

WHITEMAN (A. J.). *The Geology of the Sudan Republic*. London (Clarendon Press: Oxford University Press), 1971. xiv+290 pp., 84 figs., 14 pls. Price £8.00.

Professor Whiteman's book is a timely addition to the over-all accounts of the geology of north and north-east Africa that have appeared over the past 30 years or so. Until 1921 the only general accounts of the Sudan geology to appear were compiled largely from a few prospectors' accounts and rare incursions of professional geologists. Now we have an account from 'on-the-spot' observers helped by a great many independent observers' reports.

The volume is well illustrated by numerous text-figures, maps, and a graphic set of plates showing the striking features of the region.

Access to the wide open spaces has always been difficult and even modern transport facilities still leave problems for the field worker—of difficult terrain even for modern vehicles, and of supply of food, water, and fuel. Professor Whiteman and his colleagues have voyaged far and wide, to check, correct, and extend the observations of earlier workers in the field.

The Geological Survey was begun in 1904 with at most two staff until 1950 when an expansion began. In the early days an astonishing amount of data was collected, both by encouraging the sending in of specimens from wells (which provided a widespread and useful indication of the rocks underlying the superficial cover of the central region) and by surveys of known and possible deposits of economic value.

The foundation rocks of the Sudan, called 'Basement Complex' pending detailed mapping and correlation, are overlain by the formation known as the Nubian Sandstone, and later covered by a blanket of post-Cretaceous deposits continuing up to the Pleistocene. The Basement Complex appears in force in the marginal areas and, in much of the central plains, as isolated inselberge or in mountain masses such as the Nuba Mountains south of el Obeid. With the aid of isotope age determinations a beginning has been made with correlation, and detailed work in the Red Sea Hill area has laid the foundations of a stratigraphical table for the Pre-Cambrian (pre-Nubian) rocks of the region.

Among the more interesting features of the Basement Complex are many ring-complexes, in the 'younger granite' group. There are also a number of charnockitic intrusions in the SE Sudan and an isolated charnockitic mass in Jebel Moya, between Sennar and Kosti.

Isotopic checks have also substantiated a Mesozoic (basaltic) episode in the northern Sudan, which was assumed to belong to the Tertiary volcanicity in earlier descriptions. Although apparently of 'normal' basaltic character, this episode ties up in time with the alkaline volcanicity of basal 'Nubian Sandstone' age in Wady Natash in the Eastern Desert of Egypt.

The youngest volcanic episode is regarded as late Tertiary (possibly extending into the Quaternary); many of the occurrences have a very modern appearance, especially in the Jebel Marra area, Berti (Tagabo) hills north of el Fasher, and Bayuda. Although none of the obvious craters match the size of the similar calderas and explosion vents described to the west and north-west (e.g. Emi Koussi in Tibesti and Richat, further

west) they seem to indicate a final explosive phase to this stage of activity. This is in contrast with the volcanicity of the eastern side of the Sudan which ties up with that of the Ethiopian plateau. Hosh el Dalam in the Bayuda is a particularly impressive example, being a vertical pipe some 350 m deep and not more than 200 m in diameter.

The author has not, it seems, had access to the field-books of the earlier members of the Geological Survey. Barron's detailed sketches of the basalt/sediment outcrops in the Khor Langeb/Khor Wintri area (north-east Sudan), later Surveyed by F. Delany, are a model of observation and were shown to be accurate by the later survey. Also G. V. Colchester's field-books show excellent and accurate sketches of the various spines and eroded craters in the Bayuda volcanic field. At a later date L. Z. A. Makowiezki made a gravity survey of the Gash delta, showing a succession of faults parallel with the line of the Gash; the Gash alluvium is underlain by sheets of basalt (as shown by bores and well-sections in the neighbourhood of Tokar). This extension of the (presumably Ethiopian) lava flows, linked with the flows of the Gedaref area, is of importance in the general link-up with the Ethiopian plateau volcanicity.

Jebel Ahmad Agha is mentioned (p. 89) only in relation to the Umm Ruwaba deposits of presumed Tertiary age. The hill, which protrudes from the White Nile plains between Kostis and Malakal, is an intriguing pile of scoriaceous volcanic bombs up to 50 cm in length and isolated crystals, of which there are many samples in the Geological Survey collections. It is not known whether this was a volcanic accumulation that was buried by the Umm Ruwaba formation or is contemporaneous; no wells or bores have been sunk to throw light on this. Specimens were described by G. T. Prior (*Min. Mag.*, 13, 90 (1900)).

The Geological Survey has a few 'freak' records that are worthy of mention. G. W. Grabham collected a pegmatite from a hill on the Congo border, which contained large (1 cm) crystals of graphite. There is a specimen of pegmatite, sent in by one of the Mission fathers in the northern Nuba Mts. (locality not stated), which contains large crystals of kyanite. A specimen collected by Colchester from near Wady Oyo mine is a pegmatite with molybdenite; in this case there is of course a possibility that it may have been brought by a bedouin and dropped there. In similar case is a sample of the 'withamite'-bearing porphyry found in a wady near J. Erba, not matching the usual 'Imperial Porphyry' in detailed character, but with the same hue. This may also have been humanly transported, of course.

The diamond mentioned from the Congo border (p. 257) was collected by Colchester; it was definitely a small diamond crystal but no precise locality was given, save that it came from a river sand near Yei. Again it could be something transported by human agency.

Professor Whiteman undertook a very onerous task in the assembling of this volume; he has accomplished it with credit, both in clarity of presentation and in completeness of coverage. But there is still a lot to be done by his successors in the study of Sudan geology.

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