

Report No. 1



MINISTRY OF ENVIRONMENT AND NATURAL RESOURCES

MINES AND GEOLOGICAL DEPARTMENT

GEOLOGICAL SURVEY
OF
LOLDAIKA-NGARE NDARA AREA

by

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First print 1933
Reprint 2007

THE LOLDAIKA-NGARE
NDARE AREA

Introduction

In publishing this report, and those others which, it is hoped, will follow, the object is to bring to the notice of residents in Kenya the potential outlets for useful and profitable endeavour that lie in the exploitation of Kenya's mineral resources.

The reports will be written and arranged in as simple a manner as possible, and geological, mining and other technical expressions will be used only when the necessary explanation or definition is given. As time goes on, the need for these explanations will pass, and a more ambitious form of report, or bulletin, will be attempted.

In the meantime, however, these preliminary reports will be written essentially for "home consumption," and it is hoped that they will serve their purpose by indicating to those not versed in geology and mining those areas which are suitable for prospecting, not only for the metals but also for those other materials used for the more utilitarian purposes of life.

E. B. HOSKING,
Acting Commissioner of Mines.

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PURPOSE AND AREA OF INVESTIGATION.

The investigation, subject of this report, was made following the reports received by Government concerning the supposed discovery of gold and radium north of the Loldaika Hills.

The area is shown on the Baringo and Meru Sheets Nos. North A. 37 and North A. 37 and is enclosed approximately by longitude $36^{\circ} 50'$ to $37^{\circ} 40'$ and latitude 0° to $0^{\circ} 40'$ N.

It was found that a number of claims had been pegged on the Farm No. 2738, below the junction of the Nanyuki and Uaso Nyiro Rivers, and in the vicinity of Tura and Ol Loromade Hills. Others, it was stated, had been pegged to the west of the Ngare Ndare, some twenty-five miles to the east of the Loldaika range.

PHYSICAL CONDITIONS.

Relief.

From the plains of Kenya Mountain, the ground slopes gently to the north, losing six to seven hundred feet of height between Nanyuki and the rolling country between Ol Asera Muru and Ol Loromade. Outstanding prominences in the north are Ol Loromade, 6,475 ft. above sea level, and Mukogodo, North and South, 6,623 ft. and 6,980 ft. respectively. From a general level of 5,600 ft. there is then a sharp descent to the Uaso Nyiro Plains, which lie at about 3,600 ft. above sea level. Towards the south-west corner of the area, the Loldaika range runs north and south for ten miles at an average height of 6,000 ft., with the highest peak reaching 7,330 ft.

A region of high ground forms the central part of the area, with a fairly sharp descent to the east and down to the Ngare Ndare. From the Ngare Ndare eastwards, the country appears to show a surface of rolling hills, but actually is deeply dissected by a series of deep valleys running to the north. The Lengishu group of hills, which rise 2,000 ft. above the surrounding country, form an outstanding feature.

Drainage.

The area is drained by three rivers, which have their sources in the heights of Mount Kenya; they are the Nanyuki, which travels north-west to join the Uaso Nyiro some thirty miles north of Nanyuki Township; the Ngare Ndare, running north and south, some forty miles to the east; and the Marania, another sixteen miles to the east, which becomes the Ngare Siolo as it flows northwards.

In addition to these, there are a number of "dry" water-courses, which may occasionally be in flood during the heavy rains. The largest of these is one which runs northwards from the Loldaika range and drops to the Uaso Nyiro plain to the east of Ol Loromade. These "dry" courses are scoured to bedrock, some being carved in solid rock with banks five to fifteen feet high; but accumulations of sand occur over long stretches, and these hold water for some time and it may be obtained by digging.

Topography.

The area shows an interesting example of "topographic unconformity," which is a term applied to land surfaces consisting of two parts which are out of adjustment with one another. The divides are an old land surface which has reached a mature stage of river-erosion; the valleys are broad; there is no sharp dividing line between hills and valleys; water-worn pebbles are found scattered over the rises; and the only outstanding features are small residual hills or "tors," which have resisted erosion to a slightly greater degree than the surrounding country.

Subsidence of the ground to the north has resulted in rejuvenation of the river system, and the streams are now cutting back deeply, heading through narrow valleys worn down to bedrock. They follow definite lines of weakness (tectonic lines), which correspond to: (1) the foliation of the rocks, which is approximately north and south; (2) a system of jointing running north-west to south-east, and an important direction in the structure of East Africa; and (3) a minor system of jointing at right angles to the foliation of the rocks and therefore running east and west. If the sheets are consulted, it will be seen that nearly every topographic feature, positive (hills) or negative (valleys), has been modified by one or more of these directions.

GEOLOGIC CONDITIONS.

General.

The rocks in the southern part of the area are mostly of volcanic origin and, as they have no immediate bearing on the purpose of this paper, will not be described.

All the exposures to the north are of the older rocks for which the late Professor Gregory suggested the name Eozoic.* They are composed of various gneisses, granulites and schists.

Into this old system of rocks were intruded at great depth different types of igneous rocks, such as granite and diorite; they also have developed a "gneissose" structure, which means that bands of mineral aggregates have been formed within them, giving the rocks a foliated appearance.† Gneisses may be formed from rocks other than igneous rocks, so that a distinction is made between Orthogneiss (formed from an igneous rock) and Paragneiss (formed from a sedimentary rock). The latter type, although to be found in the area, will not be discussed, but the Orthogneiss will be considered because it is the country-rock on which the claims have been pegged.

Orthogneisses fall into two divisions—primary and secondary; for the gneissose structure can be impressed on an igneous rock before it has completely crystallized from a fluid state, as well as acquired by being subjected to enormous pressures at great depths long after its consolidation. The first type is primary, the other secondary, orthogneiss, and it is important to distinguish one from the other.

Local.

In the vicinity of Ol Loromade, the rock is a primary orthogneiss, and the field evidence for this is: (a) dykes of pegmatite essentially of the same composition of the gneiss cut the gneissose structure undisturbed; (b) there is no sharp contact between the acidic (light-coloured) and basic (dark-coloured) portions of the gneiss; (c) distinct bands of widely different composition show no evidence of shearing; and (d) there are flow-like curves of the banding that are not due to folding.

* For a general description of these rocks, the reader is referred to *The Rift Valleys and Geology of East Africa*, J. W. Gregory, D.Sc., F.R.S. (Seeley Service and Co., 1921).

† "Schistose" structure differs from gneissose structure in that the effect of foliation is produced by the development in bands of a single mineral species and not by an aggregate of minerals.

(a) in the above paragraph deals with pegmatite dykes. These are formed by the crystallization of part of the "residual juices" which remain after a granitic rock has crystallized from its magma, or molten fluid; they are composed essentially of quartz and felspar. The quartz is usually in excess of the felspar and as the content of felspar constituents is used up, the quartz fraction of the dyke increases until only quartz remains; and it is possible in areas where pegmatite dykes occur, to find one where it verges, by a decreasing quantity of felspar, into what appears to be an ordinary quartz vein. In short, the pegmatite dykes are on the border line of true igneous dykes and hydrothermal veins, and, in the field, it may be difficult to distinguish one from the other: the most important criteria are mineral composition and the relative proportions of the minerals.

There are certain accessory minerals found in pegmatites that are very characteristic, but whose absence or presence does not alter the character of the rock. A list of a few of those which are of economic value is given below:—

*Mica

Cassiterite (in stone)

Columbite

Tantalite

} Ores of tantalum.

*Monazite

Thorite

} Ores of thorium, containing traces of radium.

*Zircon

Apatite

*Beryl (Emerald)

Tourmaline

Topaz

Sapphire

Ruby.

Being so closely allied to the ordinary quartz vein, it is not unusual to find pegmatite dykes carrying a trace of those metals more typically associated with quartz veins, and one of these, of course, is gold.

* Identified under hand lens at Ol Loromade; microscopic examination may reveal others.

PROSPECTS AT OL LOROMADE AND TURA.

It is this type of rock-occurrence, then, which has been pegged at Tura and Ol Loromade, and, although I am informed that one "vein" has yielded an assay showing 2 dwt. gold, I am not of the opinion that a gold occurrence of any importance will be found on the existing claims. With regard to the other minerals shown in the list above, mica, monazite, zircon and beryl have been identified in the field, and further examination under the microscope of the concentrates which were collected may reveal the presence of some of the others. None of them is in sufficient quantity to be of any value, but that is not to say that such might not be found with further prospecting.

Again, diligent prospecting to the east and west of the Ol Loromade gneiss may reveal the fact that this old igneous mass, with its numerous associated pegmatites, had its aftermath of normal quartz veins, for it is away from the parent mass rather than within it that these would be more likely to be found. The Loldaika Range presents likely ground lying to the east of the principal line of gneiss.

PROSPECTS OF NGARE NDARE AREA.

The old gneisses and schists spread east to this area, and are abundantly veined with quartz. No gold was found by the writer in the course of his own examination, but many of the prospectors aver that samples of "float" from west of the Ngare Ndare have been proved by assay to carry gold.

As indicated previously, there appears to be no reason why this should not be the case, and further prospection may lead to a useful discovery being made.

Eozoic rocks outcrop to the north of the Ngare Ndare-Isiolo Road, up to the Marania River; they consist of hornblende-, biotite-, quartz-, and calc-schists. A few miles to the north-east of the Lewa Swamp, a small amount of development work has been undertaken on a discovery of tremolite-asbestos. This variety of asbestos is not so valuable as the crysotile, or serpentine-asbestos, although it is more resistant to the action of acids or sea-water. During the present depressed state of the asbestos industry, it is doubtful if further exploration is justified, but with a return to more normal conditions further work might well be undertaken.