

SOUTH AFRICAN GEOLOGY.¹

MR. ROGERS has produced a handbook to the geology of Cape Colony which is sure to remain a standard treatise. New observations will be recorded in future editions, as the work of his survey is carried on; but results made public as recently as 1904 are included in the present volume. The book appears with especial appropriateness, now that the visit of the British Association to South Africa has been officially organised; and the included geological map, on the scale of about one inch to ninety miles, gives an admirable impression of the country. In it we see the huge Karroo synclinal, occupying almost all the colony, and lying between the pre-Devonian masses that crop out upon the north and the closely folded rocks of the Cape system along the south; while Mr. Rogers's introduction connects the scenic features with the geological structure in a manner that attracts us at the outset.

It is unfortunate that the names chosen for the colonial systems of rocks are not readily represented by adjectives. Hence such ungrammatical expressions as "pre-Cape" and "pre-Karoo" have been received indelibly into literature. Even the International Congress may hesitate to speak of an "*étage bokkeveldien*," though we have, to be sure, "purbeckien" and "bathonien" in Europe. This use of local names is, of course, greatly to be commended, in view of the scarcity of fossils in the great majority of the series.

The invasion of the old Malmesbury beds in the west of the colony by granite is concisely described on p. 38; and it is interesting to note how gneissic structures have arisen in the granite, as in so many other instances, without "evidence of a great amount of crushing or rearrangement of its component minerals after it solidified." The foliation-planes in the gneissoid granite are parallel with the strike and cleavage of the adjacent sedimentary rocks, and the whole structure seems one of subterranean flow. The granulites of the Darling area will clearly bear comparison with those that have been so much discussed in Saxony. The intercalation of orthoclase crystals from the granite in lenticular areas between laminae of slate (p. 43) reminds us, again, of the composite rocks of Donegal.

Mr. Rogers gives an interesting account of the stages in the passage from the well known blue crocidolite to the more siliceous yellow "griqualandite" in the slates of the Griquatown series. The slates themselves are converted into jasper-rocks where the most altered amphibole occurs; and the crests and troughs of the folds have afforded hollows in which the fibres of amphibole have crystallised across from one surface to another.

The Cape system, including the Table Mountain series at its base, has been greatly contorted and overfolded in the south; but the southern edge of the Karroo beds is also involved (p. 407), and the great east-and-west ridges of the continental margin date from somewhere about Jurassic times. Flattened and striated pebbles occur in the Table Mountain

beds, and are regarded as the first evidence of a neighbouring highland on which glaciers gathered. The Devonian Bokkeveld beds follow, and the still higher and famous Dwyka conglomerate is, as all geologists know, of Permo-Carboniferous age. It is somewhat fascinating to conceive the growth of glacial conditions through at least two long geological periods, until the flood of ice at last spread southward from the Transvaal territories, and scored and rounded all the preceding rock-masses down to the region of the Cape itself.

The Dwyka beds, a facies of the Kimberley-Ecca series, and long regarded as volcanic tuffs, are here

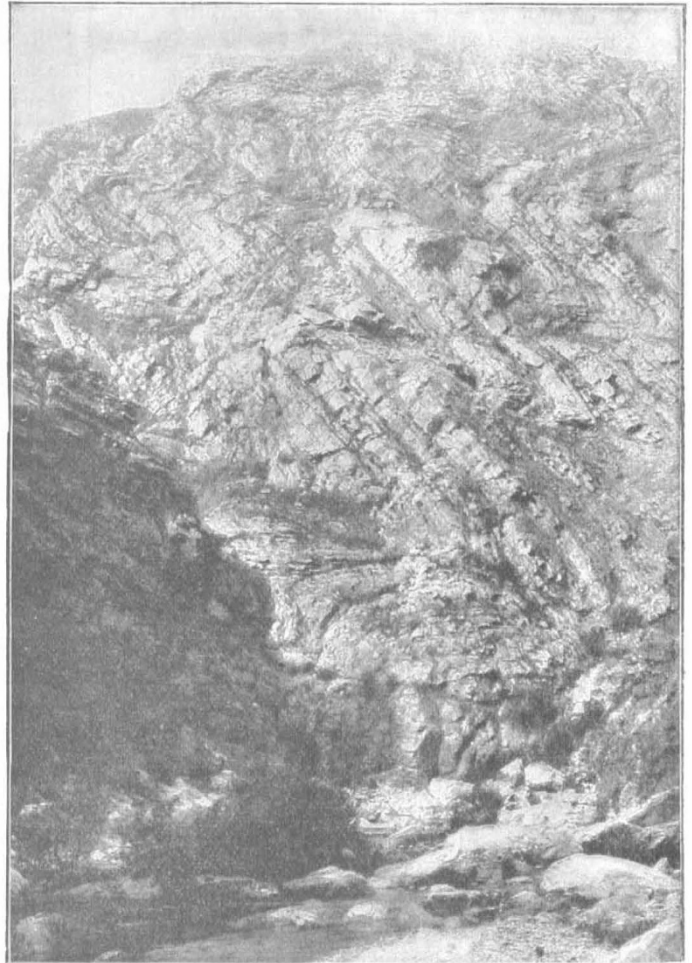


FIG. 1.—Overfolded quartzites of the Table Mountain Series, Meiring's Foot, representative of the great upheaval, which probably took place in early Jurassic times. From Rogers's "Geology of Cape Colony."

very adequately described, with several effective illustrations. The glacial series at Vereeniging is associated with beds containing the *Glossopteris* flora, and also *Sigillaria* and other northern forms; and Mr. Rogers points out that the cold cannot have been responsible for preventing a more frequent mingling of these two well marked floras. The most novel portion of the account of the reptiliferous Beaufort beds of the "Karoo system" is the strong hint (p. 198) that they should be regarded as Permian rather than Triassic. This view, based on Amalitzky's work in Russia, would lead to a reconsideration of the Elgin Sandstone also, and to the acceptance of a development of reptilian life in Permian

¹ "An Introduction to the Geology of Cape Colony." By A. W. Rogers, M.A., F.G.S., Director of the Geological Survey of Cape Colony. Pp. xviii+463. (London: Longmans, Green and Co., 1905.) Price 9s. net.

times as surprising and swiftly various as that of the Eocene Mammalia. We presume that the Stormberg series must then include the whole of the Trias, and not merely the Rhætic, as Feistmantel and Seward have proposed. The consideration of this and similar questions is made far more interesting by the appearance of Dr. Corstorphine's address on the history of stratigraphical investigation in South Africa ("Report of the South African Association for the Advancement of Science," 1904, p. 145), to which is appended a table showing the classifications of various authors, starting with the brilliant and perceptive work of Bain in 1856.

Prof. R. Broom has provided Mr. Rogers with a chapter on the Karroo reptiles, in which the early carnivorous types, *Ælurosaurus*, *Lycosuchus*, &c., are separated from the Theriodonts as "Therocephalia." The pose given to the skeleton of *Pareiasaurus* in Fig. 18 is more erect than that at present adopted in the British Museum. The well known work of Prof. H. G. Seeley is mentioned later in the bibliographical appendix.

Mr. Rogers, quoting the view of Mr. Kitchin, who compares the fossils with those of similar beds in India, does not allow the presence of Jurassic strata in the Uitenhage series, so that the Jurassic system may be represented merely by the underlying unconformity (compare p. 408). The perforation of the Stormberg and preceding rocks by the diamantiferous volcanic pipes occurred, in all likelihood, in Lower Cretaceous times. The bending up of the strata round these vents presents us with a curious reminder of the old "crater of elevation" theory.

Denudation has attacked the surface of the interior of the colony "uninterruptedly from the close of the Stormberg period (Rhætic) to the present day," and the folded belt of the south seems to have furnished a fairly complete barrier against inroads of the Cretaceous sea (p. 414). A useful chapter on the geological features to be observed along the main lines of railway concludes this compact and highly attractive handbook. GRENVILLE A. J. COLE.

THE NAUMANN FESTIVAL AT CÖTHEN.

NAUMANN is but a name to nine out of ten British ornithologists, and the proportion of them who have held in hand a volume with that name on the title-page must be smaller still. Yet it was borne by two men who, taking them all round, were the most practical ornithologists that ever lived, for their personal knowledge of the birds of Central Europe was not exceeded by that of any of their contemporaries, and it may be fairly doubted whether any of their successors, vastly improved as are the modern means of acquiring such knowledge, have attained to the like acquaintance.

The elder Naumann, Johann Andreas, seems hardly ever to have quitted the little village of Ziebigk, near Cöthen, in the duchy of Anhalt, where he was born in 1744, the son of a small landed proprietor, to whose estate he succeeded. He has left a curious autobiographical sketch, which was prefixed to the first volume of the edition of the joint work of himself and his son, Johann Friedrich, published in 1822. If ever a man devoted himself to the observation and study of birds it was this Johann Andreas, who from his boyhood passed days and nights in this sole pursuit. How he found time to take a wife—for he tells us that he often forgot his dinner—is marvellous; but marry he did, and had three sons, the eldest, Johann Friedrich, already named, born in 1780, and two others; one of them, Carl Andreas, born in 1786, became a fair assistant to his father and brother, without, however, publishing anything on his own account. The father

brought up these three boys to follow his own tastes and live his own life. A gun was put into their hands as soon as they could hold it, they were made familiar with every device for catching birds, and they were also taught to draw. In this last respect the eldest attained so much proficiency that by the time he was fifteen he had executed a great number of drawings of birds, which the father proceeded to have engraved on copper and to publish in folio form. The work thus produced proves to be one of the rarest in ornithological literature, if literature it may be called, seeing that not a word of letterpress accompanied the plates. Whether a complete set of them exists anywhere is uncertain, and Dr. Leverkühn's labours seem to show that not quite a dozen more or less imperfect copies are known, though there is no room here for bibliographical details. The next thing the father did was to bring out in small octavo the first volume of what was called "A Detailed Description of the Forest-, Field-, and Water-birds of the Principality of Anhalt and the Neighbouring Districts." This appeared in 1797, and was illustrated by coloured figures by the son Johann Friedrich. Some of them are reproductions of those in the older series, but the style of drawing was manifestly improved, and, moreover, went on improving as the work itself did, for it quite outgrew the bounds of its native principality, and the fourth and last volume, published in 1803, appeared as "The Natural History of the Land- and Water-birds of Northern Germany and the Adjoining Countries." This was followed by a series of eight supplements, the last of which came out in 1817. A remarkable feature of this work is its extreme simplicity and truth, and the absence of all scientific pretence. There is not even a Latin name in it! Yet there was no attempt by "writing down" to gain popularity, and whether it became popular is doubtful. All that can be said is that copies are now not easily to be had. In England when a man tries to do a thing of this kind we know too well what is generally the lamentable result. He makes a fool of himself on almost every page; but this is just what Johann Andreas did not. He wrote with quiet dignity from his own knowledge, and his knowledge was sound. There was no need for him to borrow from anybody else.

The father's work being thus successfully concluded, the son, Johann Friedrich, lost no time in bringing out a new edition of it, and it is on this edition that the latter's fame rests, and rests securely. The preface it dated 1818, and some copies of the first volume are said to bear 1820 on the title-page. Doubtless it was then ready for publication, though for some reason it seems to have been delayed for a couple of years. Twelve volumes (parts they are called) appeared at long intervals, the last in 1844, and it may be truly averred that for completeness nothing like them exists in any language. They continue the same simple and direct style of the father's work; but the son willingly cited other authors and showed that he had read them. He also extended his area of observation, journeying to Jutland in the north and to Hungary in the south, beside voyaging to Heligoland—the ornithological peculiarities of which he was the first to detect. Moreover, he discovered that anatomy was not to be neglected, and accordingly each genus as he treated of it had prefixed to it a brief account of its internal structure, and to this end he had the good fortune to obtain the services of Christian Ludwig Nitzsch, who carried on this portion of the work until his death in 1837, when his place was taken by Rudolf Wagner. Two years after the work was ended the author began a supplement, which had not proceeded far when he died, in 1857, and this was left to be completed by two of his friends, the late Prof. J. H. Blasius and Dr. Eduard Baldamus.

Carefully elaborated as this great work had been, its information had, of course, fallen behind the times, and