PAGE T. JENKINS - GEOLOGICAL SURVEY OF WYOMING - ASSIGNMENT: To examine vermiculite deposits south of Glenrock, Wyoming

Oct. 11, 1938 - Tuesday - fair and windy.
Left Laramie 8:15 a.m. in O-97
Arr. Glenrock 2:45 pm - 165 miles - 7.4 gals. gas.

In afternoon I looked up information on location, development and ownerships of vermiculite deposits. Started development 3 yrs. ago. Two different deposites or "lodes" are now being worked commercially. ① Washakie Lode in N½ sec. 13 T32 N; R.76 W.;
Owners; Mc Coun - Lander
Wells - Glenrock
Lesee: H.F. Winkleman - Nebraska City

Development contract!
C.D. Morgan: Glenrock
V.E. Rose: "
Morgan and Rose are trucking the raw vermiculite to their own treating plant in Glenrock. According to Morgan the two men could mine and truck about 10-12 tons max. daily, and treat about 3 tons. Their treating plant consists of a rotary screen which sorts ½ in mesh vermiculite out of fines and lumps. The ½ in mesh is burned and exfoliated in a steel gas kiln and marketed by them for insulation. Fines can be burned and used for plaster aggregate. Lumps are soft enough to be crushed by hand or shovel. Finished ½ in mesh product sells for about $7 a ton in the

immediate vicinity. It's expansion properties vary considerably; 3 to 8 times. Density of finished product is about 10 to 12 lbs. per square foot. Morgan thinks there may be enough iron in his raw vermiculite to fuse upon heating causing low expansion and high density of finished product. Finished product has bronze luster.

The other deposit being worked commercially is (2) Stardust Lode #1 N in NE¼ sec. 20 T32N; R75W

Owner: Lew Smith - Glenrock
Lessee: V.J. Bitzenhofer of Wyoming Insulating Co. - Casper
Developers: Ralph Young - Douglas
Curtis Hanson - "

Lew Smith advanced information on these deposits. Raw vermiculite is trucked to Casper and burned there. Some of his vermiculite is reported to have up to 30 times expansion and of a density as low as 3 lbs. p.s.f.

An incorporated firm, The Wyoming Vermiculite Co., is reported to have spent $3,000-4,000 dollars opening up the Beech Lode in NW¼ sec. 33 T32N; R75W during June & July, 1938. It is said that expansion property of this vermiculite was too poor to be worth while. None was marketed commercially.

The Badger claims owned by Lew Smith and Morris Flavin of Glenrock, are reported to have good grade vermiculite. Five prospect holes in the five Badger claims are in E½ sec. 29, T32N; R75W.

Oct. 12 - Wednesday - fair and windy
Examined all prospects in area. Area in which vermiculite is found is roughly a band about 4 to 5 miles long and 1 mile wide trending about NW-SE, in an area of pre-Cambrian rocks 7 to 10 miles south of Glenrock. (See Converse Co. map)

Oct. 13 - Thursday - fair and windy

Washakie Lode region:-

To the northwest of Washakie lode a neck of pre-C extends back into the Paleozoic limestones (probably Madison ls.) the area is one of intrusives and metamorphics. The general trend of metamorphics (or dikes) is south east. A dark colored diabase or metadiabase occupies the south west half of this neck. It was impossible to tell whether this rock was an intrusive or a metamorphosed roof pendant.

No contact was seen between it and unquestioned batholithic granite. In places the diabase or metadiabase seems to grade into a darker coarser material lacking in feldspar (probably a pyroxenite) The dark rock is cut all through by pegmatite dikes and stringers. In the southwest half of this pre-C neck the intrusive is a very acid pegmatite, largely quartz and prospects have been opened up along the qtz. veins.

Samples nos. 1, 2 and 3 show the results of alteration of diabase by infusion of quartz. Taken from prospect dumps on hill ½ mile northwest of Washakie lode. In the north east half of the pre-C neck granitic material predominates. Some of the granite has partially changed to a gneiss. Pegmatites predominate. Did not determine

whether granitic material was batholithic or in dikes but is cut by younger acid intrusives. Apparently no vermiculite in this neck.

about ½ mile south of Washabie Lode granite appears to grade into gneiss and then into diabase. Indications favorable to the interpretation that the diabase is a metamorphosed roof pendent, associated with batholithic granite

About ½ mile east of Washabie Lode a prospect hole shows vermiculite interfixed with disintegrated granite. Appears to be a contact between granite and pegmatite or diabase.

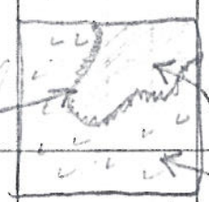
Contorted bedding in vermiculite seams. Is vermiculite a weathering product? No. Is vermiculite formed along the contact between the roof pendent as zeno liths and the granite? No. Exposed unweathered contacts do not seem to show vermiculite. All the prospect holes I've seen with vermiculite present show overburden of soil or (and) extremely weathered zones around the vermiculite and disintegrated granite (unimportant)

Washabie Lode shows the largest vein in the area covered. Strictly speaking it doesn't look as much like a vein as a large pocket very irregular in shape. Lumps of serpentine-like material (see Sample #5) of all sizes extend into the pocket from the wall rock (?). No horses were seen entirely surrounded by vermiculite but were reported by the miners. Around each lump, or "horse" there seems to be a band or layer of vermiculite which adheres to the serpentine as though the

outside of the horse was "vermiculized" (see Sample #5)

No vermiculite with scattered grs and feldspar grains as in Stardust Mine (see below). Pocket's greatest width about 20 feet.

Holes nearby show intimate relationships of vermiculite to diabase. Granitic material not so common as in hole mentioned above about ½ mile east. However granite is not far away. Wash. Code appears to be near the contact of a large mass of diabasic material and granite. The hypothetical and approximate line of separation of the two larger masses appears to be continuous with the NW-SE line dividing the neck of pre-C to the NW into predominantly diabase on the south west and predominantly granite on the northeast. Small granitic medac-shaped dike or inclusion (?) is cut across in back of pocket in Wash. Code as diagram below shows.



Stardust Code: Masses of vermiculite in serpentine cavities. Fine grained granitic material in sharp contact with vermiculite (black) layers of gold colored smooth oily feeling vermiculite in layers and scattered

through associated greenish serpentinic looking material (see sample). Serpentine asbestos and serpentine talc also associated with vermiculite locality. Diabase is shown to be metadiabase and evidently metamorphosed as a roof pendent by batholith. Roof pendent evidently serpentinized and vermiculitized in places, (always) the two together. What kind of rock could go over to serpentine and (or) vermiculite? What is the relation of the diabase to the vermiculite? No diabase was actually seen in contact with the vermiculite. However the granitic looking material (see sample) may be altered diabase or diorite. At Stardust there seem to be alternate layers of "granitic material" and black vermiculite in places. Also cavities in a large serpentine mass are filled with vermiculite. Also alternate layers of serpentine and vermiculite (See Sample). Blocks of serpentine and granitic material (see sample) are found included in and entirely surrounded by vermiculite. Many of the serpentine-vermiculite contacts have thin layer of white amphibole (?) between them — a sort of coating layer on the serpentine. No such layer between the granitic material and serpentine.

Samples:- all from area about 7 to 10 miles south of Glenrock, Wyoming. Collected and labeled by Page T. Jenkins, Oct. 12 & 13, 1938.

#1 Metadiabase from roof pendant over granite batholith. S½ sec. 12, T 32 N; R 76 W.

#2 Meta diabase injected by quartz from batholith. S½ sec. 12, T 32 N; R 76 W.

#3 Metadiabase injected by quartz from batholith. S½ sec. 12, T 32 N; R 76 W.

#4 Granitic material in contact with vermiculite at Washakie lode. N½ sec. 13, T 32 N; R 76 W.

#5 Serpentinic and amphibole material from "horse" in contact with vermiculite at Washakie lode. N½ sec. 13, T 32 N; R 76 W

#6 Raw commercial vermiculite from Washakie lode - 1/4 inch mesh

#7 Expanded commercial vermiculite from Washakie Lode - 1/4 inch mesh

#8 Golden vermiculite in greenish serpentinic material with pyroxene (?) crystals from Stardust #2. NE¼ sec. 20 T 32 N; R 75 W

#9 Vermiculite and Serpentinic in alternate bands from Stardust #1 about 1000' N of east¼ cor. sec. 20 T 32 N; R 75 W.

#10 Vermiculite with quartz and feldspar grains scattered thru it. Stardust #1

#11 Pyroxenite near Stardust #1

#12 Raw vermiculite from Stardust #2 ⅛ in mesh

#13 Expanded vermiculite from Stardust #2 - ⅛ in. mesh

#14 Raw vermiculite from Badger #1 abmt 1000' W. of east 1/4 cor. sec. 29 T32N; R25W. 1/8 in. mesh

#15 Raw vermiculite from Badger #5 abmt 2000' W. of east 1/4 cor. sec. 29, T32N; R75W 1/8 in mesh

#16 Partially expanded vermiculite from Badger #5. 1/8 in. mesh

#17 Serpentine rock cut by quartz vein 1/4 mile west of Stardust #2

#18 Serpentine rock cut by pegmatite veins 1/4 mile west of Stardust #2

#19 Serpentine rock from serpentine hill in N 1/2 sec. 29 T32N; R75W.

#20 Pegmatite in which biotite has been altered to vermiculite - Stardust claims

#21 Pyroxene crystals in vermiculite layer around serpentine rock - Stardust Claims.

#22 Expanded vermiculite from Badger #1 - 1/8 in mesh

#23 Large vermiculite plates from Stardust #1N - one expanded

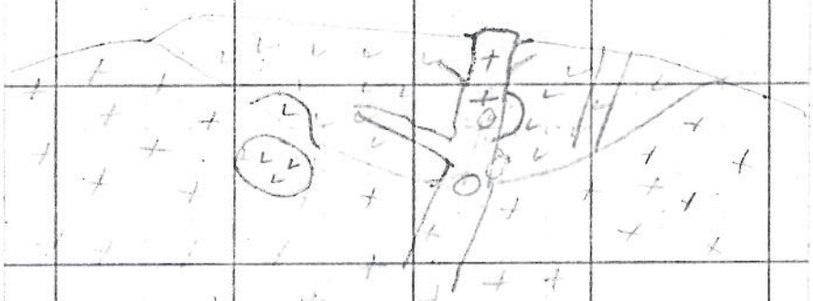
Oct. 14, Thursday - Fair

To west of main road about due east of Washakie Lode is a prospect hole showing vermiculite in a dike in the diabase. Along the wall exposed between the vermiculite and diabase is what looks like partially altered pyroxenite. Was the pyroxenite a dike in the diabase? Associated talcose schist + serpentine.

At one Stardust hole vermiculite seems to grade through weathered granitic material into diabase or diorite with little or no serpentine. On opposite side of the hole the vermiculite layers alternate with serpentine and little or no granitic material.

In another hole is a pegmatite vein with a layer of vermiculite on either side grading away into serpentine. Another hole. Large pegmatite dike strikes into Stardust hill. Contains large masses and veins of biotite. One biotite seam in one hole changes to vermiculite in depth. Hornblende or pyroxene masses also probably connected with dike. Looks like pegmatite plays important part. Inclusions of roof (now enclosed in pegmatite and

serp.) surrounded by biotite. Checks with "horses" of serpentine in vermiculite.



Pegmatite: Quartz
Feldspar
Biotite
Hornblende

In Stardust shaft granite material (see sample) appears to be a stope block the same as serpentine blocks. Pegmatite veins evidently stoped off granite blocks as well as diabase blocks.

Badger claim:

38-6
MR-~~GW-53~~

THE VERMICULITE DEPOSITS SOUTH OF GLENROCK, WYOMING

By

Page T. Jenkins

Introduction:

The deposits described in this report are located from 7 miles to 10 miles south of Glenrock, Wyoming, in section 20, 29 and 33, T. 32 N., R. 75 W. and section 13, T. 32 N., R. 76 W. The writer spent 2½ days in October, 1938, in an examination of the deposits.

General Geology:

The vermiculite is found in an elongated area about 4 or 5 miles long and 1 mile wide, trending in a NW - SE direction. The area is underlain by pre-Cambrian igneous and metamorphic rocks. From one quarter mile to two miles to the north of the area the Madison limestones, striking nearly east-west, crop out along the mountain front. The predominant pre-Cambrian rock types are a dark-colored metadiabase and a white to pinkish granite. Large irregular-shaped masses of serpentine and a few tabular masses of pyroxenite or amphibolite are exposed in the area. The serpentine and pyroxenite together with the metadiabase make up part of a pre-Cambrian roof pendant invaded by a granite batholith. The end stages of batholithic intrusion are represented by the intrusion of pegmatite dikes and veins which cut the granite, metadiabase, serpentine and probably the pyroxenite, though this latter relation was not found.

Description of the deposits:

The Washakie Lode in Sec. 13, T. 32 N., R. 76 W., shows the rgest mass of pure vermiculite opened up in the area. The vermiculite upies an irregular-shaped pocket having a maximum width of 20 feet

from which many smaller vermiculite lenses radiate out into light green, altered serpentine and light gray, impure talc schist. The vermiculite pocket is probably genetically related to a large pegmatite dike, which crops out a few hundred feet to the east. Irregular inclusions of disintegrated metadiabase and serpentine "horses" are found entirely surrounded by vermiculite. The contact between the vermiculite and metadiabase is sharp; that between the vermiculite and serpentine is gradational and, in some cases, is marked by a thin band, about 1 inch thick, of white fibrous amphibole, probably actinolite. Prospect holes nearby show vermiculite bands alternating with and grading into mica schist bands, which in turn, grade into unaltered metadiabase.

On the Stardust claims in Sec. 20, T. 32 N., R. 75 W., recent prospect holes show masses and lenses of vermiculite in altered serpentine, gold-colored vermiculite in bands and flakes scattered through impure talc schist, clusters of vermiculite plates embedded in large intergrown crystalline masses consisting of feldspar and quartz in a granite-pegmatite, and metadiabasic material grading into vermiculite. The relation of the vermiculite deposits to the pegmatite dikes and veins are best seen here. The country rock is, in most cases, a light green, altered serpentine. Smaller amounts of talc schist, chlorite schist and pyroxenite or amphibolite are found within or close to the larger serpentine masses. The serpentine also contains small amounts of chrysotile asbestos.

In the N. ½, Sec. 29, T. 32 N., R. 75W., massive unaltered serpentine streaked with dark bands is exposed in pits dug in the top of a hill, locally called Serpentine Hill. No vermiculite was noted here. A few hundred feet to the southwest a large pegmatite dike strikes about S. 30° E. Associated with this and other pegmatite dikes are the vermiculite deposits of the Badger claims. Vermiculite in most of the prospect holes here grades through talc schists into metadiabase, although altered serpentine

was found with vermiculite in some of the holes.

On the Beech claims in Sec. 33, T. 32 N., R. 75 W., a large tabular mass of vermiculite is associated with metadiabase and biotite. Apparently the biotite has been only partially converted to vermiculite as the material expends only slightly upon heating.

Mode of Origin:

The vermiculite was formed by alteration of serpentine and metadiabase under the influence of hot aqueous solutions derived from a granite-pegmatite magma. Some of the vermiculite was formed by the alteration of biotite which had previously crystallized from the pegmatite magma.

Development work:

The extreme spottiness and irregularity of the vermiculite deposits and the wide variation within and between deposits, of the vermiculite's physical properties (expansion and density of refined products) upon which its commercial value is dependent, makes it impossible to predict, in advance of exploration, the extent and character of the deposit. In one case, the expansion and density properties of the refined products of two bands of raw vermiculite in contact with each other, were markedly different. Two of the deposits are now being worked commercially on a small scale. Raw material from the Washakie Lode is mined, trucked to Glenrock and crushed to pass through a ½-inch screen. The fines are screened out. The coarser material is burned in a small steel rotating kiln fired by natural gas and is sold and installed for house insulation in the immediate vicinity. Fines are burned and used for plaster aggregate. The whole process from mine to market is handled by two men. The material is reported to expand to a volume of 3 to 8 times the original volume. The weight of the finished product is about 10 to 12 lbs. per cubic foot. The other commercially-worked deposit is on the Stardust claims. Raw vermiculite is trucked to Casper and burned

there. Some of this vermiculite is reported to expand up to 30 times the original volume and to weigh as little as 3 lbs. per cubic foot. However, the raw material from a single deposit may vary in expansion from 5 to 30 times original volume and the weight of the refined products may vary from 3 to 15 lbs. per cubic foot.