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GEOLOGICAL SURVEY
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Chief Geologist

UNITED STATES DEPARTMENT OF THE INTERIOR

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RADIOMETRIC EXAMINATION OF ROCK SPECIMENS FROM MOUNT McKINLEY, ALASKA

By

John J. Matzko

February 1951

Short Contributions to Alaskan Trace Elements Studies

for 1947

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RADIOMETRIC EXAMINATION OF ROCK SPECIMENS FROM MOUNT McKINLEY, ALASKA

By John J. Matzko

ABSTRACT

A suite of 50 rock specimens, collected by the 1947 Washburn Mount McKinley Expedition, was scanned radiometrically. The maximum radioactivity observed in any one of the specimens was about twice background. Radiometric analyses of the most radioactive samples show that a sample of vein quartz coated with manganese oxide contains 0.009 percent equivalent uranium and that the maximum equivalent uranium content of granitic rock types is 0.004 percent. The radioactivity of the manganese-stained quartz is probably due to traces of uranium in the manganese mineral, whereas that of the granitic rocks is due to radioactive accessory minerals.

INTRODUCTION

Mount McKinley lies in south-central Alaska in the heart of the Alaskan Range about 150 miles southwest of Fairbanks and 130 miles north-northwest of Anchorage (fig. 1). It is the highest mountain peak on the North American continent and has an altitude of approximately 20,300 feet.

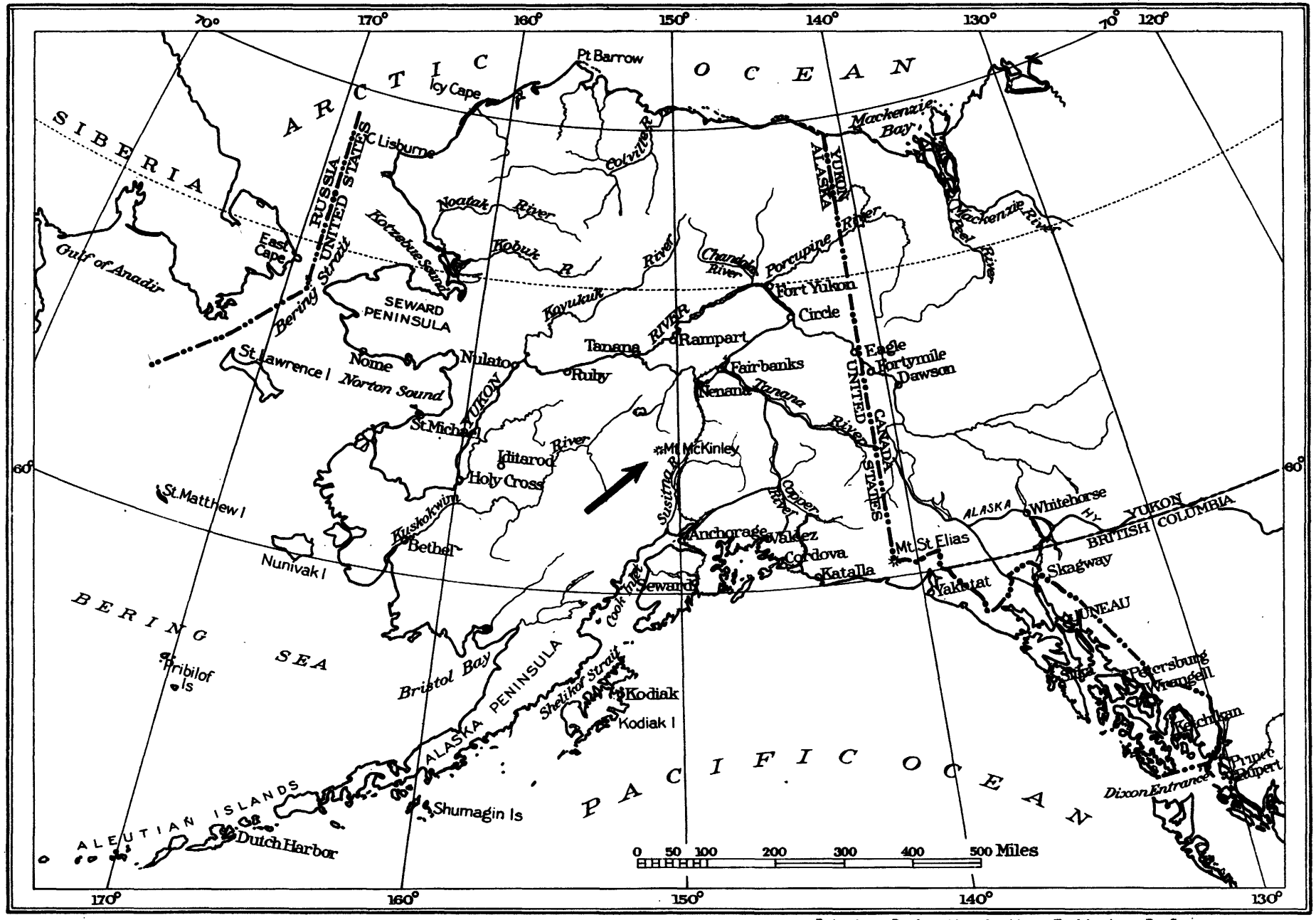

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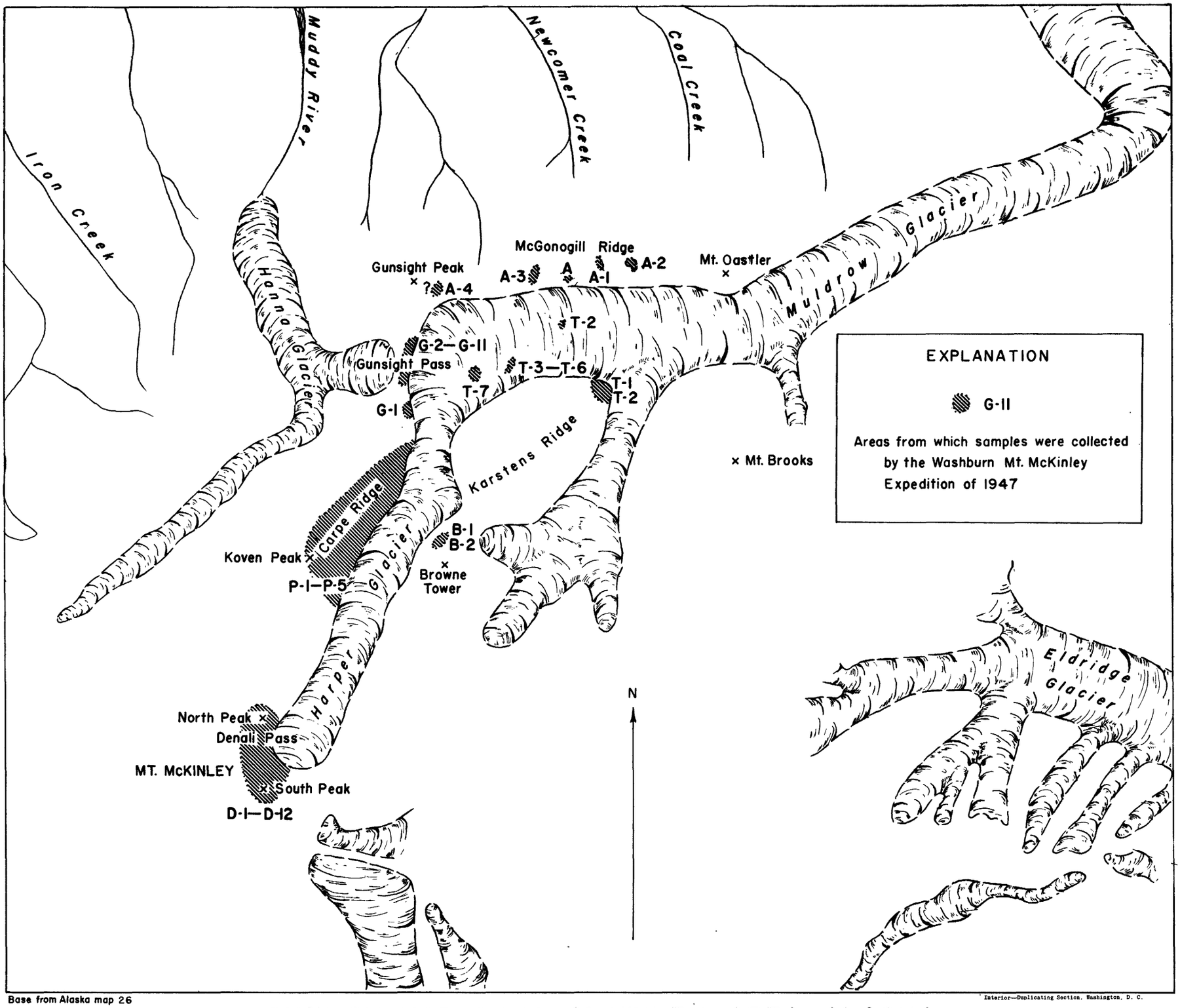
FIGURE 1. MAP OF ALASKA SHOWING LOCATION OF MOUNT McKINLEY

Very little geologic information is available on the geology of Mount McKinley, but general descriptions of the surrounding region are contained in papers by Brooks (1911) and Capps (1933).

A suite of 50 rock specimens from Mount McKinley and its northeastern approach, collected by the 1947 Washburn Mount McKinley Expedition, was presented to the Alaskan Section of the Geological Survey for special study. The purpose of this report is to present the results of the radiometric examination of these samples. It is not known whether these rock samples in part were collected in place from bedrock exposures, or whether they are entirely random pieces collected from talus slides, rock avalanches, or glaciers. Nevertheless, the distribution of the localities samples (fig. 2) indicates that the specimens are probably fairly representative of the rocks on Mount McKinley and its northeastern approach.

LOCALITIES SAMPLED AND ROCK TYPES TESTED

The suite of samples on which this report is based was collected along upper Muldrow Glacier and Harper Glacier to the summit of Mount McKinley (fig. 2), the general route of the Washburn Expedition. The areas from which the specimens were collected are indicated on figure 2. The sample numbers are those used by the Washburn Expedition. Brief descriptions of the areas and the rock types collected are given below. The names used to describe some of the granitic rocks, both in the text



Base from Alaska map 26

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SKETCH MAP OF MT. McKINLEY AREA, ALASKA

5 0 5 10 Miles

Scale

and table 1, are tentative, as detailed petrographic analyses have not been done.

1) McGonogill Ridge, north of Muldrow Glacier; specimens consist of granite and diorite cut by medium- to fine-grained diabase dikes.

2) Gunsight Pass, between the head of Muldrow Glacier and Hanna Glacier; specimens were collected in a north-south section across the pass; of eleven collected, nine are limestone, one is sillicified limestone or quartzite, and one is vein quartz.

3) Karstens Ridge and Muldrow Glacier; samples are reported to be mostly avalanched material from the north side of Karstens Ridge and were collected from the surface of Muldrow Glacier; the rocks are mostly limestone and slaty shale.

4) Carpe Ridge, west of Harper Glacier, from the vicinity of Gunsight Pass to the vicinity of Koven Peak; specimens are mostly black shale cut by veins of white quartz; one specimen is a granitic dike rock.

5) Brown Tower, east of Harper Glacier; two specimens of granitic rock.

6) Mount McKinley-South Peak (altitude about 20,300 feet), North Peak (altitude about 19,000 feet), and the intervening Denali Pass; specimens from South Peak are mostly granitic rock, those from North Peak are mostly black slate; the granite-slate contact occurs approximately at the low point of the pass.

RADIOMETRIC TESTS

The Washburn Expedition rock samples from Mount McKinley were scanned radiometrically with a Victoreen Geiger counter, model 263. The average number of gross counts per minute in a three-minute period were recorded for each specimen (table 1). The background count of the instrument averaged about 37 counts per minute. The maximum count obtained on any one specimen was about twice background. As the rock fragments vary considerably in size, precise quantitative measurements of their radioactivity could not be made without destroying them. Therefore, as a further check on the maximum radioactivity of the specimens, parts of the samples of each rock type showing the greatest radioactivity were crushed and analyzed radiometrically. The results of these analyses follow:

Sample No.	Rock type	Equivalent uranium (percent)	
		Unconcentrated crushed rock	Heavy-mineral fraction 1/
D-10	Granitic rock	0.004	0.010
P-4	Granitic rock	0.003	0.014
G-10	Vein quartz with manganese-oxide coating	0.009	
T-2	Black slate	0.001	
G-8	Limestone	0.002	0.004

1/ Heavier than bromoform, sp. g. 2.9

The radioactivity of sample G-10 is probably due to traces of uranium in the manganese-oxide coating on the quartz. The radioactivity of the granitic rocks, i.e., 0.003-0.004 percent equivalent uranium, is about the normal amount for that lithologic type and is most likely due to

Table 1. Radiometric scanning data on samples collected by the 1947 Washburn Mount McKinley Expedition

Sample No.	Total count per minute	Description
A	43	Granite, McGonogill Ridge
A-1	37	Dark, medium- to fine-grained basic (dioritic?) rock; McGonogill Ridge
A-2	42	Light-colored dike cutting granite; McGonogill Ridge
A-3a	41	Basic dike cutting granite; McGonogill Ridge
A-3b	43	Granite; McGonogill Ridge
A-3c	48	do do
A-4	50	do do
G-1	41	White and gray limestone; Gunsight Pass
G-2	38	Gray, dense limestone; Gunsight Pass
G-3	41	Gray and white limestone; Gunsight Pass
G-4	44	Banded limestone; Gunsight Pass
G-5	38	White to tan limestone; Gunsight Pass
G-6	37	Dark gray limestone; Gunsight Pass
G-7	50	Dark gray, shaly limestone; Gunsight Pass
G-8	52	Limestone from fault zone; Gunsight Pass
G-9	43	Limestone, Gunsight Pass
G-10	59	Black, manganese-stained quartz vein in limestone; Gunsight Pass
G-11	48	White, dense, silicified limestone; Gunsight Pass
T-1	46	Black, slaty shale; Karsten Ridge
T-2	55	Black, slaty shale; Karsten Ridge
T-3	46	Black, slaty shale; Muldrow Glacier avalanched from Karsten Ridge
T-4	50	Gray, granular rock speckled with limonitic muscovite; Muldrow Glacier
T-5	41	Argillaceous rock; Muldrow Glacier
T-6	43	Black shale; Muldrow Glacier
T-7	53	Black, crystalline limestone with specks of limonite; Muldrow Glacier
P-1	41	Black slate; Carpe Ridge
P-2	45	" "
P-2A[1]	49	Shale-vein quartz breccia; Carpe Ridge
P-2A[2]	49	Shale with quartz vein; Carpe Ridge
P-2A[3]	49	Black and green shale with vein quartz; Carpe Ridge
P-2A[4]	43	Black slate; Carpe Ridge
P-2A[5]	41	Shale with quartz veins; Carpe Ridge
P-2A[6]	37	Greenish-black shale; Carpe Ridge

Table 1. Radiometric scanning data on samples collected by the 1947 Washburn Mount McKinley Expedition (continued).

Sample No.	Total count per minute	Description
P-3	47	Slate; Carpe Ridge
P-4	69	Quartz diorite dike in slate; Carpe Ridge
P-5	48	Black shale; Carpe Ridge east of Koven Peak
B-1	52	Quartz diorite; Browne Tower
B-2	53	Granite; Browne Tower
D-1	51	Black shale weathering yellow and green; north side of Denali Pass
D-2	49	Slate; north side of Denali Pass
D-3	55	Light-colored, medium-grained diorite dike in altered shale; Denali Pass
D-4	45	Pegmatitic(?) dike rock; south side of Denali Pass
D-5	46	Vein quartz; south side of Denali Pass
D-6	41	Granite; South Peak
D-7	46	Weathered granite with lenses of sulphides; South Peak
D-8	51	Vein quartz with muscovite and tourmaline; Denali Pass
D-9	58	Granite; South Peak
D-10	63	Coarse-grained quartz diorite sill in slate; North Peak
D-11	48	Light-gray granite; South Peak
D-12	42	Slate; North Peak

radioactive accessory minerals. For practical purposes, all the other rocks in this collection can be classed as nonradioactive.

REFERENCES

Brooks, A. H. (1911), The Mount McKinley region, Alaska: U. S. Geol. Survey Prof. Paper 70, 234 pp.

Capps, S. R. (1933), The eastern portion of Mount McKinley National Park (Alaska): U. S. Geol. Survey Bull. 836-D, pp. 219-300.