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MEMOIRS OF THE GEOLOGICAL SURVEY.

THE "Summaries of Progress" issued by the Geological Survey of Great Britain are not by any means dry official reports, but contain a number of results, available for general use, which otherwise might remain unknown for several years. One of the chief features of the Summary for 1910, issued in June, 1911 (price 1*s.* 6*d.*), is W. B. Wright's account of the district round Loch Ba in Mull. This is accompanied by a map and sections, one of the latter (p. 36) showing the immense number of inclined intrusive sheets of basic rock that penetrate the "hybrid" mass of gabbro invaded by granophyre on the slope of Glen Forsa. On p. 39 it is mentioned that G. W. Lee's work in Morvern has led to the detection of two new localities for Cainozoic sediments among the basalts. The thin Cainozoic coals of southern Mull are discussed on p. 40. Carboniferous strata have received attention in Denbighshire and Warwickshire, where the observations are certain to have a considerable economic bearing, since these areas have not previously been mapped on the six-inch scale. In Appendix iii. (p. 80), R. G. Carruthers describes a mass of Lower Cretaceous sandstone, associated with fossiliferous Cainozoic clay and Boulder-clay, which rests on Old Red Sandstone in the heart of Caithness. This huge block, in which a quarry 160 yards long has been opened, has been investigated with the aid of borings, for the expense of which a grant was made by the Royal Society—whether of London or Edinburgh is not stated. The results show that the mass is an erratic brought in by the North Sea ice, and we become impressed by this further evidence of the wide extension of marine Cretaceous strata between Scandinavia and Britain in former times.

A second edition of the Explanation of Sheets 326 and 340 of the English map appeared in 1911 (price 1*s.* 6*d.*). The joint colour-printed map was published (price 1*s.* 6*d.*) in 1906. On this, the Clay with Flints is shown, covering with great regularity the plateaus of Cretaceous rocks. The district includes the famous landslip between Lyme Regis and Axmouth, which occurred in 1839, and was described by W. D. Conybeare, then vicar of Axminster, and speedily illustrated in Lyell's "Principles of Geology." It is pleasant to find that active author A. J. Jukes-Browne still associated with H. B. Woodward and W. A. E. Ussher in the preparation of the present memoir. We are interestingly reminded on p. 4 that W. Buckland was born at Axminster, while H. De la Beche lived at Lyme Regis from 1817 to 1821.

The long-continued borings into the concealed Coal Measures in Kent have added to our knowledge of the overlying Mesozoic rocks, and the results are now described by G. W. Lamplugh and F. L. Kitchin ("On the Mesozoic Rocks in some of the Coal Explorations in Kent," 1911, price 3*s.* 6*d.*). Lower Lias rests on the Carboniferous at Dover, and the upward succession of Jurassic and Cretaceous strata is practically complete, with a break between the Kimmeridge Clay and the base of the Hastings Sand. At Brabourne, however, between Folkestone and Ashford, even Portland beds are represented, with Purbeck beds above them, while Triassic marl and conglomerate occur below the Lower Lias. The

Palaeozoic rocks, here of doubtful age, are reached at 1921 ft. from the surface, while the boring begins in Gault. Correlating the two sections, G. W. Lamplugh states (p. 35) that they are, so far as he knows, "unparalleled in Britain—or . . . in any other part of the world—in the geological range and continuity of formations proved by them to exist in actual superposition in a single small area." The shorthand habit of recording horizons merely by a specific name leads to the anomaly of frequent references to the "Mammillatus zone," as a familiar term, while the zone-fossil is called in the same pages *Dovilleiceras mammillatum*. The crypts bored by *Pholadidea* from the Sandgate beds at Dover down into the Atherfield Clay still retain the shells in them, and are interestingly illustrated in the frontispiece. This occurrence is described on pp. 12 and 102.

Clement Reid, George Barrow, and others of the staff write on "The Geology of the Country around Tavistock and Launceston" (1911, price 3*s.*). The accompanying colour-printed map, Sheet 337 (price 1*s.* 6*d.*), shows that for "around" we should read "between," and that those who visit Tavistock for its comfortable proximity to Dartmoor must consult Sheet 338. The section at the foot of the map is a pleasing illustration of the possibility of working without an exaggerated vertical scale, and would have pleased the master, De la Beche. The interesting lavas at Brent Tor—the memoir preserves this spelling, though the map does not—are shown (p. 52) to possess pillow-structure and to be of the albitic "spilite" type. We should like to know the author of the charming sketch on p. 53. Dr. Flett remarks that Rutley's memoir on Brent Tor was "the first to contain the results of microscopic investigation of rock sections." Clifton Ward, however, was probably the pioneer in his Lake District memoir of 1876, while the Brent Tor memoir appeared in 1878, not 1876, as is here stated. The radiolarian cherts of Carboniferous age form a considerable feature on the map, and the new boundaries introduced show the importance of revision in this historic area. D. A. Macalister describes the tin and copper mines in detail, including those of Calstock and of the granite land of Bodmin Moor.

An important memoir on "The Geology of the Glasgow District" (1911, price 4*s.* 6*d.*) has been prepared by almost the entire staff of the Scottish branch of the Survey. It is accompanied by a composite colour-printed map of the district, with vertical and longitudinal sections (price 2*s.*), and it seems almost unfortunate that either of these works should be procurable without the other. The numerous and energetic attendants at geological classes in Glasgow will welcome these publications, equally with the members of the well-known local Geological Society. The elaborate subdivision of the igneous rocks may be a phase of the present epoch; but it comes naturally from a land where mineral studies have been developed with a traditional aptitude for classification. By means of letters on the map, as well as by more general colours, five types of basalt of Calciferous Sandstone age are distinguished, and also four others intrusive in the strata of the district. The separation on a map of intrusive from clearly contemporaneous rocks of the same composition is easily defensible, since the forms of the outcrops may convey no information. The coloured vertical sections on the margins of the map serve admirably to illustrate the contrast between the coal-bearing beds of the Clyde Basin and those of central England or South Wales. The memoir takes its place at once among our textbooks as a work to which all interested in European stratigraphy will refer. It will equally be the authority on the economic geology of a district where

mines and quarries are of high importance. Among the many places where modern research has been aptly utilised, we may mention E. B. Bailey's preference (p. 9) for ascribing a continental origin to the Old Red Sandstone, and his comparison of the "cornstones" with the kankar of tropical Africa—the original Indian examples might well have received mention. The alleged unconformity between the Barren Measures and the productive Coal Measures is regarded (p. 61) as improbable, owing to C. T. Clough's observations, published in 1910. G. W. Lee contributes a chapter of sixteen pages on the palæontology of the Carboniferous rocks of the district, from which it is pleasant to see how much we owe to members of the Geological Society of Glasgow. The interesting paragraphs (p. 94, &c.) on the life-zones of the system show how difficult it is to define, to the satisfaction of palæobotanists and palæozoologists alike, the lower limit of the Upper Carboniferous series. The base of the upper, or Visean, division of the Avonian, or Lower Carboniferous, lies somewhere below the Hollybush Limestone in the Calciferous Sandstone stage. All the "Carboniferous Limestone" stage near Glasgow is thus correlated with beds high up in the "Carboniferous Limestone" of southern England.

E. B. Bailey (pp. 124-50) treats of the petrology of the igneous rocks with enthusiastic thoroughness. We are glad to note the use of "alkali" as an adjective, rather than "alkaline," for types of rocks rich in sodium or potassium. Nepheline has now been found in several of these in the Glasgow district, notably in the "alkali gabbro" of Lennoxton. The influence of Rosenbusch in establishing rock-species has spread to the Central Valley of Scotland, since a rock, already described as a theralite, becomes thus qualified (p. 135):—"In these characters it approaches much more closely the bekinkinites of Madagascar, which are a highly melanocratic type of ijolite." We regret to read that several other ultrabasic rocks of the area "have a composition which places them near to the bekinkinites," so that the way lies open for at least one new name, indicating, as must so often happen, nearness rather than identity. May we quarrel also with the word "macrophyritic," which does not quite represent the author's meaning? It is interesting to find Abich's term "trachydolerite"—a very bad one from the point of view of rock-structure—revived for rocks that might surely be styled trachytic andesites. Harker's "mugearites," those interesting fine-grained types with orthoclase, oligoclase, augite, and often olivine, are recognised in the Carboniferous rocks near Glasgow. The discussion and diagram of the composition of the quartz-dolerites (p. 146) are of especial interest.

The chapters on the origin of local topographic features, including details of recession and river-capture on the escarpment of the Campsie Fells, bear further witness to the thoroughness of the Geological Survey work. These pages could be read with appreciation by persons who have never seen the district, and they will tempt many from the smoke of the great city into the gaps in the highland border that open up another world.

The Scottish branch also issues a memoir, by E. H. Cunningham Craig, W. B. Wright, and E. B. Bailey, on the "Geology of Colonsay and Oronsay, with Part of the Ross of Mull" (1911, price 2s. 3d.). The one-inch geological map issued in connection with it (Sheet 35, price 2s. 6d.) is mainly concerned with the Atlantic Ocean, and Oronsay lies beyond it on the south. Plate i. of the memoir, however, completes the island group. Most of the sedimentary rocks are believed to be representatives of

the Torridon Sandstone. There is a considerable range of igneous rocks, and W. B. Wright and E. B. Bailey describe and illustrate an attractive example of the interaction of an ultrabasic hornblende-rock with included blocks of quartzite (p. 29). The quartzite, during solution, has led to a local concentration of alkalis. Many of the blocks, "surrounded by a magma which is overwhelmingly hornblende, are actually replaced by alkali feldspars and quartz." Tectonic features are described in detail, and we wish that James Hutton could again come to life to see how, in this and other instances, physical geology holds its own in Scotland. The glaciation of Colonsay took place from the east, and a map (p. 61) shows the course of boulders over the island from the mainland beyond Loch Awe. A pre-glacial rock-shelf, due to marine erosion, with accompanying cliffs, is traceable as high as 135 ft. above high-water mark (p. 62). E. H. Cunningham Craig in part ii. describes part of the Ross of Mull, and supports Judd's view that the great mass of granite is of later Palæozoic age. Both in this memoir and in that on the Glasgow district the petrographic details owe much to the advice and notes of J. S. Flett.

A third Scottish memoir, by ten authors, deals with Knapdale, Jura, and North Kintyre (1911, price 3s.). The immense part played by quartzite in Jura is well brought out on the accompanying map, Sheet 28. The term "vitreous quartzite" (p. 99) seems a little misleading, like the "glassy feldspar" of older writers. This series in Jura may be 15,000 ft. in thickness (p. 106). A pleasant feature of the memoir is the introduction by J. B. Hill, where the geological structure and the raised beaches are concisely brought into relation with the human interests of the district.

G. A. J. C.

DISCUSSIONS OF CLIMATOLOGY.

A DISCUSSION by Dr. A. B. Rosenstein of the conditions of temperature in central and southern Spain is published in vol. xxxiv. (part iii., 1911) of *Aus dem Archiv der deutschen Seewarte*, based on observations of the last twenty years of the last century, and including a longer series for Lisbon, San Fernando, Coimbra, and Madrid. The last four stations represent essentially different climatological types, as previously pointed out by Hellmann. The author deals with the observations in considerable detail (twenty-seven tables), but we can only very briefly refer here to one or two of the results. The amplitude of the daily range, being chiefly dependent upon the season, is smallest in winter (December) at the above-mentioned stations (at San Fernando in April), and greatest in summer (August); in the latter season the mean daily range at Madrid is 13.8° C., twice that at Lisbon and San Fernando. With reference to the yearly range, one of the tables shows the deviations of the monthly from the yearly means, the sum of the greatest plus or minus monthly departures being given as the expression of the mean yearly oscillation. The stations are divided into three groups: (1) coastal, where the aggregate mean yearly oscillation is between 11.5° and 15.3° C.; (2) more inland, oscillation between 15.9° and 18.2°; and (3) central tableland and plateaux, oscillation between 18.9° and 20.1°. This useful paper closes with tables showing the interdiurnal variability of temperature at Madrid (yearly mean 15° C.) and San Fernando (10°).

A discussion of "The rainfall of Jamaica from about 1870 to end of 1909," with monthly and annual maps, has been published recently by Mr. Maxwell Hall, Government meteorologist. It includes means from a large number of stations, so far as observations were available, and general averages for each of the