.A., Sidney Sussex College, Cambridge. Communicated by R. T. Glazebrook, F.R.S.

If a calorimeter is suspended in a chamber, the walls of which are maintained at a constant temperature, we can, by observations over a *small* range across that outside temperature, deduce the rate of rise due to the mechanical work done in the calorimeter, when the supply of heat is derived from stirring only. By repeating the observations in a similar manner over ranges whose mean temperature θ_1 differs from that of the surrounding walls θ_0, we obtain the change in temperature due to the combined effects of the stirring, radiation, conduction, and convection at all points of our whole range of temperature. As the success of the method depends (1) on the possibility of maintaining the exterior temperature unchanged, and (2) on the regularity of the supply of heat due to the stirring, we briefly indicate our method of securing those conditions.

1. The calorimeter[1] was suspended within an air-tight steel chamber. The walls and floor of this chamber were double, and the space between them filled with mercury. The whole structure was placed in a tank containing about 20 gallons of water, and was supported in such a manner that there were about 3 inches of water both above and beneath it. The mercury was connected by a tube with a gas regulator of a novel form, which controlled the supply of gas to a large number of jets. Above those jets was placed a flat silver tube, through which tap water was continually flowing into the tank, all parts of which were maintained at an equal temperature by the rapid rotation of a large screw. Thus, the calorimeter may be regarded as suspended within a chamber placed in the bulb of a huge thermometer—the mercury in that bulb weighing 70 lbs. A change of 1° C. in the temperature of the tank water caused the mercury in the tubes of the regulating apparatus to rise about 300 mm. Special arrangements were made by which it was possible to set the apparatus so that the walls surrounding the calorimeter could be maintained for any length of time at any required temperature, from that of the tap water (in summer about 13° C. in winter 3° C.) up to 40° C. or 50° C. We know by observation that the temperature of the steel chamber (when once adjusted) did not vary by 1/500° C., and we believe the variations were much less.

2. We experienced great difficulty in devising a suitable form of stirrer; and we attribute the failure of our earlier experiments to defects in the ordinary forms. We find it impossible, without a lengthy description, to give a clear idea of the stirrer ultimately adopted. We can only state here that it was completely immersed when the depth of the water exceeded 1 cm., that

[1] The calorimeter was of cylindrical form, and suspended by three glass tubes. It was made of "gilding metal," which both internally and externally was covered with a considerable thickness of gold. All metal surfaces within the calorimeter were thickly gilded.