

teaching and research. Again, Lord Brassey and Mr. Douglas Freshfield, a former President of this Section, have each generously offered £500 towards the endowment of a professorship if other support is forthcoming. All this is matter for congratulation, but I need hardly point out that a professor with only a precarious working income for his department is a person in a far from enviable position. There is at present no permanent working income guaranteed to any Geographical Department in the country, and so long as this is the case the work of all these departments will be hampered and the training of a succession of competent men retarded. I do not think that I can conclude this brief address better than by appealing to those princes of industry who have made this great city of Sheffield what it is, to provide for the Geographical Department of their University on a scale which shall make it at once a model and a stimulus to every other university in the country and to all benefactors of universities.

REVIEWS.

EUROPE.

THE SCOTTISH LOCHS.

'Bathymetrical Survey of the Scottish Fresh-water Lochs,' conducted under the direction of Sir John Murray, K.C.B., F.R.S., D.Sc., etc., and Laurence Pullar, F.R.S.E., F.R.G.S., during the years 1897 to 1909. Report on the Scientific Results. 6 volumes. Edinburgh: Challenger Office. 1910. £5 5s.

THE splendid and valuable work done by the Scottish Lake Survey under the supervision of Sir John Murray, the late Mr. Frederick Pattison Pullar, and Mr. Laurence Pullar is well known through the eighteen separate papers published in this *Journal* between April, 1900, and January, 1908, and in an extra publication of the Society.

The publication under notice consists of six volumes, two of text and four of maps. This review will deal especially with vol. 1, which consists for the most part of new matter, whilst vol. 2 contains the special descriptions of the lakes already published.

In vol. 1 we find, after statistical tables of the Scottish Fresh-water Lochs and the introduction by Sir John Murray, an article on *Seiches and Other Oscillations of Lake Surfaces observed by the Scottish Lake Survey*, by Prof. G. Chrystal. This article is one of the best and most up-to-date *résumés* of the seiches problem. Physiographers will find therein the history of this interesting question, the description of the apparatus used in the survey of Lochs Earn, Tay, and Lubnaig, and the various causes of the denivellation registered by a limnograph. Amongst these denivellations the most important are the stationary oscillations of the whole lake, or "seiches." Prof. Chrystal gives also the results of his valuable studies on the mathematical theory of seiches. With Mr. Maclagan-Wedderburn he calculated the periods and nodes of Lochs Earn and Treig from the bathymetric data of the survey, and the pages in which he compares the positions given by calculation with those given by direct observation are very interesting, and show the accuracy of the theory. Many pages are also devoted to the problem of the origin of seiches.

Temperature of Scottish Lakes, by E. M. Wedderburn. After the history of temperature observations in Scottish lakes, Mr. Wedderburn, who has taken a large part in the thermic studies during the survey, gives the results arrived at.

Most of the lakes of Scotland, from a thermic point of view, belong to Forel's tropical class. In spring the water of such lakes is all of uniform temperature. In summer the lake gains heat and becomes stratified. In the third phase the "discontinuity layer" (or Sprungschicht) has made its appearance, and there is at the surface a layer of water of nearly uniform temperature, resting on a layer of rapidly varying temperature—the discontinuity layer. Below we find the abysmal waters of the lake, also of uniform temperature. As the season progresses the discontinuity layer, by transference of heat from the upper to the lower layer by conduction, sinks deeper until finally the loch is again of uniform temperature from top to bottom.

One of the most interesting facts brought to light by the Scottish Lake Survey is the "temperature seiche," a kind of wave produced in the lower of two liquids of different densities. This is the case in the lakes when the discontinuity is marked between the upper warm water and the lower cold water. Such a seiche has a very long period. Prof. Thoulet, in 1890, discovered this principle in the lake of Longemer, in the Vosges, and thirteen years later E. R. Watson, ignorant of Thoulet's observations, rediscovered the temperature oscillations in Loch Ness.

The Chemical Composition of Lake Waters, by W. A. Caspari. This rather short article is written from a general point of view. But the author shows that the waters of the mainland lochs are exceedingly pure. Both for Loch Ness and Loch Katrine 0.029 part per thousand of total solids (organic included) are reported, the figure for the Lake of Geneva being 0.169. Peaty waters are very common.

The Deposits of the Scottish Fresh-water Lochs, by W. A. Caspari. The lake deposits have been classified by the author as follows: (1) Sand or grit; (2) clay; (3) brown mud, the latter being the loch deposit *par excellence*. Three other types occur sporadically, and are by way of being rarities, viz. (4) diatom ooze; (5) ochreous mud; (6) calcareous deposits.

An Epitome of a Comparative Study of the Dominant Phanerogamic and Higher Cryptogamic Flora of Aquatic Habit in Seven Lake Areas of Scotland, by George West. The systematic list of the plants given by Mr. George West is of great value, not only to limnologists, but also to botanists. The nine plates from photos of the author show well the different types of Scottish lakes.

Biology of the Scottish Lochs, by James Murray. The biological researches of the survey were concerned solely with the Invertebrata. These observations were carried on by Mr. James Murray until he left to take part as biologist in Lieut. Shackleton's Antarctic expedition. In the course of the work twenty-nine species previously unknown have been found. The whole of the Tardigrada (thirty species) and twenty-five species of Rotifera are additions to the British fauna. Three species of Crustacea were found for the first time in Great Britain. Many of the Sarcodina, some Desmids, and Mites are also additions to the British lists. The census of the species given in Mr. James Murray's paper will be of great interest to biologists as well as to limnologists.

Some Distinctive Characters in the Fresh-water Plankton from Various Islands off the North and West Coasts of Scotland, by John Hewitt. This paper, illustrated by six plates, will be read with great interest by specialists. A *résumé* of such an article does not fall within the scope of this review.

On the Nature and Origin of Fresh-water Organisms, by W. A. Cunnington. Fresh-water organisms are the modified descendants of marine ancestors. If certain types only are to be found in all the fresh waters of the globe, it is because they alone have been able to adapt themselves to the peculiar conditions. The author thinks that passive transportation has been the most effectual agent in securing the spread of fresh-water organisms.

Summary of our Knowledge regarding Various Limnological Problems, by C. Wesenberg-Lund. After a very interesting "contribution to the general geography of the lakes," Dr. Wesenberg-Lund gives a brief review of the investigations of recent years on the variation of plankton organisms. Then, at Sir John Murray's request, the author exposes his own views on the main problems of future limnological investigations. Amongst these the author states that a thorough exploration of one of the great tropical lakes is one of the most desirable objects for the advancement of limnology.

The Scottish Lakes in Relation to the Geological Features of the Country, by B. N. Peach and J. Horne. This article could not have been written by greater authorities on the subject. These well-known geologists first describe, as no one else could have done, the geological features of Scotland, accompanied by a geological and an orographical and bathymetrical map of Scotland. The chapter devoted to the glaciation of Scotland is illustrated by a map showing direction of ice-flow and probable ice front in North-Western Europe during maximum glaciation. The authors show that by far the largest number of Scottish lakes belong to the following classes: lakes resulting from the irregular distribution of the drift, and lakes occupying rock basins. In an appendix the authors give geological notes on Scottish lochs sounded by the Lake Survey. The maps and notes on surface geology of some of the areas in which lakes are situated give great value to vol. 2 of these reports.

The Characteristics of Lakes in General, and their Distribution over the Surface of the Globe, by Sir John Murray. In this article Sir John Murray reviews the distribution and peculiarities of lakes all over the world. This great limnologist and oceanographer distinguishes, from a limnological point of view, two divisions of the land surfaces, viz. *the region of inland drainage areas*, and *the region of areas draining to the ocean*. In the former region evaporation exceeds precipitation, whilst it is the reverse in the latter region, the waters from which flow directly into the ocean. From the 250 lakes briefly described by the author, 60 are situated in inland drainage areas, and the remaining 190 lakes are situated in the areas which drain directly to the ocean. The author comes to the conclusion that the most abundant development of lakes at the present time is found in regions which have, in recent geological times, been covered by an ice-sheet. Sir John Murray gives, at the end of this capital paper, tables of the principal lakes of the world arranged according to—I. Superficial area, II. Volume, III. Maximum depth, IV. Altitude.

The value of the volume is greatly enhanced by the *Bibliography of Limnological Literature*, compiled in the Challenger Office by the general secretary of the Lake Survey, Mr. James Chumley. These hundred pages represent a large amount of work that will be useful, if not necessary, to all those interested in limnological researches from every point of view. Mr. Chumley is to be complimented upon this very valuable bibliography.

The Reports of the Scottish Lake Survey will take their place beside Prof. Forel's well-known volumes on the "Leman," to enlarge considerably the base of limnology.

The reviewer had the honour to present, at the last International Geographical Congress at Geneva, a summary of the results arrived at by the Scottish Lake Survey. On Prof. Forel's proposition, the members of the Congress present at the "Septième Séance Générale" voted thanks and compliments to Sir John Murray and Mr. Laurence Pullar for their splendid record, which shows what can be done by private enterprise.

These Reports are dedicated to the Memory of *Fred. P. Pullar*, who was

drowned while attempting to save the lives of others in one of the Scottish lochs, and they form a worthy memorial of one of the originators of the Scottish Lake Survey.

LÉON W. COLLET.

‘The Valley of Aosta.’ By F. Ferrero. (New York and London: Putman. 1910. Pp. xvi., 336. *Maps and Illustr.* 7s. 6d. net.) This volume presents a somewhat rare combination, the author having applied genuine geographical study and historical and archæological research in the district dealt with. His *métier* is apparently the two last of these; he does not appear to have any great command of the subject of physical geography, and the maps are elementary. But the whole book is eminently readable, and shows, at any rate, a most minute knowledge of the ground.

‘Quiet Days in Spain.’ By C. Bogue Luffmann. (London: Murray. 1910. Pp. xvi., 318. 8s. net.) The author has written of Spain before, and knows it well; but to judge from this work his interests lie entirely with the people, not with their country. And, truth to tell, the personal reminiscences which fill the bulk of the volume are not illuminating.

‘Alpine Profile Road Book.’ By R. H. U. Ellis. (London: Cyclists’ Touring Club. 1910. Pp. 148. *Diagrams.* 3s. 6d. net.) This excellent little volume covers all the main routes between Geneva and Cortina and between Lucerne and Innsbruck and the Italian frontier. The profile diagrams are particularly clear, with scales in feet and inches, and there are careful directions and descriptions of the various passes and routes, which, it may be added, are by no means confined to cycling roads.

ASIA.

‘A Systematic Geography of Asia.’ By G. W. Webb. (London: Methuen. 1910. Pp. viii., 100. *Diagrams.* 1s.) This volume, like many of the same type, seems to attempt too much. It is not possible to give a topographical, economic, and historical survey of every component political unit of Asia in the compass of a hundred pages, if it is to be of much educational value. We submit that from general works of this sort the history, at least—piecemeal notes, covering perhaps thirty centuries in a page, and not particularly connected with the geographical treatment—be dropped. Apart from this objection to principles, the present volume is simply written and easy to read, and as systematic as it claims to be.

‘A Short History of Burma.’ By S. W. Cocks. (London: Macmillan. 1910. Pp. x., 229. *Map and Illustr.* 2s. net.) The author’s manner of telling the story of Burma, with all its strange interest and incident, is as unemotional as an official document. But the book is admirably lucid and well proportioned, and should prove a useful text-book wherever this chapter of history is taught. It has a map distinguished by a number of place-rings to which no names are attached.

‘The Russian Road to China.’ By Lindon Bates. (London: Constable. 1910. Pp. ix., 391. *Map and Illustrations.* 10s. 6d.) The Trans-Siberian railway is used as a chain to link together a series of notes on divers subjects—description of towns and territories, history, the estimate of Roman development in Asia, and what not. The result is readable and informative, and the illustrations are good.

‘Sport and Travel in the Far East.’ By J. C. Grew. (London: Constable. 1910. Pp. xiv., 264. *Illustrations.* 10s. 6d.) This volume ranges very far east—even to New Zealand, though it is mainly concerned with shooting in India (Kashmir, Baltistan), while there is an interesting account of a tiger hunt in the Amoy district of China, and of an abortive journey in the Malay peninsula. In the intervals of sport there is ample description of scenes and experiences of travel, very pleasantly written, and the author’s photographs are excellent.