5-1949

Daibase Sill Comanche County, Oklahoma

Jean A. Hardesty

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COMANCHE COUNTY, OKLAHOMA

by
JEAN A. HARDESTY

A Thesis
Submitted to the Department of Geology
in Partial Fulfillment of the
Requirements for the Degree of
Bachelor of Science in Geological Engineering

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Butte, Montana
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INTRODUCTION

About 95 percent of the Earth's crust is igneous rock, mainly of an intrusive nature (5 : 4)*. The mechanics of intrusion and the processes involved are becoming of more and more interest to contemporary geologists, because most of our mineral deposits are assoiated with igneous intrusions, and unknown-outcropping deposits are thought to be a thing of the past. If, by studying these processes, we could understand why some igneous masses are barren, while others of similar composition carry economic mineral deposits, geological prospecting for hidden mineral concentration would see a new era. A few of the known processes are well illustrated by a suite of rock samples and specimens collected by Mr. F. Robertson during October, 1947, while making a reconnaissance survey of the igneous rocks in the Wichita and Arbuckle mountains of Oklahoma for the Missouri Geological Survey. The samples pertain to the intrusive basic body, sill-like in nature, and show evidence of differentiation near the sill's contact with the overlying acid host rock. The sill is barren in the locality sampled, but is known to carry marginal deposits of titaniferous magnetite in other areas.#

The prupose of this investigation is to check, petrographically, the existence of differentiation; thus determining the age relationship with the overlying granite, and to study the mechanics and processes involved in the intrusion.

The writer wishes to thank Mr. Forbes Robertson, Assistant

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* First number refers to bibilography, second, to page in reference.
\# Personal communication from Mr. F. Robertson.

Professor of Geology, Montana School of Mines, under whose direction this thesis was written, for his patient help and guidance. Thanks are also extended to Dr. E. S. Perry, Professor of Geology, Montana School of Mines, whose helpful hints on mechanical details of report writing aided materially.

The area in which the sill is located has previously been described by C. H. Taylor in Oklahoma Geological Survey Bulletin 20, entitled, "Granites of Oklahoma," issued in July, 1915. In this publication, no mention is made of differentiation in the corresponding basic body, which he called gabbro, although he states that "northwest of Mount Sheridan near the granite-gabbro contact the gabbro assumes a speckled pinkish appearance due to the presence of quartz and orthoclase." He further states that the gabbro is the oldest igneous rock exposed in the Wichita Mountains. In January, 1948, Mr. Robertson wrote an unpublished paper, "Notes on The Igenous Rocks of Oklahoma and Eastern Kansas," in which he mentioned the fact that he visited Mount Sheridan, in 1947, noted the possible differentiation, and took samples.

LOCATION AND GENERAL GEOLOGY

The basic body in question makes up part of the pre-Cambrian igneous rocks, consisting of rhyolites, granites, gabbros, quartz-monzonites, diorites, and diabases, in the Wichita Mountain district. According to Taylor (8 : 31) the rocks in this district fall into four natural groups: (1) Pre-Cambrian quartzite and sandstone, (2) pre-Cambrian igneous rocks, (3) Paleozoic sandstone and limestones, (4) Permian(?) red sandstones and shales. The portion of the sill sampled is in the Wichita Mountains, about sixteen miles northeast of Lawton, in the East ½, Section 5, T. 3 N., R. 13 W., Comanche County, Oklahoma (Plates I and II). The samples were taken from a knob southeast of Mount Sheridan, the top of which, along with that of Mount Sheridan, is made up of a granite called the Lugert. Underlying this granite is a basic igneous body that shows signs of differentiation near the top contact. The lower contact of the sill is not exposed (Plate III-A). Both the sill and the granite seem to be tabular and flat lying. The basic body supports a dense vegetation while the granite does not. When weathered, the sill shows quite a sharp line contact between the highly weathered and the fresh rock (Plate III-B). Three small quarries, the exact positions of which are not known, are located on the southeastern slope of the knob.

METHOD OF APPROACH

Of the twelve samples collected by Mr. Robertson, seven represent differentiation stages in the sill; two, the granite above the sill; one, a highly weathered coarse-grained portion and another the contact between an albite pegmatite and the sill. A portion of each of the above samples were sent to George Rev, who prepared the thin-sections.

The minerals and modes were determined with the use of a Lietz Petrographic microscope and a Wentworth traveling stage (Plate IV-A) and samples were classified according to the Johannsen system (6 : 141). Photomicrographs were taken with the set-up shown in Plate IV-B.

DIFFERENTIATION

Many geologists have many different theories on differentiation in igneous bodies. It is not within the scope of this paper to discuss all these theories and hypotheses, but those that would seem applicable to the body under discussion will be briefly noted. Differentiation, according to G. W. Tyrrell (9 : 148) "may be defined as the process whereby a magma, originally homogeneous, splits up into contrasted parts, which may form separate bodies of rocks, or may remain within the boundaries of a single unitary mass." Assimilation, a well known theory, may be defined, with many "ifs", as a process whereby an intruding magma dissolves some of the host rock, thus altering slightly the chemical composition of the magma's outer layer as well as that of the host rock in contact. Crystal settling is a theory whereby early crystallized minerals, basic in composition and with high specific gravities, settle out; thus giving gradational acid to basic stages from top to bottom. This concept was brought to the front after N. L. Bowen (1 : 175), in 1915, published the results of his experiments on fractional crystallization. Filter pressing is a proposed process whereby a residual acid liquid is supposed to be segregated by external pressure, the liquid material being squeezed out of the partially crystallized mass.

REVIEW OF DATA

As one approaches the contact from above, the granite becomes slightly more basic. At the contact there is a fine-grained chill stage, and just below it, an intermediate basic stage is reached. Slightly below this is an acid stage, gradually becoming more basic with depth, (Plate V), where an albite pegmatite facies was found. The amount of hornblende present increases, from above, gradually to the contact, where it increases sharply and partially gives way to augite. It then decreases, just below the contact, to again increase gradually and give way to augite with depth. The general percentage of quartz and orthoclase increase and then decrease, as does that of hornblende. The percentage of biotite does practically the opposite, that is, as hornblende increases, biotite decreases.

Granite Host Rock*

The host rock of the intruding sill is a potash-rich granite, salmon pink to greyish in color, with a phaneritic texture and a few large phenocrysts of K-spar and quartz. Microscopically, the texture is hypautomorphic granular to porphyritic.

Mineralogy (Plate VI)

Quartz, comprising about 30 percent of the rock, occurs interstitially, as poikilitic inclusion and as corroded phenocrysts. Orthoclase, 64 percent, is mainly microperthite that has been altered to kaolin and sericite, with some phenocrysts carrying concentric inclusions of ferro-magnesium minerals. Plagioclase is minor and varies from a basic albite to an acid oligioclase. It occurs as banded grains whose edges are greatly altered and whose centers are twinned according to the albite law. The Ab-An ratios was determined by measuring the maximun extinction angles of albite-carlsbad twins, when possible. The ferro-magnesium minerals and magnetite make up slightly less than six percent of the granite, with biotite predominating. The biotite, partially altered to chlorite, occurs as an alteration product of hornblende, as reaction rims on the magnetite, and as original subhedral grains.

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* More detailed descriptions of the samples in Appendix, with microphotographs following.

Diabase Sill

The diabase of the sill varies in color from a pinkish-gray "salt and pepper" to a dull black. The texture ranges from a fine grained chill stage, through micro-phaneritic to phaneritic and then to diabasic. Microscopically, the texture change from pilotaxitic through hypautomorphic granular to diabasic.

Mineralogy (Plate VI)

Quartz, occuring in almost all samples as poikolitic inclusions, and interstitially near the top of the sill, makes up some 15 percent of the rock near the top of the sill, to zero percent nearer the base. Orthoclase was found in three samples in the upper portion of the sill, and occur as phenocrysts and as subhedral grains, both of which are altered to kaolin and sericite. The amounts present range from a trace to 26 percent of the various samples. Plagioclase, the most abundant mineral in the sill, changes from a minimum of 37 percent near the contact, through a maximum of 68 percent about 100 feet below the contact, to 57 percent approximately 450 feet below the contact. The Ab-An ratio varies as shown in Plate V. Occurring in stubby to lath-like, corroded and fractured subhedral grains, the plagioclase exhibits albite, carlsbad, and pericline twinning, with wavy extinction common, and it is altered to sericite, epidote, and some clay minerals, along the numerous fractures. Biotite, mainly altered to chlorite, predominates near the contact and gives way to hornblende with depth. It occurs as original subhedral grains, as an alteration product of hornblende, and as a reaction rims on magnetite. Hornblende gives way to augite with depth, and occurs as original subhedral grains, as skeletal crystals, and as an alteration product of augite. Most grains are highly fractured and show alteration to biotite. Augite is present in the more basic portions of the sill and occurs as highly altered, fractured, and corroded interstitial grains with hornblende, biotite, magnetite, and a serpentine-like mineral (probably antigorite) as its alteration products. Pigeonite, found interstitially and altered to a fibrous serpentine-like mineral, was distinguished from augite by its small axial angle (less than 45°). Euhedral crystals of apatite were found to occur as inclusions near ferro-magnesium mineral aggregates in the upper portion of the sill. Subhedral grains of magnetite, probably titanixerous, increase in amount with depth, and occurs near the contact as original grains with biotite reaction rims, and as an alteration product with depth.

CONCLUSIONS

Considering the above data, the writer is of the opinion that the body is intrusive, that it is younger than the overlying granite and that it is differentiated. Applying the processes mentioned under "Differentiation", the author proposes the following changes and developments.

As the sheet of basic molten magma intruded the host rock of more acid composition, the portion in contact with the host rock became more acid from assimilating some of the acid rocks. On cooling, this small portion cooled faster than the center, and the narrow, 6-inch to 1-foot, fine-grained crust thus formed was slightly more acid than the rest (Specimen 3A and Sample 3). The heat and probable additions caused by this intrusion and assimilation changed the composition of the host rock (samples 1 and 2), As the magma cooled further, a stage just below the contact, representing the original composition of the magma, was formed (Sample 4). Cooling further, minerals formed according to Bowen's reaction series, began to settle out because of their higher specific gravities, giving a gradation from basic nearer the bottom to acid near the top (samples 5, 6, 7, 8, and 10). As the cooling progressed toward the center, the residual liquid, now quite acid, became compressed and forced out as acid pegmatite dikes (Specimen 11).

Other basic sills, described in the literature,* are similar to the one described above, but they show more basic stages. This could be due to the fact that the lower contact of this sill was not exposed.

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* Rose Township, Ontario, described by Collins (2 : 81).
Bridgland Township, Ontario, described by Emmons (4 : 73).

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APPENDIX I

Descriptions of Samples and Specimens

The data on the following pages is not intended to present a detailed description of the samples, but rather to point out obvious textural and mineralogical relationships. Data includes the Missouri Geological Survey (MGS) number, field location, field name,* Johannsen classification, and megascopic and microscopic descriptions. The first three numerals following the "MGS" refer to the field notebook number, the next to the page and the last to the sample. It will be noted that in classifying the samples according to Johannsen, that almost all are borderline cases. As an example, MGS 853-36-No.4, classified as 227" (adamellite), is very close to 237 (granogabbro); also MGS 853-36-No.7, classified as 228 (tonalite), is very close to 2312 (gabbro).

SAMPLE NUMBER: MGS 853-36-No.1

LOCATION: Knob southeast of Mount Sheridan, Section 5, T. 3 N., R. 13 W., Comache County, Oklahoma, several feet above top of granite-diabase contact.

FIELD NAME: Granite

JOHANNSEN CLASSIFICATION: Kaligranite (215).

MICROSCOPIC DESCRIPTION: The rock has a hypautomorphic granular texture with a few large feldspar and quartz phenocrysts. It is composed of about 28 percent quartz and 66 percent orthoclase, and biotite, hornblende, and magnetite make up about five percent of the total, with biotite predominating among the three. Minor amounts of an indeterminate plagioclase (probably an acid oligioclase or basic albite), fluorite, chlorite, and epidote are also present.

Quartz occurs interstitially, as poikilitic inclusions in the orthoclase and as corroded phenocrysts.

Orthoclase or microperthite, altering to kaolin and sericite, is quite common. The large phenocrysts are rimmed with what appears to be concentric inclusions of ferro-magnesium minerals, giving it a somewhat poikilitic texture.

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* MGS number, field location and field name supplied by Mr. F. Robertson .

Plagioclase is scarce since only one banded crystal was found in the thin-section. The center is twinned according to the albite law, but the edges are so altered that it was impossible to find the relative index of refraction.

Hornblende is almost completely altered to biotite, chlorite, and epidote. The crystal boundaries are very irregular.

Magnetite occurs as subhedral grains with altered reaction rims of biotite and chlorite.

A few euhedral crystals of apatite are associated with the ferro-magnesium mineral aggregates.

SAMPLE NUMBER: MGS 853-36-No.2

LOCATION: Knob southeast of Mount Sheridan, one foot above contact.

FIELD NAME: Granite

MEGASCOPIC DESCRIPTION: The sample is salmon-pink to grayish in color with a granitoid or phaneritic texture. A few feldspar and quartz phenocrysts about 5 mm long are in evidence. A dark ferro-magnesium mineral, probably hornblende or biotite, can also be seen.

JOHANNSEN CLASSIFICATION: This rock is very similar to MGS 853-36-No.1, except that the minor amount of plagioclase present is a little more basic (oligioclase $Ab_{86}An_{14}$) and the ferro-magnesium minerals are slightly more abundant. Its texture is hypautomorphic granular with some feldspar and quartz phenocrysts. Quartz makes up about 31 percent of this sample and occurs interstitially, as poikilitic inclusions in orthoclase and as a few phenocrysts.

Orthoclase, 62 percent, is the most abundant mineral in the sample. It is mainly altered to kaolin with some sericite, and occurs as subhedral grains with poikilitic inclusions. The larger phenocrysts, three to five millimeters in length, have moderately corroded edges.

Biotite is usually associated with magnetite as reaction rims, and with hornblende as a alteration product. When found as original grains, there is almost always some alteration to chlorite and epidote (?). It makes up about three percent of the rock.

Hornblende, amounting to slightly over one percent of the rock, occurs as corroded euhedral to subhedral grains with embayments common. Alteration to biotite, chlorite, and epidote are also common.

Magnetite is almost always associated withaggregations of the ferro-magnesuim minerals as subhedral crystals, some of which are altered to a bright red mineral, probably hematite.

SPECIMAN NUMBER: MGS 853-36-No.3A

LOCATION: Knob southeast of Mount Sheridan, at contact between granite and sill.

FIELD NAME: Sample showing contact - no name.

MEGASCOPIC DESCRIPTION: The specimen is the chill stage of the sill, and is very fine grained and black. The granite is similar to the sample described above, phaneritic in texture and salmon-pink to gray in color. The contact is very sharp.

JOHANNSEN CLASSIFICATION: Not determined.

MICROSCOPIC DESCRIPTION: The grain size of the sill's chill phase was generally too small to permit determination of its mineral composition, but an $Ab_{65}An_{35}$(?) ratio was determined on one of the larger grains of plagioclase near the contact. There seemed to be a concentration of a dark mineral, probably magnetite, in a line paralleling to contact. On the granite side of the contact, the rock was similar to samples one and two.

SAMPLE NUMBER: MGS 853-36-No.3

LOCATION: Knob southeast of Mount Sheridan, makes up lower part of contact.

FIELD NAME: Fine-grained basaltic diabase.

MEGASCOPIC DESCRIPTION: Very fine-grained black rock.

JOHANNSEN CLASSIFICATION: Indeterminate.

MICROSCOPIC DESCRIPTION: The texture of this rock is hard to define because of the very fine-grain size. It appears to have the feldspars somewhat pilotaxitic to ophitic with the ferro-magnesium minerals superimposed as subhedral to euhedral grains.

SAMPLE NUMBER: MGS 853-36-No.4

LOCATION: Knob southeast of Mount Sheridan, just below fine-grained stage.

FIELD NAME: Diabase

MEGASCOPIC DESCRIPTION: This sample could almost be described as having a "salt and pepper" color, except that the light-colored specks of feldspar are a salmon-pink color. This feldspar, along with quartz, makes up a large percentage of the rock. The ferro-magnesium minerals make up the dark specks of the rock, and are quite abundant. The texture is phaneritic to micro-phaneritic.

JOHANNSEN CLASSIFICATION: Adamellite (227")

MICROSCOPIC DESCRIPTION: This rock has a hypautomorphic granular texture and the plagioclase which makes up about 37 percent of the rock is andesine ($Ab_{53}An_{47}$). The plagioclase is twinned according to the albite, carlsbad, and pericline laws, and is altered to epidote(?) along numerous fractures. Wav y extinction was also seen on grains whose boundaries were corroded with a few embayments.

Quartz makes up about 11 percent of the sample and occurs interstitially and as poikilitic inclusions.

Orthoclase, about 20 percent of the rock, is altered to kaolin with some sercite.

Ferro-magnesium minerals, with magnetite, make up about 28 percent of the rock, with hornblende and a much altered augite predominating over biotite and magnetite.

Hornblende is extremely fractured, and is altered to biotite and some chlorite around the edges.

Augite is extremely altered to hornblende, biotite, and magnetite. This magnetite is concentrated in angular blebs along fracture lines, giving a somewhat poikilitic texture. The edges of the grains are very ragged.

Biotite occurs as alteration products of augite and hornblende, and as reaction rims on the magnetite.

Apatite crystals make up about four percent of the rock, and occur as long narrow euhedral grains throughout the quartz, feldspars, and ferro-magnesium minerals.

SAMPLE NUMBER: MGS 853-36-No.5

LOCATION: Knob southeast of Mount Sheridan, about six feet below upper contact.

FIELD NAME: Diabase

MEGASCOPIC DESCRIPTION: This rock possesses a phaneritic texture, and is colored very similar to MGS 853-36-4, except that the feldspar is not quite so pink. The ferro-magnesium minerals are quite abundant and, in some places, altered fractures are in evidence.

JOHANNSEN CLASSIFICATION: Adamellite (227")

MICROSCOPIC DESCRIPTION: This sample is hypautomorphic granular in texture with the quartz and orthoclase occuring together in a strange manner best described as poikilitically.

Quartz, making up about 14 percent of the rock, occurs interstitially and with orthoclase as described above.

Orthoclase, about 26 percent of the rock, is altered to kaolin and some sericite.

Plagioclase (oligioclase $Ab_{75}An_{25}$) is the most abundant mineral in the sample, amounting to about 34 percent, and it has fractures that are altered to sericite and epidote(?). Albite and carlsbad twins predominate over pericline.

Biotite, hornblende, and magnetite, make up about 26 percent of the rock with biotite more abundant than the other two. Biotite occurs as original grains, as an alteration product of hornblende, and as reaction rims on magnetite. It is largely altered to chlorite, and the grains are very corroded with some embayments.

Hornblende is extremely fractured and also seems to have corroded edges.

Apatite, amounting to less than one percent, is very similar to that in the previous sample, but not so abundant.

SAMPLE NUMBER: MGS 853-36-No.6

LOCATION: Knob southeast of Mount Sheridan, 20 - 30 feet below contact.

FIELD NAME: Light Diabase.

MEGASCOPIC DESCRIPTION: This rock has a phaneritic texture, and is dark gray to buff in color. The plagioclase is quite dark, and occurs in large crystals up to five millimeters in length.

JOHANNSEN CLASSIFICATION: Tonalite (228)

MICROSCOPIC DESCRIPTION: This sample, diabasic and hypautomorphic granular in texture, is composed of 64 percent plagioclase. The plagioclase (andesin $Ab_{62}An_{38}$) is altered along fractures to sericite, epidote, and some clay minerals(?). Albite and carlsbad twinning with wavy extinction were found, also a few grains exhibiting pericline twinning. Contacts between plagioclase and other minerals in the sample are corroded.

Quartz, about five percent of the sample, occurs interstitially in very ragged grains.

Hornblende, makes up about 13 percent of the rock, and occurs as subhedral grains ranging into skeletal crystals. It is altered to biotite and chlorite, and is extremely fractured.

Augite, about 17 percent of the sample, occurs interstitially in very corroded subhedral grains that are fractured and altered to hornblende, biotite, and magnetite. The magnetite, amounting to about one percent, occurs as angular concentrations along the fractures.

Euhedral apatite grains are minor, but do occur as inclusions in all other minerals.

SAMPLE NUMBER: MGS 853-36-No.7

LOCATION: Knob southeast of Mount Sheridan, about 25 feet above upper quarry and close to 100 feet below contact.

FIELD NAME: Diabase

MEGASCOPIC DESCRIPTION: This sample is dark grey to black in color, and has a phaneritic texture. The color is given by the dark-gray plagioclase and the black ferro-magnesium minerals.

JOHANNSEN CLASSIFICATION: Tonalite (228)

MICROSCOPIC DESCRIPTION: The texture of this sample is hypautomorphic granular to diabasic. The most abundant mineral in the sample is plagioclase (andesine $Ab_{55}An_{45}$), and amounts to 68 percent. This mineral, the edges of which are corroded, is altered along fractures to sericite epidote and some clay minerals. Albite, carlsbad, and pericline twinning along with wavy extinction are common.

Quartz makes up about five percent of the rock, and occurs interstitially in very ragged subhedral grains.

Augite is the most abundant ferro-magnesium mineral, and composes about 17 percent of the rock. It occurs interstitially, and is fractured and extremely altered to magnetite, hornblende, biotite, and some chlorite.

The other mafic minerals, hornblende, biotite, chlorite, and magnetite, make up about 10 percent of the whole, with hornblende being the most abundant.

Minor amounts of orthoclase and fluorite are also present.

SAMPLE NUMBER: MGS 853-36-No.8

LOCATION: Knob southeast of Mount Sheridan, in upper quarry, approximately 125 feet below the contact.

FIELD NAME: Diabase

MEGASCOPIC DESCRIPTION: This rock, dark gray in color and with minor light patches, has a texture between phaneritic and microphaneritic. The light patches are mainly quartz with dark plagioclase and ferro-magnesium minerals making up the rest.

JOHANNSEN CLASSIFICATION: Tonalite (228)

MICROSCOPIC DESCRIPTION: Again the most abundant mineral constituent is plagioclase (andesine $Ab_{52}An_{48}$), amounting to 58 percent of the rock. It occurs in stubby laths which help make up the hypautomorphic granular to diabasic texture. It is highly altered along fractures to epidote and sericite, exhibits albite, carlsbad and pericline twinning and also shows wavy extinction in some grains.

Quartz, 11 percent of the rock, occurs interstitially in ragged subhedral grains.

Hornblende and biotite, about 13 percent of the sample, occur as alteration products of augite, and as original subhedral corroded grains. Both are quite altered.

Augite, 15 percent of the sample, occurs interstitially, and is very highly altered. In one instance it seemed to be replacing hornblende.

Magnetite, amounting to about 3 percent of the sample, occurs as subhedral grains with reaction rims and as an alteration product of augite.

A minor amount of pigeonite altering to a fibrous serpentine-like mineral (probably antigorite) was found; also, a few euhedral crystals of apatite were seen.

SPECIMAN NUMBER: MGS 853-36-No.9

LOCATION: Knob southeast of Mount Sheridan, just below upper quarry.

FIELD NAME: Coarse-grained highly-weathered phase.

MEGASCOPIC DESCRIPTION: The specimen is a very coarse-grained phaneritic rock, light gray to salmon-pink in color, with plagioclase grains up to 8 millimeters in length common.

JOHANNSEN CLASSIFICATION: Indeterminate

MICROSCOPIC DESCRIPTION: The rock is very highly altered, causing grain boundaries to be indistinct. A peculiar replacement of plagioclase by hornblende and titaniferous magnetite altering to leucoxene were noted. Minor apatite(?) was also present.

SAMPLE NUMBER: MGS 853-36-No.10

LOCATION: Knob southeast of Mount Sheridan, in lower quarry about 450 feet below contact.

FIELD NAME: Diabase

MEGASCOPIC DESCRIPTION: The specimen is a very dark rock with medium-grained diabasic texture. Plagioclase laths up to six millimeters in length are present.

JOHANNSEN CLASSIFICATION: Gabbro (2312)

MICROSCOPIC DESCRIPTION: The rock has a somewhat typical diabasic texture. Plagioclase composes about 57 percent of the sample, and is labradorite ($Ab_{49}An_{51}$). It exhibits albite, carlsbad, and pericline twinning, also wavy extinction, and is altered along fractures to epidote and sericite.

Augite, about 24 percent of t he rock, occurs interstitially, and is highly altered to hornblende, biotite, magnetite, and a fibrous serpentine-like mineral.

Hornblende and biotite occur both as original subhedral grains and as alteration products. Each are altered, and possesses very ragged edges. Hornblende predonimates over biotite, and together they make up about 12 percent of the rock.

Magnetite, about six percent of the sample, occurs as an alteration product, and as original grains with reaction rims.

Pigeonite occurs interstitially, and is altered along fractures to a fibrous serpentine-like mineral.

SPECIMAN NUMBER: MGS 853-36-No.11

LOCATION: Knob southeast of Mount Sheridan, in lower quarry.

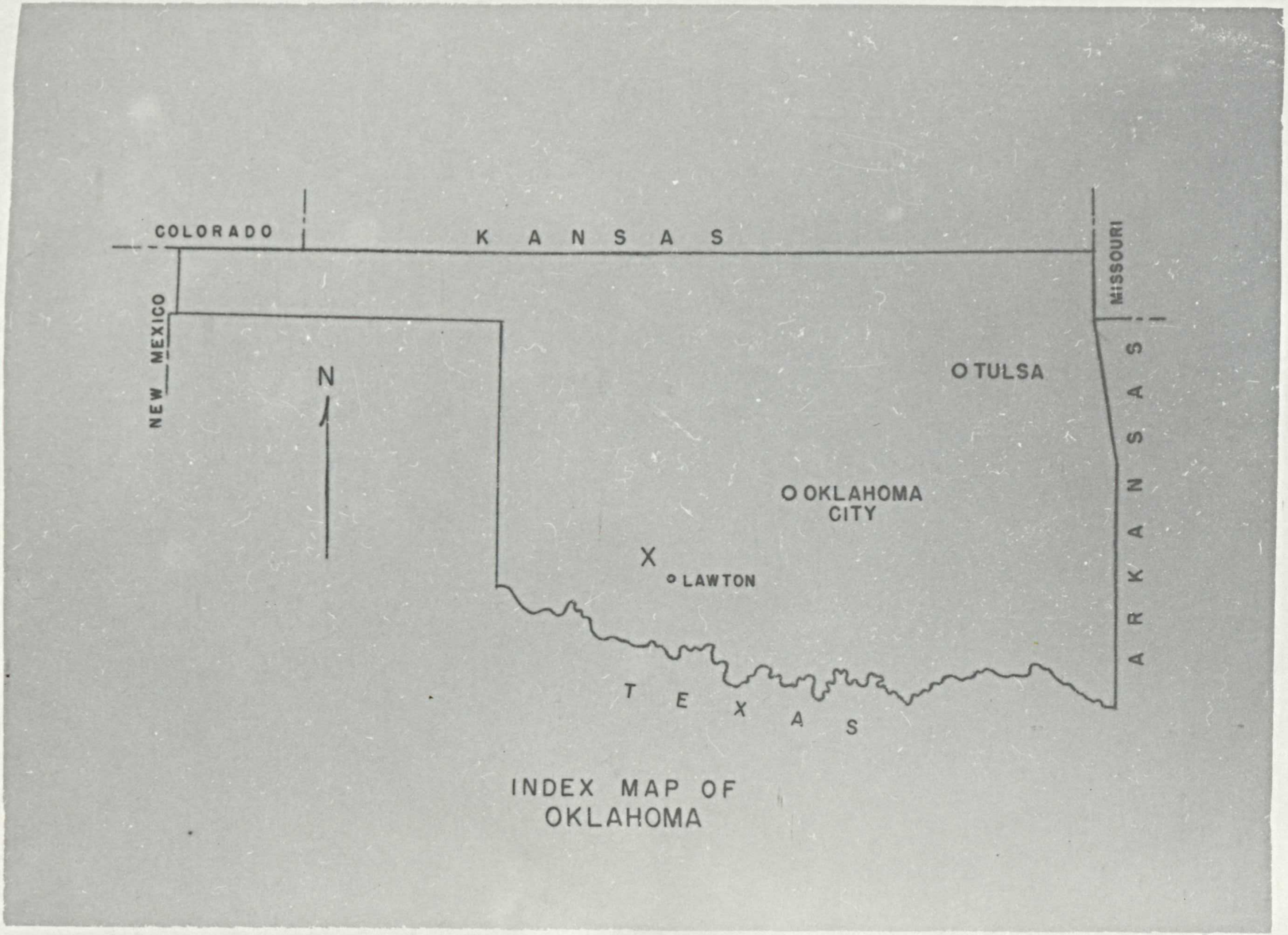
FIELD NAME: Albite pegmatite contact.

MEGASCOPIC DESCRIPTION: The color of the pegmatite is dull white to gray. Where it has intruded the sill, large phenocrysts of hornblende up to 2.5 centimeters in length are visible. Biotite, magnetite, and some augite are to be seen.

JOHANNSEN CLASSIFICATION: Not determined.

MICROSCOPIC DESCRIPTION: Plagioclase, determined to be albite ($Ab_{92}An_{8}$), was found to be minor in the pegmatite itself. Quartz and orthoclase make up the rest of the dike. Augite, hornblende, biotite, and chlorite seem to be residual from the sill, and to occur as corroded phenocrysts and as alteration products. Granophyric and micropegmatitic texture were also seen, but, the specimen was mainly hypautomorphic granular.

ILLUSTRATIONS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MISSOURI
NEW MEXICO
N
O TULSA
A R K A N S A S
O OKLAHOMA CITY
X
o LAWTON
T E X A S
INDEX MAP OF OKLAHOMA

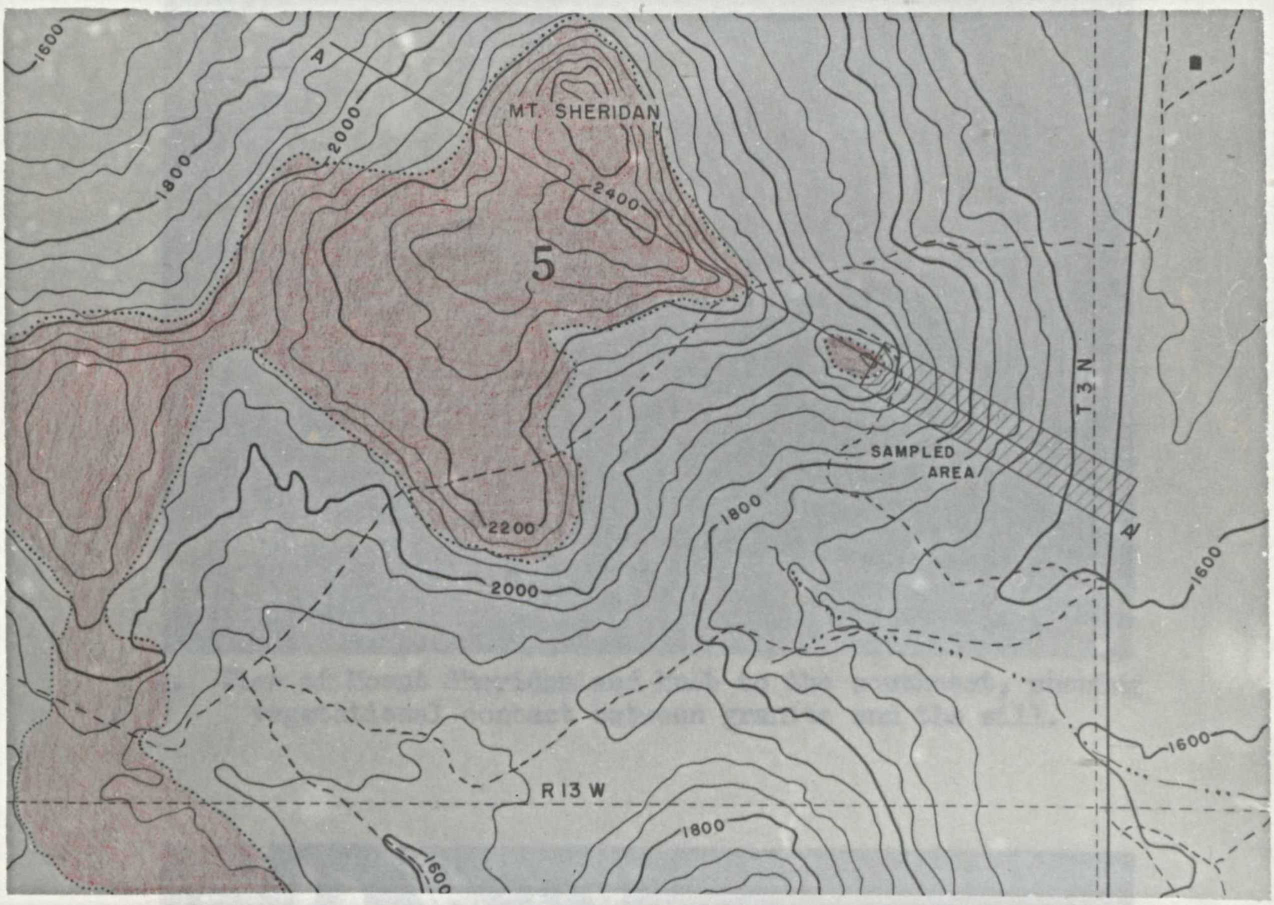
PLATE I

PLATE II

Map and Section of Mount Sheridan

This map shows topography, area sampled, and what is believed to be the areal extent of the Lugert granite (shaded area). Since no geologic maps of the area were available and because the sill is known to support a dense vegetation, while the granite does not, the map and section were modified from a United States Army Battle Map showing topography and extent of vegetation. The area of no vegetation was assumed to be the areal extent of the granite. The Township and Range lines were transferred from the United States Geological Survey's Oklahoma Cache Quadrangle, by the common point method.

PLATE II


MT. SHERIDAN
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T3N
R13W

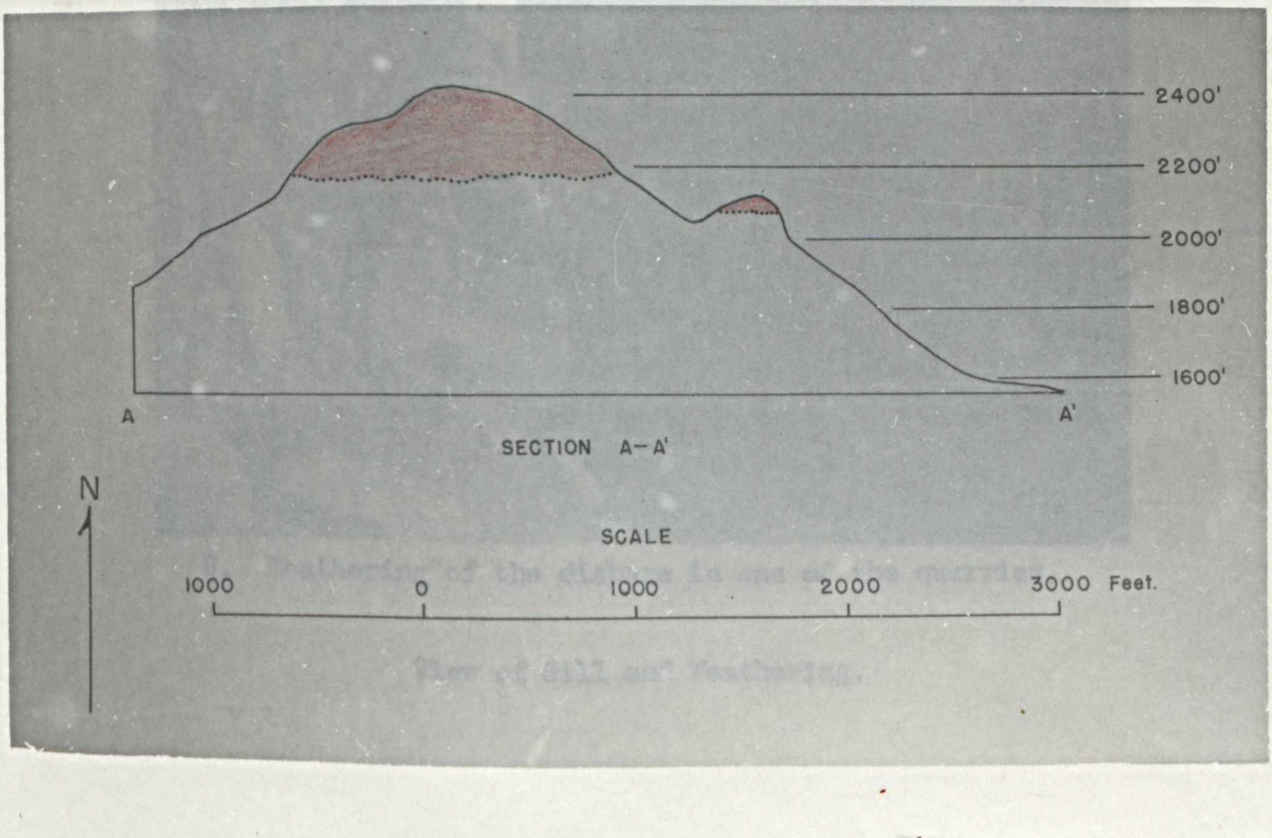
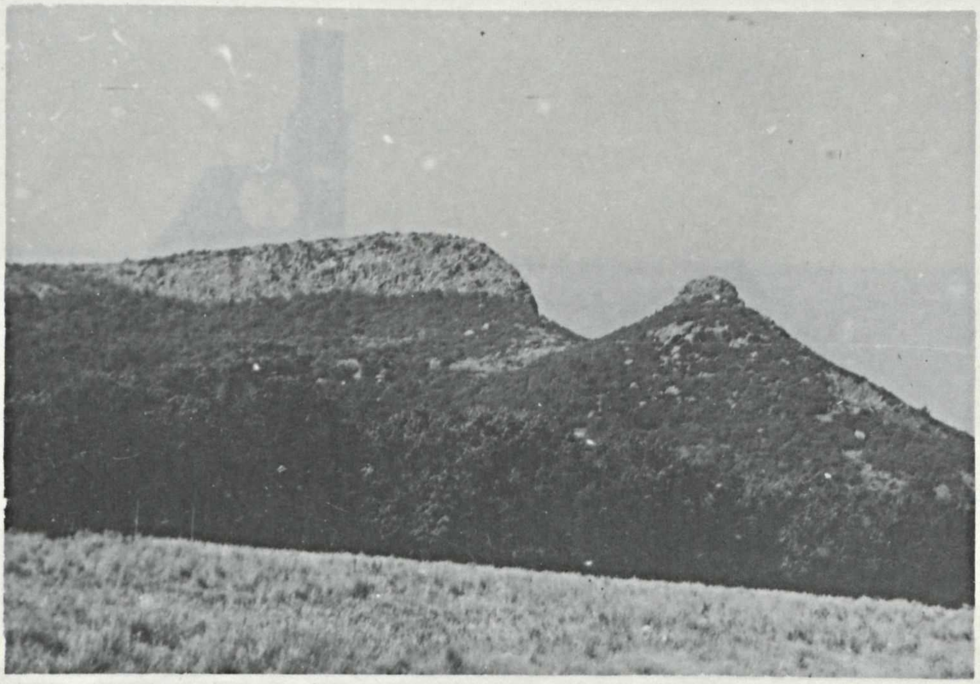
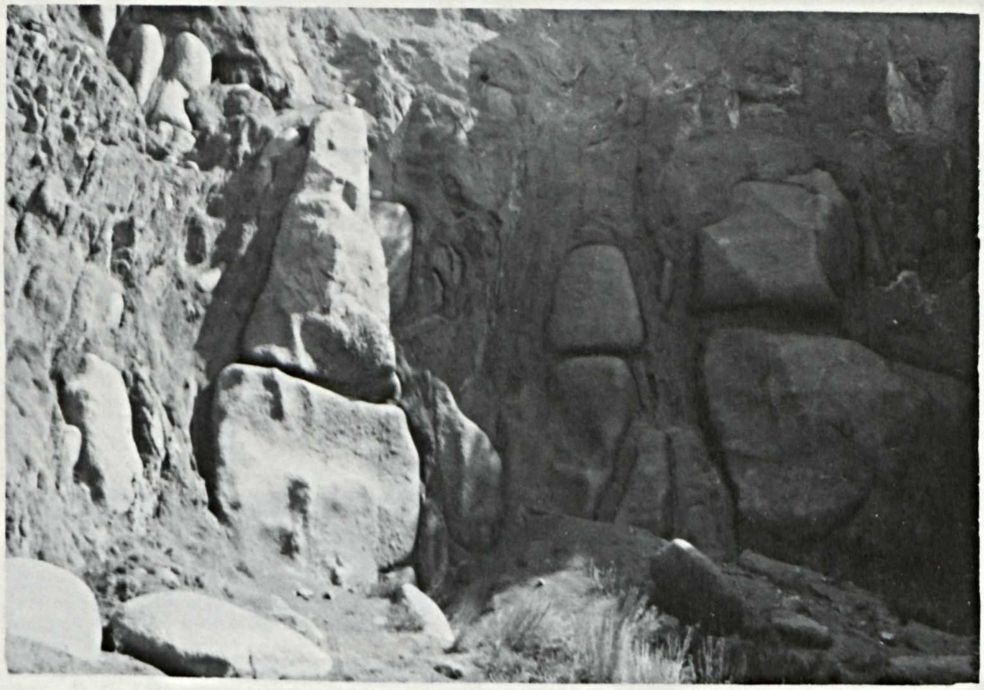

2400'
2200'
2000'
1800'
1600'
A
A'
SECTION A–A'
N
SCALE
1000 0 1000 2000 3000 Feet.

PLATE III



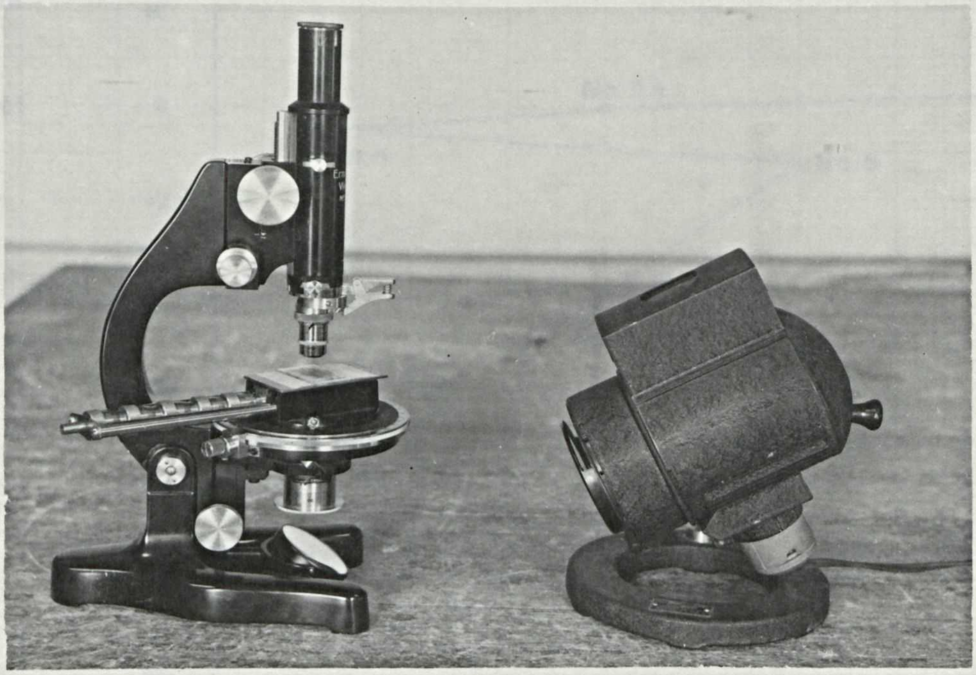
A. View of Mount Sheridan and knob to the southeast, showing vegetational contact between granite and the sill.



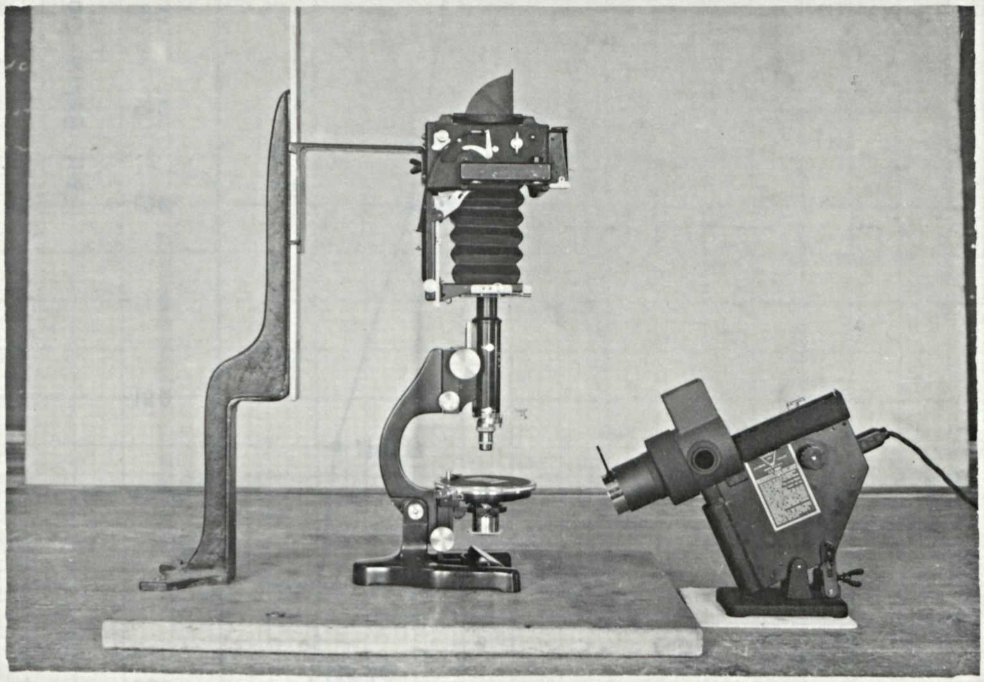
B. Weathering of the diabase in one of the quarries.

View of Sill and Weathering.

PLATE IV



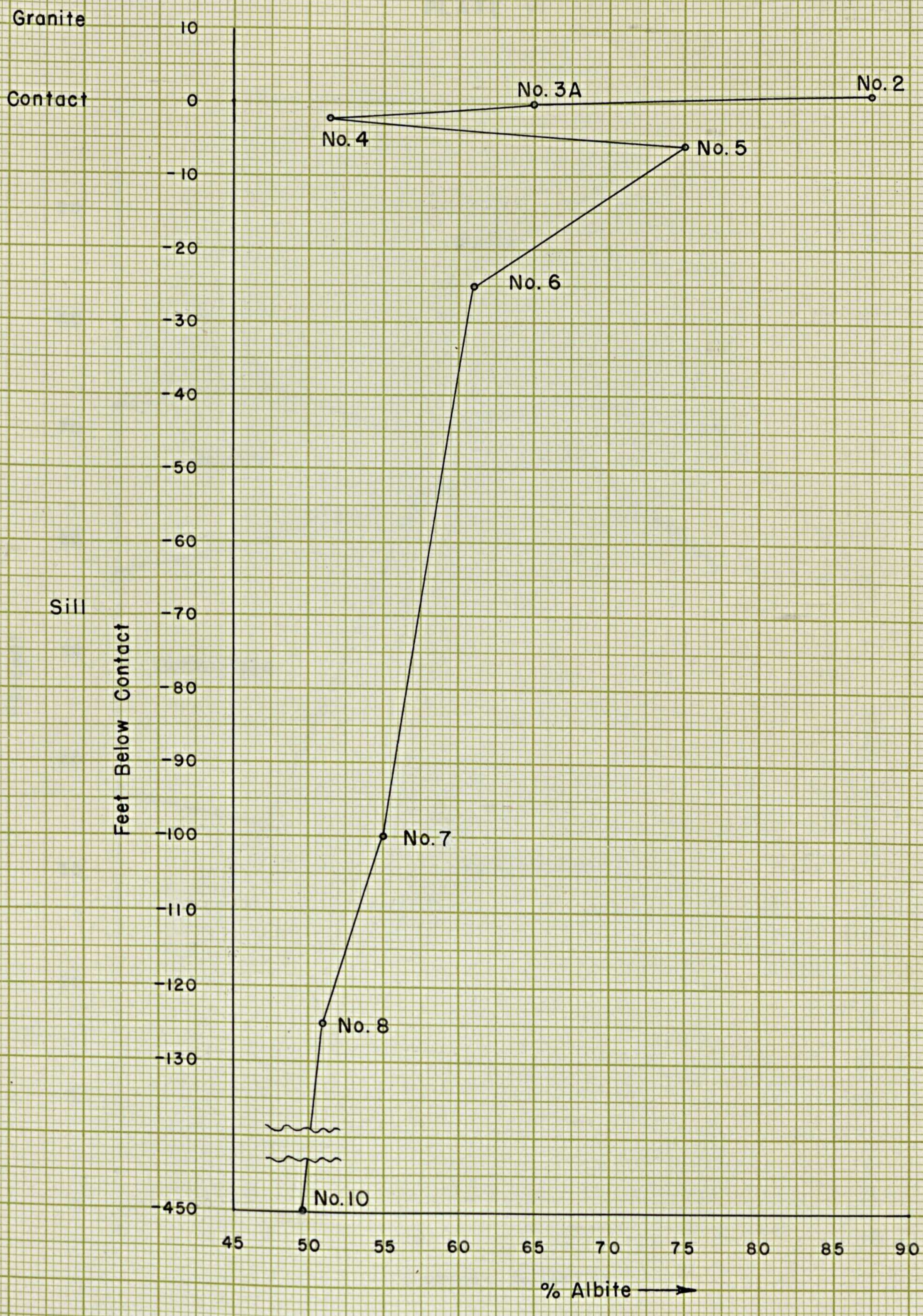
A. Equipment used in petrographic mineral determinations.



B. Set-up used in taking photomicrographs.

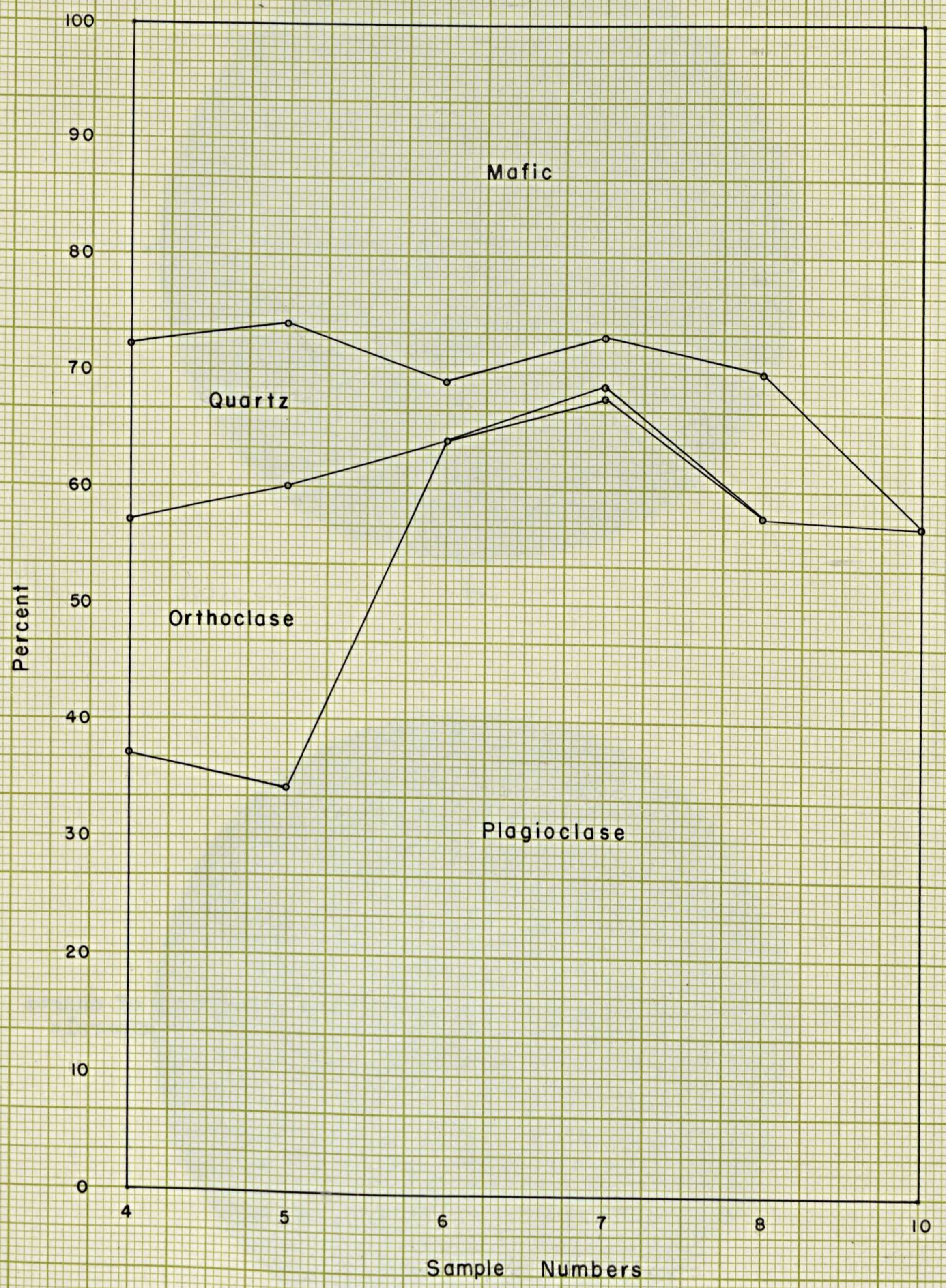
Equipment.

PLATE V



Graph of Ab-An Ratio

PLATE VI



Modes (Graphically)

PLATE VII

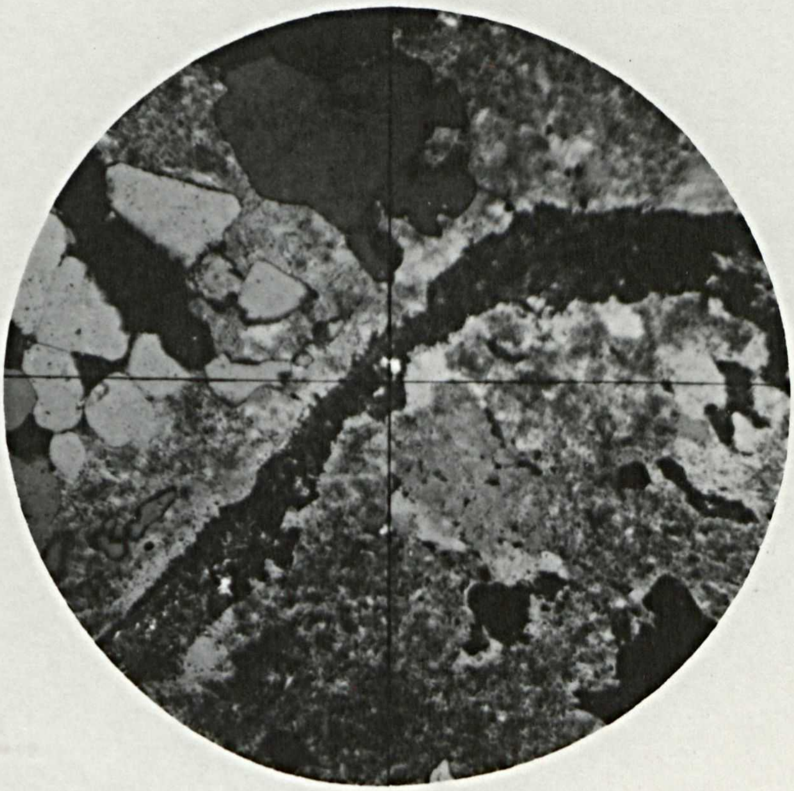
Photomicrographs of MGS 853-36-No.1

A. Hypautomorphic granular texture (X nicols, x 28).

B. Orthoclase phenocryst with poikilitic inclusions of quartz and concentric inclusions of ferro-magnesium minerals (X nicols, x 110).

PLATE VII

A.



B.

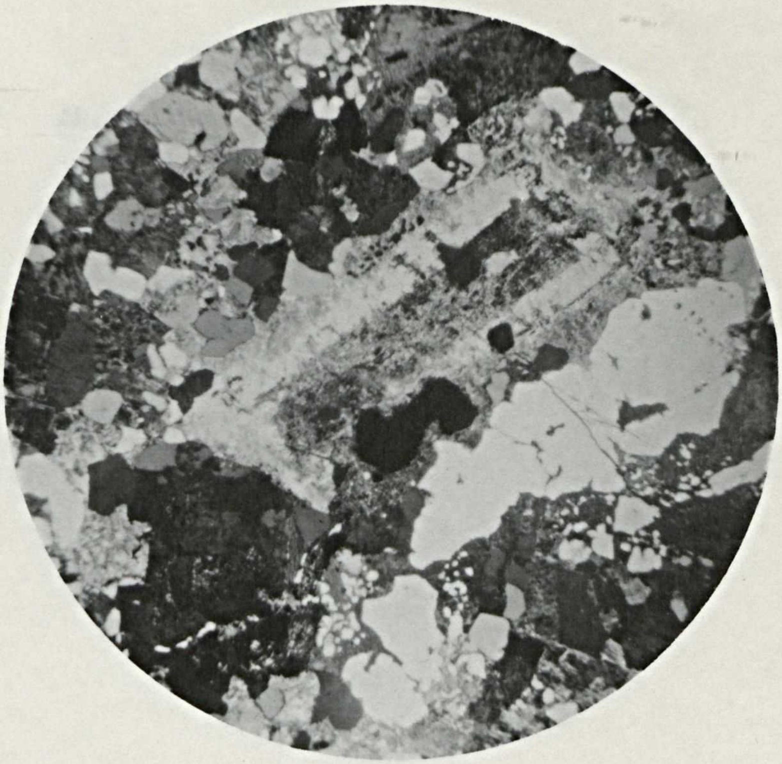
PLATE VIII

Photomicrographs of MGS 853-36-No.2

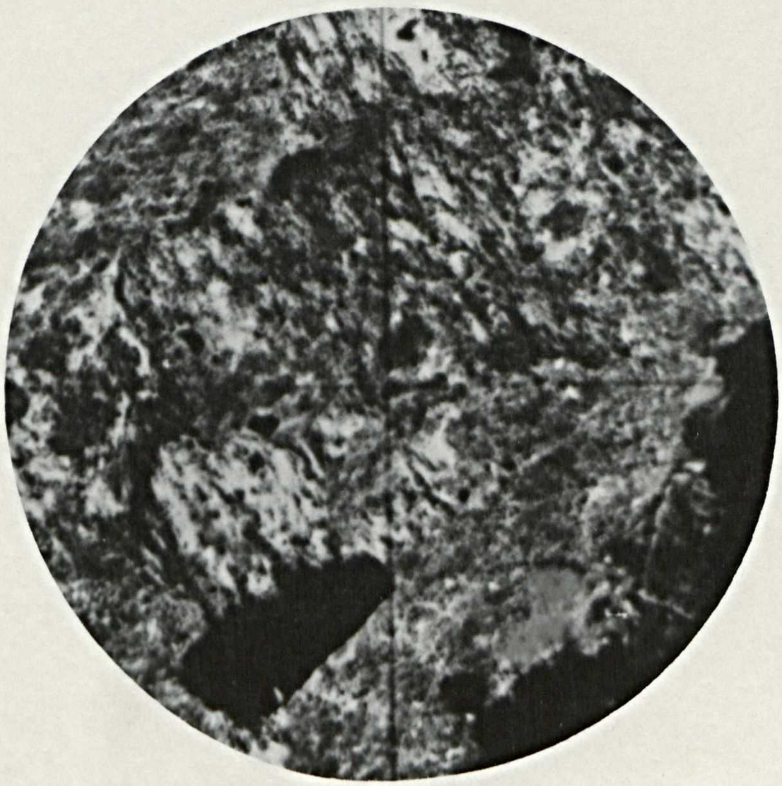
A. Hypautomorphic granular texture with banded plagioclase phenocryst. (X nicols, x 28)

B. Orthoclase altering to kaolin. (x 145)

PLATE VIII



A.



B.

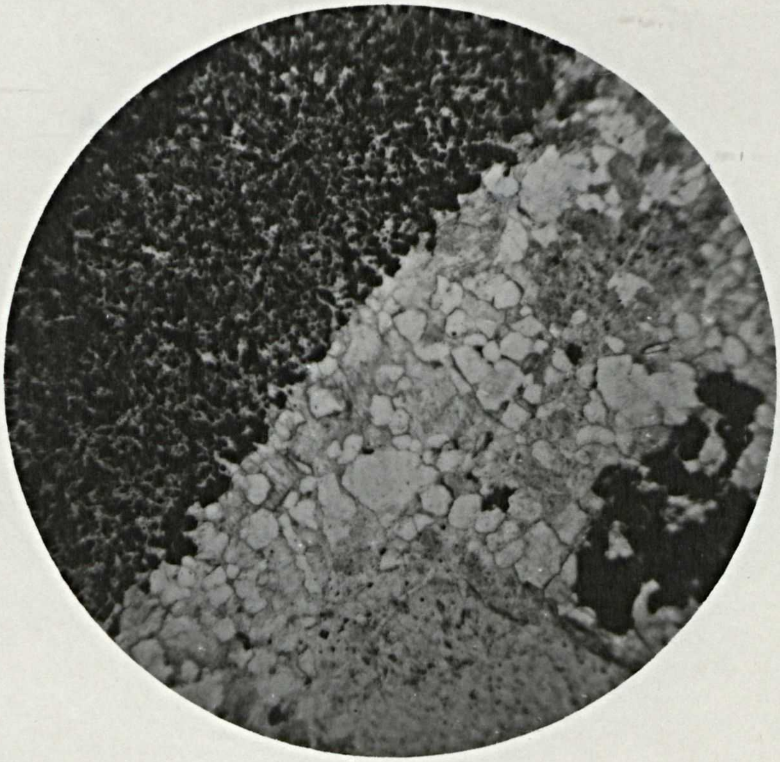
PLATE IX

Photomicrographs of MGS 853-36-No.3A

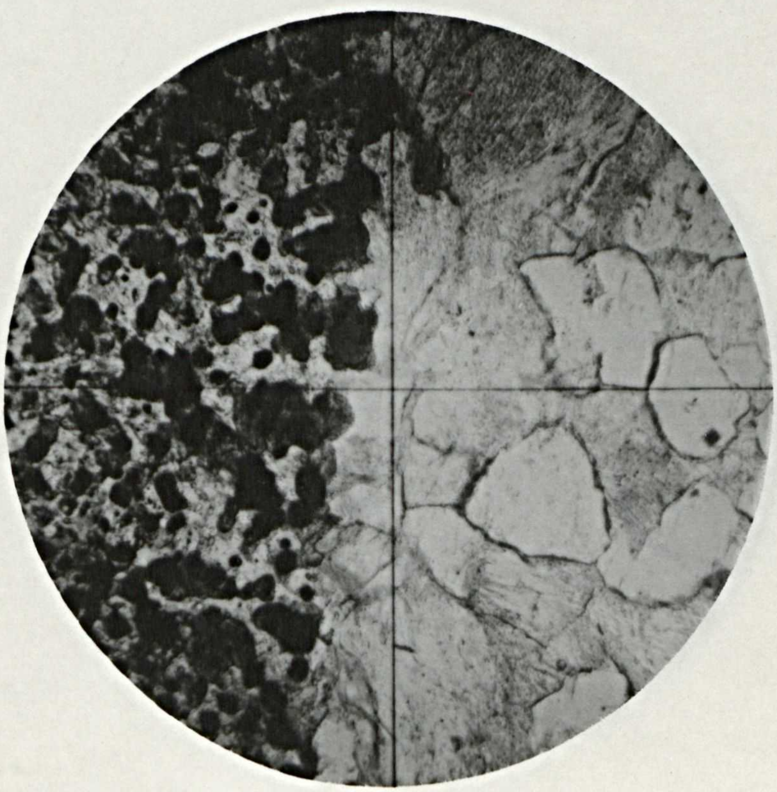
A. Contact of sill and granite. (x 28)

B. Contact of sill and granite. (x 110)

PLATE IX



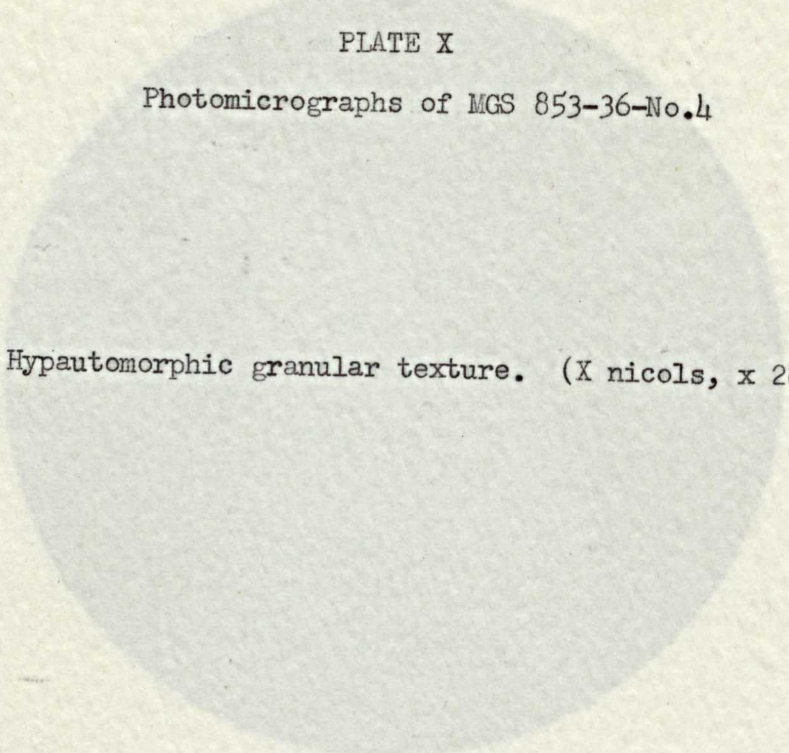
A.



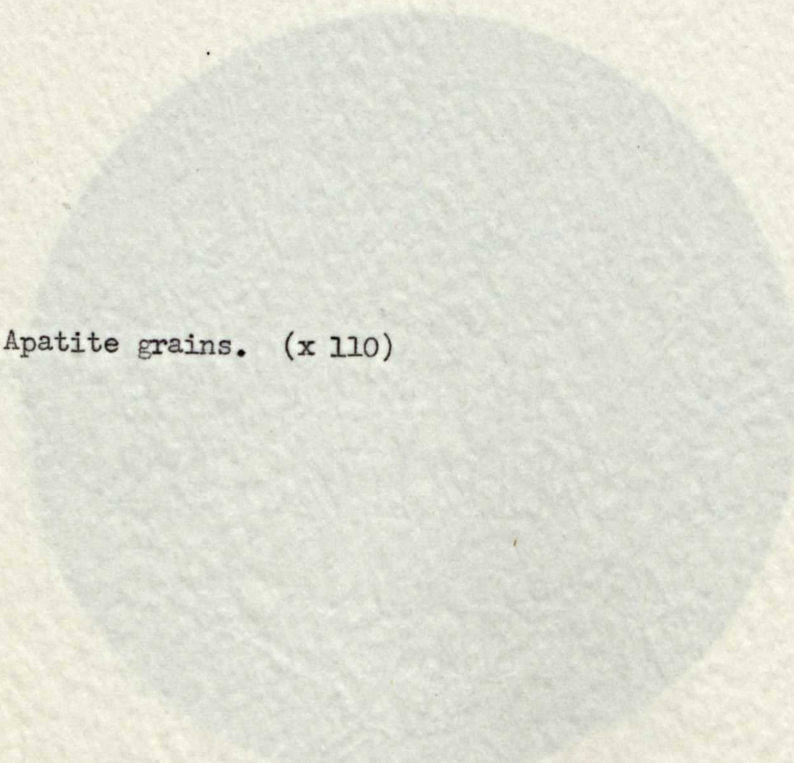
B.

PLATE X

Photomicrographs of MGS 853-36-No.4

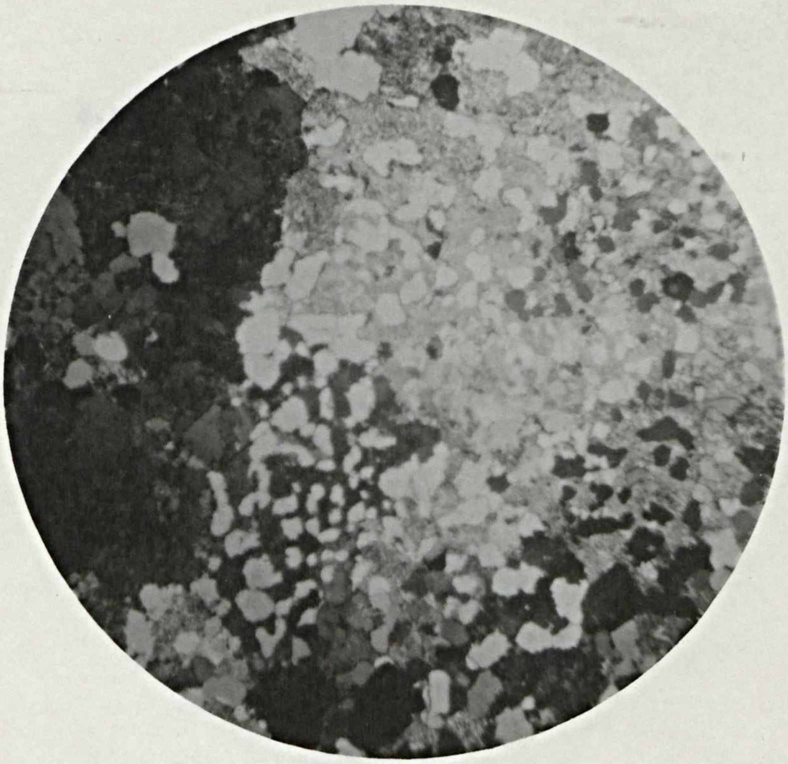


A. Hypautomorphic granular texture. (X nicols, x 28)

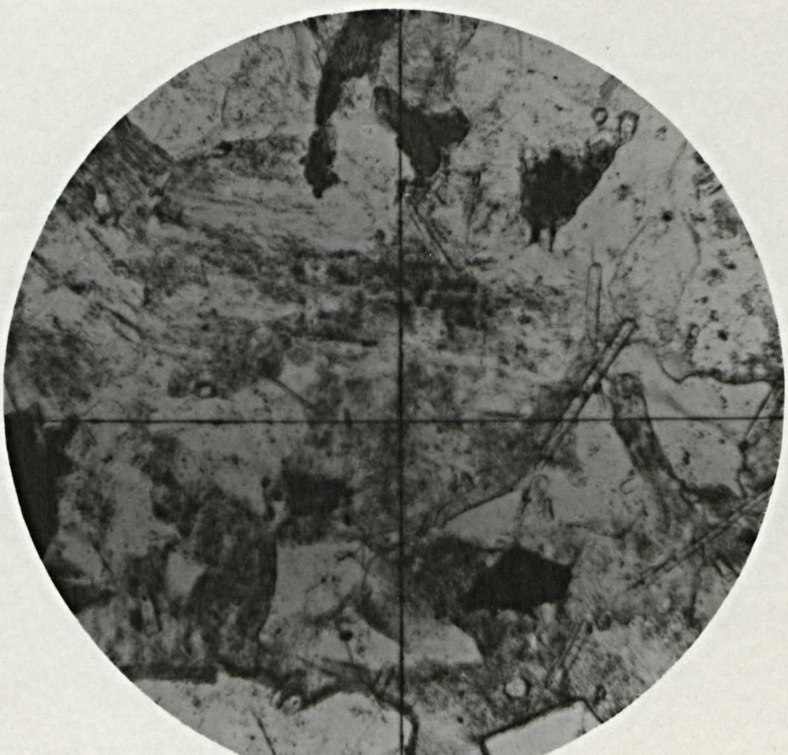


B. Apatite grains. (x 110)

PLATE X



A.



B.

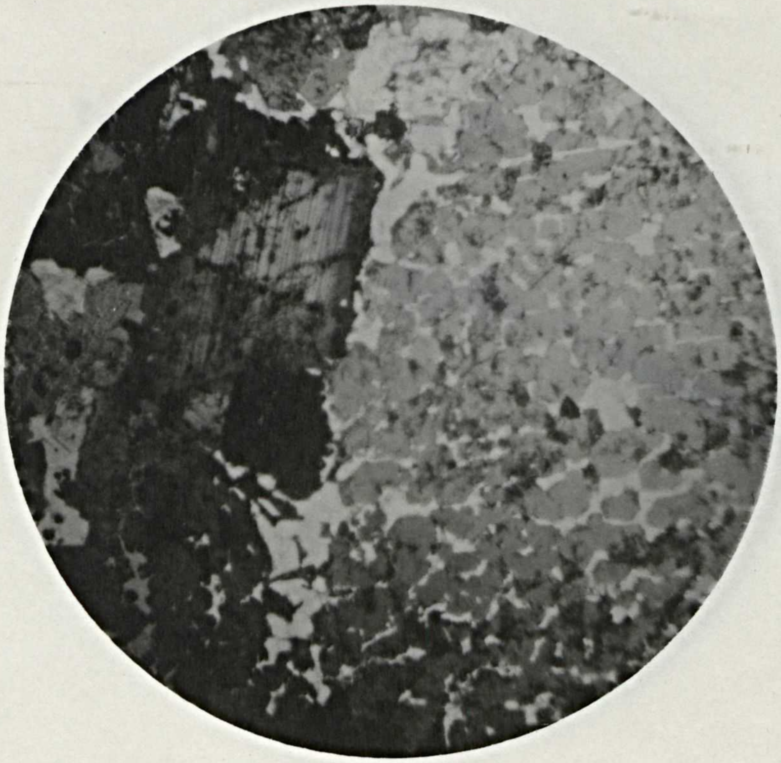
PLATE XI

Photomicrographs of MGS 853-36-No.5

A. Odd poikilitic texture of quartz in orthoclase. (X nicols, x 28)

B. Apatite grains in feldspar, quartz, and ferro-magnesium minerals. (x 110)

PLATE XI



A.

B.

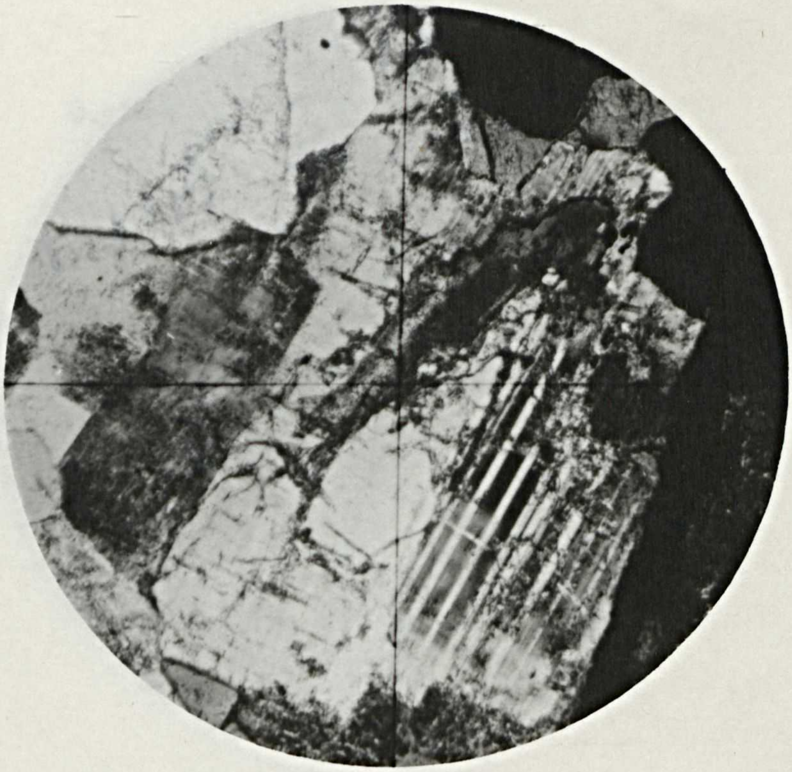
PLATE XII

Photomicrographs of MGS 853-36-No.5

C. Alteration of plagioclase. (X nicols, x 110)

D. Hornblende. (X nicols, x 125)

PLATE XII



C.

D.

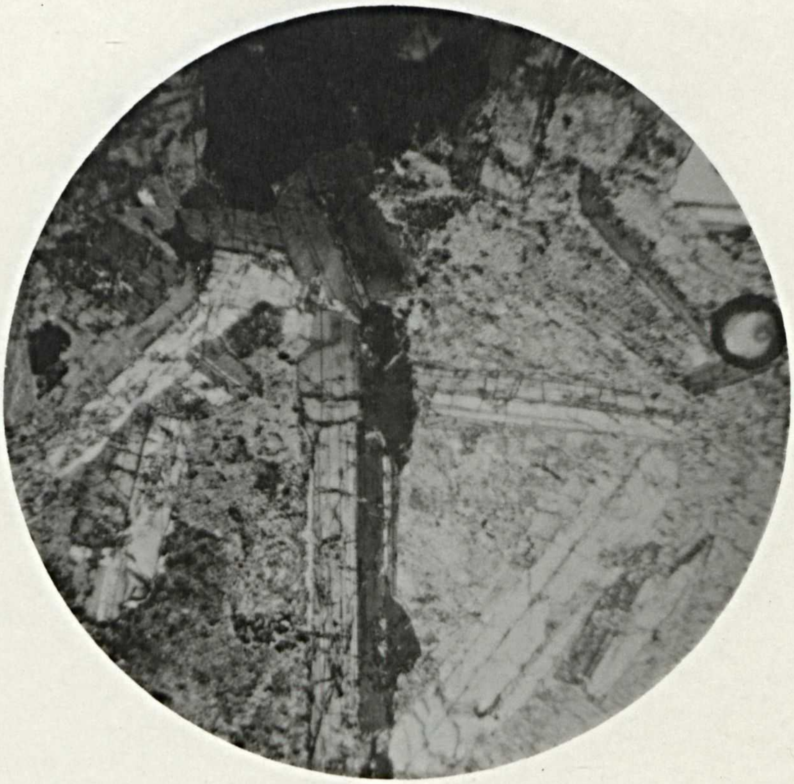
PLATE XIII

Photomicrographs of MGS 853-36-No.6

A. Diabasic texture. (X nicols, x 28)

B. Alteration of plagioclase, wavy extinction, and twinning. (X nicols, x 110)

PLATE XIII



A.

B.

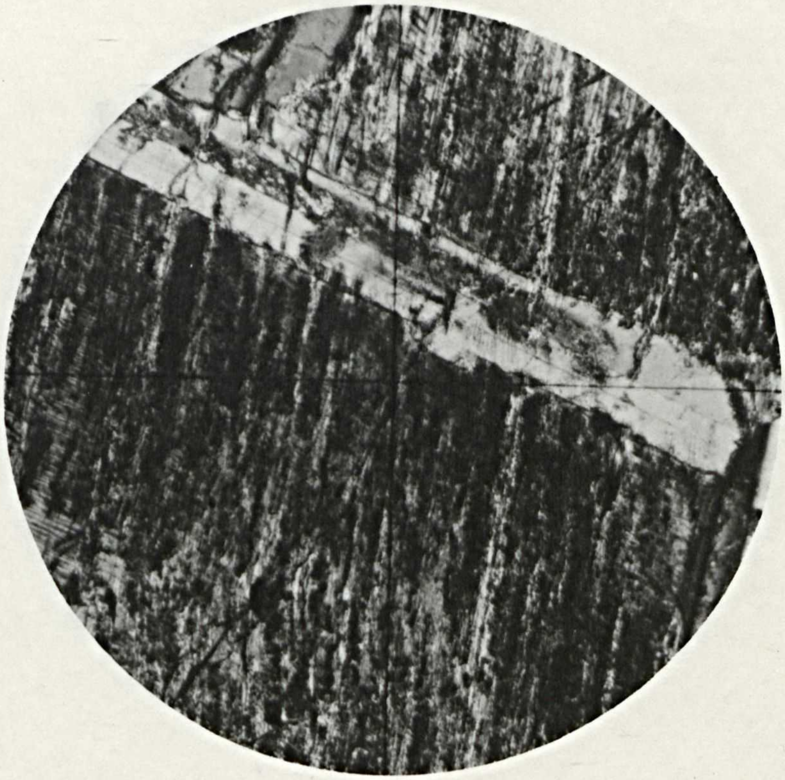
PLATE XIV

Photomicrographs of MGS 853-36-No.6

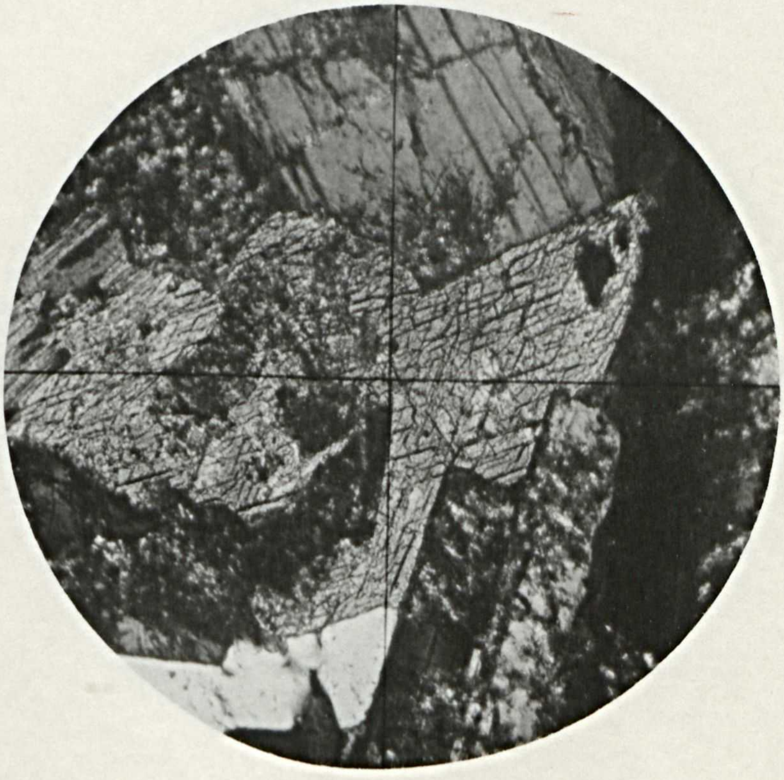
C. Ragged contact between plagioclase and altered augite. (X nicols, x 110)

D. Hornblende. (X nicols, x 125)

PLATE XIV



C.



D.

PLATE XV

Photomicrographs of MGS 853-36-No.7

A. Hypautomorphic granular to diabasic texture. (X nicols, x 28)

B. Highly altered nature of hornblende biotite, chlorite and epidote. (X nicols, x 110)

PLATE XV

A.

B.

PLATE XVI

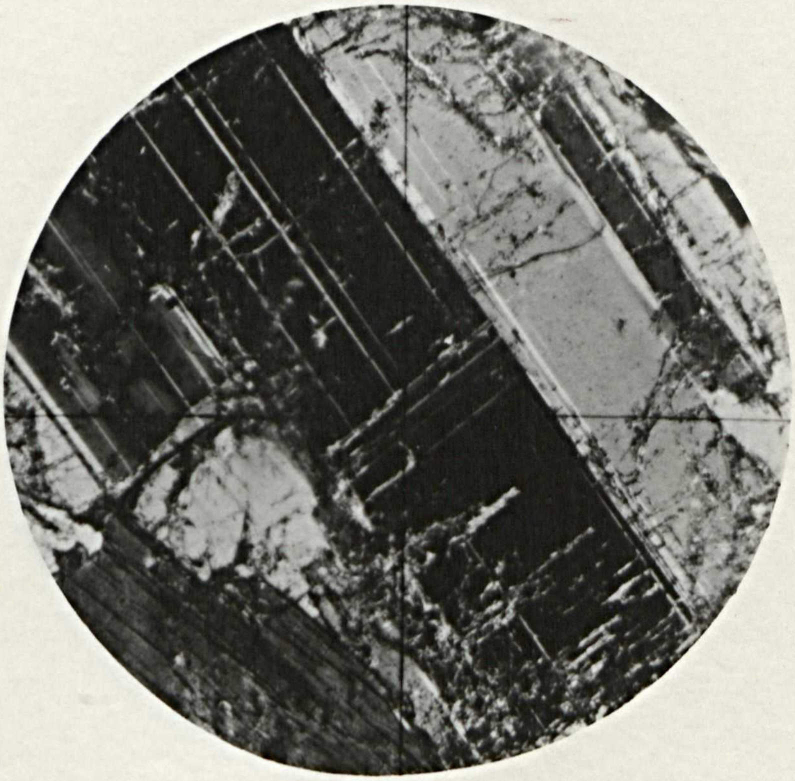
Photomicrographs of MGS 853-36-No.7

C. Alteration of augite to hornblende, biotite and magnetite.
(X nicols, x 110)

D. Albite, carlsbad and pericline twinning in plagioclase.
(X nicols, x 110)

PLATE XVI

C.



D.

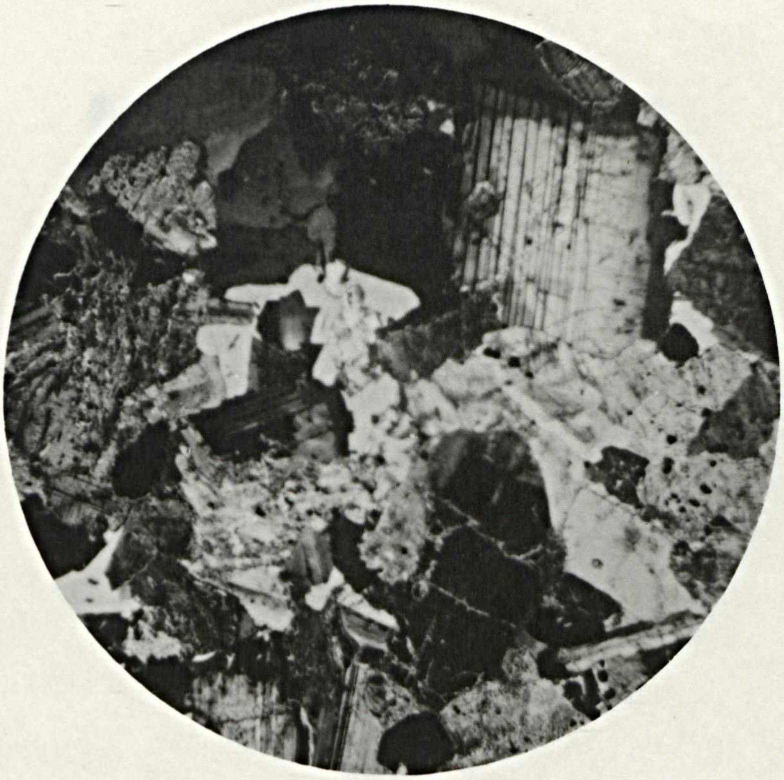
PLATE XVII

Photomicrographs of MGS 853-36-No.8

A. Hypautomorphic granular to diabasic texture.
(X nicols, x 28)

B. Highly altered augite interstitial to plagioclase.
(X nicols, x 110)

PLATE XVII



A.

B.

PLATE XVIII

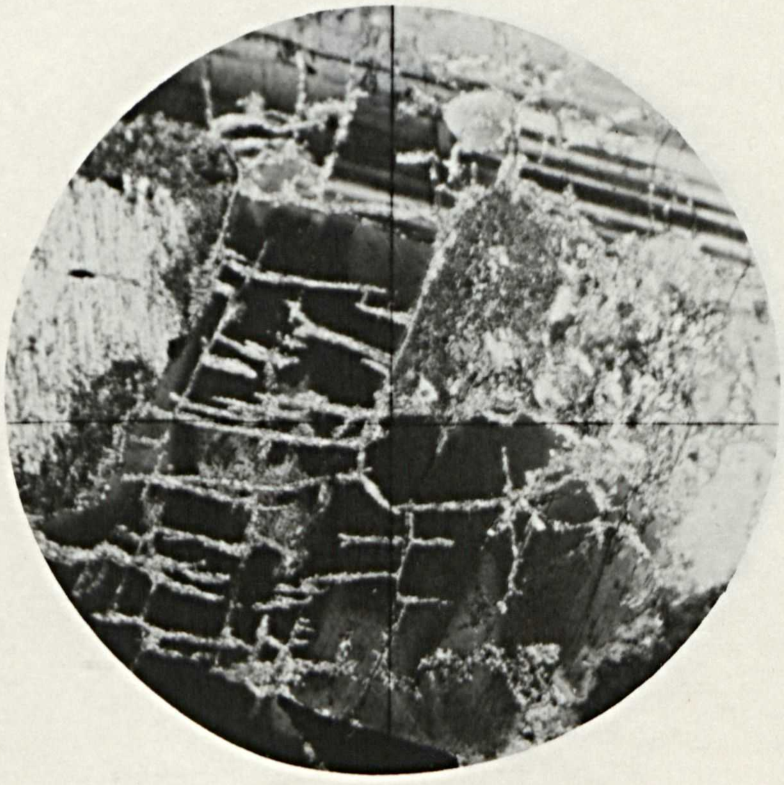
Photomicrographs of MGS 853-36-No.8

C. Augite replacing hornblende. (X nicols, x 110)

D. Alteration of plagioclase along fractures. (X nicols, x 110)

PLATE XVIII

C.



D.

PLATE XIX

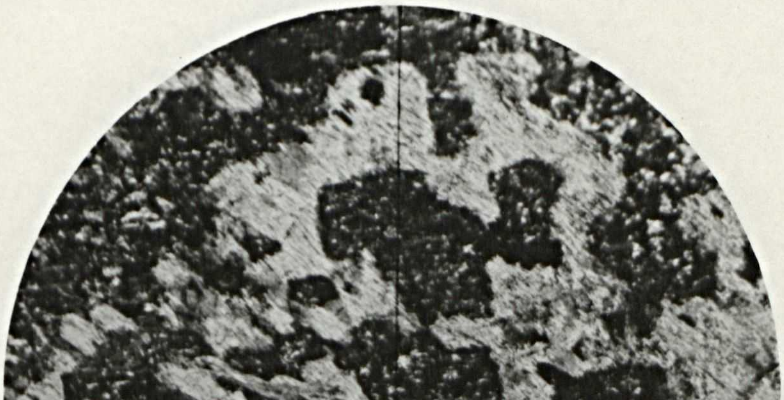
Photomicrographs of MGS 853-36-No.9

A. Highly altered nature and hypautomorphic granular to diabasic texture. (X nicols, x 28)

B. Hornblende, light, replacing plagioclase, dark. (X nicols, x 110)

PLATE XIX

A.



B.

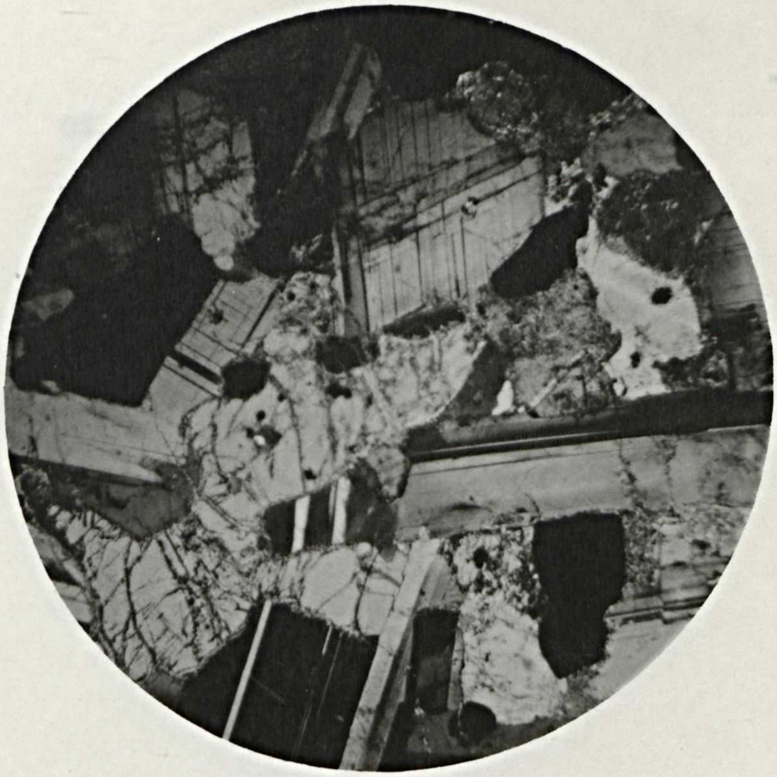
PLATE XX

Photomicrographs of MGS 853-36-No.10

A. Diabasic texture. (X nicols, x 28)

B. Pigeonite altering along fractures and contacts with plagioclase. (X nicols, x 110)

PLATE XX



A.

B.

PLATE XXI

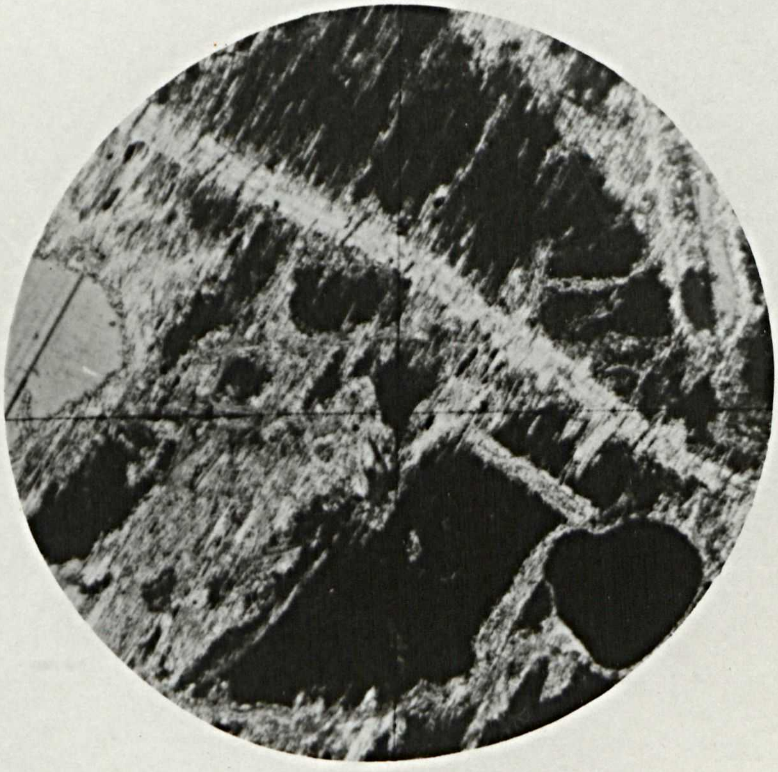
Photomicrographs of MGS 853-36-No.10

C. Pigeonite more highly altered. (X nicols, x 110)

D. Highly altered augite. (X nicols, x 110)

PLATE XXI

C.



D.

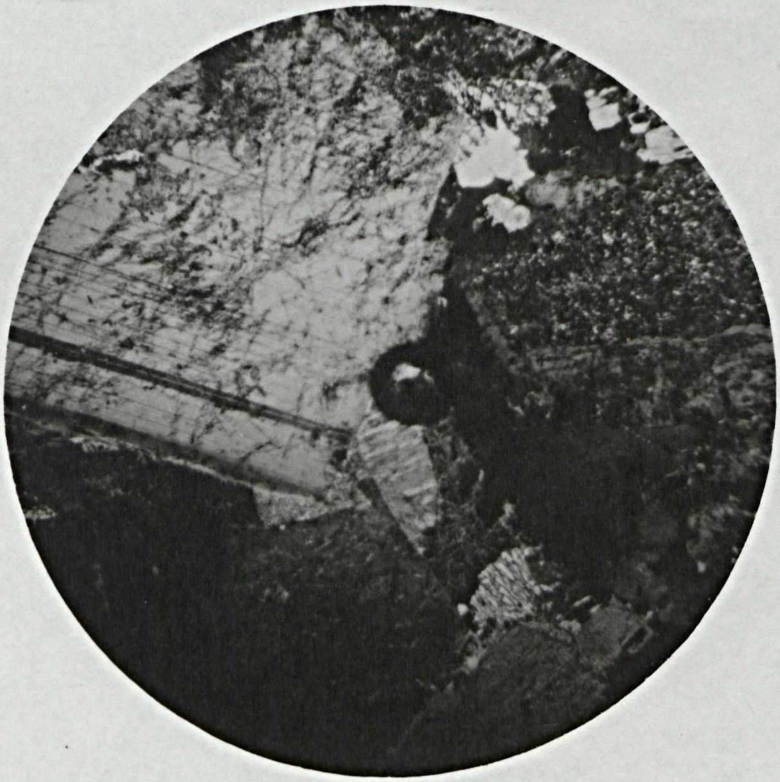
PLATE XXII

Photomicrographs of MGS 853-36-No.11

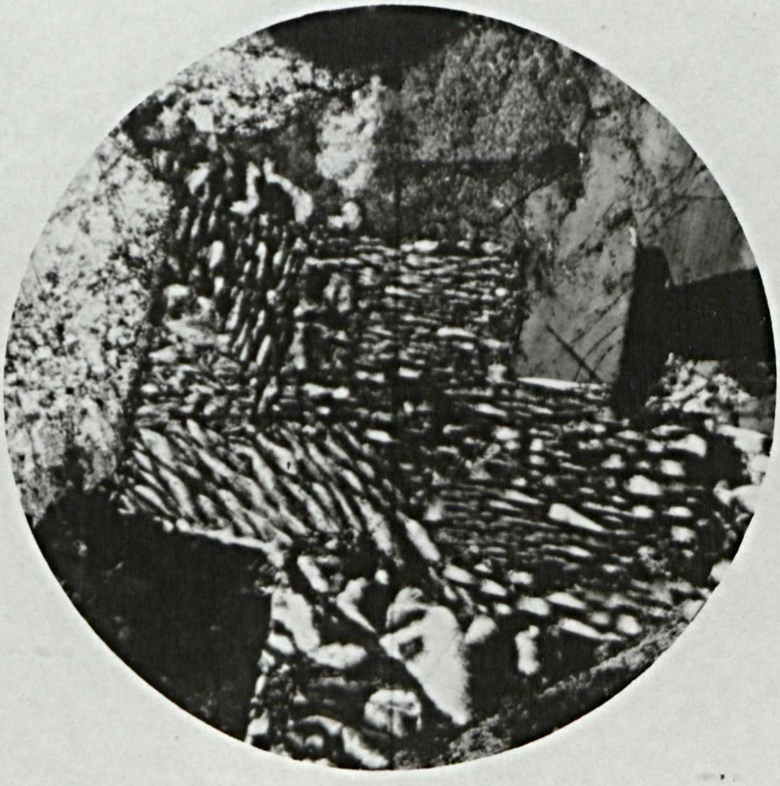
A. Hypautomorphic granular texture. (X nicols, x 28)

B. Grannophyric texture. (X nicols, x 145)

PLATE XXII



A.



B.