

Tanganyika – Colonial Geological Surveys 1947-1956

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Geological and scenic features, Tanganyika. Kibo, Kilimanjaro (19,340 ft.), from the saddle between Kibo and Mawensi. Photo by T.G.S. Plate V.



Photo by T.G.S.

Geological and scenic features, Tanganyika. Oldonyo Lengai. New cones built inside new crater during the 1954 activity. Photo by T.G.S. Plate V.



Geological and scenic features, Tanganyika. The rare-earth bearing carbonatite, Wigu

Hill, Eastern Tanganyika. Photo by T.G.S.
Plate VI.

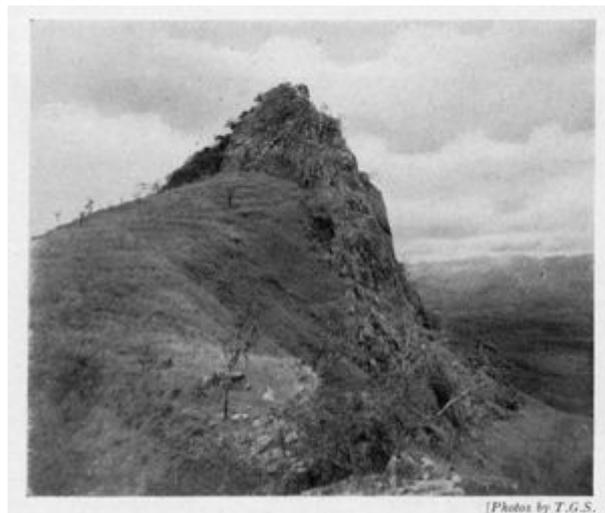
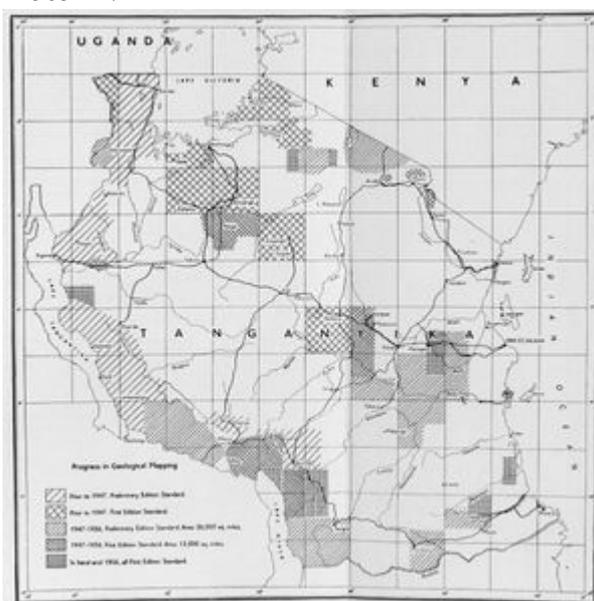


Plate VI.



Progress of mapping in Tanganyika. Plate
VII.

Tanganyika

The Geological Survey Department of Tanganyika was established at the end of 1925 when the senior staff, including a director, consisted of 4 geologists. About ten years later the Department became a Division of the Lands and Mines Department, with a Chief Geologist replacing the Director, who was then Sir Edmund Teale and who was appointed Mining Consultant. This latter was a new post designed to facilitate relations between Government and the mining community. In 1937 the senior staff was increased to 6 geologists, supported by a chemist/petrologist and a metallurgist. During its first decade, the work of the Department fell into three categories—reconnaissance geological mapping including soil surveys, geological mapping of known mineral areas, and water supply. The water supply section was transferred to the Railway Department during the early part of World War I but was integrated in the newly-formed Water Development Department at the end of that war.

Up to 1936, geological mapping was concentrated on reconnaissance of the Lupa, Musoma and south-west Mwanza goldfields, and the publication of the results of this work no doubt stimulated

the intensive prospecting and exploration of these fields. As a result, gold production was considerably increased. Geological reconnaissance mapping revealed the presence of large coal deposits in the Ruhuhu area in the south-west, and it also indicated the possibilities of mineral development in the west. Subsequently, the Uruwira mineral field was developed and mining companies were attracted. A number of scientific discoveries brought to light the presence of fossil reptilian bone-bearing strata in the Karroo beds (Permo-Triassic) of the Ruhuhu depression, while knowledge of the Olduvai prehistoric implements gave an impetus to archaeological research in East Africa. Water-supply investigations in the eastern and south-eastern coastal region increased our knowledge of the early Tertiary rocks outcropping in these little known areas, and many advances were made in general stratigraphy, revealing the divergent Ethology of the pre-Cambrian formations (Bukoban, Kavirondian, Nyanzian and Basement). Some studies were also carried out on the general structure associated with the rift valleys of East Africa.

After 1936, much progress was made in geological mapping, especially in extending the known mineral fields, primarily the Karagwe tinfield, the Singida goldfield, the Uruwira mineral field, and the mica deposits. World War II, however, caused an inevitable reduction in geological staff, and this promising progress was interrupted. During the war, in order to increase dollar reserves, the early period was devoted to stimulating gold production, chiefly by special investigations in the Musoma and Lupa goldfields. On the introduction of lease-lend, however, and the entrance of the U.S.A. into the war, the focus of attention was shifted not only to the development of the manufacture of " substitute " materials to encourage local industries, but to the proving of fuel deposits near the main lines of communication. The corundum deposits in the Dodoma District were explored and mined by the Geological Survey and the product was used in fabricating hones of various types and sizes. Reconnaissance and detailed geological mapping in the Uruwira mineral field and Ufipa District attracted the attention of the Union Corporation of South Africa, who carried out extensive exploration in the region in the immediate post-War period. The War and the post-War period saw the recovery of diamond production by the development of the Mwadui (Williamson Diamonds, Limited) and Alamas Limited in the diamond field near Shinyanga, which has yielded such rich revenue to the Territory's finances.

At the end of World War II the senior staff consisted of three geologists, including the Chief Geologist, who for a time also carried out the duties of Chief Inspector of Mines in the Territory; there was also one metallurgist, and a second one was recruited in 1946. Thereafter, the Geological Survey slowly regained ground and finally in 1950 recovered its status as a full and individual Department responsible for the exploration and development of the Territory's mineral resources. As a result of the expansion which began in 1947 the Department had become by 1951 one of the largest and best equipped of the Colonial Geological Surveys. This expansion was greatly assisted by funds freely donated by the British Government, under their Colonial Development and Welfare Organisation, which allowed extensive new offices and laboratories to be built. By 1952, the establishment had been increased to 19 geologists in addition to the Director, 2 assistant directors, metallurgist, geochemists and mineralogist/chemist, and ancillary officers, workshops, stores, and drawing office staff. The present-day establishment provides for 19 geologists, including a geophysicist, in addition to the Director and Deputy Director. There is also a Mineral Exploration Team under the direction of a mining geologist and staffed partly by 3 technical officers provided by the Technical Assistance Administration of the United Nations Organisation. The laboratory staff numbers a Chief Research Officer and 5 others.

Progress in geological mapping since the beginning of 1947, together with the mapping carried out prior to that time, is shown in the accompanying map (Plate VII). Publication of all regional geological mapping has been standardised on a scale of 1 : 125,000, but differing densities of coverage are indicated by having Preliminary and First Editions. The beginning of post-War

recruitment of geologists coincided with renewal of interest in the major coal deposits of the country, situated around Lakes Nyasa and Rukwa in the south-west. Three small coalfields were discovered, and the systematic detailed exploration of all coal resources was commenced. As more staff became available, regional mapping was started in the highly interesting and potentially economic metamorphic rocks bounding the coalfields, where, among other minerals, notable deposits of titaniferous magnetite had been located during previous reconnaissance mapping. This work has continued, until to-day there is a nearly continuous broad belt of mapped ground bordering Lake Nyasa and extending to the north-west in the area of Lakes Rukwa and Tanganyika. Mapping in the Karroo rocks has not been confined to the Lake Nyasa coalfields, as can be seen from the large area covered in the Eastern Province, west of Dar es Salaam, which is largely underlain by Karroo and younger sedimentary formations. This, and other mapping in the coastal sediments, have provided useful information to the BP-Shell Company, which is currently engaged in exploration for oil in the region. Other large areas have been mapped chiefly for reasons of mineral possibilities. One of these areas *lies* astride, and south of, the Central Railway Line to the east of Dodoma, where various mineral occurrences, notably of copper, encouraged intensive regional survey that was later supported by diamond drilling of some of the more promising prospects.

In the Nzega area, south of Lake Victoria, a large area has been mapped, and further work is proposed on formations showing gold mineralisation. In the central and eastern parts of the Southern Province the existing facilities are a first-class port and a railway which was originally planned for the Groundnut Scheme; they await development of the hinterland where various economic minerals, including graphite, are known to occur. Large areas mapped in the northern part of the Territory include not only mineralised crystalline rocks but also extensive areas of volcanic terrain, where several carbonatite bodies have been located.

The upper part of Kilimanjaro was mapped by the Sheffield University Kilimanjaro Expedition which was partly financed by funds from the C.D. & W. Scheme as well as from the Tanganyika Government. The expedition came to Tanganyika under the auspices of the Geological Survey, and was staffed to some extent by members of the Department. The other principal project carried out jointly with a university party concerned the visit of Drs. Sutton and Watson of the Imperial College, London, to map metamorphic rocks near Lake Tanganyika. Valuable contributions to geological knowledge were made in both these investigations, and during the last decade the large amount of work on the Basement and other crystalline rocks has led to a better understanding of their nature and metamorphic histories. Special attention has been paid to structural features. Particular studies have, for example, clarified the succession of metamorphic events in south-west Tanganyika and have increased our knowledge of the mica-pegmatites which are widespread and of some economic importance.

The considerable work carried out in the coalfields and in other Karroo areas has led to an increased knowledge of the basins of deposition and the structural factors involved. Attention has been paid in the Karroo and younger sediments to the collection of fossil material, and a considerable amount of new palaeontological and palaeo-botanical data has accumulated. Favourable progress has also been made in igneous petrology, ranging from work on the intrusives associated principally with the ancient rocks to the study of the Tertiary and Recent volcanic rocks whose distribution is widespread. Doleritic and ultrabasic rocks, including kimberlites, have received considerable attention. Special mention must, however, be made of the Department's work in the field of carbonatites, in which a good start was made in 1952. Intensive investigations are still in progress. Credit for the carbonatite investigations must be shared with the various sections of the Colonial Geological Surveys' organisation in London whose technical assistance and constant encouragement, especially in the initial stages, is gratefully acknowledged. Related work on the mineral dressing problems involved in the treatment of pyrochlore-bearing ores from carbonatite bodies has received

considerable attention, and a large measure of success has been achieved in the Departmental laboratory. A provisional specification has been lodged at the Patent Office (No. 30910/55) regarding the separation of pyrochlore from calcite, apatite and silica.

Mineral exploration has been one of the main functions of the Department—not least over the past ten years—and long-range tasks, like routine geological mapping, have been subject to frequent interruptions on account of the increase in the number of mineral occurrences requiring examination and the growing need for geological advice in an expanding range of activities connected with the economic development of the Territory. It is hoped that the formation and strengthening of a Mineral Exploration organisation within the Department may prevent, or at least lessen, the withdrawal of geologists from field mapping for the performance of other tasks. Although it has participated in a large number of investigations covering a wide range of minerals, the major achievements of the Department in this field are probably those concerned with the coal and iron deposits in the south-west and the pyrochlore-bearing carbonatites in various parts of the Territory.

The earlier work of the Geological Survey attracted the Colonial Development Corporation to participate and co-operate in the detailed exploration of the coal resources of the Territory. In return, rights over practically all the coal deposits were assigned to them by the Government. Following on the Department's work, the Corporation carried out an intensive programme in the Ruhuhu depression and succeeded in proving large reserves of good-quality coal. The Corporation is now engaged in more detailed investigation of the Songwe-Kiwira coalfield at the northern end of Lake Nyasa, which will eventually conclude the programme of coalfield exploration initiated by the Department in 1947.

Considerable interest has been shown in the titaniferous magnetite deposits lying immediately to the north of the Ruhuhu coalfields in Njombe District, as a result of the demonstration of their potential importance by the Geological Survey immediately before World War II. The Colonial Development Corporation were granted rights over the deposits, but exploration work has been intermittent; the Mineral Exploration Team of the Department is at present engaged in a drilling programme to determine tonnage. Previous work includes the successful smelting of samples of the ore. The potentialities of this part of Tanganyika are clear, but are dependent for exploitation on the provision of rail communication.

The Department has been well to the fore in the field of carbonatite investigations and, during the past four years, seven carbonatites and several allied bodies have been located. One of these, at Panda Hill, west of Mbeya in the south-west, was investigated to an advanced stage by surface work and diamond drilling, and has now been taken over by the Billiton Company in association with the Colonial Development Corporation for further exploration prior to development. The rights over four of the other carbonatites have been given to mining companies of international repute, and active exploration is in progress.

A systematic search for materials suitable for the manufacture of cement has been in progress for several years. The most promising locality is near Dar es Salaam, where a detailed investigation, supported by diamond drilling, has indicated adequate reserves of materials. Government is now receiving proposals by various interested companies for the further exploration and development of the deposit. Other explorations, with less notable but still important results, have been concerned with mica and vermiculite, graphite, gypsum, tin and wolfram, gold, copper, kyanite, magnesite, meerschaum, garnet, kaolin and clays. Salt investigations have been carried out in various places, and examinations have frequently been made of limestone occurrences suitable for small local needs.

Local industrial and economic development has caused greatly increasing demands to be made on

the Geological Survey, chiefly in respect of engineering geology. Water-supply investigations in the Territory are the responsibility of the Water Development and Irrigation Department, the geological section of which comprises an engineering geologist and two geologist/geophysicists based at Dodoma, close to the Geological Survey Headquarters whose facilities are freely available to the Water Department's staff. The Geological Survey has, however, undertaken the investigation of some of the larger water-supply projects, of which that at Dodoma is the most notable. The required surveys and drilling were carried out to examine the sub-surface conditions of a dam site and the geohydrology of the associated catchment area, but an alternative scheme also investigated by the Geological Survey, which utilises a large supply of underground water located north of Dodoma, was ultimately chosen. Many dam sites have been investigated and drilled in various parts of the Territory, and there has been a considerable increase in this work in the past few years largely on account of the various irrigation projects which are in progress, particularly the survey of the Rufiji Basin by the Tanganyika Agricultural Corporation which is sponsored by the Food and Agricultural Organisation of U.N.O. Various surveys, including the examination of dam and tunnel sites, have been carried out in connection with hydro-electric power. Surveys for road metal have been made in most parts of the Territory served by main communications, and occasionally road surveys have been made. Advice is frequently sought and given on quarry sites for building stone and aggregate.

A major aspect of the work of the Department, largely handled by the laboratory section, is the giving of advice to the general public and to many large mining and commercial companies on a wide variety of subjects. Large numbers of identifications, tests, and analyses are carried out on material submitted, and an assay service is available to the mining public.

In addition to the following publications of the Department, there are its Annual Reports, and Records, which are an annual work started in 1951. Some hundreds of typescript reports are also available, copies of some of which may be obtained on request.

Publications:

Memoir Summary of the Geology of Tanganyika. Part I. Introduction and Stratigraphy, by A. M. Quennell, A. C. M. McKinlay and W. G. Aitken. (In *preparation*.)

Bulletin No. 16 The Mineral Resources of Tanganyika Territory, by Sir E. O. Teale and F. Oates, 1947.

Bulletin No. 18 Geology of North, West and Central Njombe Districts, Southern Highlands Province, by G. M. Stockley, 1948.

Bulletin No. 19 Outline of the Geology of Ufipa and Ubende, by R. B. McConnell, 1950.

Bulletin No. 20 The Geology and Mineral Resources of Tanganyika Territory, by G. M. Stockley, 1948.

Bulletin No. 21 The Geology of the Ketewaka-Mchuchuma Coalfield, Njombe District, by A. C. M. McKinlay, 1954.

Bulletin No. 22 A Study of the Metamorphic Rocks of Karema and Kungwe Bay, Western Tanganyika, by J. Sutton, J. Watson and T. C. James, 1954.

Bulletin No. 23 Notes for Mica Prospectors in Tanganyika, by D. N. Sampson, 1954.

Bulletin No. 24 The Soils of Mbozi, Mbeya District, by A. M. M. Spurr, 1955.

Bulletin No. 25 The Geology of the Galula Coalfield, Mbeya District, by J. Spence, 1954.

Bulletin No. 26 The Geology and Ecology of the Nachingwea Region, Southern Province, by D. R. Grantham, 1955. „ No. 27 The Geology of the Songwe-Kiwira Coalfield, Rungwe District, by D. A. Harkin, 1955.

Bulletin No. 28 The Geology of Part of the Eastern Province of Tanganyika, by J. Spence.

Short Paper No. 26 Wartime Manufacture of Abrasives in Tanganyika Territory, by F. Oates and J. H. Harris, 1950.

Short Paper No. 27 The Geology of the Namwele-Mkomolo Coalfield, Ufipa District, by R. B. McConnell, 1947.

Short Paper No. 28 The Geology of the Mhukuru Coalfield, Songea District, by D. A. Harkin, 1953.

Short Paper No. 29 The Geology of the Country Around Mwanza Gulf, by G. M. Stockley, 1947.

Short Paper No. 30 The Mpanda Mineral Field of Western Tanganyika, by J. de la Vallee Poussin and R. B. McConnell, 1950.

Report No. 1 The Tunduru-Ruvuma Area of the Southern Province: A Reconnaissance of the Geology, Soils, Vegetation and Hydro-electric Potential, by D. R. Grantham, 1955.

Papers written by members of the Department, but published elsewhere, include the following:

Formation of Epidote in Tanganyika, by J. R. Harpum, 1954. *Bull. geol. Soc. Amer.*, Vol. 65, No 11, pp. 1075-1092.

The Sarabwe Lava Flow, Kiejo, Rungwe District, by D. A. Harkin, 1955. *Tanganyika Notes and Records*, No. 40, pp. 20-23.

Minerals and Industry in Tanganyika, by C. B. Bisset, 1955. *Colon. Geol. min. Resour.*, Vol. 5, No. 1, pp. 40-50.

Pyrochlore (Columbium) Carbonatite, Southern Tanganyika, by A. P. Fawley and T. C. James, 1955. *Econ. Geol.*, Vol. 50, No. 6, pp. 571-585.

Bibliography of the Tanganyika Karroo, by J. Spence, 1954. *C.R. 19^o Congr. geol. int.*, Fasc. 21, pp. 103-109.

Some Problems of pre-Karoo Geology in Tanganyika, by J. R. Harpum, 1954. *C.R. 19^e Congr. geol. int.*, Fasc. 20, pp. 209-239.

The Karroo System of Tanganyika, by D. A. Harkin, A. C. M. McKinlay and J. Spence, 1954. *C.R. 19^e Gongs. geol. int.*, Fasc. 21, pp. 93-101.

The Geomorphology of the Nzega Area of Tanganyika, with special reference to the Formation of Granite Tors, by J. R. F. Handley, 1954. *C.R. 19^e Congr. geol. int.*, Fasc. 21, pp. 201-210.

A Basis of Classification of the Soils of Areas of Composite Topography in Central Africa with special reference to the Soils of the Southern Highlands of Tanganyika Territory, by A. M. M. Spurr, 1956. *Inter-Aft. Soils Conf. Leopoldville*, 1954, Vol. 1, pp. 175-191.

Recent Investigations in pre-Karoo Geology in Tanganyika, by J. R. Harpum, 1955. *Proc. Ass. Serv. geol. Afr., Reunion de Nairobi*, 1954, pp. 165-215.

Mineral occurrences

Carbonatite

Cement and cement materials

Clay

Coal

Copper and copper ores

Corundum

Diamonds

Garnet

Gold

Graphite

Gypsum

Iron and iron ores

Kaolin

Kimberlite

Kyanite

Limestone

Magnesite

Meerschaum

Mica

Oil

Pyrochlore

Road metal

Salt

Tin and tin ores

Titaniferous magnetite

Tungsten and tungsten ores

Vermiculite

Water supply

Oil

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