

No. 17160.

SUBJECT

C0533/410

Geological Survey

Assistance from Colonial Development Fund

Previous

16172/30.

Subsequent

18046/32 (Liaison
*ppt)

Enclosed application for assistance from
C.S.F. for establishment of a Geological Survey.
Sup. to Mr. Smith will forward copies of Dr. Wayland's report on a
geological reconnaissance of S. Kavironda.

This application would seem to present a
difficulty in that the local authorities are
unable to give an estimate of the approximate date
of the completion of the proposed survey. It
seems highly unlikely that the C.S.F. would
~~approve~~ approve of a first annual grant of £2,500
for an indefinite period although sympathetic with
the proposed undertaking. I suggest an informal talk
with Mr. Freestone, before the application is
submitted in its present form.

G.A. Joy 1/5/51.

I must apologise for delaying this. The
Geological papers have until recently been in
circulation.

The most recent geological survey of Kenya has
been done by the Geological Survey of Kenya
in 1933. In 1933 a number of correspondence
regarding the identical mining legislation which has
recently been passed by Kenya, Uganda and Tanganyika,
the Imperial Institute advisory Committee on Mineral
Resources addressed the Secretary of State on the
subject, who has on 19/3/51 below their
recommendation in relation to the present application.
Since then when the Secretary of State has
continued to press the Government in something about
a geological survey.

The subject seems an extremely advisable for
assistance from the C.S.F., but I entirely agree
with Mr. Joy that it is impossible to ask the

Enclosed application for assistance from
C.I.B. for establishment of a Geological Survey.

Dr. H. H. Smith will forward copies of Dr. Hayden's report on a
geological reconnaissance of S. Kavironic.

This application would seem to present a
difficulty in that the local authorities are
unable to give an estimate of the approximate date
of the completion of the proposed survey. It
seems most unlikely that the C.I.B. would
approve of a three annual grant of 25,000
for an indefinite period although sympathetic with
the proposed undertaking, I suggest an informal talk
with Dr. F. F. F. before the application is
submitted in its present form.

H. A. J. 1/3/51.

I must apologise for delaying this. The
Hungarian report have until recently been in
circulation.

The next day a preliminary survey of large has
been done. In 1951 another set of correspondence
regarding the identical mining legislation which has
recently been passed by Hungary, Uganda and Paraguay.
The Imperial Institute Advisory Committee on Mineral
Resources attended the Secretary of State on 1
subject, the 14.5 on 1950/51 below; their
recommendation is given in the present application
since then since the Secretary of State has
continued to press the Government to determine the
a geological survey.

The subject seems an extremely suitable
assistance from the C.I.B., but I entirely agree
with Mr. J. that it is impossible to ask the

A

Committee for a contribution of £2,500 a year for an indefinite number of years. The work and staff are to be such that when the time comes for the institution of a combined service (i.e., when, if ever, Cleaver (Linn) comes about), the work will not be wasted and the staff could be absorbed into the combined service. I would suggest that the Committee be asked to recommend the following:-

a grant of say, £2,500 in the financial year 1933-34 (it is unlikely that more than this would be spent before the 1st April 1934) to enable a systematic survey of the geology of the Colony to be started at once, and, unless a combined service is then being set up, the present position would have to be reviewed.

It is suggested that the survey should be carried out over a period of 5 years, but it is possible to put long intervals from the one year to the next, if necessary.

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Footnote
20/3/31

on the application. The next meeting of the Committee is June 24th, closing day for applications June 10th.

Particular
25.3.31

(A) 2 years. The 1934 is to include
 before for more than say 2 years.
 (B) I have ~~thought~~ the 1934 would look
 at the scheme on this basis. They
 would want an estimate that they
 would complete the scheme in the
 financial year of the
 Ministry. If they say that
 they may not put the whole out for
 an initial limited period; but if
 there is a ~~chance~~ chance that
 they will have the whole scheme
 done as a administration expenditure
 at the end of the 1st survey
 committee, I suggest that they should
 should see this. He may wish
 to see the Minutes of the Geological
 Section of the Colonial Survey Committee
 and possibly the blessing for the
 scheme, before it goes forward to
 the 1934.
 M. S. J. 190

Unless the C.D.A. was prepared to
reimburse a grant against the
whole cost I had had some hopes
to find the money for the balance.
The next thing which I considered
as that rock.

H. Miller

2/6/31

Mr. G. Allen
Any advice or suggestions
which you may have, would
be welcome.

I should much like to see
a geological survey
started in Kenya at
least - and should much
like to see Kenya get
a share of the C.D.A.

acc. H. Miller

2/6/31

Mr. Parkinson,

I am sorry that this has been delayed
by pressure of work.

The Kenya Government are apparently
beginning to secure something of the value of a
geological survey, though they have not yet
realized that the value of minerals to a
territory is, generally, in inverse order of
their

their expanse. The most important of
all minerals to the prosperity of any country is
water; next, minerals used in agriculture, food
and constructions, such as limestone, fertilizers,
salt, building and road materials; then fuel, and
a long way down the list, metallic ores.

The organization proposed is curious.
To have two young geologists at equal salaries; and
a topographer. There must be an experienced man
to run the show, and a topographer is unnecessary
in the early stages. I would advise Kenya to begin
by modelling on the excellent example of Nyasaland,
which has been highly successful. I would estimate

Capital	£200.
Director	1000.
First Geologist	600-800.
[Native clerk, messenger etc.,	100.]
Passages	150.
Transport and travelling	600.
Assaying etc.	50.
Contingencies	100.
	£3000

For second year delete capital and passages, but
add £100 for equipment, assays, and library, making
£2500 - I assume that headquarters and necessary
furniture will be provided.

The best man for Kenya would be Dixey
of Nyasaland, whose work has pleased and impressed
the local unofficials. But he certainly would not
go under £1200.

as to (4) there is no date of completion.

The

You see X
is not what
I had in mind
I should like
to see Kenya
get a share of
the C.D.A.
I should like
to see Kenya
get a share of
the C.D.A.
I should like
to see Kenya
get a share of
the C.D.A.

see

The Geological Survey of Britain has been in existence for nearly 90 years and is still going strong. Kenya is a good deal bigger. The real point of a Geological Survey, as distinct from the rather futile expeditions sometimes tried, is its permanence and the consequent steady accumulation and record of knowledge, embodied largely in maps, and available to Government and the public. I think that the use of the word "established" in paragraph 3 of the despatch and the reference to Uganda show that Sir Byrne contemplates a permanent department and, if given a start for 3 or 5 years, is prepared to undertake to carry on.

I suggest that in the first place Sir S. Lockett might be consulted. If he considers that there is any chance of the Colonial Development Advisory Committee agreeing to the application, I could get it examined by the Survey Committee, though not in time for the Colonial Development Advisory Committee meeting on 2nd September. Or the scheme could be put forward on 2nd September with a promise so to refer it before putting it into force.

L. J. Campbell

This seems to me an advisable subject for assistance from the

the point of view of the subject what is to be done
11/11

C.D.F. But if the C.D.F. is going to take the line 5 that the C.D.F. must put up 50% or at any rate a substantial part of the cost, then we can finish with the thing at once with Kenya but as they have no money to spare, they cannot have any C.D.F. assistance. (To him that shall shall be given...)

The Kenya part of the office accommodation, technical assistance, a very small sum; but that is all.

What, I think, we should need is a free grant for 3 years or get the money properly started, the personnel being engaged on the usual 30 months' agreement for the first year, say, £4000, or, as Sir Green suggests, for the next 2 years, say, £2000. What you see here

is sound in basic
Sketch, as
Mr. Green suggests,
please?
acc. Parkman
14.7.31

I am afraid there is very little chance of getting aid here. The difficulties are:-

(i) the Comm: may take the view that this is normal administrative expenditure. It would be difficult to contest that opinion. A geological dept: is in fact part of the normal administrative equipment of any well-run Government.
(ii) the liability continues indefinitely; and it may be--probably will be--that the value of much of the work done in, say, three years will depend on that work being carried to its logical conclusion. The Comm: will certainly not accept a continuing liability; and it will probably insist--from the point of view mentioned above--on guarantees being given that the work will in fact be continued after the initial period (if it agrees to provide the funds for the initial period) as an essential condition of giving aid at all.

It is difficult to see how any satisfactory guarantees could be given as to this, as things now stand in Kenya.

(iii) I think the Comm: are disposed to be reasonably liberal, in present circumstances, as regards ~~exhibit~~ contributions from the Govt.: See para: 16 of their latest report as to their general policy in such matters. But it will be appreciated that the impossibility of getting the local Govt: to aid in the estab-

*... the ...
... the ...
... the ...
... the ...*

Yes, dear!

lishment of a Geo: Survey Dept: at present will have an effect on the Comm's decision.
4. In the light of these considerations, it seems to me that this proposal is almost certain to be rejected. As there is a formal application, I think it must--under our standing instructions--be forwarded to the Comm: There would then be no need to consult Sir Neil Skegitt unofficially. If it is still desired that ~~that~~ should be done, this consultation usually takes place through Mr. Freeston.

5. One never knows what will happen, of course; and I would send on the application, amended as suggested. I think Mr. Green's criticism is sound and valid. At the meeting, we would have to say that, if initial assistance were given, Kenya would carry on, if that were ~~not~~ financially possible. I don't think we can in fact say more, and I feel pretty sure that that will not be enough. I'd put the initial period at three years, as suggested.

That is, I'm afraid, the best we can do, and I am practically certain it will not lead to the acceptance of this proposal.

The 19th: July 1961.

[Signature]

*In C. [unclear]
... of the ...
... the ...
... the ...*

appropriate reference
body (the Ho Green's
minutes) for examination
before it is actually
embarked upon?

Alfred Buxton
15.7.31

Yes. I think it that the Govt's
scheme must go to the Committee
but we can say that we prefer
the Green's & do not lead off other
reference to the Geological Survey
C^o

We read it as a logic would
say that the want of a Geological
Survey in Hong Kong has been
known for some time, & that,
now that the Govt has
recommended it, it is established
in spite that the C.D.A.C. will
help in spite of the bad times
which prevent the Colony from
bearing any substantial part
of the expense in the initial
stages

15.08
15.7.31

100 Parkina

* 1a
16

(attach 2 of * memoranda - one covering the
officer - one financial)

Gardiner
24.7.31

~~Handwritten signature~~
DESTROYED UNDER STATUTE

C.D.A.C. 823

9/11
9 Aug 31

3 C.D.A.C. _____ 14 September
Consider provision of Geological Survey to be
a commonplace of administration in Hong Kong and not
warrantable to recommend any assistance for fund

This was not wholly unexpected
I write to the Gov. ^(copy 2 - by the former) _(copy 1 - by the former) saying
that his application was duly submitted to the
Com. but that [the Govt. would like to think
that] the Committee felt themselves unable to
recommend the grant of any assistance from
the C.D.A.C. So as to say that the reasons
which influenced the Com. in their decision
were ...

omit
C.D.A.C.

sent 2 papers 2 & 3 of 5

Subscribed 9/11

J.P. Cassin

Handwritten signature
9/11
C.D.A.C.

5 To CDAC. (w/c 4) by hand. 23 SEP 1931

Dep. Governor — 571 — 28 September, 1931

Enquires whether it is now possible to give a decision in regard to No. 1.

The Wayland Report has now been printed & copies will be transmitted.

STROYED UNDER STATUTE

Patry - this has cost 4

J. G. ...
23.9.31

10 copies to
Library

7 of Col. Scott. (Committee) — 18/9/31

Re 12 copies of Report by
the Lt. Col. Wayland "Report on a
Geological Reconnaissance of Southern
Cariondo."

h-32

This is too technical for me
but the general conclusion is that
the area is worthy of considerably
further study, & that it contains
gold - which we already know - &
tin, which I at any rate did
not know. ? send 6 copies to I.I. 12.
with copies

J. G. ...
12.1.32

It may be presumed that distribution to the
various sections has been effected from Nairobi

J. G. ...
12/1

TO

nothing much more than a note-
book. There is enough to show that the
geology is interesting and not unprofitable
from an economic point of view. I do
not know who paid for this traverse,
but it is not worth much for Kenya. Mr
Woolford, quite rightly, puts in the whole of
his observations, but a Survey would have
summarized them in 5 pages, instead of 56.

J. H. M. M. M.

2. 2. 32

Put 5

117 Allen

2/2

stave

COLONY AND PROTECTORATE OF KENYA

REPORT
ON A
Geological Reconnaissance
OF
Southern Kavirondo

BY
E. J. WAYLAND, A.R.C.Sc., M.I.M.M., F.G.S.
Director, Geological Survey, Uganda

WITH APPENDICES ON THE PETROLOGY AND ASSAYING

BY
A. W. GROVES, Ph.D., M.Sc., D.I.C.
Assistant Chemist and Petrologist, Geological Survey, Uganda

Price 8/6D

Report on a Geological Reconnaissance of Southern Kavirondo.

This Report is made up as follows:—

1. GENERAL.
2. NOTES ON INVESTIGATIONS.
3. RECOMMENDATIONS.

APPENDIX 1.—LIST OF SPECIMENS COLLECTED.

APPENDIX 2.—FIRE ASSAY RESULTS.

APPENDIX 3.—PETROLOGY.

1.—GENERAL.

The production of the following report has been long delayed. This is due to the desire to render it reasonably complete, but difficulty in doing so rapidly has been introduced by pressure of work, and shortage of staff.

A number of determinative tests, seventeen fire assays, and about 120 petrological investigations have been undertaken in this office, and Dr. Groves, who is mainly responsible for this work, has applied the means of mineral separation by the employment of heavy liquids—a process with which his name is now closely associated—to some samples of the Kisii Sandstone and quartzite, which I collected, with the highly interesting result that they are found to carry a little tin.

The work in Southern Kavirondo has proved the area to be an extremely interesting and important one geologically, and one in which conditions conducive to mineralization have obtained more than once. How far mineralization of economic significance has taken place is another matter, and one as yet not fully determined.

Igneous injection and volcanic extrusion have occurred repeatedly in this area. First in Archaean (Crystalline Complex) time, then in post-Archaean pre-Karagwe-Ankolean times, Karagwe-Ankolean times, Bukoba (i.e. Kisii Sandstone) times, probably in Karroo days, perhaps in Cretaceous times, and certainly in several of the Tertiary epochs. Associated with the larger, older and more acid intrusions, are offshoots,

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or apophyses, such as quartz-dykes and hydrothermal deposits, many of which show mineralization in the form of pyrites; few, however, have been proved to yield useful minerals at the surface. They may or may not carry gold or some other valuable material at depth.

It has not proved to go into the details of the geology in this report. It will be sufficient to say the following provisional sequence was established:—

SEDIMENTARY DEPOSITS.	IGNEOUS
3. RECENT: Recent-day beaches and dunes, etc.	Simbi Crater.
6. PLEISTOCENE: High-level terrace gravels, ancient beaches, red earth, etc., and the soft sandstones lying between Kerato and those described by Oswald in the Phoenix [?].	Volcanics of these periods are in all probability represented but they cannot be sorted out without detailed work.
1. PLEISTOCENE: The typical sediments of Karungu?	
6. MIOCENE: The well-known fossiliferous beds at Karungu (described by Oswald [?]) and those of Karungu Island and of the opposite mountain described by Woodard.	Nephelinite lavas and tuffs of Karungu.
	Volcanics of late Cretaceous to Oligocene times may well be represented, but they cannot be sorted out without detailed work.
5. Eocene (Pompeo-carboniferous?) It is not altogether probable that Karungu beds may occur, but none was seen.	Dolerite sill associated with the Kisi Sandstone.
4. EOCENE SERIES: The Kisi sandstone and associated phyllite strata.	Altered amygdaloids and deformed rhyolites, etc., apparently inter-bedded with the Kisi Sandstone. Gf granites, etc.
2. EOCENE-ANGULAN: Kisi Gf phyllites and conglomerates.	
2. PRE-KARUNGU ANGULAN-PHYLLITE COMPLEX: The Gf angulans, etc.	Wire Hill rhyolites, etc.
1. CRETACEOUS COVERING	Gf granites and amphibolites, etc.

The area is one which has suffered considerable disturbance, and faulting is common. One of the most important tectonic lines in the country is oriented approximately NW-SE. It is along this direction that a mineralized shatter-zone occurs in the south-west of the Colony and crosses over into Tanganyika Territory. Here the newer granite has intruded a porphyry belt, and the earth movements, probably associated with the intrusion, have shattered and crushed the country in a remarkable way. One of the results of this diastrophism is the metamorphism of a granite porphyry through a sheared granite porphyry (locally known as "suet-rock") to schist. In the shear-zone gold reefs occur. Another important group of sheared porphyries occurs in the Wire Hill area, and appears to have been mistaken by a previous observer for an altered sedimentary series (slates), and was given the name of the Wire Hill beds. (J. S. Coates, 1909, referred to by Oswald, loc. cit.) These rocks are dealt with in an appendix to this report.

The gold areas of South-west Kavirondo are highly interesting. The property of the Kenya Gold Mining Syndicate (see sketch plan No. 1), though not completely opened up, appears to be a valuable one, but I do not pretend to be able to quote figures from the company's assay plans. The mine is well equipped for further development. It was my good fortune to arrive just as the first mass of sponge gold (weighing about 9 lb.) was produced. The reef being worked is known as *Blackhall's*, but ore from another reef known as the *M.K. Reef*, also the property of the Kenya Gold Mining Syndicate, is dealt with on this mine. The *M.K. Reef* was being worked opencast when I saw it, while the mine is down to the 200-foot level on *Blackhall's Reef*.

A little scheelite (calcium tungstate) was noticed in the *M.K. Reef*. Siderite is also present in small quantities.

Not far from *Blackhall's Reef*, the Kisumu Prospecting Syndicate are recovering gold from the rubble on the plateau near a granite (G2) outcrop. This rubble is most unlikely-looking stuff, but I gather that it yields well.

or epiphytes, such as quartz-dykes and hydrothermal deposits, many of which show mineralization in the form of pyrites; few, however, have been proved to yield useful minerals at the surface. They may or may not carry gold or some other valuable material at depth.

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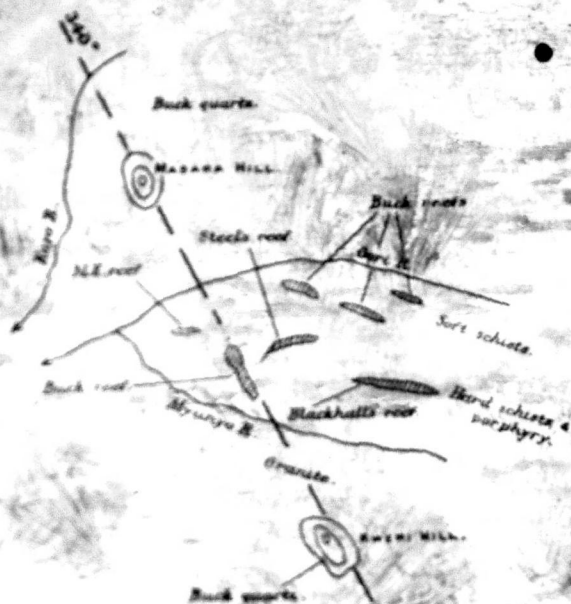
SEDIMENTARY DEPOSITS	IGNEOUS
2. Eocene. Freshly-laid beaches and clay alluvium, etc.	Sindi Center.
6. PLIOCENE. High-level terrace gravels, modern beaches, and tuffs, described in such sections lying between Londy and Kariakoo (referred to by Oswald [2]).	Volcanics of these periods are in all probability represented but they cannot be sorted out without detailed work.
7. PLEISTOCENE. The youngest alluviums at Kariakoo?	
6. MIOCENE. The well-known fresh-water beds at Kariakoo (described by Oswald [2]), and those of Kariakoo Island and of the opposite mainland (described by Woodland).	Nepheline lavas and tufts of Ruanga.
190.	Volcanics of late Cretaceous to Oligocene times may well be represented, but they cannot be sorted out without detailed work.
5. Eocene (Eocene-carboniferous?) It is not altogether probable that Kariakoo beds may occur, but there was one.	Dolerite sill associated with the Kisihi sandstone.
4. Eocene Oligocene. The Kisihi sandstone and associated phyllite strata.	Altered amygdaloids and deformed rhyolites, etc., apparently inter-bedded with the Kisihi sandstone. G ² granites, etc.
3. Eocene-Pliocene. Kisihi phyllites and conglomerates.	
2. THE KARAKOORAM AND KARIKOO-FOOT CONGLOMERATE. The Kisihi conglomerate.	Wire Hill dolerite, etc.
1. CRETACEOUS CONGLOMERATE.	G ¹ granites and amphibolites, etc.

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Sketch Plan No. 1—The District of Busia and Kisumu
Kenya

Scale is a mile to an inch. It is a general sketch of the district, e.g. not a geological map.

This sketch is a general sketch of the district in 1914, and is a geological map of it. Considering the very short time spent in going over the country—apart from the Miocene exposures at Kericho—the sketch is a very good one. The sketch is a general sketch of the district, and no attempt will be made to produce a geological map to accompany this report; the data are insufficient.

In what follows, details of the journeys undertaken will be found. These, although in note-book form, should enable anyone going over the ground to find all the outcrops referred to.

2.—NOTES ON SOME GEOLOGICAL INVESTIGATIONS IN THE SOUTHERN PARTS OF THE NYANZA PROVINCE OF KENYA COLONY.

I. OBJECT.—To obtain a general idea of the geology of the country to the south of Kisumu and north of the Kenya-Tanganyika Territory, with a view to determining whether any part of the area is worthy of a detailed survey on account of its economic possibilities.

II. PROCEDURE.—The procedure adopted was to camp at certain spots and radiate from these by car, or on foot, making preliminary geological traverses, collecting specimens, and information of geological interest.

III. NOTES.—The following are unexpended journey notes with reference to the country travelled over:—

(1) Busia to Kisumu.

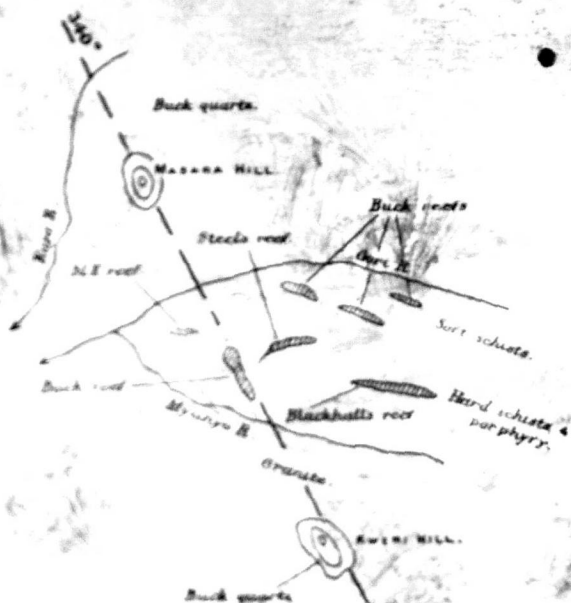
9th January, 1930. Distance, 82 miles. The country to start with is very open with but little bush.

The figures in brackets show approximate mileages from starting points, and figures in italics show the speedometer readings registered by my car from the start; these are about 3 per cent too low.

6355.0 (0) Busia.—Immediately one leaves Busia (in Uganda) and enters Kenya, the good road gives place to a bad one. The journey is over flat country, sloping very gradually towards Lake Victoria. It is diversified by wide shallow vales, each of which is occupied by a very small stream. The surface of the flat, below the soil, is formed by a blanket of laterite ironstone which masks the solid rocks beneath. This flat represents the lowest of three peninsulars, all of which are extensively developed in different parts of Uganda.

6358.2 (3.2).—Up to this point the road has been running over the flat; it now grades down into a vale.

6399.2 (4.2).—Here is a rest camp. On the flat lying to the east of the vale high-level gravels exist.



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9th January, 1930. Distance, 82 miles. The country to start with is very open with but little bush.

The figures in brackets show approximate mileages from starting points, and figures in italics show the speedometer readings registered by my car from the start; these are about a per cent too low.

0355.0 (0) Busia—Immediately one leaves Busia (in Uganda) and enters Kenya, the good road gives place to a bad one. The journey is over flat country, sloping very gradually towards Lake Victoria. It is diversified by wide shallow vales, each of which is occupied by a very small stream. The surface of the flat, below the soil, is formed by a blanket of lateritic ironstones which masks the solid rocks beneath. This flat represents the lowest of three peninsulas, all of which are extensively developed in different parts of Uganda.

6358.2 (3.2).—Up to this point the road has been running over the flat; it now grades down into a vale.

6359.2 (4.2).—Here is a rest camp. On the flat lying to the east of the vale high-level gravels exist.

6366.4 (11.5).—Descending again into another vale.

6367.5 (12.5).—Namambi River flowing south. On left bank there is a granery on the left of the road and a duka on the right of it.

6368.2 (12.8).—The second of two small streams passed since the Namambi (all the streams flow directly or indirectly into Lake Victoria).

6368.6 (14.0).—The soil which has been essentially red and sandy hitherto, now becomes sandy. It is here indicative of the presence of granitic rocks beneath the surface.

6369.7 (14.8).—Telegraph line crosses the road along the crest of a long spur. Granite tors are seen right and left. Another vale lies immediately ahead.

6372.3 (16.3).—Soil neither wholly lateritic nor wholly granitic, but now becomes lateritic, however. Here the road to Mumbisi (strongly recommended) is joined from the north by one from Malakisi (thirty-three miles).

6372.3 (16.3).—On the way down the side of another vale and a shallow gully west of the stream, the country rock is granitic, exposed in banks by the road. It consists of extremely coarse schists or gneisses, apparently the same rock as that which caps the mountains (late Cretaceous or early Tertiary) west of Busha (E. Uganda). Associated with this is a schist in the outcrop is a somewhat metamorphosed igneous granite (specimen 1000), and what appears to be a metamorphosed ammonite sediment (specimen 1007). The schists are intersected by veins of blue-grey quartz with a slightly wavy appearance, and these were some rather inviting-looking granite gneisses. This vale might with advantage be investigated by prospect pits or shallow boreholes, should a prospect opportunity arise. This dip on the schists is very steep, certainly through sections—very steep southerly.

6372.3 (16.3).—Just before Mile 62 is a bridge across the Malakisi River, and some sections are displayed in its banks. Phyllites are seen dipping very steeply at S. 10°-20° E. (specimen 1008). They are intersected by a very fine-grained doleritic dyke (specimen 1009). Soil is here, with little or no granite in the immediate foreground, and the solid rock forming a mountain to the east of the road.

6372.3 (16.3).—Doleritic outcrop crosses the road, which is here particularly bad.

6380.8 (25.5).—Quartz dykes occur here. They are probably of no economic importance.

6381.5 (26.5).—Here the road to Mumbisi (nine miles) is joined by that from Si (forty-two miles).

Between 6381.5 and the next observation, the soil becomes granitic (sandy).

6384.3 (29.3).—Here the road to Mumbisi (three miles) is joined by one from Bugoma (fourteen miles), Malakisi (twenty-nine miles) and Kitale (eighty-five miles). A few granite outcrops are passed before this road junction is reached and the soil continues to be sandy.

6382.0 (32.0).—Begin to go down into the Nzoia Valley.

6388.4 (33.4).—Nzoia Bridge. Granitic outcrop.

6390.7 (35.7).—Mumbisi.—The road makes a T junction with those from Yala (twenty miles) and Kisumu (forty-six miles), on the right; and from Kakamega (twenty-four miles) and Kapsabet, on the left.

One small stream crossed between this observation and the last.

6393.1 (38.1).—Lusitu River.

One small stream crossed between this observation and the last.

6395.4 (40.4).—Granite hill west of road.

6396.0 (41.0).—Granite outcrop east of road.

6397.3 (42.3).—Road crosses doleritic dyke in rotted granite country.

6399.1 (44.1).—Cross roads. Yala (nine miles), Ludama (fourteen miles) and Kisumu (thirty-seven miles) lie ahead; Butere (three miles) and Waki (ten miles) to the right, while Bukama (seven miles) and Kakamega (thirty miles) lie to the left.

The country, which has been very open bush and grass plain, is becoming more forested.

6400.6 (45.6).—A ravine (in well-forested country) in deep red soil, probably derived from dolerite. Basalts may perhaps occur in this vicinity.

6401.7 (46.7).—Stream running in an unexpected direction in a well-forested gully. In the soil, which is rather light-coloured and buffish, except in the immediate vicinity

6366.4 (11.5).—Descending again into another vale.

6367.5 (12.5).—Namuha River flowing south. On left bank there is a gannery on the left of the road and a duka on the right of it.

6367.9 (12.9).—The second of two small streams passed since the Namuhas (all the streams flow directly or indirectly into Lake Victoria).

6368.6 (14.0).—The soil, which has been essentially red and somewhat lateritic, now becomes sandy. It is here indicative of the presence of granitic rocks beneath the surface.

6370.0 (15.0).—Trigonometric line crosses the road along the crest of a long cone. Granite tors are seen right and left. Another ridge line immediately ahead.

6372.9 (16.9).—Soil neither wholly lateritic nor wholly granitic. It may become lateritic, however. Here the road by Msimuwa (about 10 miles) is joined from the north by one from Mubutu (thirty-two miles).

6373.9 (17.9).—Some way down the side of another vale, and a distance south west of the stream, the country rock is generally composed of blocks by the road. It consists of fragments of red schists or gneisses apparently the same rock as that forming the extraordinary late Cretaceous or early Tertiary range of Bushu, (i.e.) Uganda. Associated with this is a material in the nature of a somewhat metamorphosed sandstone with some specimens 1000, and what appears to be a conglomerated arenaceous sediment (specimen 1007). The schists are surrounded by veins of blue-grey quartz with some mica inclusions, and there were some rather inviting prospects of mica. This vale might with advantage be investigated for granitic gneiss or dioritic boulders, should a geological opportunity occur. The dip on the schists is very steep and is directed towards a very steep southerly.

6374.9 (18.9).—About the town Muk 02 is a bridge across the Msimuwa River, and some sections are displayed in its vicinity. The strata are here dipping very steeply at S. 10°-20° E. respectively 1000. They are overlaid by a very fine-grained micaceous sandstone 150. One side is shown with little or no quartz in the schistosity, the other side the solid rock. The latter is composed of somewhat altered.

6375.9 (19.9).—Granite outcrop crosses the road, which is here practically level.

6380.8. (25.8).—Quartz dykes occur here. They are probably of no economic importance.

6381.5 (26.5).—Here the road to Mumias (nine miles) is joined by that from Sio (forty-two miles).

Between 6381.5 and the next observation, the soil becomes granitic (sandy).

6384.3 (29.3).—Here the road to Mumias (three miles) is joined by one from Bugoma (fourteen miles), Malindi (twenty-nine miles) and Kitale (eighty-five miles). A few granite outcrops are passed before this road junction is reached and the soil continues to be sandy.

6387.0. (32.0).—Begin to go down into the Naosa Valley.

6388.4. (33.4).—Nzoiu Bridge. Granite outcrop.

6390.7. (35.7).—Mumias.—The road makes a T junction with those from Yala (twenty miles) and Kisumu (thirty-six miles), on the right; and from Kakamega (twenty-four miles) and Kapsabet, on the left.

One small stream crossed between this observation and the last.

6393.1 (38.1).—Lusiru River.

One small stream crossed between this observation and the last.

6395.4. (40.4).—Granite hill west of road.

6396.0. (41.0).—Granite outcrop east of road.

6397.3. (42.3).—Road crosses doleritic dyke in rather granite country.

6399.1. (44.1).—Cross roads. Yala (nine miles), Ludama (fourteen miles) and Kisumu (thirty-seven miles) lie ahead. Butere (three miles) and Waki (ten miles) to the right, while Bukama (seven miles) and Kakamega (thirty miles) lie to the left.

The country, which has been very open bush and grass plain, is becoming more forested.

6400.6 (45.6).—A ravine (in well-forested country) in deep red soil, probably derived from dolerite. Basalt may perhaps occur in this vicinity.

6401.7. (46.7).—Stream running in an unexpected direction in a well-forested gully. In the soil, which is rather light-coloured and buffish, except in the immediate vicinity

of the system, which is a nearly black, contains some pieces of spherulitic olivine very closely resembling the supposed Kamburo-Islandite beds of East Africa (Kenya). It is to be noted that after leaving Mombasa the topographic relief becomes much more pronounced than the country becomes more and more semi-desertic.

about 2 (3) miles road junction from the left.

about 2 (3) miles road junction from the left.

The road leads from the station to the road junction from the left. It is to be noted that after leaving Mombasa the topographic relief becomes much more pronounced than the country becomes more and more semi-desertic.

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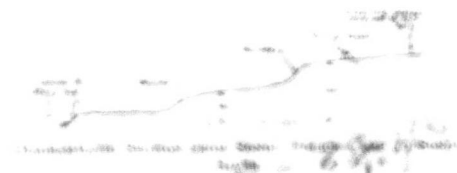
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About 100 feet higher than the camp, on the side of the scarp there are other boulder beds and gravels. All these gravels are implementiferous, and the surface soils contain tools belonging to several different industries (cultures). It is hoped that time to deal with these may eventually be found.

The high-level gravels were panned, but gave no results of economic interest.

(3) *Sondu to Kericho* (28 miles approximately).

January 31, 1939

6484.7. (6) — Police Camp.

6485.0. (11.2). — One hundred feet above the police camp there are boulder beds, and an outcrop of quartz-porphry (specimen 1010).

6486.8. (2.17). — Much altered lavas with basaltic texture, displaying spheroidal weathering (not true boulders), passing into quartz-ironstone (specimens 1011 and 1011a).

6487.4. (2.7). — Outcrops of much altered and silicified andesite (?) (specimen 1012). This is succeeded by a similar but well-jointed stony lava (specimen 1013). This persists to the top of the scarp, after which no solid outcrops were seen. At Kericho some lavas were being used as road metal, but the quartz was not seen.

(4) *Sondu Police Camp to Rai River*.

6340.4. (6) — Police Camp.

6341.7. (1.3). — Road junctions left from Keruo and Nyakachi Mission. Proceed along this. The track is extremely bad. By car to Mission, and then to the edge of the escarpment. Then by foot along the path that goes down to Bangu and ascend the Rai River, which rises to the east of Aduango. The section displayed is interesting. In its lower reaches the river cuts through alluvial deposits of a high-level plain; but affords, higher up-stream, some fine sections of amphibolite-schists (specimen 1014) with acid intrusives (specimens 1015 and 1015a) completely mylonized. These are generally gneissose and run for the most part between the parting planes of the schist, but in some places they cut across the bedding of the latter. There are also quartz stringers that usually cut the bedding. There is some concretion along the

of the strata, which is a nearly black, contains some pieces of pyritic chert, very closely resembling the supposed Karoo-~~bedded~~ beds of Europe (Gondwa). It is to be noted that after leaving Mwanza the topographic relief becomes much more pronounced than the country becomes more hilly and later semi-mountainous.

6484.7 (1.1).—Road junction from the left.

6484.7 (1.2).—*Swamp near Yala River.*

The road from here to Kericho has been built with by the British Government and is now owned by the British Government. The geological map of Uganda for 1927 and 1928.

At the base the rocks are mostly granite. The granite is about 1 mile and a quarter from a half mile. This of Karoo-~~bedded~~ beds is covered by the red low hills and red soil is in evidence by quartzite fragments which are seen at the surface, a considerable area of the country.

6484.7 (1.3).—*Swamp near Yala River.*

6484.7 (1.4).—*Swamp near Yala River.*

The road from here to Kericho has been built with by the British Government and is now owned by the British Government. The geological map of Uganda for 1927 and 1928.

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The road from here to Kericho has been built with by the British Government and is now owned by the British Government. The geological map of Uganda for 1927 and 1928.

At the base the rocks are mostly granite. The granite is about 1 mile and a quarter from a half mile. This of Karoo-~~bedded~~ beds is covered by the red low hills and red soil is in evidence by quartzite fragments which are seen at the surface, a considerable area of the country.

About 100 feet higher than the camp, on the side of the scarp there are other boulder beds and gravels. All these gravels are implementiferous, and the surface soils contain tools belonging to several different industries (cultures). It is hoped that time to deal with these may eventually be found.

The high-level gravels were panned, but gave no results of economic interest.

(3) *Sonda to Kericho* (28 miles approximately).

January 31, 1930.

6484.7. (0).—Police Camp.

6485.9. (1.2).—One hundred feet above the police camp there are boulder beds, and an outcrop of quartz-porphry (specimen 1010).

6486.8. (2.1).—Much altered lavas with basaltic texture, displaying spheroidal weathering (not true boulders), passing into quartz-ironstone (specimens 1011 and 1011A).

6487.4. (2.7).—Outcrops of much altered and silicified andesite (?) (specimen 1012). This is succeeded by a similar but well-jointed stony lava (specimen 1013). This persists to the top of the scarp, after which no solid outcrops were seen. At Kericho some lavas were being used as road metal, but the quartz was not seen.

(4) *Sonda Police Camp to Rai River*

6540.4. (0).—Police Camp.

6541.7. (1.3).—Road junctions left from Keru and Nyakach Mission. Proceed along this. The track is extremely bad. By car to Mission, and then to the edge of the escarpment. Then by foot along the path that goes down to Rangu and ascend the Rai River, which rises to the east of Andango. The section displayed is interesting. In its lower reaches the river cuts through alluvial deposits of a high-level plain, but affords, higher up-stream, some fine sections of amphibolite-schists (specimen 1014) with acid intrusives (specimens 1015 and 1015a) completely mylonitised. These are generally gneissose and run for the most part between the parting planes of the schist, but in some places they cut across the bedding of the latter. There are also quartz stringers that usually cut the bedding. There is some concretion along the

side of the amphibolite-schists which is N2W-20E, to WNW-40E, the dip being most easterly at about 60° in some places more.

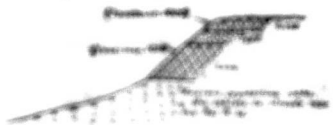
Locally some fine beds separate the main basic layers of the schist. The rocks are highly jointed, the chief systems being—

- a) Dipping along the schist, at 60°
- b) Dipping along the schist very steep to vertical.
- c) Changing from north to north westerly to the dip of the schist (45°).
- d) Dipping into schist.

Higher up-section the intrusive formations are composed by a very coarse granitic, which runs WNW-ESE, and some more fragmentary in the amphibolite schists. In the center of the schist is a conglomerate breccia zone, consisting of a coarse clay & highly crystalline rock which contains a well-sorted quartz pebbles (sample 1015). Still higher up-section are large boulders of a banded quartz rock resulting to give about the typical composition of the Transvaal granite. It is a quartzite, gneiss, containing a representative granitic specimen 1017 and many samples.

Lower section of schist are porphyritic which is a fine grained and fine-grained hornstone. It is clearly an intrusive igneous body, as in further change was seen to some extent the schist as a change of composition was indicated by the structure in the schist and as a well-defined line changes on right side of the schist and under the schist is the base of the schist which is not particularly noticeable.

The schist which is not the same as the schist and light one is represented diagrammatically in section 1010.



Diagrammatic Section of Schist, Granite, and Schist showing the schist which is not the same as the schist and light one.

The approximate N-W-ESE direction of the schist rocks makes itself felt in the topography of the lower schist.

(5) Road to Kani

1019. 10. Schist.—Crossing the Swaha River shortly after leaving camp, one saw good exposures of high-level granite and some more or less horizontal granitic rocks, resembling the general structure of the East River.

1019. 11.0.—Track from Lindava border junction left.

1019. 11.1.—Cross small stream. Shaly laves (probably decomposed dioritic) probably orthopyroxene-biotite gneiss (sample 1020 and 1021).

1019. 11.4.—In ancient lava, now nearly altered to epidote-diorite (sample 1022).

1019. 11.6.—Several small streams have been passed. There is a number, with a lava flow (sample 1023, 1024).

1019. 12.0.—Track from Orange junction right.

Sample 1025, a rock resembling in the mass the Ventenary amphibolite of South Africa. It is found, however, to be very much altered, and to contain largely of chloritoid, chlorite and epidote.

1019. 12.5.—Track junction left.

1019. 13.0.—Highly jointed exposure altered diorite (sample 1025).

1019. 13.2.—Road junction. Pyroxene-chlorite stream, the line of the kind was more toward Kani.

1019. 13.3.—Light grey rock of somewhat extensive exposure, evidently an amphibolite-schist, possibly the same as that of Mt. Condo's porphyry, from North Karonda (see General Report Geological Survey, 1912 and 1913).

1019. 13.5.—A small stream of Swaha River right, Kani left. In the upper part Swaha River and Kani were collected. These are amphibolite-schist.

1019. 13.7.—Bridge over Swaha River. Beyond the bridge the Swaha River flows junction right.

1019. 14.0.—A. J. C. a house Kani.

The country passed over is undulating, but the high ground tends to be much of the same level as a NNE-SSW zone, the surface mostly laterwards, in the east however, the country is higher and more irregular.

course of the amphibolite-schists which is N30W-50E, to W30W-50E, the dip being much steeper at about 60° to some places more.

Locally more and harder rocks are seen from top of the schist. The rocks are highly jointed, the chief systems being:-

- (a) Dipping along strike only, at 60°
- (b) Dipping along strike only, very steep to vertical
- (c) Plunging downwards at right angles to the dip of the strike dip joints
- (d) Vertical line joints

Highly argillaceous fine grained sandstones are interbedded by a very coarse grained, which pass W2N-20E, and contain some impregnations in the amphibolite-schists. In the center of this interbedded is a conglomerate which shows some thin beds like a sandstone a highly crystalline rock which contains in a scattered spots numerous small white shell fragments and some remains of a limited quartz rock resulting in some cases the typical biconvexity of the Trilobites and Rhynchonella. It is a granular quartzite containing a conglomerate pebbles (specimen 1027 and some others).

A more typical of quartzite an amphibolite system is to be seen in the place between the schist. It is usually an argillaceous quartzite, but in higher stages was with the same kind of the level as in change of argillaceous was substituted by an argillaceous to the schist and as it was getting later, argillaceous was again much of the gully and some the very hard to the base of the schist which had probably developed.

The sandy schist can be seen at a hill just higher up in conglomerate impregnated with a coarse sand.

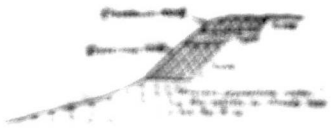


Diagram showing the schist, amphibolite-schist, quartzite, sandstone, and conglomerate. The schist is shown dipping to the right, and the amphibolite-schist is shown above it. The quartzite is shown to the left, and the sandstone is shown below. The conglomerate is shown at the base of the schist.

The argillaceous W30-50E sequence of the schist ends where level but is the outcropping of the lower schist.

(3) Road to Kani.

0002. (3) Road. - Crossing the Banda River shortly after leaving camp, one saw good exposures of high-level granite and some high or low level granitic rocks, resembling the granite intrusions of the Banda River.

0002. (15) - Track from Lumbwa under junction left.

0002. (16) - Cross small stream. Shaly layer (probably detrital) exposed passing into quartzite (specimens 1022 and 1023).

0002. (14) - In general level, now mostly altered to quartzite (specimen 1024).

0002. (11) - Several small streams have been passed. There is another, with a large (boulders) outcrop (specimen 1025).

0002. (10) - Track from Danga junction right.

Sample 1026, a rock resembling in the mass the Yanteng-shu conglomerate of South Africa. It is found, however, to be very much altered, and to consist largely of chert, quartz, calcite and quartzite.

0002. (12) - Track junction left.

0002. (13) - Sandstone exposed above detrital sample 1026.

0002. (18) - Road junction. Pappus-shaded stream. One end of the level now upon leaving Lumbwa.

0002. (20) - Light grey rock of somewhat calcareous composition, actually an amphibolite-schist, probably the same as that of the Lumbwa schist. See North Kivu and other Annual Report Geological Survey of Kenya, 1927 and 1928.

0002. (19) - Road junction of Banda River right, Kani left. In the granite formation 1026 and 1027 was collected. These are amphibolite-schist.

0002. (21) - Bridge over Banda River. Beyond the bridge the Banda River flows junction right.

0002. (22) - A.C. a house Kani.

The country passed over is volcanic, but the high ground tends to be much of the same level as a N30-50W, zone, but incline steadily downwards, to the east however, the country is higher and more irregular.

The gentle sloping plain is essentially lava, and so are the hills to the east, till one gets about half way to Kien, when the Kien quartzites and sandstones are seen capping the outcropment. Exposures along the road are irregular and patchy. Kien itself is situated on banks of dolomite, presumably a sill which, according to Felix Oswald (Q.J.G.S. Vol. 20), underlies the mass of sandstone (specimen 2044, fine-grained basalt).

(6) Kien to the "Scapstone" Hill on Napochnicki Hill.
Approximate position: E. 26° 39' 0"; S. 97° 43' 30".

Proceeded by the highest narrow point on the road to this hill. Then went over the hill, and afterwards descended back to Kien by the

The hill is found to contain largely of somewhat altered siliceous sediments of the Kien group, which I have no doubt are of the same age as the Bialbica sandstones and quartzites. Like the Bialbica, Mityasa, and Bialbica beds, the Kien deposits vary between medial sandstones and quartzites, and in some places display igneous rocks; and again like the Bialbica sandstones they are displaced and covered by dolomite (Oswald's dolomite). The lower part of Napochnicki hill shows a good exposure of quartzites (specimen 2042) resting on a dolomite sill. Near the top of this hill there is a small exposure of a part of the hill containing the "Scapstone" beds. The rest of the hill consists of conglomeratic beds and some sandstones of lower of dolomitic dolomite and so forth. These are some of the same age as the Bialbica sandstones and quartzites (see above) and are of Bialbica Sandstone age. There are also a number of small rock outcrops along the top of the hill. They are formed of hard rocks. The mass of the hill from which the sandstone of this is, I was told, *Wapostage*, and the same name is called *Oyon*. The *Oyon* is a big town very close to Kien, and is well known and is working the same things the same as what is on the

There may possibly be required to determine their end by of the same relationship of the *Oyon* to the sandstones which are exposed on the hillside above and below it. From such evidence as I get here as possible, however the *Oyon* might appear to be connected with the sandstones etc. The *Oyon* is a quartzite sandstone and seems to have a deep dip than the sandstones exposed near the town away from it. In a profile section below it seems to have been a pure clay or pure clay like some of that of the Bialbica beds—which has been metamorphosed. It is not a little exposure but a conglomeratic or dolomite filled rock.



The Ogosi is carved by natives into pots and pipe bowls, etc. It was used for the first purpose in prehistoric times, as shown by some of Mr. Leakey's discoveries, and by a "digging-stone" of this material found near Lugyan, in Uganda. The present industry is, however, very young. Specimens collected from the hill are as follows:—

Quartzite, 1031 amygdaloid, 1032 "waspstone," 1033 sago sandstone, 1034; leucitiferous rhyolite, 1035; glassy lava with spherulitic structure, 1036.

Return Traverse to Kiso.

6009.4. (0) —Start

6010.0. (1.6) —Stream crossing road to left

6010.3. (1.9) —Amphibolite (specimen 1027) in lumps by roadside. Before reaching this spot, fragments of amphibolite were seen in the road.

6011.1. (1.7) Amphibolite

6012.0. (2.6) —After crossing a stream a road from Kiso junction is left.

6012.3. (2.9). Dolerite.

6012.5. (3.3) —Bauxite (?) (sample 1038). Due to its composition of dolerite or other basic rock.

6013.1. (3.7) —Dolerite.

6013.8. (4.4) —Stream crossing road to left.

6014.7. (5.3) —Bauxite (?). Several dolerite outcrops have been passed, usually near small streams.

6015.0. (7.6) —Stream crossing road to left

6015.8. (8.4) —Fine-grained epidiorite (specimen 1030). It would appear that up to date the road has been running for the most part along a dolerite sill.

6019.1. (9.7) Junction of Kar. Kagwe Home Bay and Karungu Soko roads.

6019.5. (10.1) —Red epidioritic outcrops (specimen 1040).

6020.3. (10.9) —Red epidiorite.

6021.1. (11.7) —Pink granite, somewhat resembling the famous Peterhead rock.

6021.2. (11.8) —Epidiorite (derived from a diorite dike) (specimen 1042).

6021.3. (12.1) —Dull-looking, partly decomposed granitic rock (specimen 1043). This is a reworked Newer Gneiss.

6021.4. (12.3) —Granitic rocks in situ.

6021.5. (12.7) —Highly decomposed fine-grained dolerite or basalt.

6021.6. (14.5) —Junction of Karungu Home Bay, Soko and Kiso roads.

6021.7. (15.5) —A dike of basic rock, Kiso in fact, on a rock similar to that recorded at 6012.3 (specimen 1044).

Go East to Ogosi.

6022.1. (0) —A dike of basic rock, Kiso.

6022.2. (1.5) —Road from Soko junction left. The rocks here are essentially those of the basic Kiso sill.

6022.3. (4.0) —Road from Soko junction right (specimens 1029 and 1030 collected from here before).

6022.4. (4.2) —Amphibolite-amphibole zone to 1030.

6022.5. (4.8) —Road entrance of coarse dolerite (specimen 1045).

6022.6. (5.5) —Fine-grained basaltic zone to 1046.

6022.7. (6.2) —Doleritic rock with slight gneissic, easily weathered to bauxite (?) surface in this crossed outcrops at 6022.1 (specimen 1047).

6022.8. (6.8) —Road crosses stream running left. Much decomposed granitic rock in situ.

6022.9. (8.15) —Lumps of a somewhat conglomeratic soft lava mass, locally highly porphyritic, close to the road (specimen 1048). High level gneiss on the east is a horizon pt.

6022.9. (10.4) —Road crosses stream running left. The brown silt and red chlorite zone and fine outcrops of basaltic conglomerates were crossed. These outcrops correspond to the Ogosi's Karungu conglomerates (Annual Report, 1897, page 130).

6022.9. (11.8) —Dolerite, probably Karungu-Karungu, dy about 50' along N. N. E. zone (specimen 1049). I propose to call them the Kiso dykes. It is to read

The Ogosi is carved by natives into pots and pipe bowls, etc. It was used for the first purpose in prehistoric times, as shown by some of Mr. Leakey's discoveries, and by a "digging-stone" of this material found near Lugazi, in Uganda. The present industry is, however, very young. Specimens collected from the hill site as follows:—

Quartzite, 1031 smygdaloid, 1032; "wagstone," 1033; sago sandstone, 1034; devitrified hyalite, 1035; glassy lava with spherulitic structure, 1036.

Return Traverse to Kani.

6609 4 (0) —Start

6610 0 (6) —Stream crossing road to left.

6610 3 (9) —Amphibolite (specimen 1037) in large boulder by roadside. Before reaching this spot, fragments of amphibolite were seen in the road.

6611 1 (1.7) Amphibolite

6612 9 (2.6) —After crossing a stream a road from Kani joins junction left.

6612 3 (2.9) Dolomite

6613 1 (3.3) —Bauxite (?) (sample 1038) Due to composition of dolomite or other basic rock.

6613 3 (3.7) —Dolomite.

6613 8 (4.4) —Stream crossing road to left.

6614 3 (5.3) —Bauxite. Several dolomite outcrops have been passed usually near small streams.

6615 1 (6.1) —Stream crossing road to left.

6615 8 (7.4) —Fine grained epidiorite (specimen 1039). It would appear that up to date the road has been crossing for the most part along a dolomite hill.

6616 1 (8.7) Junction of Kani, Mungwa-Nama She and Karingu-Nama roads.

6619 3 (10.1) —Red epigranitic outcrops (specimen 1040).

6620 3 (10.9) —Red epigranitic.

6621 1 (11.7) —Pink granite, somewhat resembling the famous Peterhead rock.

6622 3 (12.5) —Epidiorite (derived from a coarse dolomite (specimen 1042).

6622 3 (12.5) —Dark-looking, partly decomposed granite rock (specimen 1043). This is a captured Ngora Granite.

6622 3 (12.5) —Granite rocks as above.

6622 3 (13.3) —Highly decomposed fine-grained dolomite or basalt.

6622 3 (14.0) —Remnants of granite (Ngora) in sandy and clay roads.

6622 3 (15.0) —A large, rounded, smooth, light-colored rock similar to that of the Ngora Granite (specimen 1044).

(3) East to Oropo's

6622 3 (16) —A large, rounded, smooth, light-colored rock.

6622 3 (17) —Road from Kani junction left. The rock here is essentially those of the basic Ngora hill.

6622 3 (18.0) —Road from Kani junction right. Specimens 1045 and 1046 collected from here before.

6622 3 (19.0) —Amphibolite outcrops (specimen 1047).

6622 3 (20.0) —Road outcrops of coarse dolomite (specimen 1048).

6622 3 (21.0) —Fine-grained basalt, massive like that of the Ngora Granite.

6622 3 (22.0) —Decomposed rock with shaly bedding, easily weathered to bauxite (?) soils in the stream courses in the Ngora (specimen 1049).

6622 3 (23.0) —Road crosses across valley, all with decomposed granite rock a gap.

6622 3 (24.0) —Lumps of a coarse-grained conglomerate with iron matrix, locally highly crystalline. These occur in the road (specimen 1050). High-level gravels on this side is a Ngora pit.

6622 3 (25.0) —Road crosses across valley left. Beyond this and for about 1000 yards the outcrops of basaltic conglomerates were crossed. These formations correspond to the Contact & Limestone conglomerates (Kani) (specimen 1051) (page 100).

6622 3 (26.0) —Epidiorite, probably Karingu-Nama, outcrops about 20' along N. N. E. road (specimen 1052). I propose to call them the Kani epidiorite. It is a rock

probable, the conglomerates are part of the same sedimentary series as the phyllites, then they are lower than the phyllites, unless displaced by faulting, and may well represent the middle of the Karagwe-Ankolean here, as similar conglomerates appear to do in North Kavirondo (see Mr. Combe's remarks, p. 16, *Annual Report for 1927*).

6636.1. (11.0).—Lumps of conglomerate seen beside the road; they probably represent an interbedded band.

6636.5. (11.4).—Green-grey rocks, probably altered volcanic tuffs (specimen 1052). These are similar to certain rocks discovered by Mr. Combe in North Kavirondo.

6636.7. (11.6).—Phyllites again. The bedding in some places is horizontal, but the rocks are clearly highly disturbed, and much jointed and twisted.

6636.9. (11.8).—Green-grey rocks, apparently interbedded with or intrusive into the phyllites. The exact relationship was not determinable, and it is quite possible that the green-grey rocks are pre-phyllite in age.

6637.0. (11.9).—Road crosses stream running left.

6637.4. (12.3).—Epidioritised coarse dolerite (specimen 1053).

6637.7. (12.6).—Rotted basic rock, probably derived from a lava.

6638.3. (13.2).—Road from Nzumia, Kericho and Kisumu junctions right.

6638.4. (13.3).—Fine-grained decomposed lava, of which specimen 1053 was the upper decomposed portion (specimen 1054).

6639.0. (13.9).—Good outcrops of rocks similar to 1054.

6639.8. (14.7).—Road junctions right.

6640.1. (15.0).—Stony lava—a trachy-andesite, with calcite amygdalae (specimen 1055).

6640.2. (15.1).—Much platy white quartz in soil.

6640.6. (15.5).—Ovugi's camp.

(8) From Oyugi's to Site of Old German Prospect Pits.

6640.6. (8).—Oyugi's; go along road to dukas.

6640.9. (3).—Rangwe road junctions left. Proceed along this.

6641.7. (1.1).—Coarse dolerite, like that recorded at 6629.9 (specimen 1047).

6642.6. (2.0).—Road crosses Ometi stream running right.

6643.2. (2.6).—Change of soil; much lateritic material on slopes.

6643.5. (2.9).—Road crosses stream running right.

(Car left here on account of a broken bridge.)

400 yards.—Some dolerite and quartz, the latter with hematite and limonite in shatter planes.

120 yards.—Pyritiferous extremely altered dolerite (specimen 1056).

185 yards.—Pyritiferous dark-grey siliceous rock (sooty sample).

85 yards.—Pyritiferous dolerite.

600 yards.—On dolerite up to now. Here one is on an altered (and iron-impregnated) rock resembling shale; it is probably, however, an extremely decomposed amphibolite-schist.

200 yards.—Silicified ferruginous shale.

100 yards.—Trench in quartz-dyke, dug by Germans in pre-war days. Some dolerite outcrops become seen, and last observation (sooty sample of quartz taken; proved valueless).

170 yards.—Another and similar trench; sooty sample taken; proved valueless.

Bearing to Home (3,742') 330° mag. Bearing to Wire trig. 44° mag.

All the above traverse has been over outlying country.

(9) Oyugi's to Wire Hill

6646.1. (8).—Oyugi's.

6646.9. (8).—Rotted rocks, amphibolites or phyllites? Probably the former. Dip 85° steep.

Rotted rocks, amphibolites or phyllites?

probable, the conglomerates are part of the same sedimentary series as the phyllites, then they are lower than the phyllites, unless displaced by faulting, and may well represent the middle of the Karagwe-Ankolean here, as similar conglomerates appear to do in North Kavirondo (see Mr. Combe's remarks, p. 16, *Annual Report for 1927*).

6636.1. (11.0).—Lumps of conglomerate seen beside the road; they probably represent an interbedded band.

6636.5. (11.4).—Green-grey rocks, probably altered volcanic tuffs (specimen 1052). These are similar to certain rocks discovered by Mr. Combe in North Kavirondo.

6636.7. (11.6).—Phyllites again. The bedding in some places is horizontal, but the rocks are clearly highly disturbed, and much jointed and twisted.

6636.9. (11.8).—Green-grey rocks, apparently interbedded with or intrusive into the phyllites. The exact relationship was not determinable, and it is quite possible that the green-grey rocks are pre-phyllite in age.

6637.0. (11.9).—Road crosses stream running left

6637.4. (12.3).—Epidioritised coarse dolerite (specimen 1053)

6637.7. (12.6).—Rotted basic rock, probably derived from lava

6638.3. (13.2).—Road from Nzumas, Kericho and Kisumu directions right

6638.4. (13.3).—Fine-grained decomposed lava, of which specimen 1054 was the upper decomposed portion (specimen 1054)

6639.0. (13.5).—Good outcrops of rocks similar to 1054.

6639.5. (14.0).—Road junctions right

6640.1. (15.0).—Stony lava—a trachy-andesite, with calcite amygdalae (specimen 1055)

6640.2. (15.1).—Much platy white quartz in soil.

6640.6. (15.5).—Oyugi's camp.

(16). From Oyugi's to Site of Old German Prospect Pits.

6640.8. (16).—Oyugi's; go along road to dukas.

6640.9. (16.3).—Rangwe road junctions left. Proceed along this.

6641.7. (1.1).—Coarse dolerite, like that recorded at 6629.3 (specimen 1047).

6642.6. (2.0).—Road crosses Onneti stream running right

6643.2. (2.6).—Change of soil; much laterite material on slopes.

6643.5. (2.9).—Road crosses stream running right.

(Car left here on account of broken bridge)

400 yards.—Some dolerite and quartz, the latter with hematite and limonite in shatter places.

120 yards.—Pyritiferous extremely altered dolerite (specimen 1056)

188 yards.—Pyritiferous dark-grey siliceous rock (same sample)

35 yards.—Pyritiferous dolerite

600 yards.—On dolerite up to now. Here ~~too~~ is an altered (and iron-impregnated) rock resembling slate, it is probably however, an extremely decomposed amphibolite-schist.

200 yards.—Silicified ferruginous shale

100 yards.—Trench in quartz-dyke, dug by Germans in pre-war days. Some dolerite outcrop between here and last observation (same sample of quartz taken, proved valueless).

170 yards.—Another and similar trench; assay sample taken; proved valueless.

Bearing to Houth $3,742^{\circ}$ 308° mag. Bearing to Wire trig. 44° mag.

All the above (where) has been over outlying country.

(17) Oyugi's to Wai Hill

6646.1. (16).—Oyugi's.

6646.9. (16).—Rotted rocks, amphibolite or phyllite? Probably the former. Mag. 538° mag.

Rotted rocks, amphibolite or phyllite?

6647.3 (1.3).—Cellular dark-grey quartz with much pyrites, most of which is now represented by limonite (specimen 1063), probably intruded into the phyllites. Found in large lumps. No quartz in situ.

6647.4 (1.3).—Bifurcated amygdaloidal lava. This is found by the roadside in large specimens 1059.

6648.2 (2.1).—Same as 1059 above.

6648.5 (1.5).—Leave car, and go towards Wire Hill, just over NE approximately.

300 yards.—Now on a laterite platform containing lumps of rock and rounded pebbles 50 feet above the spot where car was left. Approximate altitude, 4,700 ft.; nearly 1,000 ft. above Lake Victoria.

200 yards.—Road called Moko. Turn E. by N.

100 yards.—Another legal right.

500 yards.—Going up hill towards saddle (S) in sketch—much quartz-hornfelsite and hornfelsite-quartz rock in large lumps about specimens 1060, and some lumps of felsite and ferruginous chert-strewn.



FIGURE SHOWING POSITION OF WIRE HILL.

200 yards.—In middle (S) the felsite is in situ. It has a generally 30° north-westerly. There are some slickensides along the pseudo-bedding. The whole of the hill (S) at present seems to be of this felsite, but it is less elevated in the middle of this mass. On the far side (over lower saddle (S)) a shaly plane, perhaps E. W. and N.E. S.W. are clearly seen.

Going up hill towards the trig station, one chance almost immediately upon hornfelsite-chert rock—specimen 1062; the felsite apparently passes into this.

A little higher up, lumps of felsite again appear, then sometimes from siliceous clay below in places. Felsite lumps are greenish, also some efflorescence, with a tendency to banding.

A little higher up, some 50 feet above the saddle, sheared felsite appears in place (sample 1063). Still higher up felsite again passes, apparently, into ironstone.

As the next comparatively flat piece of ground (local summit) is approached, a softish white rock, an extremely sheared porphyry, appears. It is well seen on the top of this rise (specimen 1064), where many *Mutatin* trees are growing.

At point X, ferruginous felsite occurs. Higher up more ferruginous felsite, then a quartzose variety, then pyriticiferous chalcidonic rock (local), probably of hydro-thermal origin (specimen 1055).

Approximately 50 ft. higher up is the trigometrical point on felsite.

According to Coates (see *Q.J.G.S.* Vol. 70, 1914, p. 159), this hill (Wire Hill) is composed of slates, which he calls the Wire Hill beds. It would seem from samples brought back from hills D and E of sketch, by Yunusu, one of my employees, that they too consist of felsite.

(10) *Oyugi's to Kendu, etc.*

6653.4. (6).—Point reached by car on the trip to Wire Hill yesterday.

6654.0. (6).—Some lumps of a rock resembling dolerite with inclusions (amygdalae?) of calcite.

6654.3. (9).—Many lumps and boulders of dolerite.

6654.7. (1.3).—Large lumps of felsite (used in making culvert).

6655.3. (1.9).—Altered amphibolite-schist, outcropping in small stream, dip N.W. by E. steep (specimen 1066).

Beyond last outcrops much felsite is seen.

6655.8. (2.3).—Dolerite with shaly jointing; dip of slabs WNW, steep.

Road junction.

6657.4. (4.0).—Altered (decomposed) amphibolite-schist, similar to those recorded at 6655.3, strike NE.-SW., dip NW, steep to vertical. Much dolerite about. Soon after this one passes on to granitic soils.

6658.7. (5.3).—Granite (contaminated by amphibolite), with xenoliths of hornblende-schist. Quartz veins are present (specimen 1067).

6647.0. (1.9) — Cellular dark-grey quartz with much pyrites, most of which is now represented by limonite (specimen 1067), probably intrusive into the phyllines. Found in large lumps. Not quite so rare.

6647.4. (1.9) — Silicified amygdaloidal lava. This is found by the roadside in lumps (specimen 1068).

6648.2. (2.12) — Same as 1068 above.

6648.5. (2.5) — Leave car, and go towards Wire Hill; path goes NE. approximately.

430 yards. — Now on a felsite platform containing lumps of rock and rounded pebbles, 50 feet above the spot where car was left. Approximate altitude, 4,700 ft.; nearly 1,000 ft. above Lake Victoria.

330 yards. — Road called Molo. Turn E. by N.

300 yards. — Another road right.

300 yards. — Going up hill towards east (with) in sketch — much quartz-hornblende and hornblende-quartz rock in lumps lying about (specimen 1066), and some lumps of felsite and ferruginous chert-brocks.



PROFILING SECTION DIAGRAM OF WIRE HILL.

6648.5. (2.5) — The felsite is a sil. It has a granitic-like 40° north-easterly. There are some slickensides along the porphyry bedding. The whole of the hill is as much as to be of this felsite, but it is now covered by the maficite of this mass. On the far side of the road, some maficite is shown, showing a 1° to 2° dip NE. 20° are clearly seen.

Going up hill towards the trig station, some maficite is seen, and a road junction upon hornblende-quartz rock — approximately 1066; the felsite apparently passes into this.

A little higher up, groups of limonite again appear, then hornblende and maficite, these indicate in plenty. Felsite lumps are present, but more rare, with a tendency to banding.

A little higher up, some 50 feet above the saddle, sheared felsite appears in place (sample 1063). Still higher up felsite again passes, apparently, into ironstone.

As the next comparatively flat piece of ground (local summit) is approached, a softish white rock, an extremely sheared porphyry, appears. It is well seen on the top of this rise (specimen 1064), where many *Mutatin* trees are growing.

At point X, ferruginous felsite occurs. Higher up more ferruginous felsite, then a quartzose variety, then pyritiferous chalcidonic rock (local), probably of hydro-thermal origin (specimen 1065).

Approximately 50 ft. higher up is the trigometrical point on felsite.

According to Coates (see *Q.J.G.S.* Vol. 70, 1914, p. 159), this hill (Wire Hill) is composed of slates, which he calls the Wire Hill beds. It would seem from samples brought back from hills D and E of sketch, by Yunusa, one of my employees, that they too consist of felsite.

(10) *Oyugi's to Kendu, etc.*

6657.4. (4.0) — Point reached by car on the trip to Wire Hill yesterday.

6654.0. (6.) — Some lumps of a rock resembling dolerite with inclusions (amygdaloid?) of calcite.

6654.3. (9.) — Many lumps and boulders of dolerite.

6654.7. (1.5) — Large lumps of felsite (used in making culvert).

6655.3. (1.0) — Sheared amphibolite schist, outcropping in small stream, dip NE., by E., steep (specimen 1066).

Beyond last outcrop, much felsite is seen.

6655.8. (2.3) — Dolerite with slabby jointing; dip of slabs WNW, steep.

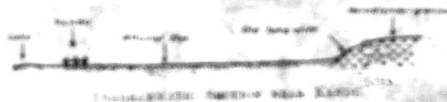
Road junction.

6657.4. (4.0) — Altered (decomposed) amphibolite-schists, similar to those recorded at 6655.3, strike NE.-SW., dip NW, steep to vertical. Much dolerite about. Soon after this one passes on to granitic soils.

6654.7. (5.3) — Granite (contaminated by amphibolite), with xenoliths of hornblende-schist. Quartz veins are present (specimen 1067).

6700 E. (3.6) - Spent Road bridge. Still water rock in
pool.

6702 E. (3.13) - Descended to alluvial flat



Locality is about a mile beyond the hill. Proceeding to Kitaro, and then to Kitaro, about one mile west. This has been done many times. Refer to my paper on the "Geology of the Kitaro District" U.S.G.S. Vol. 100, 1901. There were some very fine specimens reported as Plinianic in several places, but these are probably Plinianic, as far as the material is in the district of the Kitaro. The Plinianic is probably the same as that obtained from a spot near Kitaro Mt. approximately 10 miles. The Plinianic was found. Oswald's original description does not give a name, but says that the glass was very fine in the center of the stone.

Some of the so-called Plinianic specimens contain soft and light colors. These rocks which are soft are ground up by small tools and the softness is not noticed.

- 6703 E. (3.14) - Lava to Kitaro (25) 30
- 6704 E. (3.15) - Lava to Kitaro

6705 E. (3.16) - Section of Kitaro Kitaro and Kitaro. The section is of the Kitaro and Kitaro. The section is of the Kitaro and Kitaro.

6706 E. (3.17) - Red spherulitic rock of the Kitaro. The section is of the Kitaro and Kitaro.

6707 E. (3.18) - Red spherulitic rock of the Kitaro. The section is of the Kitaro and Kitaro.

6708 E. (3.19) - Glass pebbles

6709 E. (3.20) - Deep red soils are very common. There are a few lumps of felsitic rock. Usually when the pebbles are again seen. They black soil with red iron and there are some lumps of a black looking pebbles. Granite probably a diamond G.E.

6700 A. (3.5) - Road crosses stream running left. Oudreg data on left of road.

6701 E. (3.1) - Banded quartz-porphyr, or granite-porphyr? (specimen 1073).

6704 E. (10.1) - Banded red granite-porphyr (specimen 1074).

6704 E. (10.2) - Granite rocks here, and at intervals since the last observation.

6706 E. (11.2) - Deep red soils and rocks as at 6708.7.

6706 E. (11.3) - Granite-porphyr (specimen 1075), associated with red granite. These exposures are near a stream.

6707 E. (11.4) - Fine-grained felsite? This is followed by red granite and then some rocks like 1073.

6708 E. (11.5) - Large lumps of paper-broccia with chalcocite content, near top of hill (specimen 1077).

6709 E. (12.1) - Banded granite rock.

6709 E. (12.2) - Granite felsite with a pseudo-dip, N. by a little E. (specimen 1078).

6709 A. (12.3) - Marble.

6709 E. (12.4) - Obsidian rock with spheroidal weathering (specimen 1079).

6709 E. (12.5) - Strongly selected lava resembling in appearance the rock at 6700 (specimen 1080).

6710 E. (12.6) - Granite-porphyr (specimen 1081).

6710 E. (12.6) - Banded felsitic schistose rock.

6711 E. (12.7) - Kitaro; granite felsite.

6711 E. (12.8) - Cross roads; Kitaro left, Oyugi's right.

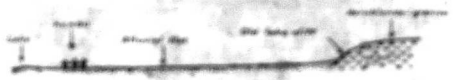
6711 E. (12.9) - D.C. camp.

(12) Kitaro is Kitaro and back by the "Sagstone" locality generally called - Journey 6.

This map was made with the object of being whether the area around Kitaro is worthy of detailed investigation or not; for something to Oswald's map it should be. A detailed traverse was not made at, but it was proposed to revisit the Kitaro site on the return journey, and to secure from the local inhabitants some ethnological information for the British Museum.

6703.5 (13.1) - Arch River Bridge. Still same rock as

6703.4 (13.1) - Descended to allowed that



Remains in about a mile beyond the cliff. Proceeded to Kintore, and then to Kintore camp, about two miles west. This has been much written in some journals in the paper on the "Monoclinic Belt of the Canadian Highlands" - U.S. Geol. Surv. p. 158. Their conclusions over the anticline, regarded as Plinian, is doubtful they are almost certainly Plinian, as far as the near dip on the slope of the L. side. The limestone is granitic in appearance, as obtained from a spot near Kintore Hill, upper part of the hill, the fossils whatever were found. Oswald's original description states that it seems conglomerate and the piece was very large in size, and of very light color than the shale.

Remains of the original Plinian deposits between north and south. These rocks which are well exposed up by road side and the anticline occurred by accident.

6703.6 (13.2) - Kintore (13.2) -

6703.7 (13.3) - Kintore (13.3) -

6703.8 (13.4) - Kintore (13.4) -

6703.9 (13.5) - Kintore (13.5) -

6704.0 (13.6) - Kintore (13.6) -

6704.1 (13.7) - Kintore (13.7) -

6703.5 (13.1) - Road crosses stream running left. Ondreg dikes on left of road.

6703.7 (13.3) - Rotted quartz-porphry, or granite-porphry? (specimen 1073).

6704.2 (13.1) - Rotted and granophyre (specimen 1074).

6704.3 (13.2) - Granitic rocks here, and at intervals since the last observations.

6704.4 (13.3) - Deep red soil and rocks as at 6703.7.

6704.5 (13.4) - Granophyre (specimen 1075) associated with red granite. These exposures are near a stream.

6704.6 (13.5) - Fine-grained felsite? This is followed by red granite and that more rocks like 1075.

6704.7 (13.6) - Large blocks of pepper-brocia with chalcocite cement near top of hill (specimen 1077).

6704.8 (13.7) - Rotted granitic rock.

6704.9 (13.8) - Organic dolomite with N. paleo-dip, N. by a fault E. approx. 1078.

6705.0 (13.9) - Marsh.

6705.1 (14.0) - Dolomite rock with spheroidal weathering (specimen 1079).

6705.2 (14.1) - Strongly spotted lava resembling in appearance the rock at 1080 (specimen 1080).

6705.3 (14.2) - Granite-porphry (specimen 1081).

6705.4 (14.3) - Rotted feldspathic whitestone rock.

6705.5 (14.4) - Heavy quartz dolomite.

6705.6 (14.5) - Cross roads: Kintore left, Oryg's right.

6705.7 (14.6) - D.C. camp.

(13) Kintore to Kintore and back by the "Sagstone" locality previously recorded - Journey 6.

This trip was taken with the object of seeing whether the above general Kintore is worthy of detailed investigation or not; for according to Oswald's map it should be. A detailed traverse was not allowed at, but it was proposed to revisit the mountains one on the return journey, and to secure from the local inhabitants some ethnological information for the British Museum.

Most unfortunately the rains had rendered the roads almost impassable in places and owing to getting stuck at the mud on several occasions there was much delay, so that in the end there was no time to revisit the suspicious locality.

- 6721.1 (37.3) — Bangwe camp
- 6721.2 (37.4) — same locality E. bank to the right
- 6721.3 (37.5) — same locality E. bank ahead and bridge left

6721.4 (37.6) — Boulder conglomerate like that, composed of (thin) ... between here and the ... the road to ...

6721.5 (37.7) — ...

6721.6 (37.8) — ...

6721.7 (37.9) — ...

6721.8 (37.10) — ...

6721.9 (37.11) — ...

6721.10 (37.12) — ...

6721.11 (37.13) — ...

6721.12 (37.14) — ...

6721.13 (37.15) — ...

6721.14 (37.16) — ...

6721.15 (37.17) — ...

6721.16 (37.18) — ...

6721.17 (37.19) — ...

6721.18 (37.20) — ...

6722.1 (37.21) — Sandstone.

6722.2 (37.22) — Quartz-reef (dyke) running apparently N.E. by E. (assy sample, no value).

6740.1 (38.5) — Road crosses stream running left. Some granitic boulders.

6740.2 (39.4) — Point where I stopped the car in road when visiting the suspension bridge—Journey (6).

The whole of the country passed over between Kabwochi (6721.1) and 6736.1 (near Nkara) is granitic. It forms a sort of low plateau for the most part capped with lateritic ironstone. This frequently contains pebbles and artifacts.

(12) Bangwe to Homa Bay

6737.1 (39) — Bangwe.

6737.2 (40.1) — Felite.

6742.1 (42.9) — Augite-nephelinite (specimen 1084).

6742.2 (43.0) — Cross road, that to Kochia being to the right. At the junction of Augite-nephelinite.

6746.7 (45.0) — Road crosses stream running left.

Here we pass of agglomerates and come on to rotted quartz-porphyr(?) intruding a series consisting chiefly of sheared silicified felites (specimen 1065), gritstones, brecciated crystalline limestones (specimen 1066), and conglomerates with lava matrix, resembling an agglomerate (specimen 1087). The specimens were collected near 6767.0.

6767.2 (46.4) — Felite again, and rocks represented by specimen 1090.

6767.3 (46.5) — Aligned and sheared agglomerate (or conglomerate) (specimen 1090).

6768.2 (46.8) — Augite-bearing lava, again resembling 1084.

6769.1 (47.0) — Road crosses stream running left.

6769.2 (47.6) — Road junction. Augite-nephelinite agglomerate outcrop.

6770.3 (48.2) — Kwan River (bridge). Agglomerates.

6771.2 (49.0) — Porphyritic lava—a limburgite (specimen 1081).

6772.1 (49.4) — Light-colored completely rotted igneous rock.

Most unfortunately, the rains had rendered the roads almost impassable in places, and owing to getting stuck on the road on several occasions there was much delay, so that at the end there was no time to revisit the soapstone locality.

6711.2 (1) - Bangwe camp

6711.3 (2) - Cross roads. Khorra to the right

6711.4 (3) - Cross roads. Khorra ahead and Bangwe left

(See 6722.5.)

6711.5 (4) - Soapstone outcrop same place as suggested in 6710.1. Soapstone here and the rest of the road the road is calcareous and.

6711.6 (5) - Soapstone outcrop. Soapstone here. Soapstone here.

6711.7 (6) - Soapstone outcrop. Soapstone here.

6711.8 (7) - Soapstone outcrop. Soapstone here.

6711.9 (8) - Soapstone outcrop. Soapstone here.

6711.10 (9) - Soapstone outcrop. Soapstone here.

6711.11 (10) - Soapstone outcrop. Soapstone here.

6711.12 (11) - Soapstone outcrop. Soapstone here.

6711.13 (12) - Soapstone outcrop. Soapstone here.

6711.14 (13) - Soapstone outcrop. Soapstone here.

6711.15 (14) - Soapstone outcrop. Soapstone here.

6711.16 (15) - Soapstone outcrop. Soapstone here.

6711.17 (16) - Soapstone outcrop. Soapstone here.

6711.18 (17) - Soapstone outcrop. Soapstone here.

6711.19 (18) - Soapstone outcrop. Soapstone here.

6711.20 (19) - Soapstone outcrop. Soapstone here.

6722.1 (1) - Sandstone.

6722.2 (2) - Quartz-reef (dyke) running apparently N.E. by E. (noy sample, no value).

6722.3 (3) - Road crosses stream running left. Some granitic boulders.

6722.4 (4) - Point where I stopped the car in road when visiting the soapstone deposit—Journey (6).

The whole of the country passed over between Kabwochi (6722.2) and 6722.1 near Khorra is granitic. It forms a sort of low plateau for the most part capped with lateritic ironstone. This frequently contains pebbles and artifacts.

(13) Bangwe to Homa Bay

6722.5 (1) - Bangwe.

6722.6 (2) - Felsite.

6722.7 (3) - Angite-nephelinite (specimen 1064).

6722.8 (4) - Cross roads, that to Khorra being to the right. At this junction is Angite-nephelinite.

6722.9 (5) - Road crosses stream running left.

Here we pass off agglomerates and come on to rotted quartz porphyry (?) intruding a series consisting chiefly of shaly siliceous felsites (specimen 1065), gneisses, brecciated crystalline limestone (specimen 1066), and conglomerates with lava matrix, resembling an agglomerate (specimen 1067). The specimens were collected near 6767.0

6722.10 (6) - Felsite again, and rocks represented by specimen 1068.

6722.11 (7) - Aligned and sheared agglomerate (or conglomerate) specimen 1069.

6722.12 (8) - Angite-bearing lava, again resembling 1068.

6722.13 (9) - Road crosses stream running left.

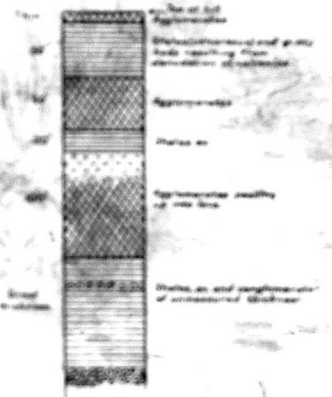
6722.14 (10) - Road junction. Angite-nephelinite agglomerate specimen.

6722.15 (11) - Anom. River (bridge). Agglomerates.

6722.16 (12) - Porphyritic lava—a limburgite (specimen 1070).

6722.17 (13) - Light-colored completely rotted igneous rock.

The section exposed in Karungu Hill on Huruwa Island—a new (undoubtedly) shown on the map to the west of Luanda and between that hill and Gualala—is approximately as follows—



Approximate section of Karungu Hill on Huruwa Island

The section exposed in Karungu Hill on Huruwa Island is a very granite. It is composed of a variety of metamorphic rocks of various grades in the field.

The section exposed in Karungu Hill on Huruwa Island is a very granite. It is composed of a variety of metamorphic rocks of various grades in the field. The metamorphic limestone specimens 1100 and 1101 are of the mica class. The mica class specimens 1100 and 1101 are of the mica class. The mica class specimens 1100 and 1101 are of the mica class. The mica class specimens 1100 and 1101 are of the mica class. The mica class specimens 1100 and 1101 are of the mica class.

war. It lies to the west of Mbeta, on the hillside, some 500-600 feet above the camp. A sample of this limestone was collected (specimen 1100). It overlies some calcareous shales that may possibly prove to be a form of cement-stone. A sample was taken for further investigation. (Magnetic bearing of quarry to Gualala Hill on mainland, 80°, and to Mbeta Camp, 204°.)

The return journey to Homa Bay was also through the mist, so nothing further was observed.

(15) Homa Bay to Karungu.

On account of lateness of arrival at Homa Bay, the journey to Karungu (by car) had to be undertaken without delay. It was entirely over volcanic ground (as Oswald's map shows it should be). A sample of the common rock exposed is provided by specimen 1107—a basalt.

6774.6. (0) —Start.

6779.5. (4.9) —Turning to Karungu.

This road was said to be quite impassable, so I continued ahead to Mirogi.

6782.4. (7.9) —Specimen 1107.

6783.1. (13.5) —Stone walls (right). These are said to be the remains of a fort built during the war. No doubt there was good reason for building a fort there; but it is difficult now to see what that reason could have been.

6790.1. (15.5) —Mirogi.

6790.5. (16.2) —Turning from the right.

6819.5. (45.0) —The Government Camp, Karungu. This is situated on the so-called black cotton soil. From this camp I visited the Miocene sites that were dealt with so well by Oswald. No further description of them is needed here.

Specimen 1106—Oswald's "basalts" overlying sediments. The specimen collected proved to be nepheline.

Specimen 1109—Anorthosite from below basalts.

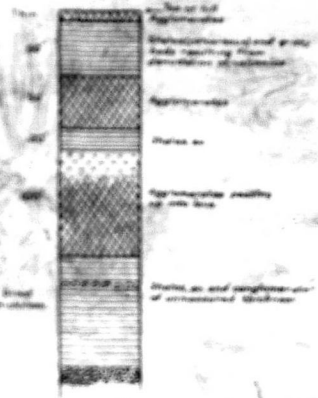
(16) The Gold Mine Area.

This lies to the south of the Kuja River, along an approximately NW.-SE. zone. The NW.-SE. line is an important one in the geology of East Central Africa, and is frequently one of crushing and shearing.

6827.1. (3) —Start. Ground swampy.

6825.2. (8.2) —Other side of swamp. Dead-looking semi-cottled granite. Probably a sheared G3 granite.

The section exposed in Karungu Hill on Buninga Island
— a line inadequately shown on the map to the west of
Lauze and between that hill and Gamba—is approximately
as follows:—



Geological Column of Karungu Hill, Buninga Island

The section exposed in Karungu Hill on Buninga Island is approximately as follows:—

The section exposed in Karungu Hill on Buninga Island is approximately as follows:—

war. It lies to the west of Mbeta, on the hillside, some 500-600 feet above the camp. A sample of this limestone was collected (specimen 1100). It overlies some calcareous shales that may possibly prove to be a form of cement-stone. A sample was taken for further investigation. (Magnetic bearing of quarry to Gamba Hill on mainland, 80°, and to Mbeta Camp, 104°.)

The return journey to Homa Bay was also through the mist, so nothing further was observed.

(15) Homa Bay to Karungu

On account of lateness of arrival at Homa Bay, the journey to Karungu (by car) had to be undertaken without delay. It was entirely over volcanic ground (as Oswald's map shows it should be). A sample of the common rock exposed is provided by specimen 1107—a basalt.

6779.6. (0) —Start.

6779.5. (4.9) —Turning to Karungu.

This road was said to be quite impassable, so I continued ahead to Mirogi.

6782.4. (7.8) —Specimen 1107.

6788.1. (13.5) —Stone walls (right). These are said to be the remains of a fort built during the war. No doubt there was good reason for building a fort there; but it is difficult now to see what that reason could have been.

6790.1. (15.5) —Mirogi.

6790.8. (16.3) —Turning from the right.

6819.8. (45.0) —The Government Camp, Karungu. This is situated on the so-called black cotton soil. Prior to this camp I visited the Miocene sites that were dealt with so well by Oswald. No further description of them is needed here.

Specimen 1106—Oswald's "basalts" overlying sediments. The specimen collected proved to be nephelinitic.

Specimen 1109—Amphibolite from below basalt.

(16) The Gold Mine Area

This lies to the south of the Kuja River, along an approximately NW-SE zone. The NW-SE line is an important one in the geology of East Central Africa, and is frequently one of crushing and shearing.

6827.1. (0) —Start. Ground swampy.

6833.9. (8.2) —Other side of swamp. Dead-looking semi-rotted granite. Probably a sheared G2 granite.

6846.6 (12.4)—Much the same rock, but more rotted in appearance.

6847 (12.4)—Kaga River.

6847.1 (12.4)—Hornblende-granite, somewhat gneissic (specimen 1143)

6847.2 (12.4)—Shaded quartz porphyry (specimen 1143)

6847.3 (12.4)—Blackhall's Reef

When crossing the swampy country mentioned above, the ground was somewhat more fringed again towards the Kaga. The strike of these strata is about N 100° E from above Lake Victoria.

The rocks are granite with a good deal of ironstone at the surface, which passes into quartz below. The quartz itself is the original quartz, having gold-bearing veins, and contains a little mica. The granite has a porphyry which passes to a quartz porphyry at the east or north-east side of the reef and is about N 100° E. In the east of Blackhall's Reef is a quartz porphyry which on the western side the wall is seen. The dip of the granite is generally steep to the SSW.

The nature of the granite was described between the river and the reef. Between the reef being largely porphyry and quartz, the granite granite as it is known prospecting by the natives is called the N. E. of the reef and is a little different.

At the base of Blackhall's Reef there is a horizon of the same rock, but it is

at the base of the reef is a granite which is a little different from that which is approximately the same as that of the reef. It is called the N. E. of the reef and is a little different.

6847.4 (12.4)—Blackhall's Reef

The rocks are granite with a good deal of ironstone at the surface, which passes into quartz below. The quartz itself is the original quartz, having gold-bearing veins, and contains a little mica. The granite has a porphyry which passes to a quartz porphyry at the east or north-east side of the reef and is about N 100° E. In the east of Blackhall's Reef is a quartz porphyry which on the western side the wall is seen. The dip of the granite is generally steep to the SSW.

6847.5 (12.4)—Blackhall's Reef

6847.6 (12.4)—Blackhall's Reef

6847.7 (12.4)—Blackhall's Reef

1,000 yards.—Less foliated granite (specimen 1139); also exhibits crushing.

650 yards.—Non-gneissose granite with purple quartz (specimen 1140), like that on Rusinga Island (cf. specimen 1096).

400 yards.—Diorite-porphry (specimen 1141), and porphyry with augite (specimen 1142).

30 yards.—Quartz floaters common. Now at or very near the base of Kweri Hill. There is much laterite ironstone here

60 yards.—Granite again.

80 yards.—Quartz scattered on hillsides.

500 yards.—Top of Kweri Hill. Masses of quartz (specimen 1143). On the north side of the hill a rock (floaters), resembling aplite, was collected (specimen 1144). It was found to be a crushed Newer Granite.

Kweri Hill is a puzzle. I do not know whether it is a quartz of igneous origin or a completely metamorphosed and partly absorbed mass of quartzite. I incline to the former view.

The relationship of Kweri Hill to Masara Hill (also barren quartz, I am told, and to a large barren reef between the two, appears to be (as pointed out to me) as is shown in sketch plan No. 1.

The return journey to Blackhall's Reef was made by a native path. Where this crosses the Mynyo River the dolerite (specimen 1145), associated with amphibolite (specimen 1146), is exposed.

(17) Return to Kim, via Gori River

6847.6. (4)—Start.

6850.0 (2.4)—Hornblende granite (not very gneissose) at Kisumu Prospecting Syndicate's camp (specimen 1147c).

The Syndicate are not mining; they are collecting and crushing the surface rubble (specimens 1147 and 1147a), which is largely composed of granular quartz, in which visible gold is sometimes seen. Methods of crushing and recovering are primitive but the yield seems to be good. An artifact was recovered from this rubble (specimen 1147b).

6860.0 (12.4)—Ferry over the Gori River.

Here some extremely ancient and much metamorphosed conglomerates, etc., are found. They may well be Karagwe-Ankoleah in age. The dip is south-westerly and steep. (Specimen 1148.)

6542.2 (12.4).—Much the same rock, but more cotted in appearance.

6542.7 (12.4).—Kaga River.

6542.7 (12.4).—Hornblende-granite, somewhat gneissic (specimen 1139)

6542.8 (12.4).—Shaded quartz-porphry (Specimen 1144).

6542.9 (12.4).—Blackhall's Reef

When crossing the swampy country mentioned above, the ground soon becomes very steep again towards the Kaga, after which it runs irregularly. The gold veins are on a plateau, rather more than 1/2 mile east above Lake Victoria.

The rocks are quartz, and a good deal of feldspar, of the medium which passes into granite below. The quartz itself is in the regions where nothing gold-bearing occurs, and contains a little mica. The granite has a porphyry which passes to a gneissic granite particularly on the east of north-west side of the reef, and into a schist in the case of Blackhall's Reef. Some outcrops suggest that on the easterly side the gold porphyry veins in the country under the hill is a schist. The dip of the country is generally in conformity to the 6542.

The relation of porphyry are situated between the local and Masara, forming the area being largely porphyry and granite, and partly gneiss, as in the Kisumu Prospecting Site. The dip of the country is east, which the 6542.1 found a local granite.

The return journey to Blackhall's Reef there is a distance by the road of 12 miles.

The return journey to Kaga River is a distance by the road of 12 miles, and a half mile to the Kisumu Prospecting Site.

6542.9 (12.4).—Blackhall's Reef

The return journey to Kaga River is a distance by the road of 12 miles, and a half mile to the Kisumu Prospecting Site. The dip of the country is east, which the 6542.1 found a local granite.

The return journey to Kaga River is a distance by the road of 12 miles, and a half mile to the Kisumu Prospecting Site.

The return journey to Kaga River is a distance by the road of 12 miles, and a half mile to the Kisumu Prospecting Site.

1,000 yards.—Less foliated granite (specimen 1139); also exhibits crushing.

650 yards.—Non-gneissose granite with purple quartz (specimen 1140), like that on Rusinga Island (cf. specimen 1096).

400 yards.—Diorite-porphry (specimen 1141), and porphyry with augite (specimen 1142).

30 yards.—Quartz floaters common. Now at or very near the base of Kweri Hill. There is much lateritic ironstone here.

60 yards.—Granite again.

30 yards.—Quartz scattered on hillside.

500 yards.—Top of Kweri Hill. Masses of quartz (specimen 1143). On the north side of the hill a rock (floater), resembling aphte, was collected (specimen 1144). It was found to be a crushed Newer Granite.

Kweri Hill is a puzzle. I do not know whether it is a quartz of igneous origin or a completely metamorphosed and partly absorbed mass of quartzite. I incline to the former view.

The relationship of Kweri Hill to Masara Hill (also barren quartz, I am told), and to a large barren reef between the two, appears to be (as pointed out to me) as is shown in sketch plan No. 1.

The return journey to Blackhall's Reef was made by a native path. Where this crosses the Myunyo River the diorite (specimen 1145), associated with amphibolite (specimen 1146), is exposed.

(17) Return to Kwa, via Gori River

6547.6. (0).—Start.

6550.0 (2.4).—Hornblende granite (not very gneissose) at Kisumu Prospecting Syndicate's camp (specimen 1147c).

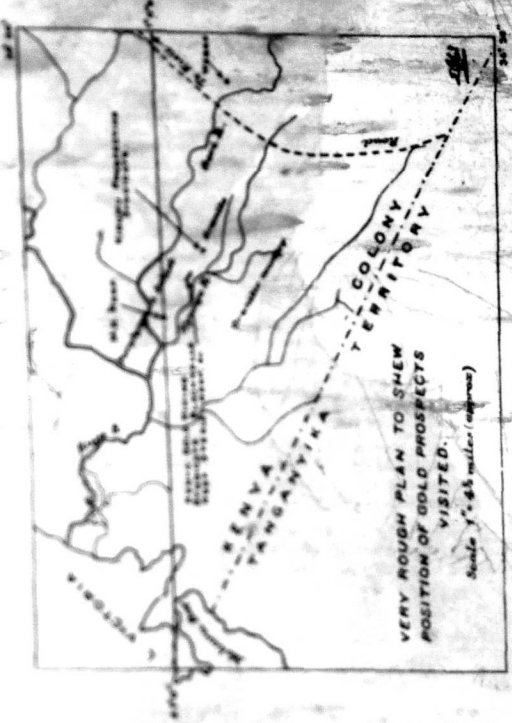
The Syndicate are not mining; they are collecting and crushing the surface rubble (specimens 1147 and 1147a), which is largely composed of granular quartz, in which visible gold is sometimes seen. Methods of crushing and recovering are primitive, but the yield seems to be good. An artifact was recovered from this rubble (specimen 1147b).

6660.0. (12.4).—Ferry over the Gori River.

Here some extremely ancient and much metamorphosed conglomerates, etc., are found. They may well be pre-Karaga-Ankolean in age. The dip is south-westerly and steep. (Specimen 1148.)

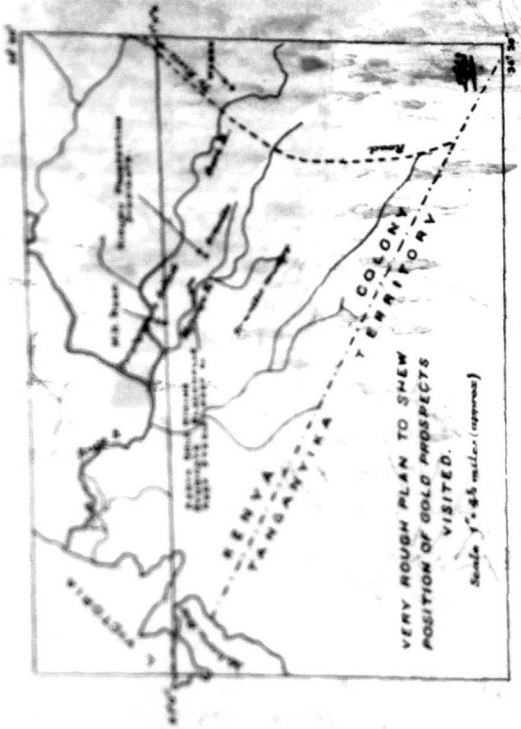
- 1902.2. 123.10 - Porphyry country; much quartz lying about Porphyry systems (1230) in a mica-schist porphyry
- 1902.2. 123.11 - Porphyry country High-level ground
- 1902.2. 123.12 - Masses of iron-quartz lying about
- 1902.2. 123.13 - Porphyry exposures
- 1902.2. 123.14 - Mine
- 1902.2. 123.15 - Exposure of a fine-grained diorite porphyry (1230)
- 1902.2. 123.16 - Dioritic masses of the group, sub-parallel to the main porphyry system (1230)
- 1902.2. 123.17 - Diorite masses
- 1902.2. 123.18 - Diorite masses
- 1902.2. 123.19 - Diorite masses
- 1902.2. 123.20 - Diorite masses
- 1902.2. 123.21 - Diorite masses
- 1902.2. 123.22 - Diorite masses
- 1902.2. 123.23 - Diorite masses
- 1902.2. 123.24 - Diorite masses
- 1902.2. 123.25 - Diorite masses
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- 1902.2. 123.46 - Diorite masses
- 1902.2. 123.47 - Diorite masses
- 1902.2. 123.48 - Diorite masses
- 1902.2. 123.49 - Diorite masses
- 1902.2. 123.50 - Diorite masses

- 1902.2. 123.2 - Dolerite exposures of irregular form
- 1902.2. 123.9 - Cross roads. Kitare to the left.
- 1902.2. 123.2 - Kiar village
- 1902.2. 123.3 - T junction in road. Right to Kiani, left to Kachia.
- 1902.2. 123.0 - Kiani (A.D.C.'s house).



- 4885.2 (38.2) - Porphyry country; much quartz lying about Porphyry specimens (3885) in a thin-dotted porphyry.
- 4887.2 (38.2) - Porphyry country. High-level ground.
- 4888.2 (38.2) - Masses of vein-quartz lying about.
- 4889.2 (38.2) - Porphyry specimens.
- 4890.2 (38.2) - Same.
- 4891.2 (38.2) - Exposure of a fine-grained diorite porphyry specimens (3891).
- 4892.2 (38.2) - Another example of the group, in higher diorite porphyry specimens (3892).
- 4893.2 (38.2) - Substrata shown.
- 4894.2 (38.2) - Diorite specimens containing quartzite specimens (3894).
- 4895.2 (38.2) - Same as 4894.
- 4896.2 (38.2) - A gully in the bottom of a dry dip slope, containing scattered quartzite specimens (3896) specimens of the ground around about a 20-foot pit.
- 4897.2 (38.2) - Substrata shown in quartzite specimens (3897).
- 4898.2 (38.2) - Diorite specimens in hard beds and the same.
- 4899.2 (38.2) - Diorite specimens containing quartzite specimens (3899).
- 4900.2 (38.2) - Diorite specimens containing quartzite specimens (4900).
- 4901.2 (38.2) - Diorite specimens containing quartzite specimens (4901).
- 4902.2 (38.2) - Diorite specimens containing quartzite specimens (4902).
- 4903.2 (38.2) - Diorite specimens containing quartzite specimens (4903).
- 4904.2 (38.2) - Diorite specimens containing quartzite specimens (4904).
- 4905.2 (38.2) - Diorite specimens containing quartzite specimens (4905).
- 4906.2 (38.2) - Diorite specimens containing quartzite specimens (4906).
- 4907.2 (38.2) - Diorite specimens containing quartzite specimens (4907).
- 4908.2 (38.2) - Diorite specimens containing quartzite specimens (4908).
- 4909.2 (38.2) - Diorite specimens containing quartzite specimens (4909).

- 4885.4 (38.2) - Dolomite exposures of irregular form.
- 4886.4 (38.2) - Cross roads. Kitare to the left.
- 4887.4 (38.2) - Rish village.
- 4887.5 (38.2) - T junction in road. Right to Kitui, left to Kaitale.
- 4889.4 (38.2) - Kitui (A.D.C.'s house).



VERY ROUGH PLAN TO SHOW POSITION OF GOLD PROSPECTS VISITED.

Scale 1" = 2.5 miles (approx)

F-RECOMMENDATIONS

Southern Kentucky is worthy of much more detailed study than it has received, not only from the point of view of pure geology, which should provide a key to the study of other districts, but also as a possible area for economic minerals. The mapping of the area should form part of the work of a Geological Survey of Europe, should one be formed in any year.

With regard to field studies progressing in southern Kentucky, the known outcrops now should be investigated by geologic cross-sections of the strata shown, or geologic maps which are progressing quickly, and, within them, as well as recording observations and mineral deposits.

The metamorphic history of the East Tennessee is of great interest and importance. Heavy exposures from the East Tennessee. The gneiss and migmatite have not been studied in detail, and this fact would seem to be one possibility toward the solution of such bodies and other deposits in local basins, and the character of their deposits produced by the metamorphism of the strata. It is likely that the metamorphic history would be especially important in the study of the metamorphism of the southern.

Study of the basin in which the East Tennessee was deposited during the early of the Cambrian, it is possible, at least, that this may have been highly developed, but the metamorphic history of the basin would not be expected to be very different from that of the other small basins.

If the question of the true position of metamorphic rocks within the basin is not in fact, it is likely that the study of the basin and the exposure recorded by the metamorphic rocks.

The metamorphic history of the basin would not be expected to be very different from that of the other small basins.

P. J. WALKER

APPENDIX I

LIST OF TROUSERS COLLECTIONS

- 100.—Silty siliceous rock (metamorphosed quartzite), associated with some gneiss, quartz veins and dykes; 10 miles from town, by a small stream, known as located in the State Marine Road.
- 101.—A metamorphosed schist, associated with specimen 100, consisting of the rocks unknown; the rock is scattered pieces on the surface.
- 102.—Phyllite, exposed by stream called Malaga, 10 miles from town, by a small stream, known as located in the State Marine Road.
- 103.—Dioritic intrusion into rocks, represented by specimen 100.
- 104.—Quartz porphyry (?) 1.4 miles beyond police camp on the State Marine Road, and 100 ft. above the camp.
- 105.—Fine-grained meta-siltstone, with lenticular texture, passing locally to quartzite-gneiss (specimen 101); 1.1 miles beyond police camp and 100 ft. above it.
- 106.—Migmatite schist (?) covered by quartz; 10 miles beyond police camp, and 100 ft. above it.
- 107.—Altered schist (migmatite) (?). The presence of rock and polished shows that represented by specimen 100.
- 108.—Amphibolite schist, the River.
- 109.—Completely metamorphosed and associated with 100, 101, 102, & a massive coarse, white or tan, granitic variety, the River.
- 110.—Brown fine-grained schist of amphibolite appearance, altered after 7, according to the center of a porphyritic vein, the River.
- 111.—Dark quartz rock, somewhat crystalline, resembling a metamorphic rock, but probably a quartzite; the River.
- 112.—Common granitic rock; the River.
- 113.—Fine-grained schist, very dark of granitic composition of the River, and reflected poor dark red.

5—BIOHERMITEZATIONS

Further knowledge is worthy of much more detailed study than it has received; not only from the point of view of pure geology, which should provide a key to the study of other districts, but also as a possible area for systematic study. The mapping of the area should form part of the work of a Geological Survey of Europe, should one be formed in any time.

What is required is first further prospecting in addition to this within the known outcrops areas, should be undertaken by plotting configurations of the strata, etc., in determining which are the important quartz-dikes, etc., within them, as well as sampling these and other deposits.

The specimens collected in the East Caucasus are of great interest and especially 122. Many specimens from the East Caucasus. The grains are irregular and have not as well defined faces, and these faces would seem to be two possibilities, namely the outlines of small tubes and flattened deposits in small cavities, and the outlines of elliptical deposits produced in the compression of liquid or crystalline or like material under especially unusual high temperature conditions and the irregularity of its outlines.

Most of the grains in which the East Caucasus was reported clearly show the edges of the crystals, it is possible, however, that this may have been merely rounded edges, but this hypothesis is proved in quartz and would not be applicable to the other minerals. The grains are small, usually spherical.

If the presence of the two possibilities of formation is proved, namely by special methods in which to separate the mineral inclusions and the specimens investigated by the necessary methods.

The specimens in the collection of various minerals may be made a more appropriate systematic arrangement and finally (1) is the list of the types, which 122 to the end of the East Caucasus.

A. J. WATLAND

APPENDIX I

LIST OF SPECIMENS COLLECTED.

- 126.—Single siliceous rock metamorphosed quartzite, associated with several grained quartzites and dykes; 15 miles from Linn, by a small stream (name unknown) on the East Russian Road.
- 127.—A metamorphosed schistose (?) associated with specimen 126, metamorphosed of the same nature; also several scattered pieces in the section.
- 128.—Dykes, exposed by stream called Nulungva, which runs from 1 1/2 miles north Nulungva than specimens 126 and 127.
- 129.—Siliceous schistose rock, exposed by specimen 128.
- 130.—Quartz porphyry (?) 1-2 miles beyond police camp on the North Russian Road, and 120 ft. above the camp.
- 131.—Fine grained metamorphosed limestone, with abundant quartz, passing locally to quartzite (specimen 132); 2 1/2 miles beyond police camp and 120 ft. above it.
- 132.—Altered schistose (?) exposed by quartz; 2 1/2 miles beyond police camp, and 120 ft. above it.
- 133.—Altered schistose altered (?) The specimen has well defined faces that represented by specimen 132.
- 134.—Amphibole schist; the River.
- 135.—Completely crystallized and crystalline type 134; 120 ft. is a common occurrence, more or less granitic nature; the River.
- 136.—Brown fine grained altered of argillaceous schistose altered quartzite, occurring in the center of a quartzite vein; the River.
- 137.—Darkish quartz rock, somewhat crystalline, consisting a replacement rock, but probably a quartzite; the River.
- 138.—Common quartz rock; the River.
- 139.—Fine grained schistose, acid base of schistose composition of Linn "all" "altered quartzite rock" and

- 1020.—Closely similar to 1019; from top of escarpment.
- 1021.—Closely similar to 1019; from above plateau north of police camp at Nanda.
- 1022.—Devitrified glassy lava, probably a rhyolite, about 2½ miles beyond Nanda on the Kund Road.
- 1023.—Intensely silicified vesicular lava, closely associated with 1022.
- 1024.—Epidote-quartz rock, altered lava; ¼ mile beyond (Kum) wards of 1023.
- 1025.—Grey lava with smouldering black staurolite? 10½ miles beyond 1024.
- 1026.—Rock resembling in the mass the Eocene-trachyte described of South Africa. Much altered lava, the rock now consists of calcite epidote and chlorite; ¼ mile beyond 1025.
- 1027.—Altered dolerite; ¼ mile beyond 1026.
- 1028.—Light grey amygdaloid trachyte (possibly the same as one of Mr. Condie's Northern Kivu trachytes), rather more than 2 miles beyond 1027.
- 1029.—Dark amygdaloid trachyte, at junction of Kund and Kundu Roads, approximately 4 miles beyond 1028.
- 1030.—Rock similar to 1029; same locality as 1029.
- 1031.—Quartzite of the Bushuwa Mountains, from Napier's H.R.
- 1032.—Amygdaloid associated in an intricate way, the probably hydrothermal with 1031.
- 1033.—Trachyte? from Napier's Hill, is characteristically fine-grained and somewhat altered, especially amygdaloid.
- 1034.—Saprophytic outcrop, above 1033.
- 1035.—Devitrified amygdaloid, above 1034.
- 1036.—Glassy lava with spherulitic structure? "
- 1037.—Amygdaloid; 1½ miles from Kund on the Kundu Road.
- 1038.—Basalt (?) & decomposed product of dolerite; 2½ miles from Kund, on the upper part of slope.
- 1039.—Fine-grained syenite; ¼ mile from Kund.

- 1040.—Red syenite; 1.2 miles from Kund.
- 1041.—Pink Newer Granite, containing the Alstonian rock, ¼ mile from Kund.
- 1042.—Syenite, derived from coarse-grained dolerite; 4.2 miles from Kund.
- 1043.—Mylonitic Newer Granite; ½ mile from Kund.
- 1044.—Fine-grained basalt; Kund.
- 1045.—Silicified dolerite; 1 mile west beyond junction of Kundu and Kundu-Kimber-Kund Road.
- 1046.—Flinty lava (collected basalt?); same locality as 1045.
- 1047.—Coarse dolerite; 1½ miles from Kundu Road, just the junction (see locality of 1045).
- 1048.—Basaltic material? ½ mile beyond (Kundu side of) 1047.
- 1049.—Springs of mineral water, described.
- 1050.—Lava conglomerate; 4 miles beyond 1048.
- 1051.—Phyllite; 4,200 feet beyond 1049.
- 1052.—Green-grey rock of those found by Mr. Condie in N. Kivu, probably an altered volcanic rock; 1 mile beyond 1051.
- 1053.—Epithermal coarse dolerite; 1 mile beyond 1052.
- 1054.—Stony lava, fine-grained and amygdaloid; 1 mile beyond 1053.
- 1055.—Amygdaloid trachyte-trachyte; 1.1 mile from beyond 1054.
- 1056.—Porphyrone and completely altered dolerite; ½ mile from Otagi's along the Kundu Road.
- 1057.—Porphyrone culture, green siliceous rock, apparently of hydrothermal origin; 1,200 feet beyond camp at Otagi's on the Kundu Road.
- 1058.—Silicified amygdaloid lava; ½ mile from beyond 1057.
- 1059.—Aluminous-siliceous breccia, lower slope of Waga Hill, one mile beyond 1058, 1,000 yards from the Kundu Road.
- 1060.—Shaly porphyry, in middle of Waga Hill (see Profile Diagram of Waga Hill, p. 15.).

- 1020.—Closely similar to 1019; from top of escarpment.
- 1021.—Closely similar to 1019; from above garrison north of police camp at South.
- 1022.—Devitrified glassy lava, probably a rhyolite, about 1/2 miles beyond South on the Kaiti Road.
- 1023.—Intensely alkali-fused vesicular lava, closely associated with 1022.
- 1024.—Epoxide-quartz rock (altered lava) 1/2 miles beyond (Kaiti-wards of) 1023.
- 1025.—Grey lava with nodding black (trachyte?) 100 miles beyond 1024.
- 1026.—Rock resembling in the mass the batholithic amygdaloid of South Africa. Much altered lava, the mass now consists of calcite, epoxide and chlorite; 1/2 miles beyond 1025.
- 1027.—Altered dolerite; 1/2 miles beyond 1026.
- 1028.—Light-grey amygdaloidal trachyte (possibly the same as one of Mr. Condie's Northern Keweenaw porphyries); trachite more than 1/2 miles beyond 1027.
- 1029.—Light amygdaloidal trachyte, at junction of Kaiti and Kaiti Roads, approximately 1/2 miles beyond 1028.
- 1030.—Light similar to 1029, same locality as 1029.
- 1031.—Quartzite of the Dakota drainage basin from Napier Hill.
- 1032.—Amygdaloid amygdaloid in an extremely fine and probably interstratified with 1031.
- 1033.—Trachyte from Nighthawk Hill; an extremely fine-grained and somewhat altered amygdaloid amygdaloid.
- 1034.—Amygdaloidal amygdaloid, above 1033.
- 1035.—Devitrified amygdaloid amygdaloid, above 1034.
- 1036.—Glassy lava with extensive amygdaloid.
- 1037.—Amygdaloidal amygdaloid; 1/2 miles from Kaiti on the Kaiti Road.
- 1038.—Dolerite & amygdaloidal amygdaloid of dolerite; 1/2 miles from Kaiti, in the same zone as above.
- 1039.—Fine grained epoxide; 1/2 miles from Kaiti.

- 1040.—Red epoxide; 1/2 miles from Kaiti.
- 1041.—Pink Newer Granite, overlying the Aberdeen and; 1/2 miles from Kaiti.
- 1042.—Epoxide, derived from amygdaloidal dolerite; 1/2 miles from Kaiti.
- 1043.—Altered Newer Granite; 1/2 miles from Kaiti.
- 1044.—Fine grained basalt; Kaiti.
- 1045.—Siliceous dolerite; 1/2 mile north (beyond junction of Kaiti and Kaiti Roads) from Kaiti Road.
- 1046.—Glassy lava (altered basalt); same locality as 1045.
- 1047.—Green dolerite; 1/2 mile from Kaiti Road, just the junction (see locality of 1045).
- 1048.—Dolerite amygdaloid; 1/2 mile beyond (Kaiti side of) 1047.
- 1049.—Amygdaloid of amygdaloid, amygdaloid.
- 1050.—Lava amygdaloid; 1/2 mile beyond 1049.
- 1051.—Trachyte; 1/2 mile beyond 1049.
- 1052.—Green grey rock (of glass) found by Mr. Condie in Keweenaw, probably an altered amygdaloid; 1/2 mile beyond 1051.
- 1053.—Epoxide-altered basalt dolerite; 1/2 mile beyond 1052.
- 1054.—Glassy lava, amygdaloid and amygdaloid; 1/2 mile beyond 1053.
- 1055.—Amygdaloidal amygdaloid; 1/2 mile beyond 1054.
- 1056.—Epoxide and extremely altered dolerite; 1/2 mile from Otago's along the Kaiti Road.
- 1057.—Trachyte amygdaloid grey amygdaloid rock, apparently of amygdaloidal origin; 1/2 mile north beyond Otago's on the Kaiti Road.
- 1058.—Siliceous amygdaloidal lava; 1/2 mile north beyond 1057.
- 1059.—Amygdaloidal amygdaloid, lower stage of Wagon Hill, one mile beyond 1058, 1/2 mile north from the Kaiti Road.
- 1060.—Altered amygdaloid, in middle of Wagon Hill (see Profile Diagram of Wagon Hill, p. 33).

WIRE HILL, LOOKING NORTH FROM OYUGI.

- 1061.—Granite-porphry; little south-east of 1060; less sheared.
- 1062.—Hematite-chert rock, presumably an altered felsite, a few yards higher up hill (towards trig. station), on the sheared side of the felsite.
- 1063.—Sheared felsite; 50 ft. above last observation.
- 1064.—Extremely sheared porphyry. Top of this part of the rise.
- 1065.—Pyritiferous chalcadonic rock, about 50 ft. below trig. station, Wire Hill.
- 1066.—Altered amphibole-schist (?) (resembling shales); $\frac{1}{2}$ miles down the Kendu Road from Oyugi's.
- 1067.—Dioritic rock, with xenoliths of hornblende-schist; nearly $\frac{3}{4}$ miles beyond 1066 is the amphibole-schist.
- 1068.—Red felsite pebble from Pleistocene Bed of Sumbi (sheared lithic and crystal tuff).
- 1069.—Granular crystalline limestone, near (NE of) Homa Mt.
- 1070.—Grey argillite; one mile towards hills behind D.C. house, Kisii (collected by D.C.); used as slate pencils and was at one time carved into pots, but the work who undertook that work is now dead.
- 1071.—Red aplogranite (as in specimen 1040); 7-1/10th miles from Kisii, along the Rangwe Road (exactly similar to 1040).
- 1072.—Granite porphyry, jointed so as to resemble sedimenta; $\frac{1}{4}$ mile beyond 1071.
- 1073.—Rotted rock (porphyry or granite?); $\frac{2}{3}$ miles beyond 1072.
- 1074.—Rotted red rock (granophyre), apparently passing into red granite; nearly $\frac{1}{4}$ mile beyond 1073.
- 1075.—Granophyre, associated with red granite (passes into material like 1074); $\frac{1}{4}$ miles beyond 1074.
- 1076.—Fine-grained quartz-porphry; $\frac{1}{5}$ th mile beyond 1076.
- 1077.—Jasper-breccia, cemented by chalcadony; $\frac{1}{4}$ mile beyond 1076.

- 1078.—Cyclic dolerite; nearly $\frac{1}{2}$ mile beyond 1077.
- 1079.—Basic rock weathering spheroidally (dolerite?); $\frac{1}{4}$ - $\frac{1}{2}$ mile beyond 1078.
- 1080.—Strongly sheared lava, resembling specimen 1078; $\frac{1}{2}$ mile beyond 1079.
- 1081.—Granite-porphry; $\frac{1}{4}$ mile beyond 1080.
- 1082.—Dioritic granite; Kaurung Mt.; $\frac{1}{4}$ - $\frac{1}{2}$ mile from Kloro on the Rangwe Road.
- 1083.—Sheared amphibole-schist; same locality as 1082 on the Rangwe Road.
- 1084.—Amphibole-schist; at same locality as 1083; $\frac{1}{4}$ mile beyond 1082.
- 1085.—Sheared sheared felsite or porphyry; $\frac{1}{4}$ mile beyond 1084.
- 1086.—Dissected crystalline limestone, same locality as above.
- 1087.—Conglomerate with iron oxides, same locality as 1086; $\frac{1}{4}$ mile beyond 1086.
- 1088.—Granite porphyry; same locality as 1087.
- 1089.—Dissected conglomerate or conglomerate; $\frac{1}{4}$ mile beyond 1088.
- 1090.—Limestone; $\frac{1}{4}$ mile beyond 1089.
- 1091.—Secondary limestone with much shales from conglomerate quarry a gully west of Sumpu, Sumpu Island.
- 1092.—Magnesian limestone from the gully west of Sumpu, Sumpu Island; high ground beyond site of 1092, on west side of gully between Sumpu and Ganda.
- 1093.—Magnesian limestone from the gully west of Sumpu, Sumpu Island; same locality as 1092.
- 1094.—Limestone Ganda Mt., Sumpu Island.
- 1095.—Grey granite Ganda Mt.
- 1096.—Grey amphibole-schist at Sumpu on Ganda Mt.
- 1097.—Mafic granite from Kaurung Mt., Sumpu Island; weathered out of hills, etc.

WIRE HILL, LOOKING NORTH FROM OYONIS.

- 1061.—Granite-porphry; little south-east of 1060; less sheared.
- 1062.—Hematite-chert rock, presumably an altered felsite, a few yards higher up hill (towards trig. station) on the sheared side of the felsite.
- 1063.—Sheared felsite; 50 ft. above last observation.
- 1064.—Extremely sheared porphyry. Top of this part of the rip.
- 1065.—Pyritiferous chalcadonic rock, about 60 ft. below trig. station, Wire Hill.
- 1066.—Altered amphibole-schist (?) (resembling shales 4) miles down the Kendu Road from Oyonis.
- 1067.—Dioritic rock, with xenoliths of hornblende-schist, nearly $3\frac{1}{2}$ miles beyond 1066 is the amphibole-schist.
- 1068.—Red felsite pebble from Pleistocene beds of Samba (un-ciified lithic and crystal buff).
- 1069.—Granular crystalline limestone near (NE. of) Home Mt.
- 1070.—Grey argillite, one mile towards hills behind D.C. house, Kism (collected by D.C.), used as slate pencils and was at one time carved into pots, but the funds who undertook that work is now dead.
- 1071.—Red apigranite (as in specimen 1049), 7-1/10th miles from Kism, along the Rangwe Road (exactly similar to 1049).
- 1072.—Granite porphyry, pointed so as to resemble sediments, $\frac{1}{4}$ mile beyond 1071.
- 1073.—Hotted red rock (porphyry or granite?), $2\frac{1}{2}$ miles beyond 1072.
- 1074.—Hotted red rock (granophyre), apparently passing into red granite, nearly $\frac{1}{4}$ mile beyond 1073.
- 1075.—Granophyre associated with red granite (passes into material like 1074); $1\frac{1}{4}$ miles beyond 1074.
- 1076.—Fine grained quartz-porphry, $1\frac{1}{5}$ th mile beyond 1075.
- 1077.—Jasper breccia, cemented by chalcodony; 1 mile beyond 1076.

- 1078.—Oxalic felsite; nearly $2\frac{1}{2}$ th mile beyond 1077.
- 1079.—Basic rock weathering spheroidally (felsite?), $2\frac{1}{2}$ th/10th miles beyond 1078.
- 1080.—Thinly sliced lava, fossiliferous specimen 1080; $2\frac{1}{2}$ th mile beyond 1079.
- 1081.—Granite porphyry; $\frac{1}{2}$ mile beyond 1080.
- 1082.—Dark granite, Kumbia Group, $4\frac{1}{2}$ th mile from Kism on the Rangwe Road.
- 1083.—Stratified sandstone 1083-1084, 10th mile from the Rangwe Valley on the Rangwe Road.
- 1084.—Light argillite; at cross south, 2-2/10th miles beyond 1083.
- 1085.—Sheared siliceous felsite or porphyry $1\frac{1}{2}$ miles beyond beyond 1084.
- 1086.—Granular crystalline limestone, same locality as 1085.
- 1087.—Conglomerate with iron oxides, same locality (ap-proximately as 1085 and 1086).
- 1088.—Granite porphyry, 2-2/10th miles beyond 1086.
- 1089.—Stratified argillite or conglomerate, with beyond 1088.
- 1090.—Limestone, $2\frac{1}{2}$ th miles beyond 1089.
- 1091.—Succulent limestone with green schists, 2-2/10th miles from Kism, $1\frac{1}{2}$ miles west of Sanga Sanga hill.
- 1092.—Magnesian cement from the green rock by weathering; high ground beyond one of 1091, on west side of valley between Sanga and Sanga.
- 1093.—Magnesian in the green rock (unstratified lime-stone), same locality as 1091.
- 1094.—Dark granite, Kumbia Hill, Sanga Sanga hill.
- 1095.—Grey granite, Kumbia Hill.
- 1096.—Grey argillite; same as large one Kumbia Hill.
- 1097.—Mafic granite from Kumbia Hill, Sanga Sanga hill, weathered out of hills, etc.

- 1090.—Reconstructed volcanic tuff, with clay pellets; near the top of the Miocene, Kaswanga Hill, Rusinga.
- 1100.—Limestone from old quarry site, west of camp at Mbeta, Rusinga Island.
- 1101.—Lumps of basic material resting on conglomerate; same locality as 1092.
- 1102.—Compact crystal tuff derived from nephelinite above agglomerate that succeeds thick deposits of sedimentaries; Kaswanga Hill.
- 1103.—Nephelinite tuff, exposed near camp at Mbeta.
- 1104.—Same as 1103, but cemented by calcite; same locality as 1103.
- 1105.—Nephelinite; near 1104.
- 1106.—Nephelinite interbedded with Miocene; Kaswanga Hill.
- 1107.—Typical rock (basalt) of country between Homa Bay and Karungu.
- 1108.—Nephelinite, overlying Miocene sediment, at Karungu.
- 1109.—Amphibolite, from below Miocene beds, Karungu.
- 1110.—Hornblende-granite, somewhat gneissose, passing into orthogneiss derived from pyroxene-granite; approximately $\frac{1}{2}$ mile beyond Kija River on track to gold mine from Karungu.
- 1111.—Sheared quartz-porphry, nearly 4 miles beyond 1110; same track.
- 1112.—Foot wall, Blackhall's Reef, west face.
- 1113.—Hanging wall; Blackhall's Reef, west face.
- 1114.—Rock in fault (E.-W. approximately) Blackhall's Reef.
- 1115.—Reef sample E. face, at 150 feet.
- 1116.—Hanging wall, near west face.
- 1117.—Steel's Reef (average sample).
- 1118.—Dolerite with pyrrhotite; 400 yards west of camp (Blackhall's Reef), running SSE. by S.
- 1119.—Sheared granite-porphry ("suet rock"); $\frac{1}{2}$ mile east of camp.
- 1120.—Same as 1119, but further south, towards granite contact.

- 1121.—M.K. Reef (average sample).
- 1122.—Quartz rock, shattered and re-cemented, showing visible gold; M.K. Reef.
- 1123.—Reef with siderite, and country rock; east side, M.K. Reef.
- 1124.—Country rock, M.K. Reef (sheared granite-porphry).
- 1125.—Small leader in country rock; Blackhall's Reef.
- 1126.—Highly mineralised patch of Blackhall's Reef.
- 1127 to 1132.—Transition series between granite-porphry, sheared granite-porphry ("suet rock"), and schist (the final stage of shearing).
- 1134.—Pyritic reef (Blackhall's), with "semi-suet" rock.
- 1135.—Completely rotted "suet rock" at surface; Blackhall's Reef.
- 1136.—Gneissose hornblende-granite in river below Blackhall's (at the pump).
- 1137.—Diorite, 500 yards beyond 1136, towards Kweri Hill; non-gneissose "syenite."
- 1138.—Crushed Newer Granite, 200 yards further on in the same direction. Here the foliation runs NW. by W. The exposures are becoming less foliated.
- 1139.—Ditto, 1,000 yards further on; rock still less gneissose.
- 1140.—Ditto, 650 yards further on, near gneissose granite with pink feldspar and purple quartz.
- 1141.—Diorite, 500 yards further on; grey granite (porphyry) and transition to 1142.
- 1142.—Porphyry with augite.
- 1143.—Quartz; top of Kweri Hill.
- 1144.—Floater of crushed Newer Granite, on quartz-schist of Kweri Hill.
- 1145.—Dolerite in stream below pump; a few hundred yards down-stream of 1136.
- 1146.—Amphibolite associated with 1145.
- 1147.—Granular quartz, from rubble at Kinross Prospecting Syndicate's mine (visible gold).

- 1099.—Reconstructed volcanic tuff, with clay pellets; near the top of the Miocene, Kaswanga Hill, Busings.
- 1100.—Limestone from old quarry site, west of camp at Mbeta, Businga Island.
- 1101.—Lumps of basic material, resting on conglomerate; same locality as 1092.
- 1102.—Compact crystal tuff derived from nephelinite above agglomerate that succeeds thick deposits of sedimentaries; Kaswanga Hill.
- 1103.—Nephelinite tuff, exposed near camp at Mbeta.
- 1104.—Same as 1103, but cemented by calcite, same locality as 1103.
- 1105.—Nephehnite; near 1104.
- 1106.—Nephelinite interbedded with Miocene; Kaswanga Hill.
- 1107.—Typical rock (basalt) of country between Homa Bay and Karungu.
- 1108.—Nephelinite, overlying Miocene sediment, at Karungu.
- 1109.—Amphibolite from below Miocene beds, Karungu.
- 1110.—Hornblende granite, somewhat gneissose, passing into orthogneiss derived from pyroxene-granite; approximately $\frac{1}{2}$ mile beyond Kupa River on track to gold mine from Karungu.
- 1111.—Sheared quartz porphyry, nearly 4 miles beyond 1110, same track.
- 1112.—Foot wall, Blackhall's Reef, west face.
- 1113.—Hanging wall, Blackhall's Reef, west face.
- 1114.—Box in fault (E-W approximately) Blackhall's Reef.
- 1115.—Reef sample, E. face, at 150 feet.
- 1116.—Hanging wall near west face.
- 1117.—Reef (average sample).
- 1118.—Siderite with pyrrhotite; 400 yards west of camp Blackhall's Reef; running SSE. by S.
- 1119.—Sheared granite porphyry ("suet rock"); $\frac{1}{4}$ mile east of camp.
- 1120.—Same as 1119, but further south, towards granite contact.

- 1121.—M.K. Reef (average sample).
- 1122.—Quartz rock, shattered and re-cemented, showing visible gold; M.K. Reef.
- 1123.—Reef with siderite, and country rock; east side, M.K. Reef.
- 1124.—Country rock, M.K. Reef (sheared granite porphyry).
- 1125.—Small leader in country rock.
- 1126.—Highly mineralised patch of Blackhall's Reef.
- 1127 to 1132.—Transition series between granite porphyry sheared granite porphyry ("suet rock"), and schist (the final stage of shearing).
- 1134.—Pyritic reef (Blackhall's), with "semi-suet" rock.
- 1135.—Completely rotted "suet rock" at surface, Blackhall's Reef.
- 1136.—Gneissose hornblende-granite in river below Blackhall's (at the pump).
- 1137.—Diorite, 500 yards beyond 1136, towards Kwen Hill; non-gneissose "syenite".
- 1138.—Crushed Newer Granite, 300 yards further on in the same direction. Here the foliation runs NW by W. The exposures are becoming less foliated.
- 1139.—Ditto, 1,000 yards further on; rock still less gneissose.
- 1140.—Ditto, 650 yards further on, near gneissose granite with pink feldspar and purple quartz.
- 1141.—Diorite, 400 yards further on, grey gneiss (pyroxene) and transition to 1142.
- 1142.—Porphyry with aegite.
- 1143.—Quartz; top of Kwen Hill.
- 1144.—Floater of crushed Newer Granite, on quartz-schist of Kwen Hill.
- 1145.—Dolerite in stream below pump; a few hundred yards down-stream of 1136.
- 1146.—Amphibolite associated with 1145.
- 1147.—Granular quartz, from rubble at Kweni Engineering Syndicate's mine (visible gull).

- 1147a.—Breccia; same locality as 1147.
 1147b.—Artifact; same locality as 1147.
 1147c.—Hornblende-granite, not very gneissose; same locality as 1147.
 1148.—Ancient conglomerate at Gori Ferry on the Tanganyika-Kisii Road; possibly pre-K.A.
 1149.—Fine-grained mica-diorite-porphry; 2/5th mile beyond 1148 on the Kisii Road.
 1150.—Another member of the porphyry group (a diorite porphyry), less porphyritic than 1149; 4 miles approximately beyond 1149.
 1151.—Amphibolite-diorite porphyry; 1/4 mile beyond 1150.
 1152.—Variety of 1151? 2-1/8th miles beyond 1151.
 1153.—Conglomerate with lava matrix; 2-1/10th miles beyond 1152.
 1154.—Mediocrystalline or noted igneous rock? 2 1/2 miles beyond 1153.
 1155.—Dolerite agglomerate, 9/10ths mile beyond 1154.
 1156.—Altered dolerite nearly 5 miles beyond 1155.
 1157.—Altered dolerite 1/2 mile beyond 1156.
 1158.—Altered shale 1/2 miles beyond 1157.

APPENDIX II.—FIRE ASSAY RESULTS.

LOCALITY	Nature of Specimen	Det. by long ton of	
		Silver	Gold
Kisumu hills of a mile beyond camp at Oyugi on the Kisii River Road. Gori Ferry on Tanganyika-Kisii Road. One and three-fifths miles from junction of Kisii-Siaya Road and the Kitare track, along the former towards Kisii. Five and two-third miles beyond Rangwe Camp on the Homa Bay Range Camp. Long hill west of Rangwe Camp. Three and one-half miles from junction of the Rangwe Rd. and the Kisii road. Three and one-third miles beyond Souda on the Kisii Rd. In grass, below pump at Mwachala. Four miles beyond Rangwe Camp, Homa Bay Road. Seven and one-quarter miles from Kisii down the Kerani Road. Six and three-quarter miles from Souda on the Kisii Rd. Kisii River. The Kisii River. Rangwe track. Gorani forest on the S.W. of Oyugi. Old prospect pit at Oyugi. One mile S.W. of Oyugi. Five miles from Oyugi. Gorani prospect track on the N.W. of Oyugi.	Pyritiferous cellular, grey, quartz-rock. Ancient conglomerate	4	2
	Quartz-reef	4	2
	Shale agglomerate of conglomerate	3	6
	Quartz-reef	2	2
	Amphibolite	2	2
	Conglomerate	2	2
	Lava conglomerate	2	2
	Pyritiferous trachytic lava	2	2
	Banded quartz rock, somewhat pyritiferous	2	2
	Amphibolite dolerite with pyrites	2	2
Ferrous quartz	2	2	
Quartz	2	2	
Pyritiferous cherty rock	2	2	
Quartz	2	2	

Assayed by A. W. GEOWESS.

- 1147a.—Biotite; same locality as 1147.
 1147b.—Artifact; same locality as 1147.
 1147c.—Hornblende-granite, not very gneissose; same locality as 1147.
 1148.—Ancient conglomerate at Gori Ferry on the Tanganyika-Kisi Road, possibly pre-K.A.
 1149.—Fine-grained mica-diorite-porphry; 2/5ths mile beyond 1148 on the Kisi Road.
 1150.—Another member of the porphyry group (a diorite porphyry), less porphyritic than 1149; 4 miles approximately beyond 1149.
 1151.—Amphibole-diorite porphyry; 1/2 mile beyond 1150.
 1152.—Variety of 1151? 2-1/5th miles beyond 1151.
 1153.—Conglomerate with lava matrix 2-1/10th miles beyond 1152.
 1154.—Siderite? noted igneous rock? 2 1/2 miles beyond 1153.
 1155.—Siderite conglomerate; 9/10ths mile beyond 1154.
 1156.—Altered diorite nearly 3 miles beyond 1155.
 1157.—Altered diorite 1/2 mile beyond 1156.
 1158.—Altered diorite 1/2 miles beyond 1157.

APPENDIX II.—FIRE ASSAY RESULTS.

LOCALITY	Nature of Specimen	Dist. per long ton of	
		Silver	Gold
Kisicumbi of a mile beyond camp at Oryga on the Kisi Road.	Pyritic, coll. gty. quartz-rock	4	2
Gori Ferry on Tanganyika-Kisi Road.	Ancient conglomerate	4	2
One and three-fifths miles from junction of Kisi-Sulu and the Kisiar track, along the former track.	Quartz-reef	3	6
Kisi road, 1 1/2 miles beyond Rangwe Camp on the Kiwa Road.	Shearred aggregate or conglomerate "Reef?"	3	6
Long hill north of Rangwe Camp	Quartz-reef	3	6
Three-quarters of a mile from Kisiar on the Rangwe Rd.	Amphibole-diorite porphyritic lvs.	3	6
Three and one-half miles beyond Sulu on the Kisi Rd.	Amphibole	3	6
In stream below pump at "Blue-hills"	Conglomerate	3	6
Four miles beyond Rangwe Camp, Kiwa Road	Lava conglomerate	2	2
Seven and one-quarter miles from Kisi down the Kisiar	Pyriticiferous trachyte lvs.		
Six and three-quarters miles from Sulu on the Kisi Rd.	Shearred quartz reef, somewhat pyriticiferous		
Kisi River	Amphibole-diorite with pyrite		
Three and one-half miles from Oryga along the Kiwa Road	Pyriticiferous quartz		
Rangwe Camp	Quartz		
German prospect 1/2 mile S. W. of Oryga	Pyriticiferous cherty rock		
Old prospect 1/2 mile S. W. of Oryga	Quartz		
One mile from Oryga, Kiwa Road			
German prospect 1/2 mile S. E. W. of Oryga			

APPENDIX III

THE GEOLOGY OF THE KERRICHIE GROUP IN THE DISTRICT OF
 GEORGIAN MOUNTAINS AND SURROUNDING PARTS OF THE
 KERRICHIE PROVINCE OF KENYA.

By J. S. H. GIBSON.

Some 200 specimens were collected from 100 localities, and all of them have been studied and determined under the microscope. Descriptive specimens were assigned for each and where the results of which are given in Appendix II.

A good proportion of the rocks are calcareous, but there are many other groups represented, the chief being granites, gneisses, amphibolites, quartzites, porphyries and various schists. They are all in places well exposed by their position at the foot of the hills, and are easily seen by field observation.

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The rocks belong to two or three distinct systems, as is shown by the presence of various fossils and the characteristic mineralogy. The rocks are all of great interest and importance, and the study of them is a difficult but interesting task. The rocks are all of great interest and importance, and the study of them is a difficult but interesting task.

The rocks are all of great interest and importance, and the study of them is a difficult but interesting task. The rocks are all of great interest and importance, and the study of them is a difficult but interesting task.

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See also page

cellular grouping. Elongated vesicles were subsequently occupied by quartz, but they are all elongated parallel to the flow-line exhibited by the crystalline.

Trachytes.—These have the usual fine-grained trachytic groundmass, but generally with relatively few phenocrysts. The latter consist of sanidine, biotite, feldspar, and quartz, partly enclosed in biotite, and sometimes a pyroxene with just a suggestion of colour of the very weakest green. Vesicles are occupied either by fibrous sanidine or by chlorite and epidote.

A further type of trachyte is characterized by the presence of sanidine-like phenocrysts. No. 1029, 2½ miles from Sondu on the Kericho Road, is typical of several. It is a light-grey rock which under the microscope consists of abundant lath- and fibrous inclusions, crowded with minute inclusions in a trachytic groundmass. Such specimens of feldspar have the included material segregated at the centre of the lath. Examination under a high-power objective shows exceedingly fine twinning in sanidine and albite systems, so that the prisms are definitely constitutive, and one can only surmise that most, if not all, of the feldspar is anorthoclase. There are also scattered crystals of calcic feldspar.

Vesicles are occupied by a granular brown epidote, and at other times by chlorite and chlorite. Accessory pyrite is minute and sporadic. No other pyroxenes or amphiboles are developed, and the rock is an anorthoclase-trachyte.

Trachyte Tuffaceous.—No. 1030, near Oyugi, is an amygdaloidal lava with the small vesicles occupied by chlorite, while the largest, which measure two or three inches across, are filled with calcite. The phenocrysts of plagioclase, which are up to half an inch or more in length, contain many included portions of epidote. The groundmass consists of fine laths of plagioclase showing a tendency towards a variolitic arrangement. Small granules of colourless feldspar occur in the groundmass.

The maximum crystalline extinction angle of the plagioclase is 18° (albite); but among the phenocrysts and in the groundmass there is some sanidine present. The lava is thus a trachyte-andesite.

Basalts.—There are several widely different types of basalt. Some very fine-grained types are much altered and contain irregular quartz, epidote and chlorite as in 1011; 5 miles beyond the police camp on the Kericho-Sondu Road.

The E. S. H. Gibson and Biology of East Africa, by Prof. J. S. H. Gibson, p. 200 (1910)

APPENDIX III.

THE GEOLOGY OF THE SANTA BARBARA AND THE DIVISION OF COASTAL STRATA OF THE SOUTHERN PART OF THE SANTA BARBARA COUNTY, CALIFORNIA.

By Dr. A. N. S. Grew.

About 200 specimens were collected from 120 localities, and all of these have been studied and described under the microscope. In some specimens were secured for gold and silver the results of which are given in Appendix II.

A good description of the rocks are given, the chief being granitic, dioritic, and gabbroic. The gabbro is of the same type as that of the Santa Barbara mountains, and is of the same age. The gabbro is of the same type as that of the Santa Barbara mountains, and is of the same age.

LAKES.

The lakes of the Santa Barbara mountains are of the same type as those of the Santa Barbara mountains, and are of the same age. The lakes are of the same type as those of the Santa Barbara mountains, and are of the same age.

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colored grouping. Elongated vesicles were subsequently occupied by quartz, but they were elongated parallel to the flow-line established by the crystalline.

Trachyte.—These have the usual fine-grained trachytic groundmass, but generally with relatively few phenocrysts. The latter consist of massive, angular, Carlsbad twinning, partly resorbed basalt, and sometimes a pyroxene with just a suggestion of colour of the very weakest green. Vesicles are occupied either by fibrous calcite or by chlorite and epidote.

A familiar type of trachyte is characterised by the presence of acanthitic phenocrysts. No. 1025, 2 1/2 miles from Sondu on the King Road, is typical of several. It is a light grey rock which under the microscope consists of abundant lath- and fibrous of felspar, crowded with minute inclusions in a trachytic groundmass. Small prisms of felspar have the included material arranged at the centre (cf. p. 397). Examination under a high-power objective shows exceedingly fine twinning on irregular and oblique systems, so that the prisms are definitely acanthitic, and one can only surmise that most, if not all, of the felspar is acanthitic. There are also scattered crystals of colourless feldspar.

Vesicles are occupied by a greenish-brown epidote, and at other times by calcite and chlorite. Accessory pyrite is visible in some places. No alkali pyroxenes or amphiboles are developed, and the rock is an acanthitic trachyte.

Phenocrystic trachyte.—No. 1018, near Orygia, is an amygdaloidal rock with the small vesicles occupied by chlorite, while the trachyte, which measures two or three inches across, are filled with calcite. The phenocrysts of plagioclase, which are up to half an inch or more in length, contain many included particles of epidote. The groundmass consists of fine laths of plagioclase showing a tendency towards a varicose structure. Small granules of colourless feldspar occur in the groundmass.

The maximum symmetrical extinction angle of the plagioclase is 28° (clockwise) but among the phenocrysts and in the groundmass there is some anisotropy present. The lava is thus a nearly-anisotropic.

Basalt.—There are several widely different types of basalt. Some very fine-grained types are much altered and contain irregular quartz, epidote and chlorite as in 1011; 2 miles beyond the police camp on the Korocho-Santa Road.

Published by the U.S. Geological Survey, Washington, D.C., 1907.

1864. Small crystals of a very fine mesh of prismatic habit and small octahedral granules of monoclinic habit in a glassy base and without accessory iron-ore.

1865. When Mr. Weyland states a typical of the country between Horns Bay and Kaurangi, is a dark rock with the principal crystals under the microscope it consists of numerous large, elongated and very well-developed crystals showing sharp cleavage and absorption by the transparent. The ground granulation formed of crystals of quartz, mica, and feldspar with occasional small crystals of iron-ore in places there are smaller prismatic habit and these are from granitic source.

The crystals are distinct and the texture which is difficult to describe, appears to be a fine granulation in places also with a few prisms with the habit of quartz.

1866. The granulation collected which is a fine granulation as well as seen from the following description:

1867. The granulation is a fine granulation in places also with a few prisms with the habit of quartz.

Under the microscope it contains a quantity of prismatic habit of quartz granulation from description is very fine granulation as well as seen from the following description: quartz, mica, and feldspar with the habit of quartz. The granulation is a fine granulation in places also with a few prisms with the habit of quartz. The granulation is a fine granulation in places also with a few prisms with the habit of quartz.

1868. The granulation is a fine granulation in places also with a few prisms with the habit of quartz.

Under the microscope it contains a quantity of prismatic habit of quartz granulation from description is very fine granulation as well as seen from the following description: quartz, mica, and feldspar with the habit of quartz. The granulation is a fine granulation in places also with a few prisms with the habit of quartz.

1869. Near Camp at Akaroa, New Zealand—This is a similar rock to the last, but has a very dark brown matrix developed in it, while, as in other altered nephelinites the nephelinite is largely decomposed to calcite and carbonate. 1870. A nephelinitic sandstone with the exposed Micaons of Kawangi Hill, has much nephelinite developed and some of it

1871. 1/2 mile beyond Napier Camp on the Akaroa Road—This is a dark rock, with numerous crystals of fresh crystals up to an inch in length, accompanied by distinct mica, amphibole, and quartz.

In this section under the microscope, the whole rock is granularly light. The nephelinitic crystals are very large and dark, but are lower in number than the previous. In other cases they show cleavage by the mica, resulting in a fringe of magnesian crystals. Some of the smaller crystals have been almost entirely crushed and are surrounded by a large mass of magnesian grains. In other cases a dark circle of magnesian grains marks the complete absorption of an crystal by the fungus. The crystals are quite colorless, optically positive and has an estimated optic axial angle of about 10°.

The crystals are of the greenish prismatic habit of pinkish-brown in color, but in some cases it is very highly colored. In between the smaller and large crystals are some few smaller crystals, while the granulation is glassy and mixed with crystals of quartz.

There are a few prismatic crystals, and close examination of the granulation which is crystalline and glassy, shows anophanite crystals of quartz, but none of largest even under a magnification of 100 diameters. The rock is thin a typical nephelinite.

1872. These include attached here, altered nephelinitic habit, and situated largely altered to epidote and quartz.

The attached here such as 1873—about 1/2 mile beyond the point camp on the South Akaroa Road are fine-grained, but have all the characters and all the large habit required by quartz. The granulation consists of partial crystallization decomposition products. What appears to be greenish crystals of the kind granulation has some fish in greenish, and probably represent an original base-nephelinitic material.

1164. *Thin crystals of a very fine mesh of plagioclase feldspar and small colorless granules of amorphous substance in a glassy base and without accessory minerals.*

1165. *Thin, white, rectangular crystals of the variety between those of 1164 and 1163, in a dark base with few plagioclase crystals. Under the microscope it appears of lamellar large phenocrysts of very pale-colored matter, frequently showing sharp, wavy and irregular by the margins, and in a fine-grained groundmass formed of crystals of smaller phenocrysts resulting with amorphous base and quartz in some of the glassy areas are rather large feldspar grains and these are from these phenocrysts.*

The crystals are transparent and the base is different in appearance especially in a light projecting, as when the rock is lit, in contrast with the matrix.

Microscopic. The crystallites collected, which are 100 microns in size, are somewhat irregular in form but the following microscopic.

Large crystals. The crystals are small, with a few larger ones, and are in the matrix. In the large specimens they are small and with dimensions of 100 microns.

The crystals are composed of plagioclase, probably the same as that of the matrix, but with a very fine-grained texture, and a number of smaller crystals appear to be of a different variety, and sometimes in a matrix of amorphous substance. The crystals are composed of small crystals of plagioclase, and the large ones are of a different variety, and sometimes in a matrix of amorphous substance. The crystals are composed of small crystals of plagioclase, and the large ones are of a different variety, and sometimes in a matrix of amorphous substance.

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1166. *Near Camp at Mount, Hastings Island. This is a similar rock to the last, but has a very deep brown tincture developed in it, which, as in other altered nephelinites the nephelinite is largely decomposed to calcite and calcosite. The 4 nephelinites identified with the supposed Massena of Kaituma Hill, but much tincture developed and some of it is found.*

Large crystals. The crystals are small, with a few larger ones, and are in the matrix. In the large specimens they are small and with dimensions of 100 microns.

In this section under the microscope, the whole rock is produced from. The plagioclase crystals are very large and light, but are fewer in number than the nephelinites. In some cases they show evidence by the margins, showing in a fringe of amorphous material. Some of the smaller calcite crystals have been almost entirely removed and are surrounded by a broad band of amorphous matter. In other cases a dark circle of amorphous matter marks the complete absorption of an object by the matrix. The crystals are quite colorless, especially in the matrix, and have an estimated optic axial angle of about 70-80°.

The crystals are of the finest possible shades of pinkish to white in color, but in some cases it is very nearly white. The crystals are composed of plagioclase, and the large ones are of a different variety, and sometimes in a matrix of amorphous substance. The crystals are composed of small crystals of plagioclase, and the large ones are of a different variety, and sometimes in a matrix of amorphous substance.

There are no large phenocrysts, and these are composed of the groundmass which is amorphous and glassy. There are some amorphous granules of quartz, but none of feldspar even under a magnification of 400 diameters. The rock is thin and typical of the type.

Small crystals. These include small, with a few larger ones, and are in the matrix. In the large specimens they are small and with dimensions of 100 microns.

The attached large rock is 1166, about 5 miles beyond the main camp on the South-Southwest Coast, and is composed of large crystals of plagioclase, and the large ones are of a different variety, and sometimes in a matrix of amorphous substance. The crystals are composed of small crystals of plagioclase, and the large ones are of a different variety, and sometimes in a matrix of amorphous substance.

... field (some locality on road) is a rock composed of fragments of quartz, which has clearly been broken up and crushed by siliceous solution crystallizing in quartz.

Other fine-grained siliceous laves, such as 1100 (1 mile beyond camp in Orange at the Kandy Road), have pseudo-spherulitic or quartz-like pseudomorphic shapes.

1100 (1 mile from Kani on the Kandy Road) has an almost interstitial granular structure, produced by a siliceous solution crystallizing in quartz.

The character of the remaining siliceous types of lavas is such that they were probably produced separately.

Plagioclase Crystals—The structure of these crystals is of the type with characteristic glass structure and a curved surface. The most characteristic is the almost interstitial form of the crystals, which are often surrounded by quartz and feldspar, as if they were in solution.

Spinel—This is a rare mineral, occurring in small amounts in some specimens. It is found in the lavas of 1100, 1101, 1102, 1103, 1104, 1105, 1106, 1107, 1108, 1109, 1110, 1111, 1112, 1113, 1114, 1115, 1116, 1117, 1118, 1119, 1120, 1121, 1122, 1123, 1124, 1125, 1126, 1127, 1128, 1129, 1130, 1131, 1132, 1133, 1134, 1135, 1136, 1137, 1138, 1139, 1140, 1141, 1142, 1143, 1144, 1145, 1146, 1147, 1148, 1149, 1150, 1151, 1152, 1153, 1154, 1155, 1156, 1157, 1158, 1159, 1160, 1161, 1162, 1163, 1164, 1165, 1166, 1167, 1168, 1169, 1170, 1171, 1172, 1173, 1174, 1175, 1176, 1177, 1178, 1179, 1180, 1181, 1182, 1183, 1184, 1185, 1186, 1187, 1188, 1189, 1190, 1191, 1192, 1193, 1194, 1195, 1196, 1197, 1198, 1199, 1200.

... 1100 is a very typical of such lavas which have crystallized out of a melt in the presence of a siliceous solution. The structure of the crystals is such that they were probably produced separately.

lavas, which is a peculiar brown variety, though not barkeville, it is usually intergrown in a peculiar manner with the quartzite. There is much close brown spherulitic enclosed in the siliceous variety, as well as crystals of quartz with well-defined faces of pyroxene and amphibole. Large patches of magnetite are also present.

Plagioclase Crystals—These consist of small grains of plagioclase, which are very much decomposed into a matrix of quartz and feldspar, the rounded grains being largely altered to calcite and albite.

Lava Crystallization—These consist of pebbles and laminae of lava and other rocks in a matrix which is in part sedimentary, but which has been invaded and cemented by subsequent lava flows and the liquid emanations therefrom.

Specimen 1100 (1/2 mile from Kani on Kandy Road) has a peculiar structure of stony lava up to about six inches in length, and occasionally shows a coating of pyrite. The pebbles are of the very smallest size, and in some specimens show a very fine matrix. Slices cut from the fine-grained lava showing the matrix show it to consist of phenocrysts of plagioclase, and some of quartz, in an indistinct groundmass. Some of the phenocrysts are slightly corroded by the matrix. Quartz is accompanied by chlorite and albite, while there are also some pseudomorphs in chlorite after probable pyroxene or amphibole. The maximum uniaxial extinction angle of the plagioclase is 15° corresponding to calcite. The lava matrix is also sedimentary. There are included in the lava matrix, as seen under the microscope, pebbles of all sizes down to the size of grains or bits. They consist of different types of calcite and some of pyrite. There are also old quartz grains of sedimentary appearance, and the lava appears to have flowed in small flows. In places the groundmass consists of angular grains of quartz, chiefly of sedimentary origin, cemented by a siliceous matrix of calcite and chlorite probably derived from lava.

No. 1101 (1/2 mile from Govt Ferry on the Tangayika-Kani Road) is very similar to the last, but it has some pebbles of granite and other plutonic types in addition to lava pebbles. Slices specially cut from the matrix show it to consist of quartz in calcite grains of plagioclase, with only a few grains of quartz and occasional granules of lava. The cementing material is a mixture of the chlorite and quartz.

No. 1200 sample locality as shown is a type composed of fragments of black, which has clearly been broken up and crushed by subsequent crystallization as quartz.

Other fine-grained siliceous rocks, such as 1205 1 mile beyond camp at Orange at the Sandy Road, have pseudomorphs in quartz after pyrophyllite fragments.

One of miles from East on the Sandy Road has an almost siliceous pyrophyllite pseudomorph in a siliceous matrix originally siliceous.

The character of the foregoing siliceous types of gneiss and they were probably produced originally.

Black pyrophyllite 1206—The fragments of other rocks are all filled with fibrous quartz, calcite and a variety of oxides. The same fibrous pyrophyllite strongly impregnated with calcite and all the crystals with quartz, calcite and calcite as they are to be identified.

Leaf—This is a rock composed of finely divided thin pyrophyllite layers. It is very soft in the way of mica. The layers contain usually numerous fragments of amphibole in the 1207, while there are not numerous crystals of amphibole in the 1208 pyrophyllite. If the pyrophyllite has decomposed into mica and quartz with decomposition products derived in the same form as the mica. 1208 from the same locality is a rock of somewhat a similar character and pyrophyllite in an impure matrix of a siliceous granular nature. The matrix is composed of fragments of mica, quartz, calcite and calcite. The pyrophyllite large and composed of pyrophyllite and quartz crystals in a granular matrix of black brown mica.

The 1209 sample is a rock matrix which has been broken up into fragments of the same kind. The matrix is a siliceous granular nature and in this matrix are numerous small well defined crystals of quartz, calcite. The fragments are all decomposed and a combination of the same in composition. The average size of the grains is 2 mm. and the fragments are all well defined. In addition a granular pyrophyllite which has been broken into thin layers found in the fragments of quartz, calcite, amphibole and mica. The especially fibrous fragments is composed of a mixture of quartz, calcite, amphibole, quartz, calcite and mica. The mica is probably produced and mica. The mica

matrix, which is a peculiar brown variety, though not barbed. It is minutely intergrown in parallel manner with the quartz-calcite. There is much close-grained mica enclosed in the calcite matrix as well as crystals of quartz with well-defined cores of pyrophyllite and amphibole. Large patches of mica are also present.

Black pyrophyllite 1210—This is a rock from Gov. Ferry on the Tanganyika-Kani Road is a very much decomposed granular siliceous pyrophyllite, the rounded grains being largely altered to calcite and mica.

Black pyrophyllite 1211—These consist of pebbles and fragments of lava and other rocks in a matrix which is in part calcareous, but which has been crushed and cemented by subsequent lava flows and the liquid associated therewith.

Sample 1212—This is a rock from East on the Sandy Road has rounded pebbles of dark lava up to about six inches in length, and occasionally some have a coating of pyrite. The pebbles crush down to the very smallest size, and in some specimens show a very little mica. Slides cut from the fine-grained lava showing the matrix show it to consist of pyrophyllite of pyrophyllite, and some of calcite, in an calcareous granular nature. Some of the pyrophyllite are slightly roughed by the mica. Vesicles are marked by calcite and mica, while there are also some pseudomorphs in calcite after probable pyrophyllite or amphibole. The numerous fibrous calcite crystals of the pyrophyllite in 1212, corresponding to calcite. The lava matrix is thin and mica. There are included in the lava matrix, as seen under the microscope, pebbles of all sizes down to the size of a pin or less. They consist of different types of calcite and some of quartz. There are also old quartz grains of calcareous appearance, and the lava appears to have flowed in round them. In places the granular matrix of angular grains of quartz, chiefly of calcareous origin, cemented by quartz-calcite mica and calcite probably derived from lava.

No. 1213 1/2 miles from Gov. Ferry on the Tanganyika-Kani Road is very similar to the last, but it has some pebbles of granite and other primary types in addition to lava pebbles. Slides especially cut from the matrix show it to consist of calcite to sub-calcite grains of pyrophyllite, with only a few grains of quartz and occasional granules of lava. The cementing material is a mixture of the calcareous mica and green calcite.

The origin of these last two rocks is believed to be as follows: Pebbles and boulder beds were covered by lava, which also flowed into them. Where the source gap between the pebbles was not actually sealed by lava, fluid communication from the flow continued.

HYALINICAL ROCKS

Granite.—The outcrops of a large mass of red granite, about 20 to 22 miles from Kam, along the Kong-wu Road, its talus is decomposed and indurated. The granitic character is however completely disguised. (See 122 miles from Kam, along the Hing-wu Road) appears as the basal specimen to be a granite with green and pink taluses. A thin section under the microscope shows it to be a granodiorite, a peculiar instance of which is that the talus outcrops and the quartz is plagioclase, showing fine twin lamellae appearing with much extinction.

Quartz Porphyry.—Occurs in the above-mentioned locality of the Kam-Hing-wu road, and is probably associated with the granite. It has few large crystals, smaller crystals but they are conspicuous by the masses.

Quartz Porphyry.—Specimens were collected from Mile 75 and Mile 87 from Kam on the Hing-wu Road. They contain porphyritic hypocrysts of quartz and orthoclase. In the specimens from Mile 75, the quartz is a good deal of size and the introduction of some orthoclase.

Quartz Porphyry.—No. 122, 1 7/8 miles from the camp by the river above Hing-wu, in the direction of Kong-wu, is a porphyry with abundant porphyritic phenocrysts, generally subhedral quartz and a little quartz.

Quartz Porphyry.—From specimens from above-mentioned locality, and one is that from the Tientsin, the base of the bed, are porphyritic and phenocrysts of subhedral quartz and orthoclase pyroxene. The quartz is the characteristic of large pyroxene, with orthoclase crystals of similar size.

Quartz Porphyry.—A thin zone of basal was collected a few feet in the middle of Mile 122, but nearly from the neighborhood of Hing-wu's Road. In the lower locality the altered porphyry has been generally known as "red rock".

The altered porphyry of Mile 122, in some cases, show under the microscope phenocrysts of pyroxene, quartz, and orthoclase aggregates which represent former felsic phenocrysts.

as that they represent a variety. In other specimens, however, they are possibly altered siliceous rocks, with much quartz, being fine granitic material, which has probably resulted from the decomposition of former felsics.

The series of quartz specimens from the neighborhood of Hing-wu's Road illustrates especially how powerful changing has caused a gradual transition from porphyry to diorite and diorite rocks, which in the basal specimens resemble altered sedimentary rocks than an igneous rock.

In the basal altered zone the porphyritic felsic and phenocrysts usually, both in the basal specimens and thin section. None of the specimens are elongated from crushing but, as might be expected, the felsic phenocrysts elongate and decompose progressively rapidly when the quartz phenocrysts preserve their integrity after crushing by metamorphism. At the same time, changes take place in the composition of the groundmass, and feldspar is developed in showing in common. Pyroxene is also developed, and there may be some orthoclase and orthoclase formed.

With increasing silicification, the phenocrysts of quartz and felsic become smaller and more elongated. The rock is now a groundmass felsic, and the elongation of quartz and orthoclase are developed along the crushing planes. In the advanced stages portions of the specimen parallel to the foliation have to be carefully examined before a view of the altered phenocrysts of the porphyry are recognized.

Finally the rock appears to be a coarse felsic of pyroxene, quartz, and orthoclase of the former phenocrysts, are visible in the basal specimens. The silicification has been very marked, and the rock is a very siliceous. A thin zone of this rock (122) shows elongated feldspar-orthoclase pyroxene, might elongate with the elongation of feldspar, which consists of quartz, orthoclase, but probably represent remnants of former felsic phenocrysts.

Altered Basalts of Hing-wu Porphyry.—Specimens 122, from Mile 122, is a variety of patches of altered porphyry composed with orthoclase and quartz.

Specimen 122. From 1/2 mile beyond Hing-wu Camp on the Hing-wu Road, is similar to the last, but is contained and thoroughly altered with orthoclase and quartz.

Diabase, Amphibole and Sphalerite.—There are some very specimens of diabase and sphalerite in the collection.

The origin of these last two rocks is believed to be as follows: Pebbles and boulder beds were covered by lava, which also flowed into them. When the water got between the pebbles was not actually covered by lava, but originated from the flow underneath.

HYPERBOLICAL ROCKS

Geography.—One specimen is a fragment placed in red granite, about 20 to 25 miles from Kam, along the Sengwe Road. The felsite is decomposed and indurated, the porphyry structure is essentially destroyed. 100 to 125 miles from Kam, along the Sengwe Road, appears as the hard specimen to be a granite with green and pink felsites. A thin section under the microscope shows it to be a porphyry, a peculiar texture of which is that the felsite comprises and the granite is plagioclase, showing but two bands together with much quartz.

Quartz Porphyry.—Occurs in the characteristic position of the Kibira-Kamukoko Road, and is particularly associated with the granite. It has few porphyritic grains, but some very irregular in the texture.

Quartz Porphyry Specimens were collected from Mile 75 and Mile 77 from Kam in the hydrographic. They contain porphyritic igneous quartz and felsite. In the specimens from Mile 77 the felsite is a fine kind of felsite and the interposition of some chlorite?

Quartz Porphyry.—Occurs in the same position as the quartz. It is very irregular in the texture of the felsite, and is a fine kind of felsite.

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Quartz Porphyry.—Occurs in the same position as the quartz. It is very irregular in the texture of the felsite, and is a fine kind of felsite.

The mineral porphyries of Kam 24, in some cases, show some of the characteristic phenomena of hyperbolic quartz, and some specimens show irregular felsite porphyry.

as that they mature in felsite. In other specimens, however, they are possibly altered siliceous bodies, with much exceedingly fine quartz material, which has probably resulted from the destruction of felsite felsites.

The nature of twenty specimens from the hydrographic of Kamukoko's Road (Kamukoko Road) is very peculiar, showing a fine crystalline structure from porphyry to felsite and other rocks, which is the hard specimen resembles altered felsite rather than an igneous rock.

In the section along the hydrographic (Kamukoko Road) the porphyry shows the characteristic structure, both in the hard specimen and thin section. Some of the specimens are porphyritic from quartz but, as might be expected, the felsite porphyry is much and irregularly decomposed rapidly while the quartz porphyry remains fine irregularly after cooling by crystallization. At the same time, changes take place in the composition of the groundmass, and felsite is developed in changing processes. Felsite is also developed, and there may be some chlorite and mica formed.

With increasing distance, the porphyry of quartz and felsite becomes rather fine and highly decomposed. The rock is now a granitic grey color, and the structure of quartz and felsite is less developed along the jointing planes. In the advanced stages of the specimen, the felsite is to be carefully examined before any of the mineral phenomena of the porphyry are recognized.

Finally, the rock appears to be a massive kind of porphyritic grey quartz, and is similar to the felsite porphyry, as shown in the hard specimen. The structure is very irregular, and the felsite is a fine kind of felsite. The structure of the rock is very irregular, and the felsite is a fine kind of felsite. The structure of the rock is very irregular, and the felsite is a fine kind of felsite.

Mineral Porphyry of Kamukoko Road.—Specimen 1000, from Mile 210, is a mixture of porphyritic quartz porphyry, composed with felsite and quartz.

Specimen 1001, from 15 miles beyond Kamukoko Camp on the Kibira Road, is similar to the last, but is composed and thoroughly altered with chlorite and mica.

Quartz Porphyry and Felsite.—There are some twenty specimens of felsite and quartz in the collection.

The normal dolerites are usually characterised by a pyroxene which is colourless in thin section when fresh and unaltered. In this respect they resemble the dolerite of Uganda and N.W. Tanganyika. This pyroxene is optically positive, and has a very small optic axial angle, so that it may be classed as pigeonite. Its fairly high extinction angle indicates that it is rich in lime.

The dolerites are usually more or less ophitic and the plagioclase is the usual labradorite, and there is accessory ilmenite.

Alteration of the pyroxene changes it first to a very pale brown tint, and then to green as it becomes amphibolised. These same changes are to be found in many of the dolerites of the Ankole District of S.W. Uganda and Bukoba Province of Tanganyika Territory.

Several of the specimens from the neighbourhood of Kisi are apparently extrusive dolerites, and in some of these chalcedonic solutions have attacked both the pyroxene and feldspar.

The amphibolites and epidiorites derived from the dolerites have no outstanding features of petrographic interest.

PLUTONIC ROCKS.

Granites.—Most of the biotite-granite specimens when examined under the microscope show crushing to a greater or less extent. The feldspars are microcline, micropertthite or microcline-micropertthite, and a little oligoclase, but they are usually severely granulated by crushing. A characteristic of the feldspars is the strong delineation of the cleavages due to the formation along them of iron oxide, biotite and chlorite, etc. Sometimes there are remnants of crushed porphyritic feldspar crystals. In all these characters they resemble the "Newer" granites of Uganda. Each slide has its counterpart among the slides made from specimens collected by Mr. A. D. Combe from the granites of Ankole, and a study of their heavy mineral assemblages confirms this. The localities from which specimens of "Newer" Granite have been collected are Rai River (3 miles from Kisi), Kweri Hill, and near Blackhall's.

1982, from Nyasuki Bridge (4-2/5ths miles from Kitaro on the Bangwe Road), is a biotite-hornblende-granite different from the foregoing. The hornblende is pleochroic from an

extremely pale green to deep olive-green, and there is suggestive evidence that some of the amphibole was originally hypersthene. The feldspars are rather varied and comprise orthoclase, finely twinned oligoclase, and some wavy plagioclase. There is much accessory sphene in well-formed idiomorphic crystals pleochroic from cream to clove-brown. The quartz indicates stress conditions during the late stages of crystallisation, and this is also reflected to some extent by the feldspars. The heavy mineral suite shows that this granite is to be correlated with the "Newer" Granites.

Apophenite.—Two specimens of rather fine-grained apophenite, with a strikingly red feldspar, appear from field evidence to be related to the "Newer" Granites. In thin section something of the reddish tint of the feldspar is still visible. It is probably due to finely dispersed ferric oxide. The feldspar is largely oligoclase, with some microcline. There does not appear to be much orthoclase, and ferro-magnesian minerals are absent.

Diorites.—Specimen 1982, 20 miles from Oyoja down the Kanda Road, appears in the field to be a diorite rock including hornblende-schist and surrounding masses of it. The xenoliths vary from fragments of an inch up to large boulders.

Under the microscope the diorite rock is seen to be a hornblende-diorite, with many small plagioclases, but with much secondary quartz. It appears to be a granite containing diorite by assimilation of hornblende-schist. As the hornblende-schist is assimilated by the granite it is first strongly etched and then its texture disappears as the hornblende crystals flow away in the diorite. The diorite is richer in sphene near to where hornblende-schist is being assimilated, and the titanium is evidently derived from the schist.

Two specimens of normal diorite were collected from between Blackhall's and Kweri Hill.

Hornblende Granites.—Specimen 1982, from a point approximately half a mile beyond the Kaga River, on the bank from Karungu to the gold mine, is a hornblende-granite which has clearly been derived from a pyroxene-granite. The hornblende, sometimes with some of pale pyroxene from which it is clearly derived, is set in a groundmass of strongly etched feldspars and crystallised quartz. The remnants of plagioclase show best in the hornblende, but some are probably oligoclase and there is a little microcline. Brown sphene and pale yellow epidote occur as accessory minerals.

The normal dolerites are usually characterised by a pyroxene which is colourless in thin section when fresh and unaltered. In this respect they resemble the dolerite of Uganda and N.W. Tanganyika. This pyroxene is optically positive, and has a very small optic axial angle, so that it may be classed as pigeonite. Its fairly high extinction angle indicates that it is rich in lime.

The dolerites are usually more or less ophitic and the plagioclase is the usual labradorite, and there is accessory ilmenite.

Alteration of the pyroxene changes it first to a very pale brown tint, and then to green as it becomes amphibolised. These same changes are to be found in many of the dolerites of the Ankole District of S.W. Uganda and Bukoba Province of Tanganyika Territory.

Several of the specimens from the neighbourhood of Kisii are apparently extrusive dolerites, and in some of these chlorite solutions have attacked both the pyroxene and feldspar.

The amphibolites and epidiorites derived from the dolerites have no outstanding features of petrographic interest.

PLUTONIC ROCKS.

Granites.—Most of the biotite-granite specimens when examined under the microscope show crushing to a greater or less extent. The feldspars are micro-line, micropertitite or microcline-micropertitite, and a little oligoclase, but they are usually severely granulated by crushing. A characteristic of the granites is the strong delineation of the cleavages due to the formation along them of iron oxide, biotite and chlorite, etc. Sometimes there are remnants of crushed porphyritic feldspar crystals. In all these characters they resemble the "Newer" granites of Uganda. Each slide has its counterpart among the rocks made from specimens collected by Mr. A. D. Combe near the granites of Ankole, and a study of their heavy mineral assemblages confirms this. The localities from which specimens of Newer Granite have been collected are Rai River 17 miles from Kisii, Kweri Hill, and near Blackhill's.

From Iron Nvasuki Bridge (4-2/3ths miles from Kitara near the Bangwe Head) is a biotite-hornblende-granite different from the foregoing. The hornblende is pleochroic from an

extremely pale green to deep olive-green, and there is suggestive evidence that some of the amphibole was originally hypersthene. The feldspars are rather turbid and comprise orthoclase finely twinned oligoclase, and some zoned plagioclase. There is much accessory epidote in well-formed idiomorphic crystals pleochroic from cream to clove-brown. The quartz indicates stress conditions during the late stages of crystallisation, and this is also reflected in some extent by the biotite. The heavy mineral suite shows that this granite is to be correlated with the "Newer" Granites.

Amphibolite.—Two specimens of rather fine-grained amphibolite, with a strikingly red biotite, appear from Kweri and are to be related to the "Newer" Granites. In thin section something of the reddish tint of the biotites is still visible. It is probably due to finely dispersed ferric oxide. The biotite is largely oligoclase, with some microcline. There does not appear to be much orthoclase, and horn-magnetite inclusions are absent.

Diorite.—Specimen 1067 is a diorite from Uganda near the Kando Road, appears in the field to be a diorite such as would be hornblende-schist and micropertitite biotite of it. The amphiboles vary from fragments of an inch up to large boulders.

Under the microscope the dioritic rock is seen to be a hornblende-diorite, with many zoned plagioclases, but also much secondary quartz. It appears to be a granite-schist diorite by assimilation of hornblende-schist. As the hornblende-schist is assimilated by the granite it is first strongly etched and then its solution fragments as the hornblende crystals flow away in the diorite. The diorite is etched in places near to where hornblende-schist is being assimilated, and the titanium is evidently derived from the schist.

Two specimens of normal diorite were collected from the same Blackhill's and Kweri Hill.

Hornblende-Granite.—Specimen 1120 from a point approximately half a mile beyond the Kago River on the track from Karungu to the gold mine, is a hornblende-granite which has clearly been derived from a pyroxene-granite. The hornblende, sometimes with cores of pale pyroxene from which it is clearly derived, is set in a groundmass of strongly microcline feldspar and recrystallised quartz. The remnants of plagioclase show broad twin lamellae, but some are probably oligoclase and there is a little microcline. Brown ophitic and pale yellow epidote occur as accessory minerals.

The foliation has been imposed by intense crushing, the original rock having been a pyroxene-granite.

The rock exposed in the river below Blackhall's (at the gorge) is a hornblende-gneiss, with some visible pyrite. It contains some macrocline and, like Specimen 1110 above, is highly orthopyroxene.

Hydrothermal Siliceous Rocks.—Several specimens from the vicinity of *Levings* and *Wire Hill* are siliceous rocks of various kinds, the origin of all of which is probably hydrothermal. Some are cellular and may have been pyritiferous, the spaces being then occupied by hydrated iron oxide. Thin sections show that whole quartz may be present, the bulk of the silica as in the form of chalcedony. Some are cherty in appearance and others resemble jasper, though a little accessory pieces of epidote may be present.

A specimen No. 1122 of quartz containing visible gold, as the *W. E. Hill* appears under the microscope to have been the same, is stained and cemented by fine quartz and epidote.

Jasper Jasper. Specimen 1079 (13 miles from Kisi) along the Rangwe Road is a breccia, comprising red jasper and pieces of epidote as seen in the hand specimen. The thin sections reveal small pebbles of lava in addition to jasper. This is an extremely fine grained lava—possibly a trachyte—which contains a silty base. In addition there are numerous small angular crystals, the whole conglomerate being cemented by chalcedony silica and to some extent by epidote.

SEMENTARY ROCKS

Specimen 1011. Ngatibuchi Hill, is a quartziferous conglomerate with a siliceous cement. The majority of the quartz grains grow more subangularity and sedimentary character, and there is evidence of minute inclusions indicating their probable hydrothermal origin. Several rounded grains of magnetite were also noted. Specks of iron oxide give a rusty pink colour to the rock, but apart from this the rock is almost wholly silica. This specimen and the next belong to the Rangwe Mountains.

This Ngatibuchi Hill, is a coarse sandstone formed of large well rounded quartz grains of 2-3 mm diameter, set in a fine-grained matrix of angular and subangular quartz grains. The whole is cemented by a little interstitial secondary silica. There is no evidence of any crushing or subsequent disturbance

and the deposit is ill-sorted. A number of minute zircons, mostly well worn, are visible in the finer-grained portions of the slide. One of the quartz pebbles is derived from a severely crushed rock such as an orthogneiss, and another is entirely composed of chalcidonic silica.

Crystalline Limestone. Specimen 1069, from NE. of Homa Mountain, is a finely granular crystalline limestone, with occasional grains of a colourless accessory mineral which appears to be berylite.

Limestone-Breccia.—1086, 3½ miles beyond Rangwe Camp on the Homa Road, is an unusual rock, consisting of lumps of a greenish rock with lighter-coloured veins running in between the lumps. Some veins of pure calcite and chalcedony are visible, as well as small pieces of stony lava.

The lumps of green rock in thin section are seen to comprise angular grains of calcite, quartz, occasional plagioclase, and some patches of green chlorite. The calcite grains greatly predominate, and the greenish rock is actually an impure crystalline limestone which has been broken into small pieces, and invaded by quartz which has clearly crystallised under stress conditions.

The lumps of fine-grained lava are without phenocrysts, and are probably either trachytic or phonitic.

Calcite-Siderite Rock.—A specimen from a conglomerate outcrop in a gully west of Sienga, Rusinga Island (No. 1092), is a peculiar rock displaying wavy bands. Thin sections under the microscope show the lighter bands to be calcite, while the brown bands are siderite. In between the bands there are areas where the two minerals are intergrown. The siderite is altering in places to limonite. Specimen 1100 is an impure limestone very similar to the foregoing No. 1092.

Contact Metamorphosed Limestone.—Specimen 1094, on west side of the valley between Sienga and Gumba, Rusinga Island, is a contact metamorphosed limestone, with prominent megacrystic crystals of magnetite and biotite, some of the magnetite being in good octahedra.

A thin section of the more normal limestone shows it to be very similar to the calcite-siderite rock (1092) described above, though not so banded. The proportion of siderite varies considerably in different parts of the specimen, and in some slides there are octahedra of magnetite. Biotite of a bright reddish-brown shade occurs in thick crystals or "books," and

The foliation has been imposed by intense crushing, the original rock having been a pyroxene-granite.

The rock exposed in the river below Blackhall's (at the group) is a hornblende-gneiss, with some visible pyrite. It contains some muscovite and, like Specimen 1110 above, is mainly orthopyroxene.

Hydrothermal Siliceous Rocks.—Several specimens from the vicinity of Orange and Ware Hill are siliceous rocks of various kinds, the origin of all of which is probably hydrothermal. Some are cellular and may have been pyritiferous, the spaces being now occupied by hydrated iron oxide. Thin sections show that while quartz may be present, the bulk of the silica is in the form of chalcedony. Some are cherty in appearance, and others resemble jasper, though a little accessory pyrite or epidote may be present.

Specimen No. 1122 of quartz containing visible gold. In the W. E. part appears under the microscope to have been dissolved, etched and reprecipitated by fine quartz and calcite.

Specimen No. 1079 (13 miles from Kisi) along the Bangwe Road is a breccia comprising red jasper and pieces of epidote as seen in the hand specimen. The thin section shows small pebbles of lava in addition to jasper. The matrix is a fine-grained lava—possibly a trachyte—on a siliceous or glassy base. In addition there are numerous small fragments of the whole conglomerate being composed of siliceous lava and to some extent by epidote.

QUARTZITE ROCKS

Specimen No. 1092 (Nagahanda Hill) is a quartziferous rock of a somewhat unusual character. The majority of the quartz is in the form of subangular and sedimentary character, and is set in a matrix of hornblende indicating their probable origin in a hydrothermal source. Several rounded grains of quartz are also present. Specks of iron oxide give a reddish-brown color to the rock, but apart from this the rock is white and crystalline. This specimen and the next belong to the Nagahanda Hill.

Specimen No. 1093 (Nagahanda Hill) is a coarse sandstone, formed of large well rounded quartz grains of 2-3 mm. diameter, set in a homogeneous matrix of angular and subangular quartz grains. The matrix is considered to be a little interstitial secondary silica, the result of either of any crushing or subsequent disturbance

and the deposit is ill-graded. A number of minute zircons, mostly well worn, are visible in the finer-grained portions of the slide. One of the quartz pebbles is derived from a severely crushed rock such as an orthogneiss, and another is entirely composed of chalcocite silica.

Crystalline Limestone.—Specimen 1063, from N.E. of Homa Mountain, is a finely granular crystalline limestone, with occasional grains of a colourless accessory mineral which appears to be brucite.

Limestone Breccia.—1086, 3½ miles beyond Bangwe Camp on the Homa Road, is an unusual rock, consisting of lumps of a greenish rock with lighter-coloured veins running in between the lumps. Some veins of pure calcite and chalcocite are visible, as well as small pieces of stony lava.

The lumps of green rock in thin section are seen to comprise angular grains of calcite, quartz, occasional plagioclase, and some patches of green chlorite. The calcite grains greatly predominate, and the greenish rock is actually an impure crystalline limestone which has been broken into small pieces, and invaded by quartz which has clearly crystallised under stress conditions.

The lumps of fine-grained lava are without phenocrysts, and are probably either trachytic or phonolitic.

Calcite-Siderite Rock.—A specimen from a conglomerate outcrop in a gully west of Sienga, Rusinga Island (No. 1092), is a peculiar rock displaying wavy bands. Thin sections under the microscope show the lighter bands to be calcite, while the brown bands are siderite. In between the bands there are areas where the two minerals are intergrown. The siderite is altering in places to limonite. Specimen 1100 is an impure limestone very similar to the foregoing No. 1092.

Contact Metamorphosed Limestone.—Specimen 1094, on west side of the valley between Sienga and Gumba, Rusinga Island, is a contact metamorphosed limestone, with prominent megascopic crystals of magnetite and biotite, some of the magnetite being in good octahedra.

A thin section of the more normal limestone shows it to be very similar to the calcite-siderite rock (1092) described above, though not so banded. The proportion of siderite varies considerably in different parts of the specimen, and in some slides there are octahedra of magnetite. Biotite of a bright reddish-brown shade occurs in thick crystals or "locks," and

is positively dark in the position of maximum absorption. The lustre is sometimes in the centre of a patch of magnetite, and is clearly a strongly ferruginous variety.

Serpentine.—The "scapstone" of Nagichendi Hill (specimen 1031) has a very smooth and almost soapy feel on its joint faces. When broken open, the rock is of a pale colour inside and is seen to be slightly banded by what appears to be some silicious bands and streamers. Under the microscope the rock is extremely fine-grained and mottled in lighter and darker patches. The darker patches appear to be more quartz and quartzite mass, while the lighter patches appear to be pyrophyllite. Under the high power it is seen to be an extremely fine aggregate of vermic, talc or kaolin, or a mixture of them. It appears to be derived from an extremely fine argillaceous rock by low grade metamorphism. The report of the mineralogist shows it to be a pyrophyllite.

HEAVY MINERALS OF THE KISII SANDSTONE.

Specimens 1031 and 1034 were crushed, washed and passed through mesh-sieves. The crop of heavy minerals so obtained was small but of considerable interest inasmuch as the bulk of the mineral has to be compared with that of the neighbouring Newer Granites and contains much cassiterite.

The suite of heavy minerals is as follows:—

Zircon.—Abundant. Buff to tawny zircons, generally showing zoning and of "Newer" Granite type, symplectite.

Cassiterite. (Tin-ore). Very common. Colourless, or white-green to blood-red. Very angular and some in sharp splinters.

Stibite.—Common. Fresh. Pleochroic halos well developed suggesting derivation from granites.

Monazite.—Common.

Wavellite.—Rare.

Galena.—Rare. Pink.

Thurstonite.—Rare. Brown, uneven grains, clearly doubly derived.

Antimony.—Rare. Blue.

Amphibole.—Rare.

Staphite.—Rare. Colourless variety.

The cassiterite occurs in larger grains than any of the other minerals. The grains are all angular and evidently directly derived. The pleochroism is precisely the same as that of the cassiterite of the Bukoba Sandstone of the Bukoba Province of Tanganyika, and of the cassiterite deposits associated with the G.T. ("Newer") Granites of Ankole and Karawe. The mineral is present in marked amount, and, in part of specimen 1031, which was crushed, it was the dominant heavy mineral next to iron-ore. In no English sediments, so far as the writer's experience goes, even in the Pliocene of Cornwall, does cassiterite occur in such quantity as in the Bukoba and Kisii Sandstones.

The petrography and heavy mineral assemblage of the Bukoba Sandstone is described by the writer in the forthcoming memoir on the "Geology of Tanganyika, Ankole and adjacent Territories." Comparison of the heavy mineral suite of the Bukoba Sandstone with that of the Kisii Sandstone shows that they are very similar indeed. The ten minerals recorded from the Kisii Sandstone all occur in the Bukoba Sandstone, and the varietal characters of each mineral are the same in both formations. In both, the zircons are of types characteristic of the local "Newer" Granites of each district, and both are characterised by a marked amount of cassiterite having the same pleochroism. The general lithology and petrography in this section of these two sandstone formations is markedly similar, and, having regard also to their similar stratigraphical position, there appears to be every reason for their correlation.

The evidence of the zircons tends to show that the material of the Kisii Sandstones is mainly derived from the Kisii Highlands "Newer" Granites. Whether contributions have come across from the country to the west of Lake Victoria is doubtful, though on the face of the evidence available this does not appear to have taken place to any very appreciable extent. The cassiterite of the Kisii Sandstone is, if anything, rather more abundant than it is in the Bukoba Sandstone of Bukoba Province, and in view of its lack of rounding and relatively large size it seems probable that this cassiterite has been derived from some source on the eastern shores of Lake Victoria.

is practically dark in the position of maximum absorption. The lustre is sometimes in the centre of a patch of magnetite, and is clearly a strongly ferruginous variety.

Asbestos.—The "asbestos" of Nagichemchi Hill (specimen 1031) has a very smooth and almost soapy feel on its joint faces. When broken open, the rock is of a pale siliceous matrix and as seen to be slightly banded by what appear to be more siliceous bands and streamers. Under the microscope the rock is extremely fine-grained and mottled in lighter and darker patches. The darker patches appear to be more quartz and sparsely inert, while the lighter patches appear to be more siliceous. Under the high-power it is seen to be an extremely fine aggregate of sericite, talc or kaolin, or a mixture of these. It appears to be derived from an extremely fine argillaceous rock by low grade metamorphism. The report of the American Institute shows it to be a *grophyllite*.

HEAVY MINERALS OF THE KISII SANDSTONE.

Specimens 1031 and 1034 were crushed, washed and passed through Newmofium. The crop of heavy minerals so obtained was small but of considerable interest inasmuch as the bulk of the material can be matched well that of the neighbouring Newmofium granites and contains much cassiterite.

The signs of heavy minerals is as follows:—

Zircon.—Abundant. Half to twofold zircon, generally showing zoning and of "Newer" Granite type.

Cassiterite.—Common. Very common. Colourless, white green to blood-red. Very angular and with sharp splinters.

Monazite.—Common. Fresh. Pleochroic haloes well developed suggesting derivation from granites.

Uranium.—Common.

Wernerite.—Rare.

Corundum.—Rare. Pink.

Staurolite.—Rare. Brown, square grains, clearly doubly derived.

Andalusite.—Rare. Blue.

Leucophaea.—Rare.

Pyrochroite.—Rare. Colourless variety.

The cassiterite occurs in larger grains than any of the other minerals. The grains are all angular and evidently directly derived. The pleochroism is precisely the same as that of the cassiterite of the Bukoba Sandstone of the Bukoba Province of Tanganyika, and of the cassiterite deposits associated with the G2 ("Newer") Granites of Ankole and Karagwa. The mineral is present in marked amount, and in part of specimen 1031, which was crushed, it was the dominant heavy mineral next to iron-ores. In no English sediments, so far as the writer's experience goes, even in the Pliocene of Cornwall, does cassiterite occur in such quantity as in the Bukoba and Kisii Sandstones.

The petrography and heavy mineral assemblage of the Bukoba Sandstone is described by the writer in the forthcoming memoir on the "Geology of Part of S.W. Ankole and adjacent Territories." Comparison of the heavy mineral suite of the Bukoba Sandstone with that of the Kisii Sandstone shows that they are very similar indeed. The ten minerals recorded from the Kisii Sandstone all occur in the Bukoba Sandstone, and the varietal characters of each mineral are the same in both formations. In both, the zircons are of types characteristic of the local "Newer" Granites of each district, and both are characterised by a marked amount of cassiterite having the same pleochroism. The general lithology and petrography in thin section of these two sandstone formations is markedly similar, and, having regard also to their similar stratigraphical position, there appears to be every reason for their correlation.

The evidence of the zircons tends to show that the material of the Kisii Sandstones is mainly derived from the Kisii Highlands "Newer" Granites. Whether contributions have come across from the country to the west of Lake Victoria is doubtful, though on the face of the evidence available this does not appear to have taken place to any very appreciable extent. The cassiterite of the Kisii Sandstone is, if anything, rather more abundant than it is in the Bukoba Sandstone of Bukoba Province, and in view of its lack of rounding and relatively large size it seems probable that this cassiterite has been derived from some source on the eastern shores of Lake Victoria.

C.O.

Handwritten notes and signatures:
Mr. [unclear]
Mr. [unclear]
Mr. [unclear]
Mr. [unclear]
Mr. [unclear]
Mr. [unclear]
Mr. [unclear]
Mr. [unclear]
Mr. [unclear]
Mr. [unclear]
Mr. [unclear]
Secretary of State

C.D.
SEP 28 1931

DOVER STREET,

23 September, 1931.

DRAFT

(No. 11)

Vertical stamp: RECEIVED BY THE SECRETARY OF STATE SEP 28 1931

Sir,
I have, etc., to refer to your
despatch No. 180 of the 3rd March
concerning an application for assistance
from the Colonial Development
Fund for the establishment of a
geological survey in Tanganyika and to enclose
for your information a copy of the
documents submitted for consideration
by the C.F.A.C. at their meeting on
September 2nd.

In reporting upon this
application, the Committee ~~submitted~~
has not questioned the need for such a
service as is proposed nor its value
in furthering the economic development
of Tanganyika. However, ~~its~~
its desirability has been generally

(See minutes)

CDAC 7/11
(of your committee)
(under the supervision of)
Angus D. D. D.

Comd. C.J.
28/9/31

[Small stamp]

recognised for many years, and they regard as a matter for possible regret the fact that no active steps have been taken for its inception until the finances of the Colony have reached so low an ebb as to render it impossible without extraneous assistance]

but it

it appears to them

~~that~~ that in a territory such

~~as~~ the provision of a

geological survey Department is

~~common~~ a necessary

as a normal adjunct of the administration;

and they feel obliged to reiterate

that the function

of the Department is not to relieve

the Government of its

normal obligations. In these

circumstances they are unable to

request assistance from the

3. While I regret the decision at which the Commissioner arrived, I fear that it was inevitable

(SIGNED) J. H. THOMAS

Communications on this subject
should be addressed to:-

THE SECRETARY.

Telephone: VICTORIA 2222.

8540.

17607/5
COLONIAL DEVELOPMENT ADVISORY COMMITTEE

3
4
CORRESPONDENCE OFFICE,
CANTON HOUSE,
Downing Street,
Tottenham Street, S.W.1

C.D.A.C./F/194.

H September 1931.

Sir,

RECEIVED
5-SEP-1931
C.L. OFFICE

I am directed by the Colonial Development
Advisory Committee to request you to inform Mr. Secretary
Thomas that, at their 42nd Meeting on 2nd September,
they had before them a despatch from the Governor of
Kenya applying for annual grants from the Fund, for an
indefinite number of years, of the cost of establishing
and maintaining a geological survey of the Colony
(C.D.A.C. 623). The application is supported by the
Secretary of State, who proposes, however, that
assistance from the Fund should be limited to a period
of three years.

2. The Committee do not question the need for such
a service as is proposed, nor its value in furthering
the economic development of Kenya. They note that, in
the Governor's words its desirability has been generally
recognised for many years, and they regard as a matter
for possible regret the fact that no active steps have

BE SEEN BY THE SECRETARY OF STATE,

been

COLONIAL OFFICE.

Communications on this subject
should be addressed to:-

THE SECRETARY.

Telephone: VICTORIA 2222.
8540.

COLONIAL DEVELOPMENT ADVISORY COMMITTEE.

3
4
GENERAL OFFICE
CARTON HOUSE,
LEWIS STREET,
TOSHILL STREET, S.W.1.

C.D.A.C./F/194.

4 September 1931.

Sir,

RECEIVED
5-SEP-1931
P.L. OFFICE

I am directed by the Colonial Development Advisory Committee to request you to inform Mr. Secretary Thomas that, at their 42nd Meeting on 2nd September, they had before them a despatch from the Governor of Kenya applying for annual grants from the Fund, for an indefinite number of years, of the cost of establishing and maintaining a geological survey of the Colony (C.D.A.C. 823). The application is supported by the Secretary of State, who proposes, however, that assistance from the Fund should be limited to a period of three years.

2. The Committee do not question the need for such a service as is proposed, nor its value in furthering the economic development of Kenya. They note that, in the Governor's words its desirability has been generally recognised for many years, and they regard as a matter for possible regret the fact that no active steps have

been

THE CHIEF SECRETARY OF STATE,

COLONIAL OFFICE.

been taken for its inception, until the finances of the Colony have reached so low an ebb as to render it impossible without extraneous assistance.

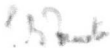
In a territory such as Kenya the provision of a Geological Survey Department appears to the Committee to be a commonplace of administration, and they feel obliged to reiterate their opinion that the function of the Colonial Development Fund is not to relieve a Colonial Government of its normal obligations. In these circumstances, they are unable to recommend any assistance from the Fund.

A similar letter is being sent to the Treasury.

Yours,

Sir,

Your obedient servant,



Secretary to the Committee.

keep taken for its inception, until the finances of the Colony have reached as low an ebb as to render it impossible without extraordinary assistance.

3. In a territory such as Kenya the provision of a Geological Survey Department appears to the Committee to be a prerequisite of administration, and they feel obliged to reiterate their opinion that the function of the Colonial Development Fund is not to relieve a Colonial Government of its normal obligations. In these circumstances, they are unable to recommend any assistance from the Fund.

4. A similar letter is being sent to the Treasury.

Yours,

Sir,

Your obedient servant,



Secretary to the Committee.

Draft released 2/17

to Parkinson 1/17/8 J. Abacci

16 42

Colonial Office Memorandum.

1. The want of a geological survey in Kenya has been obvious for some time. In 1929 the Advisory Council on Mineral Resources of the Imperial Institute ^{at} made ^{such} recommendations urging that a geological survey should be established and that the necessary funds should be in part provided from Imperial resources. ^{Recommendations of the Council are} This resolution is quoted in full on page 2 of the application submitted by the Kenya Government. Apart from

^{not important here the possibility of the discovery of} ~~the possibility of extensive minerals like metallic~~ ^{the value as regards metallic ores} ~~recoverable~~ the geological survey should provide most valuable data, first as to water supply,

of which in many parts of the country there is a pronounced shortage: secondly, as to minerals used in agriculture, food and construction work, such as limestone, fertilisers, salt, building and road materials;

likely as to find supply the former of the latter to what just have a note of considerable importance

The financial situation in Kenya which is ^{outlined} fully explained in the ~~enclosure~~ to this memorandum is such that it is impossible for Kenya to contemplate ~~for her own resources~~ any new services at the present moment, but, now that Sir Joseph Byrne, the new Governor, has recommended the establishment of this valuable work, the Secretary of State hopes that in spite of ^{practically none of} the fact that ~~a substantial part~~ of the expense in the initial stages can be borne by the Colony, the Government will be able to recommend the grant of the necessary assistance from the Colonial Development Fund.

At the same time, while the Secretary of State strongly supports the principle of the establishment of the geological survey, there are certain objections to

Case for further investigation
the detailed proposals made:

(1) Organisation.

It is proposed to appoint two young Geologists at equal salaries and also a Topographer. ~~It is suggested that there should be an experienced officer to take charge of the survey, and that a Topographer should be unnecessary in the early stages; it is suggested that it would be preferable that the organisation should be modelled on the excellent example of Nyassa Land, where the work has been highly successful.~~ *It is suggested that there should be an experienced officer to take charge of the survey, and that a Topographer should be unnecessary in the early stages; it is suggested that it would be preferable that the organisation should be modelled on the excellent example of Nyassa Land, where the work has been highly successful.* On this basis the estimates ~~would be~~ *would be* as follows:-

First Year

A. <u>Capital</u>	
Purchase of instruments, tools and equipment... ..	£400
B. <u>Recurrent.</u>	
Salary of Director	£1,000
Salary of Field Geologist. (£600-30-1640)	£ 600
Passages	£ 150
Transport and Travelling	£ 600
Assaying, etc.	£ 50
Contingencies	£ 200
Total	£3,000

12/12
Second Year

<u>Recurrent</u>	
Salary of Director	£1,000
Salary of Field Geologist	630
Transport and Travelling	600
Equipment, assays and Library	150
Contingencies	320
Total	£ 2,800

It will be observed that these estimates are substantially the same as those contained in the application

application by the Kenya Government. [If the Committee are prepared to consider the matter favourably the Secretary of State would propose before asking for a definitive recommendation to refer the matter to the appropriate technical body (namely the Geological Section of the Colonial Survey Committee). It is, however, inconvenient to hold a meeting of that body before the autumn and there would in any case be no point in referring the matter to them if the Committee were unable to recommend any grant of assistance for the scheme.]

2. Period of assistance from Colonial Development Fund.

No limit is set in the Governor's application to the term during which assistance should be granted from the Fund. It is realized that the Committee could hardly be expected to accept an indefinite liability. At the same time it is impossible to say that the work will be complete within any measurable period of years. If the survey is to be of any ~~value~~ ^{practical & scientific value} ~~it must be permanent~~ ^{degenerate into merely an expedition, the survey work} must be ~~effected~~ ^{continued} permanently and there must be a consequent steady accumulation and record of knowledge embodied largely in maps and available to Government and the public.

Admittedly, therefore, what is now desired is the establishment of a permanent department, and ^{it is realized that} ~~it has been suggested~~ that for this reason the Committee may consider that the project is of an administrative nature and therefore unsuitable for assistance from the Colonial Development Fund. ^{The Secretary of State} ~~The Secretary of State~~ would

To R. J. H. [?]
 The fact proposed to
 obtain technical
 advice on the scheme
 from the Geological
 Section of the Colonial
 Survey Committee but
 it is not clear
 necessary in the
 first instance to
 ascertain whether the
 Colonial Development
 Advisory Committee is
 prepared to agree in
 principle that it is
 a matter that can
 properly be referred
 to the Development
 Fund.



~~would however~~ ^{say} that in the present impoverished condition of the Kenya finances it would be quite impossible for the work to be begun within the next few years unless the whole cost (apart from the provision of office accommodation, etc.) is borne by the Fund: ~~the Committee should recommend that the whole cost of the survey for the first three years should be borne by the Colonial Development Fund on the understanding that after that period the work would be carried on by the Kenya Government if it were at that time at all financially~~ ^{able} ~~able to do so.~~ ^{unless conditions make it absolutely impossible to do so.}

To summarise, the Secretary of State ^{hopes} ~~trusts~~ that the Committee will see their way to ^{agree in principle to} ~~recommend~~ the grant of assistance from the Colonial Development Fund to meet the whole cost of the establishment of the geological survey in Kenya and the running of it for the first three years on the understanding (i) that ~~if it were possible financially~~ ^{possible} the Kenya Government will then continue the work ~~and~~ (ii) that the ~~entire cost of the scheme should be dependent upon the recommendations of the Geological Section of the Colonial Survey Committee.~~ ^{cost should be} ~~entire cost of the scheme should be dependent upon the recommendations of the Geological Section of the Colonial Survey Committee.~~ ^{the cost of the scheme will be estimated by the Kenya Government and the amount that would fall to be met by the Colonial Development Fund in the current financial}

Unless financial conditions make it absolutely impossible to do so

Should the Kenya Government be unable to meet the cost of the scheme?

financial

financial year is unlikely to be large as it would hardly be possible to initiate the scheme before the end of the present year. The figures might perhaps be tentatively put as follows:-

1931-32.	£1150
($\frac{1}{4}$ of £3,000)	£250.
1932-33	
($\frac{3}{4}$ of £3,000 plus $\frac{1}{4}$ of £2,600)	£2,775
1933-34	2,500.
1934-35	
($\frac{3}{4}$ of £2,600)	1,950.

Alternatively if the scheme is deferred until the beginning of the financial year 1932-33.

~~the capital £400, revenue £200, £1,200, £1,200~~
at ¹²⁰⁰ ~~£1,200~~ made up of the capital expenditure £400, the current expenditure of £800.
Expenditure revenue £200 & ~~£1,200~~

Alternatively the initiation of the scheme might be deferred until the beginning of the financial year 1932-33.

C. O.
13th August

Note on the Financial Position of Kenya.

REVENUE AND EXPENDITURE.

The revenue and expenditure of the Colony since 1928 is shown in the following table, but it should be noted that in order to arrive at the ^{net} revenue and expenditure a substantial amount has to be subtracted on account of reimbursements and gross entries: the amount in respect of 1931 being about £50,000.

Year.	Revenue.	Expenditure.
1928	£ 2,069,4	2,074,647.
1929	2,333,740	2,500,072 (*)
1930	3,401,51	3,547,729 (*)
1931		
Original estimate	£ 2,15,500	2,220,000
Revised estimate	2,300,000	2,400,000
at 31st July.		
	* including special expenditure from surplus balances.	

The revised estimates for 1931 prepared in November 1930 were based on the hope of an increase in trade receipts and a fall in market prices ^{as} of raw materials. They showed a surplus of £17,000, but have been completely upset owing to the influence of trade depression and to the ^{fact} that the ^{due to} ~~actual~~ ^{revised} estimates showed in the middle of July last a deficit of £110,000. It is expected that the deficit will be reduced by unexpected receipts of about £70,000. According to the latest figures the deficit on transactions of 1931 is now estimated at £40,000. Some additional revenue has been granted from increased customs duties on motorcars and parts and from increased postal rates, and economies amounting to about £170,000 have already been made. Supplementary expenditure

expenditure

40

expenditure chiefly to meet the locust menace has amounted to some £35,000; and ^{although} in ~~present~~ ^{present} circumstances a deficit ^{of £100,000} on the working ^{is at present foreseen} ~~would~~ ^{will be liable to} be inevitable although every endeavour ~~has~~ ^{is} been made to reduce it to the smallest possible proportion. Drastic reductions have been made in the 1932 Estimates which were prepared with the object of budgeting for a surplus of £62,000.

SURPLUS BALANCES.

The total surplus balances, i.e. assets over liabilities, amount ^{ed} according to the latest appreciation of the position, to £510,702. Virtually the whole of this sum is earmarked for working capital, unallocated stores, agricultural advances, etc., and the unreserved surplus was put at £68,700. Against this has to be set the anticipated deficit of £100,000 in 1931, leaving a balance on the wrong side of £1,300, but it is understood that the margin of working capital and allocated stores will more than cover the Colony's cash requirements. It may be mentioned that the financial policy recently laid down in consultation with the Treasury was to aim at bringing up the total surplus balances to £1,000,000 by the end of 1930. Under present conditions there is, of course, no possibility of reaching that figure by that date, ^{but} ~~and~~ the policy of building the surplus up to £1,000,000 remains ^{as} ~~an~~ ^{one} ~~object~~ to be achieved as soon as circumstances permit.

PUBLIC DEBT.

The Public Debt of the Colony consists of:-
£5,000,000 6 per cent stock 1946-56 issued in 1931
(in respect of which a sinking fund has been accumulated to the value of approximately £400,000).

£5,000,000

47

£5,000,000 5 per cent stock 1948-58 issued in 1927
£3,500,000 4½ per cent stock 1950 issued in 1928.
£3,400,000 4½ per cent stock 1961-71 issued in
1930.

The charges on a large portion of these loans are payable by the Kenya and Uganda Railways and Harbours. The Colony's share of the loans is approximately £3,665,000.

The 1930 loan was in respect of works already completed or nearing completion, the cost of which has so far been met from advances. Further proposals for loan expenditure for Colony purposes amounting to approximately £1,300,000 have been approved by the Treasury but until the revenue outlook is brighter the Colonial Government will proceed slowly with all capital expenditure not directly and immediately productive. In point of fact, the fresh loan expenditure ^{in works} with which it is ^{likely} ~~proposed~~ ^{to} ~~proceed~~ ^{be} ~~at once~~ ^{advised} only amounts to £165,775, all to be spent on works of great urgency or of a remunerative nature.

LIABILITIES TO THE IMPERIAL EXCHEQUER.

The question of the settlement of Kenya's war debt to the Imperial Exchequer amounting to some £1,400,000 has been postponed until 1934. ^{The settlement} ~~of the~~ ^{Kenya} ~~also has~~ liability ~~of about~~ £5,500,000 in respect of the cost of the original Uganda Railway ~~and settlement of this liability~~ has also been postponed until 1934. ^{The amount involved is about} £5,500,000

KENYA.

No. 180



GOVERNMENT HOUSE,
NAIROBI,
KENYA.

RECEIVED
20 APR 1931
COL. OFFICE

30th March, 1931.

My Lord,

I have the honour to refer to Your Lordship's despatch No. 467 of the 19th June last and to transmit an application for assistance from the Colonial Development Fund for the establishment of a Geological Survey in this Colony.

2. Sir Edward Grigg in his despatch No. 249 of the 26th April, 1930 referred to the circumstances in which the institution of this new and important service had been delayed. Since that despatch was written, a geological reconnaissance of the Southern Kavirondo area has been carried out by Mr. H.J. Wayland, Director of the Uganda Geological Survey, and his report, to which reference is made in the enclosure to this despatch, is at present being printed locally. Copies of this report will be transmitted to Your Lordship in due course.

3. The organisation now contemplated is considered to be the minimum which could operate with efficiency and, at the same time the maximum which, in the circumstances, could be suggested, in view of the fact that the assistance asked for from the Colonial Development Fund takes the form of a free grant of almost the whole cost of the service. It is hardly necessary for me to add that at the present time, when existing activities are being heavily curtailed, the Colony has no funds for this new service and that, in

the /

THE RIGHT HONOURABLE LORD PASSFIELD, P.C.,
SECRETARY OF STATE FOR THE COLONIES,
DOWING STREET,
LONDON.....S.W.1.

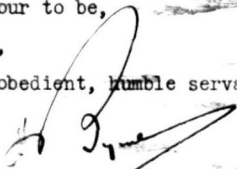
the absence of substantial financial assistance, the establishment of a Geological Survey would be indefinitely postponed.

4. This application is being submitted in advance of others which are still receiving consideration, in order that further delay may be avoided in instituting a service the desirability of which has been generally recognised for many years.

I have the honour to be,

My Lord,

Your Lordship's most obedient, humble servant,



BRIGADIER-GENERAL.
GOVERNOR.

APPLICATION FOR ASSISTANCE FROM THE
COLONIAL DEVELOPMENT FUND
FOR THE ESTABLISHMENT OF A GEOLOGICAL
SURVEY IN KENYA.

1. DESCRIPTION OF SCHEME.

The proposal is to initiate a Geological Survey in Kenya Colony. The East African Parliamentary Commission 1925 observed that in East Africa it was abundantly clear that an immense field existed for the investigation of mineral resources, which demands the services of geologists, and that, in view of the confident prediction of Mr. Wayland (Director of the Uganda Geological Survey) in regard to the petroleum areas in the Rift Valley, there was every need for the speedy establishment of a geological department.

Public prospecting, which is encouraged, is of necessity limited in its outlook. The aim of a geological survey is to discover the mineral constitution, geological structure and geological history of the territory and to correlate its discoveries with those made in other territories in order that the results may be applied to the solution of local economic and scientific problems which for their complete solution require consideration of one or more geological factors. It thus enters into mining, building construction, siting of dams and bridges, agriculture (rock derivatives as plant food and surface drainage), sanitation, roads, water supplies, mineral fuels and a number of other necessary activities. The East African Parliamentary Commission referred to the need of the territories for fuel other than wood and considered that the value of a Geological Department to the Railway and Public Works Departments could not be sufficiently emphasised.

The Advisory Council on Mineral Resources of the Imperial Institute, at a meeting held in 1929, agreed :-

- (a) That from the standpoint of Imperial interests it is highly desirable that a more rapid development of the mineral resources of East Africa should be encouraged.
- (b) That in order to achieve this purpose, an efficient and adequately staffed Geological Survey should be established in Kenya to carry out as early as possible a geological survey of that Colony, while at the same time it is necessary to expedite the completion of the geological surveys of Uganda and Tanganyika.
- (c) That the funds requisite for this purpose should be in part provided from Imperial sources.

The Council further pointed out that, quite apart from the discovery of mineral resources, a geological survey is of the utmost value in dealing with all problems of water supply.

The Government of Uganda has been approached with the suggestion that a joint survey for Kenya and Uganda should be instituted, but considers that the formation of a joint service would only be justified if it included Tanganyika and prefers to await a decision regarding the question of closer union. Geological survey is, in the meantime, becoming more and more a necessity and if work is to be deferred until it is possible to organise a co-ordinated service for the three territories after the setting up of a common authority, further considerable delay is inevitable.

It is suggested, therefore, that work on a systematic geological survey of the Colony should be begun

at once, the work and staff to be such that, when the time comes for the institution of a combined service, the work would not be wasted and the staff could be absorbed into the combined service.

A geological reconnaissance of the Southern Kavirondo area has recently been undertaken by the Director of the Uganda Geological Surveys and the following is taken from his Report :

"Southern Kavirondo is worthy of much more detailed study than it has received; not only from the point of view of pure geology, which should provide a key to the study of other districts, but also as a possible area for economic minerals. The mapping of the area should form part of the work of a Geological Survey of Kenya, should one be formed at any time.

With regard to gold, further prospecting (in addition to that within the known auriferous area) should be undertaken by locating continuations of the shatter zones or determining others and prospecting quartz-dykes, etc., within them, as well as sampling stream beds and alluvial deposits.

The occurrence of detrital tin in the Kisii sandstone is of great interest The grains are angular and have not travelled far, and thus there would seem to be two possibilities, namely, the existence of useful lodes and derived deposits in Southern Kavirondo and the existence of alluvial deposits produced by the denudation of tin in stream beds or lake beaches - consequent upon the breakdown of the sandstone.

A study of the basin in which the Kisii sandstone

were deposited should reveal the source of the
tinstone

Mr. Wayland considers that his reconnaissance
has proved this area to be an extremely interesting and
important one geologically, and one in which conditions
conducive to mineralisation have obtained more than once.

Experience in Uganda shows that Mining Companies
and the public make much use of the local Geological
Survey and its laboratory staff; and (to quote Mr.
Wayland) it is safe to say that were it not for the
activities of that Department, the mineral discoveries
of Ankole (Kintu), Ruwenzori (copper) and elsewhere would
not have been made.

For the details of the scheme set out below the
Government of Kenya is largely indebted to the Director
of the Uganda Geological Survey.

The scheme involves the appointment of two
field geologists and one topographer as a skeleton survey
to be attached to the Commissioner of Mines, who would
provide office accommodation and necessary clerical
assistance. The laboratory work is to be carried out in
the laboratory of the Government Analyst. This applica-
tion deals with the three posts referred to and the
initial capital cost of instruments and equipment.

2. ESTIMATED TOTAL COST.FIRST YEAR.

(a) Capital.	£.
Purchase of instruments, tools and equipment.	100
(b) Recurrent.	
Two field geologists (£600 by £30 to £100) salary	1200
One topographer (£372 by £18 to £180)	372
Passages	300
Transport and Travelling	500
Contingencies	100
	<u>£ 3,122</u>

SECOND YEAR.Recurrent.

Two field geologists, salary	1260
One topographer, salary	390
Transport and Travelling	500
Contingencies	<u>100</u>
	<u>£ 2,600</u>

3. LATEST ESTIMATED DATE OF COMPLETION.

If and when this application is approved.

4. APPROXIMATE ESTIMATED DATE OF COMPLETION.

This it is impossible to forecast.

5. APPROXIMATE ESTIMATE OF ALLOCATION OF COST BETWEEN

- (a) Local Expenditure;
 (b) Expenditure in Great Britain.

First Year.

(a) Local expenditure	£ 2,772
(b) Expenditure in Great Britain Purchase of instruments, etc. (excluding freight and insurance)	325

Thereafter, expenditure will be almost entirely local.

8. WHAT CIRCUMSTANCES HAVE PREVENTED THE WORK FROM BEING PUT IN HAND BEFORE?

Lack of funds.

9. A. - These questions have been answered above.

10. FORM OF ASSISTANCE DESIRED.

A direct grant from the Fund of £5,000 in the first year, and thereafter a direct grant of £2,500 annually.

11. This question does not apply.

12. AMOUNT REQUIRED IN NEXT FINANCIAL YEAR.

Since some delay will inevitably occur in making the appointments, one half the 1st year's cost is estimated to be required during the financial year ending the 31st March, 1952. In the following financial year the grant if approved would amount to £2,750 and in ensuing years £2,500.