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The Minerals of New Mexico

Lee McGuinness

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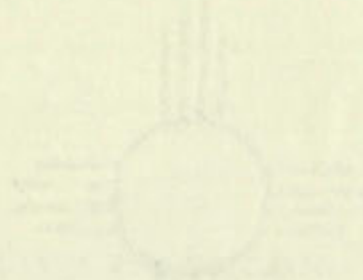
By

Lee McGuinness

A Thesis Submitted for the Degree
of Master of Science in Geology

University of New Mexico

1936



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PREFACE

Inorganic bodies known as minerals make up, either in whole rock-masses or in isolated form, the material of the upper crust of the earth. Through the evidence furnished by the study of meteorites, we also infer that other bodies in the universe are made up of minerals, or at least those portions of them which are represented by meteorites.

Since minerals are, then, important in making up the observable part of the earth, a study of them is of importance in any study of the earth. Because the variety of minerals occurring in New Mexico is large, it will be of interest to all students of nature to consider them in some detail. It is the purpose of the present work to acquaint the reader with the types of minerals found in the State, and to present the amateur and professional collector with both information regarding localities where these minerals may be found, and with criteria for their identification. It is to be hoped that this paper may also be of some use as a very elementary textbook of general mineralogy for the beginner.

The work is divided into the following parts:

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- I. Introduction: Properties of Minerals.
- II. Crystallography.
- III. Physical Mineralogy.
- IV. Chemical Mineralogy.
- V. Origin, Occurrence, and Association of
Minerals.
- VI. Descriptive Mineralogy of New Mexico Minerals,
with Lists of Occurrence in the State.

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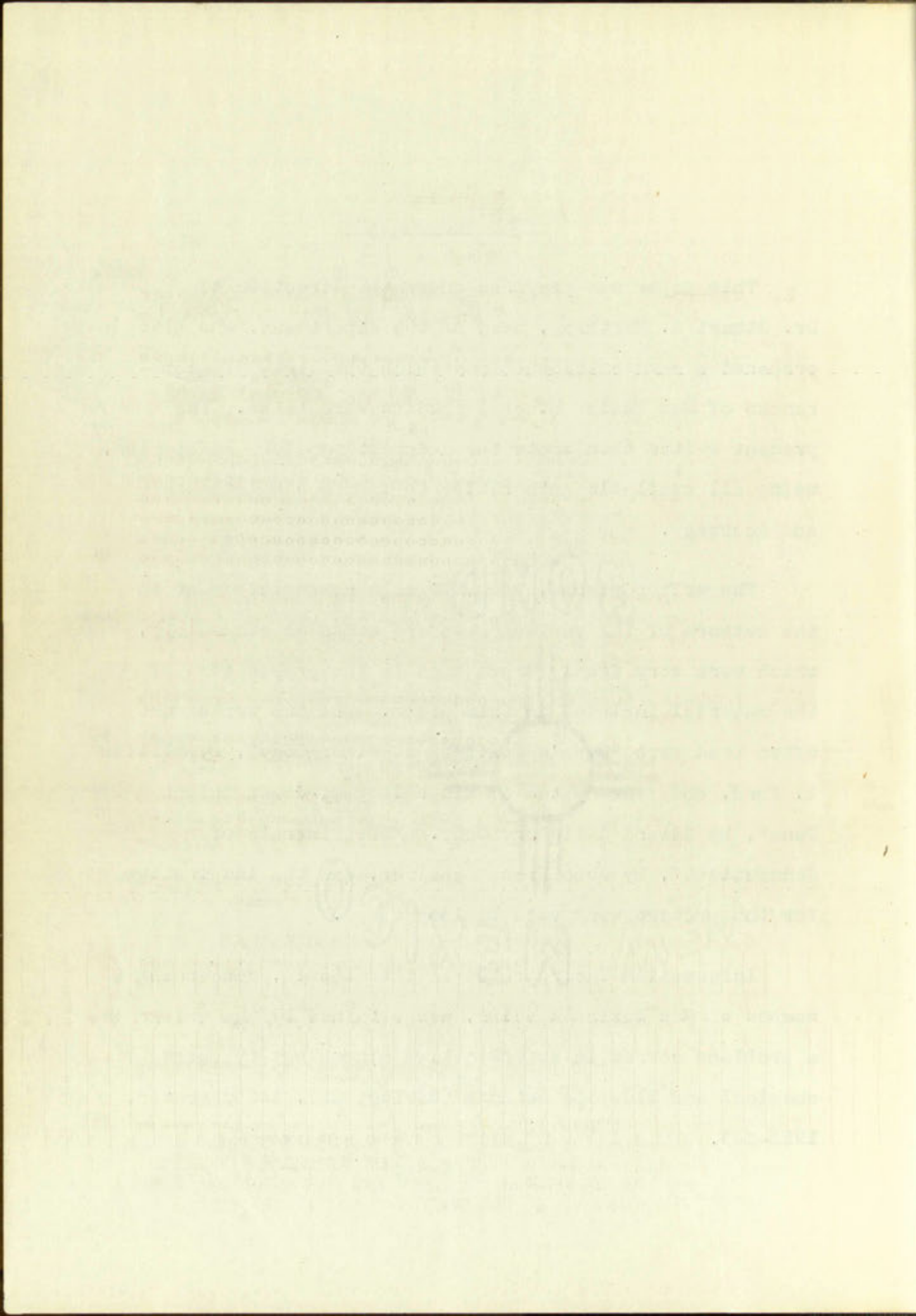
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ACKNOWLEDGEMENTS

This paper was prepared under the direction of Dr. Stuart A. Northrop, head of the department, who also prepared a card catalogue from which the lists of occurrences of New Mexico mineral species were taken. The present writer then wrote the descriptions for the species, using all available authorities to insure completeness and accuracy.

The writer wishes, then, to make acknowledgement to the authors of the various standard works on mineralogy, which were very freely drawn upon in the preparation of the material included in this paper. The two works most often used were "Dana's Textbook of Mineralogy", by William E. Ford, and "The System of Mineralogy of James Dwight Dana", by Edward Salisbury Dana. "The Minerals of Connecticut", by John Frank Schairer, was the inspiration for the present work (see bibliography).

Information incorporated in this thesis, concerning a number of New Mexico species, was obtained by the writer in a problems course in determinative mineralogy by means of chemical and blowpipe methods (Geology 251, 1st semester, 1935-36).



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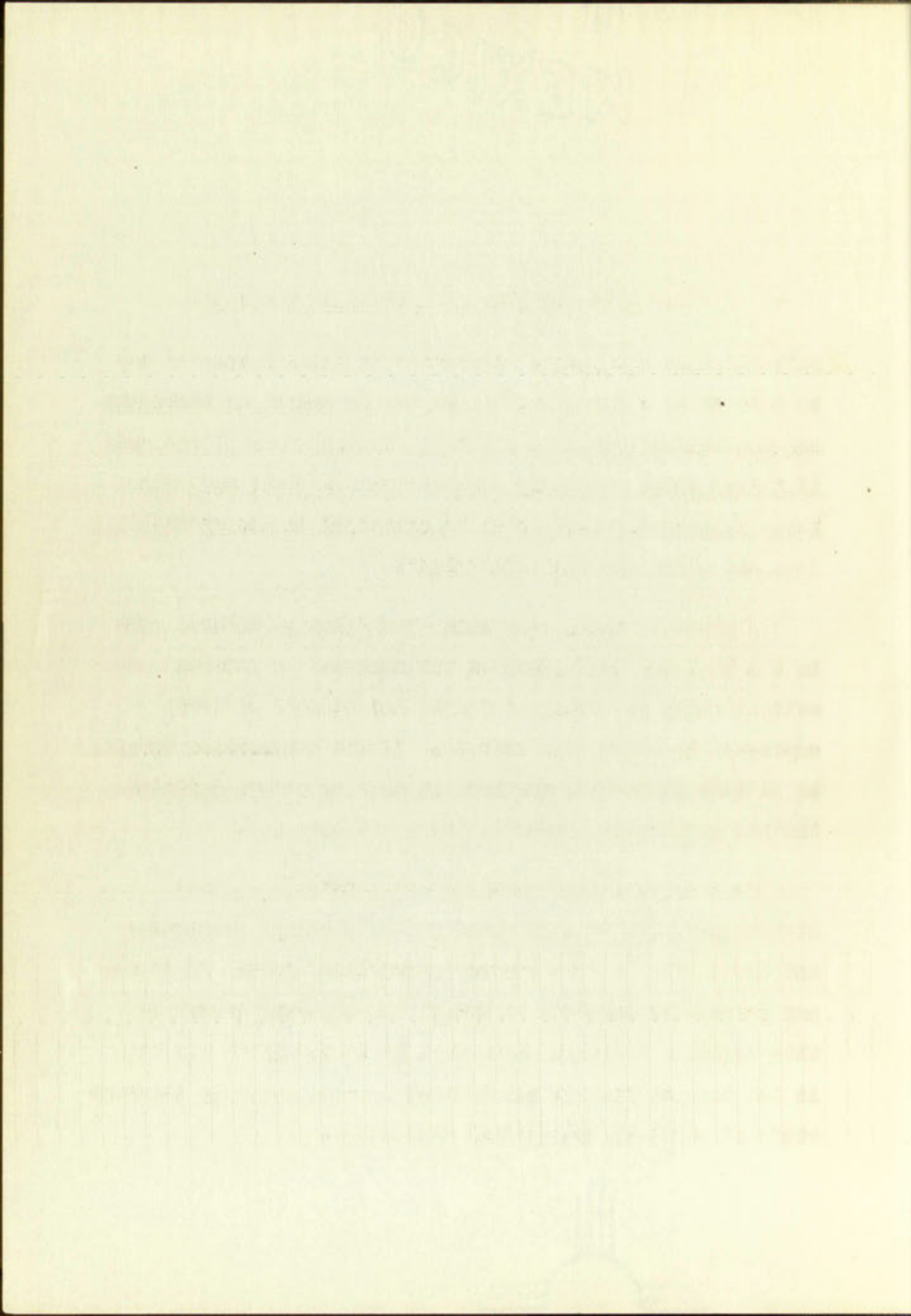
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PART I
GENERAL MINERALOGY



I. INTRODUCTION: PROPERTIES OF MINERALS.

Definition of a Mineral. According to Dana, a mineral may be defined as a body produced by the processes of inorganic nature, having usually a definite chemical composition and, if formed under favorable conditions, a certain characteristic atomic structure which is expressed in the crystalline form and other physical properties.

A mineral, then, must have a homogeneous nature, even in the smallest fragments, and it must have a chemical composition which is usually definite and capable of being expressed by a chemical formula. If the composition varies, as it does in certain species, it does so within definite limits, and usually according to a definite law.

Further, a mineral usually has a definite atomic structure, which is manifested in the physical properties and especially in the external crystalline form. It is not our purpose to consider in detail the abundant proofs of this definite internal structure; it is enough to say that it has been definitely established in most cases by thorough study of physical and optical characters.

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For our purpose, we shall restrict the term mineral to substances originating through natural processes alone, terming those compounds formed in the laboratory or metallurgical furnace as artificial minerals.

Mineral species are, further, usually limited to solid substances, the only exceptions being the liquids mercury and water, both meeting in all respects the conditions established in the definition.

Scope of Mineralogy. Any study of mineralogy necessarily embraces five major divisions:

1. Crystallography.
2. Physical Mineralogy.
3. Chemical Mineralogy.
4. Occurrence of Minerals.
5. Descriptive Mineralogy.

Except for the descriptions of New Mexico species, which are given in considerable detail, only the fundamentals will be treated here. For complete information concerning any of the first four phases, the reader is referred to Dana's "Textbook of Mineralogy".#

Dana, Edward Salisbury. A textbook of mineralogy. 4th ed., revised and enlarged by William E. Ford. New York. John Wiley and sons, inc., 1932. 851p

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II. CRYSTALLOGRAPHY.

In any consideration of minerals, a study of crystal form is necessary, because a knowledge of the crystal types of the various species is one of the most important means of identification of minerals without chemical analysis. Further, a study of crystallography is valuable because it is in the external crystalline form of minerals that the interatomic structure is best demonstrated. For these reasons, we may regard some knowledge of crystal types as fundamental in mineralogy.

Definition of a Crystal; Terminology. According to Dana, a crystal is the regular polyhedral form, bounded by smooth surfaces, which is assumed by a chemical compound, under the action of its interatomic forces, when passing, under suitable conditions, from the state of a liquid or gas to that of a solid.

Thus a crystal is the normal form of a mineral species, as of all definite chemical compounds when in the solid state, but conditions permitting complete and perfect development of crystal form are seldom realized in mineral formation. Many mineral species always occur in massive form

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(without observable crystals), yet with definite molecular structure; in a few cases the definite internal structure is absent, and the mineral cannot exhibit crystal form even when conditions during formation would be ideal for the development of crystals in a normal mineral.

A definite molecular structure is the essential character of a crystal, and it is manifested in several ways, chief among which is the external form. External form without definite relation to internal structure does not make a crystal of a solid; the external form must be a result, not a cause, of the internal structure. For this reason, any man-made object resembling a crystal, such as a crystal model or a cut gem, is not considered as a crystal.

Further, a replacement of mineral A by mineral B, retaining the form of A, is not a crystal, since the molecular structure of B is not responsible for the external form of the resulting mineral.

The term crystal, then, is reserved to minerals showing natural crystal faces; a cleavage or irregular fragment of a mineral, if with definite internal structure, is said to be crystalline, but not a crystal.

Crystalline minerals without external crystal form are said to be massive. If the structure is shown to be the same in all parallel directions through the mass, the

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mineral is described as a single individual; if it varies from grain to grain, the mass is said to be a crystalline aggregate.

If the microscope shows more or less distinct crystalline structure, which cannot be resolved into individuals, the mass is said to be cryptocrystalline. If definite structure is entirely wanting, and the structure is the same in all directions through the mass, the material is said to be amorphous. This state is rare among minerals, more than 98 per cent of which exhibit definite crystalline structure, according to statistical study. (Dana)

Constancy of Interfacial Angles. While crystals often show a considerable variation in the size of like faces, producing what are called distorted forms, the angles of inclination between like faces of crystals of any given species are constant, no matter what the source of the mineral. These angles form an important distinguishing characteristic of any species.

Crystal Habit. The actual forms of the crystals may show considerable variation, especially in certain species, even though the interfacial angles between like faces remain constant. Nevertheless, crystals of a single species generally show tendencies toward certain definite types, this being known as crystal habit. There is, further,

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usually a considerable diversity in size of crystals, even in a single species, though some species are characterized by large crystals and others by small crystals. The most perfect development of crystal form is found usually in small specimens.

Symmetry. The faces of a crystal are arranged according to certain definite laws of symmetry, forming a natural basis for division of crystal types into systems and classes. The symmetry of like faces, angles, or corners may be defined in relation to a plane of symmetry, an axis of symmetry, or a center of symmetry. Obviously, the highest grade of symmetry will occur when all three— plane, axis, and center of symmetry, are present. In contrast, the symmetry of a certain class of one of the systems is of such a low grade that neither plane, axis, nor center of symmetry is represented.

In crystals, symmetry is said to apply as long as the angular positions of opposite faces retain equal relation to the plane, axis, or center of symmetry, even if the faces are unequally developed.

In certain species, the crystals may approximate closely in angle the symmetry of other species of higher symmetry. This is known as pseudo-symmetry. Twin or compound crystals of certain species may simulate a higher



grade of symmetry than that which belongs to the individual crystals. This is also pseudo-symmetry, and the crystals are more specifically referred to as mimetic.

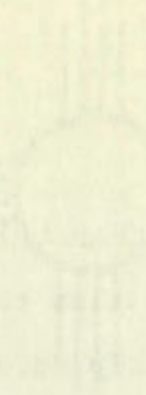
In some cases, crystals belonging to a system of high grade of symmetry may imitate the symmetry of a system of lower grade. This is especially true in the isometric system, where distortion may result in elongated forms resembling those of lower systems.

Crystallographic Axes. In describing a crystal, especially with reference to the position of the faces, it is found convenient to assume certain lines passing through the center of the ideal crystal, as a basis of reference. These are the crystallographic axes. In most cases, these may coincide with axes of symmetry, for the symmetry of the crystal generally determines the position of the crystallographic axes.

It is customary to indicate the crystallographic axes by means of letters, and to orient a crystal in terms of the position of these axes with respect to the observer.

The following paragraphs give the number, arrangement, orientation, and lettering of the crystallographic axes of the six systems of crystals.

In the isometric system, all three crystallographic



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axes, which are at right angles to each other, are lettered a, since they are equal and interchangeable. With respect to the observer, the horizontal axis coinciding with the line of sight is a₁, the horizontal axis normal to the line of sight is a₂, and the vertical axis is a₃ (Fig. 1, Plate I).

In the tetragonal system, there are three axes at right angles to each other, two of equal length, and one longer or shorter. They are lettered a₁, a₂, and a, a₁ being the horizontal axis in line with the observer, a₂ the horizontal axis (equal to a₁, and interchangeable with it) normal to the line of sight, and a the vertical axis (Fig. 1, Plate III).

In the hexagonal system, there are four axes, three equal and interchangeable axes in a horizontal plane at angles of 60° , and a vertical axis at right angles to these. These are lettered a₁, a₂, a₃, and a, a₁ and a₃ being the horizontal axes oblique to the observer (a₁ to the left and a₃ to the right in front), a₂ the horizontal axis normal to the line of sight, and a the vertical axis (Fig. 1, Plate V).

In the orthorhombic system, there are three axes at right angles to each other, and unequal in length. Any one of these three may be taken as the vertical or a axis. Of the two horizontal axes, the longer is always taken as the

Diagram

The diagram illustrates the process of a chemical reaction. It shows a central circle representing a reaction vessel or a specific stage of the reaction. This central circle is connected to several lines that extend outwards, representing the flow of reactants and products. The lines are labeled with chemical symbols and formulas, such as H_2 , O_2 , and H_2O , indicating the substances involved in the reaction. The diagram is a schematic representation of a chemical process, showing the transformation of reactants into products through a series of steps or stages.

macro-axis or b axis, normal to the line of sight; while the shorter or brachy-axis is taken as the a axis, coinciding with the line of sight (Fig. 1, Plate VIII).

In the monoclinic system, there are three axes of unequal length, two of which are at right angles, while the third is inclined. Of these, the inclined or clino-axis, sloping down toward the observer, is taken as the a axis. Of the two axes at right angles, the horizontal axis normal to the line of sight (and usually longer) is taken as the ortho-axis or b axis. The remaining axis is vertical, and is taken as the c axis. (Fig. 1, Plate IX)

In the triclinic system, there are three axes of unequal length, and oblique to each other. A triclinic crystal when oriented has one axis in a vertical position, the c axis; one sloping down toward the observer, the a axis; and the remaining axis, more or less normal to the line of sight, is the b axis (Fig. 1, Plate X).

Further, the ends of each axis are referred to as being positive or negative, the usual arrangement being as follows: the positive end of the axis parallel (or nearly so) to the line of sight is the one closer to the observer; the positive end of the horizontal (or nearly so) axis normal to the line of sight is at the right of the observer; and the positive end of the vertical axis is the upper one. In the hexagonal system, the positive and negative signs of the

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horizontal axes are arranged alternately, with the positive end of the a_2 axis (normal to the line of sight) at the right of the observer; the positive end of the vertical axis is, as usual, the upper one. These relations are brought out clearly for all the systems in the figures referred to at the ends of the preceding paragraphs.

While the actual lengths of the crystallographic axes vary with the size of the individual crystals, the axial ratio (the relative lengths of the axes) for a single species remains constant. For example, in the mineral zircon, the axial ratio is $c = 0.64037$; that is, the c axis is 0.64037 times as long as the a axes. One of the horizontal axes is always taken as the basis of reference. In the isometric system, the axes are of equal lengths, so the axial ratio is always unity.

Classification. Theoretically, there are thirty-two possible types of symmetry in crystals built up of like structural units, divided into six systems. In nature, seven classes, one in each system except the hexagonal, and two in that system, include by far the larger number of crystallized minerals, though a dozen other classes are represented, some very rarely. These classes containing the majority of crystal types are the normal classes of the various systems.

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The normal class of each system not only includes the majority of natural types of crystals, but members of the normal class also possess the highest grade of symmetry possible in the system. As mentioned above, the hexagonal system is divided into two major divisions, each of which has a normal class, and each of which is sometimes treated as a separate system.

The following discussions of the systems include a definition of the symmetry of the normal or highest class for each system, and a description of the more common and important crystal types. These nearly always fall into the normal class, but wherever there are important types outside the normal class, they are also described briefly.

ISOMETRIC SYSTEM (Regular or Cubic System)

In crystals of the isometric system, there are three crystal axes at right angles to each other and of equal lengths (Fig. 1, Plate I).

In crystals of the normal class, there are three like axial planes, dividing the ideal crystal into identical halves, parallel to the cubic faces, and fixing the crystallographic axes by their intersection. There are six like diagonal planes of symmetry, passing through each opposite pair of cubic edges.

Further, there are three like axes of tetragonal

The normal class of each system has not included the majority of natural types of crystals, but because of the normal class also possess the highest grade of symmetry possible in the system. An additional class, the hexagonal system is divided into two major divisions, each of which has a normal class, and each of which is sometimes treated as a separate system.

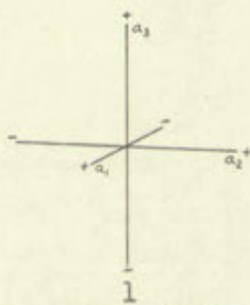
The following discussion of the systems includes a definition of the symmetry of the normal or highest class for each system, and a description of the other classes and important crystal types. These nearly always fall into the normal class, but wherever there are important types outside the normal class they are also described briefly.

ISOMETRIC SYSTEM (Cubic System)

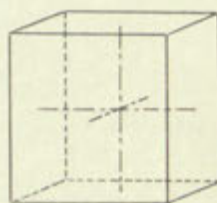
In crystals of the isometric system there are three crystal axes of right angles to each other and of equal lengths (Fig. 1, Plate I).

In crystals of the normal class, there are three equal axes, dividing the space equally in all directions, parallel to the cubic faces, and dividing the crystal into eight equal parts. There are only three important planes of symmetry, passing through the centers of the cube edges.

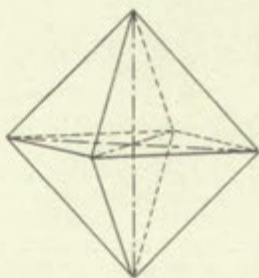
Further, there are three lines of symmetry.



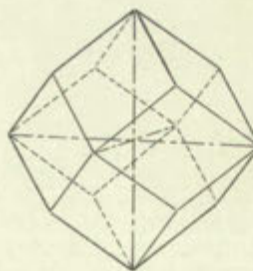
Isometric Axes



2
Cube



3
Octahedron



4
Dodecahedron

1. General Information Name: _____ Date: _____

2. Objectives The purpose of this experiment is to determine the effect of temperature on the rate of reaction between hydrogen peroxide and potassium iodide.

3. Materials Hydrogen peroxide (H₂O₂), Potassium iodide (KI), Sulfuric acid (H₂SO₄), Water, Test tubes, Stopwatch, Thermometer.

4. Procedure 1. Prepare a series of test tubes containing different volumes of hydrogen peroxide and potassium iodide. 2. Measure the temperature of each mixture. 3. Start the stopwatch when the reaction begins (indicated by the appearance of a precipitate). 4. Record the time taken for the reaction to complete.

Table 1: Reaction Rate vs. Temperature

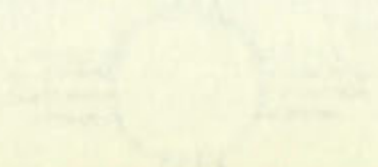
Temperature (°C)	Time taken (s)	Rate (1/time)
10	120	0.0083
20	60	0.0167
30	30	0.0333
40	15	0.0667
50	8	0.1250

5. Results The reaction rate increases significantly with increasing temperature, as shown in the table above.

6. Conclusion The rate of reaction is directly proportional to the temperature of the reactants.

Temperature (°C)	Rate (1/time)
10	0.0083
20	0.0167
30	0.0333
40	0.0667
50	0.1250

7. Discussion The increase in reaction rate with temperature is due to the increase in the number of effective collisions between the reactant molecules.



symmetry[#], coincident with the crystallographic axes and normal to the faces of the cube; four like diagonal axes of trigonal symmetry, normal to the faces of the octahedron; and six like diagonal axes of binary symmetry, normal to the faces of the dodecahedron.

The three simplest types of isometric crystals of the normal class are the cube (Fig. 2, Plate I), the octahedron (Fig. 3, Plate I), and the dodecahedron (Fig. 4, Plate I). The cube is the basal type; the crystallographic axes intersect the centers of the six faces.

If the eight corners of the cube are cut off, forming eight new faces, and if these are enlarged until the cubic faces are obliterated, an octahedron is formed.

If the twelve edges of the cube are cut off, forming twelve new faces, and if these are enlarged until the cubic faces are obliterated, a dodecahedron is formed. These

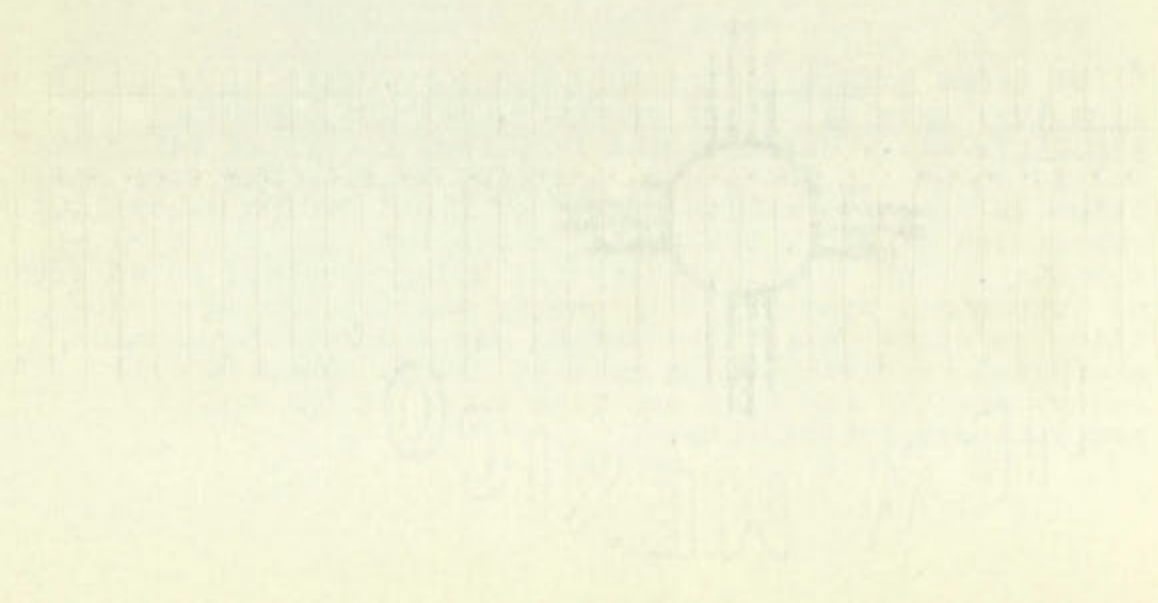
[#] The terms axis of tetragonal symmetry, axis of trigonal symmetry, axis of binary symmetry, axis of hexagonal symmetry, etc., refer to the fact that a crystal being revolved on one of these axes occupies exactly the same position in space a certain number of times during a complete revolution of 360° , the number depending upon the type of symmetry. For example, a crystal being revolved on an axis of tetragonal symmetry will occupy exactly the same position in space four times during one complete revolution; a crystal revolving on an axis of binary symmetry will occupy exactly the same position twice during one complete revolution, etc.

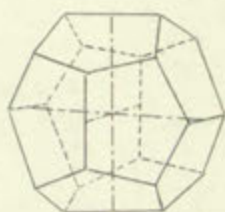
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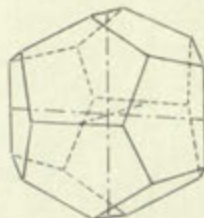
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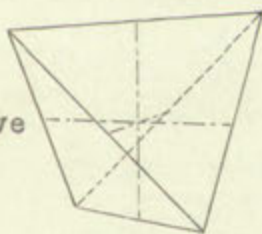


1



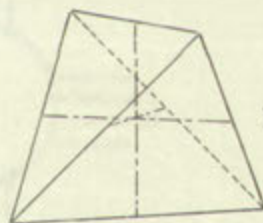
2

Pyritohedrons



Positive

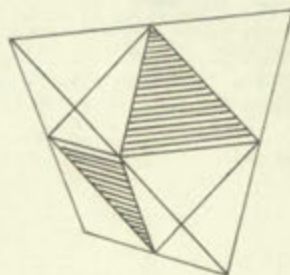
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Negative

4

Tetrahedrons



5

Relation of Octahedron
to Tetrahedron

1910

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relations are readily seen by studying the relation of the faces of these two forms to the crystallographic axes in Figs. 3 and 4, Plate I.

These three types alone, or various combinations of them, form most of the crystals of isometric minerals of the normal class.

Two other classes besides the normal class, the pyritohedral and tetrahedral classes, have numerous representatives among isometric minerals.

In the pyritohedral class, the basal type or pyritohedron (Figs. 1 and 2, Plate II) has twelve pentagonal faces, in each of which one edge is longer than the other four similar edges. The type was so named because it is a typical form with the common mineral species pyrite.

In the tetrahedral class, the basal form or tetrahedron (Figs. 3 and 4, Plate II) has four faces, each an equilateral triangle, and meeting the axes at equal distances. It may be formed by enlargement of alternating octahedral faces until the remaining faces are obliterated (Fig. 5, Plate II). Depending on which octahedral faces are enlarged, the resulting tetrahedron is referred to as positive or negative.

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TETRAGONAL SYSTEM

In crystals of the tetragonal system, there are three crystallographic axes at right angles to each other, of which the two horizontal axes are equal in length to each other and interchangeable, while the third or vertical axis is either longer or shorter (Fig. 1, Plate III).

In crystals of the normal class, there is one principal axis of tetragonal symmetry, coinciding with the vertical crystal axis c . There are also four horizontal axes of binary symmetry, two coinciding with the horizontal crystallographic axes, and two diagonal axes bisecting the angles between the first two. There is one principal plane of symmetry, that of the horizontal crystallographic axes, and four vertical planes of symmetry making angles of 45° with each other. The two planes including the horizontal crystallographic axes are called axial planes of symmetry; the other two are diagonal planes of symmetry.

The principal crystal types of the normal class are the square prisms of the first and second order (Figs. 2 and 3, Plate III). The vertical faces are known as prismatic faces or prism faces. The horizontal faces, parallel to the plane of the horizontal axes, are known as the base or basal pinacoid.

These two prisms may occur in combination, in which



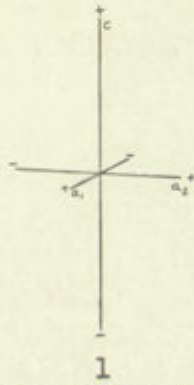
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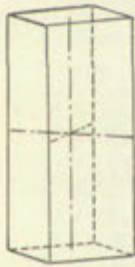
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Tetragonal Axes



2

First Order Prism



3

Second Order Prism



4

First and Second
Order Prisms



5

Ditetragonal Prism

TETRAGONAL FORMS

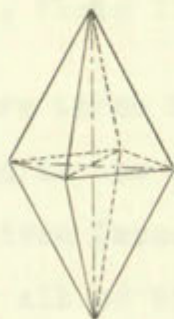
PHYSICS

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PHYSICS DEPARTMENT

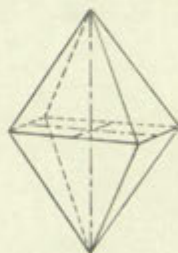


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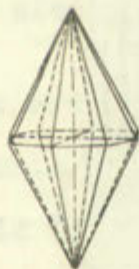
1

First Order Pyramid



2

Second Order Pyramid



3

Ditetragonal Pyramid



Positive

4



Negative

5

Sphenoids

TETRAGONAL FORMS

The first of these is the fact that the
 population of the country has increased
 rapidly since 1911. This has led to
 a corresponding increase in the demand
 for food and other necessities. The
 Government has therefore had to
 take steps to increase production
 and to ensure that the food supply
 is adequate for the needs of the
 population.



The second of these is the fact that
 the Government has had to take
 steps to ensure that the food supply
 is adequate for the needs of the
 population. This has led to the
 establishment of the Food Control
 Administration, which has the
 authority to regulate the production,
 distribution, and consumption of
 food.

The third of these is the fact that
 the Government has had to take
 steps to ensure that the food supply
 is adequate for the needs of the
 population. This has led to the
 establishment of the Food Control
 Administration, which has the
 authority to regulate the production,
 distribution, and consumption of
 food.

one may dominate (Fig. 4, Plate III). The ditetragonal prism is a form in which the two prisms are equally developed (Fig. 5, Plate III).

There are three types of pyramids in the normal class, corresponding to the three major types of prisms. The term pyramid is given (except in the isometric system) to forms intersecting all of the crystallographic axes. In the tetragonal system, a form in which each face intersects the vertical and one horizontal axis, and is parallel to the other horizontal axis, is also called a pyramid.

Pyramids of the first order have eight faces which intersect the horizontal axis at equal distances, and also intersect the vertical axis (Fig. 1, Plate IV). Pyramids of the second order have eight faces, each of which is parallel to one horizontal axis, but intersects the other two axes (Fig. 2, Plate IV). The ditetragonal pyramid is formed by equal development of the pyramids of the first and second order (Fig. 3, Plate IV).

The sphenoidal class, analogous to the tetrahedral class of the isometric system, is quite important. The basic form or sphenoid (Figs. 4 and 5, Plate IV) may be formed by the development of alternating faces of the first order pyramid. There are two types, positive and negative, depending upon which pyramidal faces are enlarged. The form

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resembles a tetrahedron, except that each face is an isosceles instead of an equilateral triangle.

HEXAGONAL SYSTEM

In crystals of the hexagonal system, there are four axes, three equal horizontal axes in a common plane intersecting at angles of 60° , and a fourth, vertical axis, at right angles to them, and longer or shorter (Fig. 1, Plate V).

There are two major sections in this system, each being sometimes treated as a separate system. They are the Hexagonal Division and the Trigonal (or Rhombohedral) Division. In the Hexagonal Division, the vertical crystallographic axis is an axis of hexagonal symmetry; in the Trigonal Division, it is an axis of trigonal symmetry.

There are seven possible classes in the Hexagonal Division. The normal class is by far the most important, but two others are also of importance.

There are five classes in the Trigonal Division. Of these, the rhombohedral class is most important, but three others are important.

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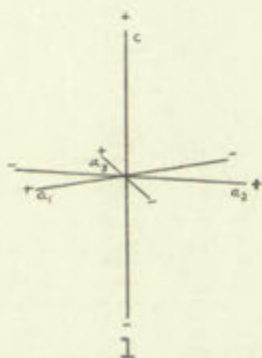
A. Hexagonal Division.

In crystals of the normal class, there is one principal axis of hexagonal symmetry, coinciding with the vertical crystallographic axis; and six horizontal axes of binary symmetry, three of which coincide with the horizontal crystallographic axes, while the other three bisect the angles between them. There is one principal plane of symmetry, the plane of the horizontal crystallographic axes, and six vertical planes of symmetry which intersect the vertical crystallographic axis. Three of these planes include the horizontal crystal axes, and the other three bisect the angles between them.

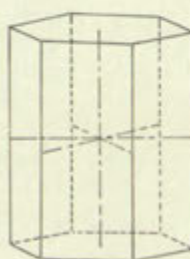
The principal crystal types of the normal class are the hexagonal prisms of the first and second order (Figs. 2 and 3, Plate V). The prisms have six like vertical faces. They are terminated by a horizontal face, the base or basal pinacoid, parallel to the plane of the horizontal crystallographic axes; the prisms may also be terminated by pyramids.

The dihexagonal prism, formed by equal development of first and second order prisms, is also an important type (Fig. 4, Plate V).

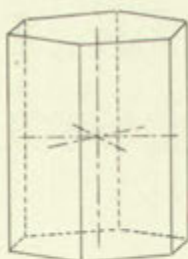
There are three types of pyramids, corresponding to the three major prisms (Figs. 1, 2, and 3, Plate VI).



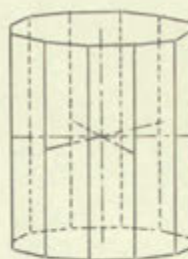
1
Hexagonal Axes



2
First Order Prism



3
Second Order Prism



4
Dihexagonal Prism

HEXAGONAL FORMS

MEMORANDUM
TO THE LEGISLATIVE COUNCIL

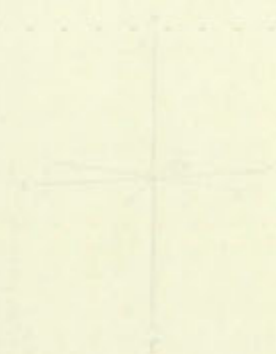


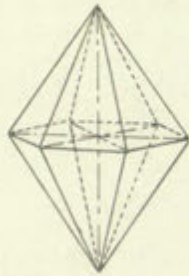
FIGURE 1

FIGURE 2

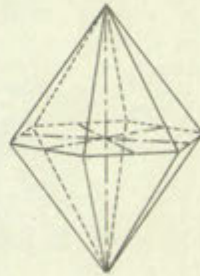


FIGURE 3

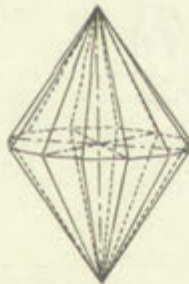
FIGURE 4



1
First Order Pyramid



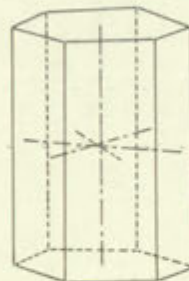
2
Second Order Pyramid



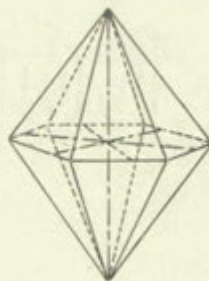
3
Dihexagonal Pyramid



4
Pyramid and Base



5
Third Order Prism



6
Third Order Pyramid

HEXAGONAL FORMS

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Combinations of the base with the pyramids are not uncommon (Fig. 4, Plate VI).

These are the most common types of the Hexagonal Division. The two other important classes are the Hemimorphic class; and the Tripyramidal class, in which prisms and pyramids are of the third order (Figs. 5 and 6, Plate VI).

B. Trigonal (Rhombohedral) Division.

In crystals of the rhombohedral class, there is one principal axis of trigonal symmetry, coincident with the vertical crystallographic axis; and three horizontal axes of binary symmetry, parallel to the horizontal crystallographic axes. There are only three planes of symmetry; they are diagonal to the horizontal crystallographic axes and intersect at angles of 60° in the vertical crystallographic axis.

The group is analogous to the tetrahedral class of the isometric system, and to the sphenoidal class of the tetragonal system.

The two important forms, the fundamental types, of the rhombohedral class are the rhombohedron and the scaleno-hedron (Figs. 1, 2, and 3, Plate VII).

The rhombohedron has six like faces, each a rhomb. There are six like lateral edges forming a zigzag line about the crystal; and six like terminal edges, three above

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2. The second part of the paper discusses the experimental results.

3. The third part of the paper discusses the theoretical results.

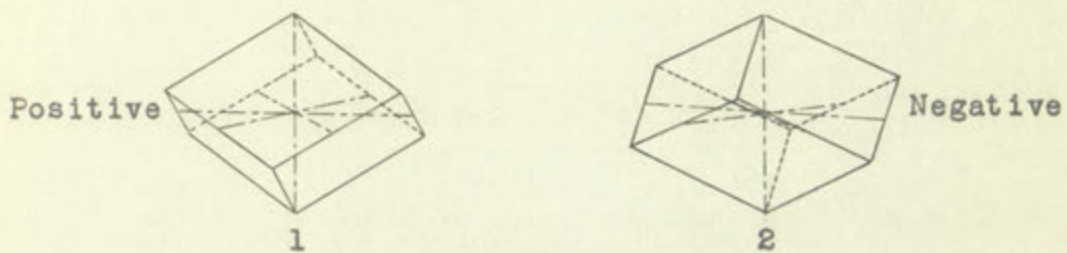
4. The fourth part of the paper discusses the conclusions.

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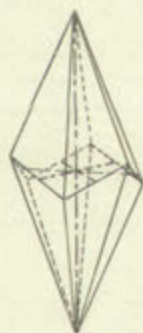
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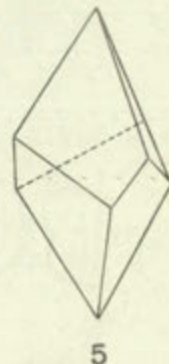
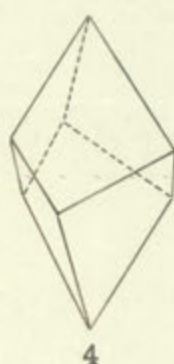
8. The eighth part of the paper discusses the tables.



Rhombohedral



3
Scalenohedron



4 Trigonal Trapezohedrons 5

HEXAGONAL (RHOMBOHEDRAL) FORMS

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and three below, in alternate position. The shape of the rhombohedron varies greatly as the interfacial angles change, so that some types are nearly equidimensional, while others may be flattened.

Rhombohedral forms are positive or negative, depending on which alternate sectants the faces fall in. The two complementary forms together embrace all the like faces of the double hexagonal pyramid of the first order of the normal class of the Hexagonal Division, and if they occur equally developed in combination, the form is identical with the pyramid. Usually, there is a slight irregularity in the development, and the better developed rhombohedron is usually taken as the positive one.

The scalenohedron has twelve similar faces, each a scalene triangle. Roughly, the form is like that of a double hexagonal pyramid, but there are differences in the angles of the terminal edges, and the lateral edges form a zigzag line around the crystal. It may be thought of as being derived from a dihexagonal pyramid by the development of alternating faces of that form. Scalenohedrons may be either positive or negative also, depending on which alternate faces are developed.

Other forms in this class include the base or basal pinacoid, the prisms, and the pyramids, which are identical in form with those of the normal class of the Hexagonal

and three sides, in a right-angled triangle. The hypotenuse is the longest side, and is opposite the right angle. The other two sides are the legs, and are adjacent to the right angle.

The area of a right-angled triangle is given by the formula: $\text{Area} = \frac{1}{2} \times \text{base} \times \text{height}$. The base and height are the two legs of the triangle.

The perimeter of a right-angled triangle is the sum of the lengths of its three sides. The Pythagorean theorem states that the square of the hypotenuse is equal to the sum of the squares of the two legs: $a^2 + b^2 = c^2$.

Right-angled triangles are used in many fields, including engineering, architecture, and physics. They are also used in trigonometry to solve problems involving angles and distances.

One of the most important properties of a right-angled triangle is that the sum of its interior angles is always 180 degrees. The right angle is 90 degrees, and the other two angles are acute angles that add up to 90 degrees.

In fact, the sum of the interior angles of any triangle is always 180 degrees.

Division, and can be distinguished only by the occurrence of rhombohedral faces on other crystals of the same species, or by etching-figures.

There are three other important classes in this division. The first is the rhombohedral-hemimorphic class, in which there are no horizontal axes of symmetry, and no center of symmetry. There are, however, three diagonal planes of symmetry, meeting at angles of 60° in the vertical axis, which is an axis of trigonal symmetry. The class includes the important species tourmaline.

The tri-rhombohedral class has no planes of symmetry, but the vertical axis is an axis of trigonal symmetry, and there is a center of symmetry. The basal types are the positive and negative rhombohedrons of the second order, derived by enlargement of alternating faces of the second order pyramid of the normal class of the Hexagonal Division. Phenacite is the characteristic mineral.

The trapezohedral class is characterized by the absence of planes and center of symmetry, but the vertical axis is one of trigonal symmetry, and there are three horizontal axes of binary symmetry, coincident with the horizontal crystallographic axes. Quartz is the characteristic mineral here, and the basal form is the trigonal trapezohedron, the faces of which correspond to one-fourth of the faces of the dihexagonal pyramid of the normal class of the Hexagonal

Division, and can be distinguished only by the occurrence of
 characteristic lines in other spectra of the same system, or
 by doublet-splitting.

There are three other important classes in this dis-
 tinction. The first is the *orthorhombic* class, in
 which there are no horizontal axes of symmetry, and no
 center of symmetry. There are, however, three diagonal
 planes of symmetry, meeting at angles of 60° in the vertical
 axis, which is an axis of tetragonal symmetry. The class
 includes the important species *hemimorphite*.

The *trigonal* class has no planes of symmetry,
 but the vertical axis is an axis of trigonal symmetry, and
 there is a center of symmetry. The basal planes are the
 positive and negative rhombohedra of the *trigonal* system,
 derived by arrangement of alternating ions of the *trigonal*
 order pyramids of the hexagonal class of the hexagonal system.
Hemimorphite is the characteristic mineral.

The *trigonal* class is characterized by the absence
 of planes and center of symmetry, but the vertical axis is
 one of trigonal symmetry, and there are three horizontal
 axes of binary symmetry, coincident with the horizontal
 axes of the *trigonal* system. *Hemimorphite* is the characteristic mineral
 here, and the basal form is the *trigonal* *hemimorphite*, the
 form of which corresponds to one-fourth of the faces of the
 hexagonal pyramids of the hexagonal class of the hexagonal

Division (Figs. 4 and 5, Plate VII). There are thus four such trapezohedrons, two positive, and either right- or left-handed; and two negative, and either right- or left-handed, depending on which way they rotate the plane of polarization of light transmitted in the direction of the vertical axis. Right- and left-handed crystals cannot be converted into one another by rotation, but are mirror-images of one another.

ORTHORHOMBIC SYSTEM (Rhombic or Prismatic System)

In crystals of the orthorhombic system, there are three axes at right angles to each other, and of unequal lengths (Fig. 1, Plate VIII).

In crystals of the normal class, there are three axes of binary symmetry, coincident with the crystallographic axes. There are also three unlike planes of symmetry at right angles to each other, fixing the crystallographic axes by their intersection.

The differences among the isometric, tetragonal, and orthorhombic systems, each of which is characterized by three axes at right angles to each other, are due to the fact that normal isometric crystals are developed equally in the three axial directions; normal tetragonal crystals have a like development only in two directions, those of



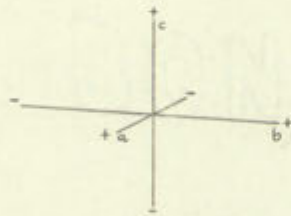
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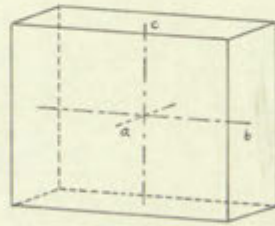
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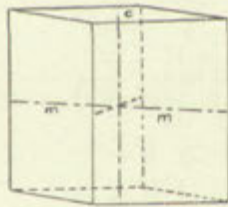
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Orthorhombic Axes



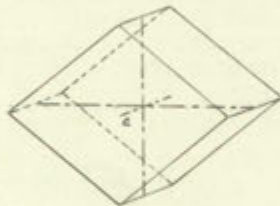
2
Diametral Prism
(Macro-(a), Brachy-(b),
and Basal (c) Pinacoids)



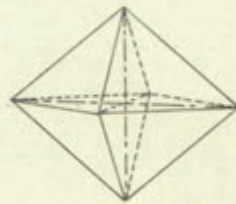
3
Prism (m) and
Basal Pinacoid



4
Macrodome and
Brachypinacoid



5
Brachydome and
Macropinacoid



6
Pyramid

MINERALOGY OF NEW ZEALAND PART VIII



1. Hexagonal Prism

(Quartz, Kyanite, Staurolite, Beryl, and Sphalerite)



2. Rhombohedron



3. Hexagonal Prism with Cleavage



4. Rhombohedron with Cleavage



5. Hexagonal Prism with Cleavage



6. Rhombohedron with Cleavage

ORTHORHOMBIC SYSTEM

15

the horizontal crystal axes; and normal orthorhombic crystals are developed unequally in the three axial directions.

The forms possible in the normal class of the orthorhombic system are the macropinacoid or a-pinacoid, the brachypinacoid or b-pinacoid, the base or c-pinacoid, the prisms, the macrodomes, the brachydomes, and the pyramids.

A pinacoid is a form whose faces are parallel to two axes (parallel to an axial plane). The macropinacoid is parallel to the b and c axes, while cutting the a axis. The brachypinacoid is parallel to the a and c axes, while cutting the b axis. The base or c-pinacoid is parallel to the a and b axes, while cutting the c axis (Fig. 2, Plate VIII).

Each pinacoid is an open form; that is, like faces number only two, and thus cannot enclose a solid body. Together, three pinacoids form the diametral prism, the analogue of the cube of the isometric system (Fig. 2, Plate VIII).

A prism is a form whose faces are parallel to the vertical axis, but intersect the two horizontal axes (Fig. 3, Plate VIII).

A dome, also called a horizontal prism, is a form whose faces are parallel to one horizontal axis, but intersect the vertical and other horizontal axis. The macrodome

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is parallel to the macro- or b axis; the brachydome is parallel to the brachy- or a axis (Figs 4 and 5, Plate VIII).

A pyramid is a form whose faces intersect all the axes (Fig. 6, Plate VIII).

Figs. 1-6, Plate VIII, illustrate the various common combinations of forms in the normal class. These, and other combinations of them, make up most of the crystals of orthorhombic minerals.

MONOCLINIC SYSTEM (Oblique or Monosymmetric System)

In crystals of the monoclinic system, there are three crystallographic axes of unequal length, two of which are at right angles to each other, while the other is oblique (Fig. 1, Plate IX).

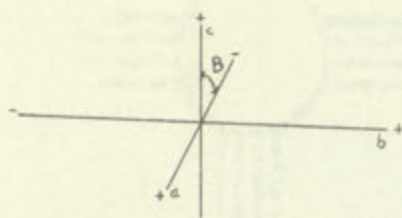
In crystals of the normal class, there is one plane of symmetry and one axis of binary symmetry at right angles to it. The plane of symmetry is always the plane of the a and c axes, and the axis of symmetry coincides with the b axis, normal to this plane. Thus the position of one axis (b) and that of the plane of the a and c axes is fixed by the symmetry, but the a and c axes may occupy different positions in the plane. In crystals of a single species, the angle B between the a and c axes is constant (Fig. 1, Plate

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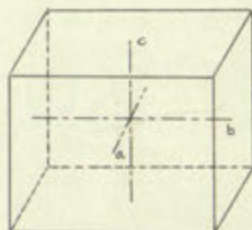
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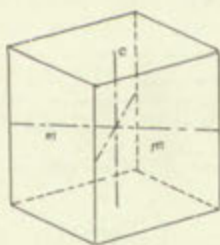
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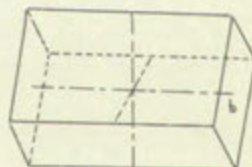
1
Monoclinic Axes



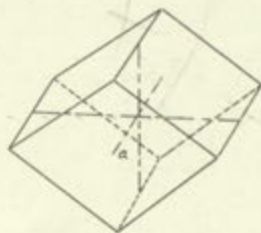
2
Diametral Prism
(Ortho-(a), Clino-(b)
and Basal (c) Pinacoids)



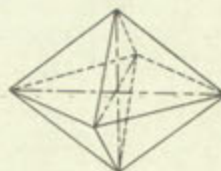
3
Prism (m) and
Basal Pinacoid



4
Orthodomes and
Clinopinacoid



5
Clinodomes and
Orthopinacoid



6
Pyramids

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IX).

The forms possible in the normal class are the orthopinacoid or a-pinacoid, the clinopinacoid or b-pinacoid, the base or c-pinacoid, the prisms, the orthodomes, the clino-domes, and the pyramids.

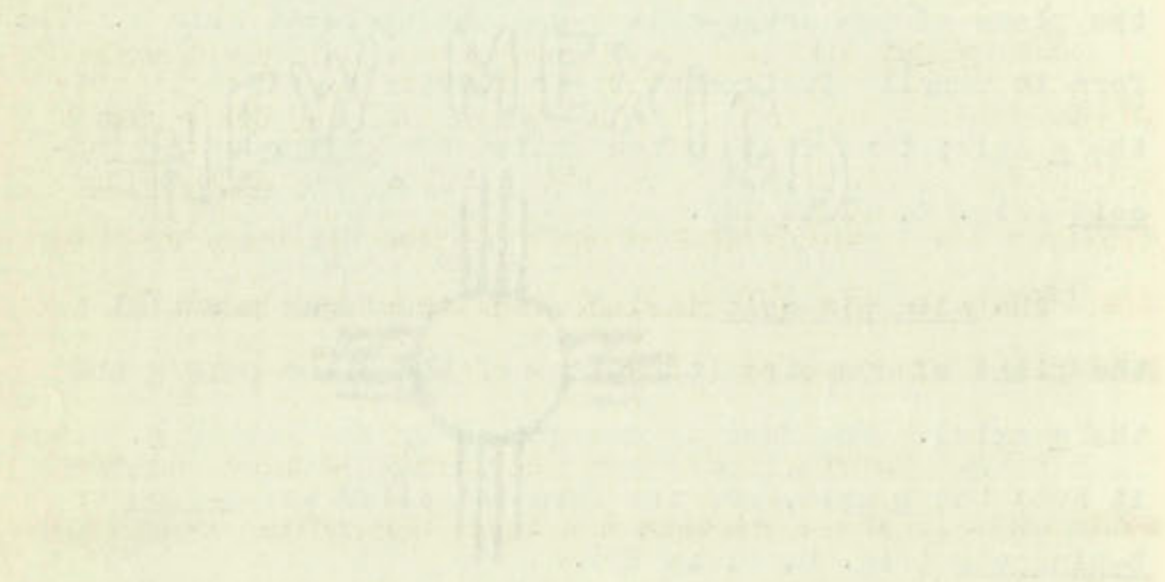
The orthopinacoid includes the two faces parallel to the plane of the ortho-axis b and the vertical axis c. The form is usually designated by the letter a, since it cuts the a axis; thus it is often called the a-face or a-pinacoid (Fig. 2, Plate IX).

The clinopinacoid includes the two faces parallel to the plane of symmetry (the plane of the clino-axis a and the c axis). The face is designated by the letter b, since it cuts the b axis, and the form is called the b-face or b-pinacoid (Fig. 2, Plate IX).

The base or basal pinacoid includes the two terminal faces, above and below, parallel to the plane of axes a and b. The face is designated by the letter c, and is called the c-face or c-pinacoid (Fig. 2, Plate IX). It is inclined to the orthopinacoid a, and the normal angle between faces a and c is the acute axial angle B (Fig. 1, Plate IX).

The diametral prism (Fig. 2, Plate IX), formed by these three pinacoids together, is analogous to the cube of the isometric system. It is bounded by three sets of unlike

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faces; it has four similar vertical edges, and four similar edges parallel to the axis a, but the other four edges, parallel to the axis b, are of two sets. The eight solid angles (corners) fall into two sets of four each, the ones above in front being similar to those below behind, and vice versa. These relations may be seen by studying Fig. 2, Plate IX.

The prisms are all of one type, the oblique rhombic prism, consisting each of four faces, cutting the a and b axes while being parallel to the c axis. The unit prism (cutting the a and b axes at unit length) is designated by the letter m. The termination is usually the basal pinacoid (Fig. 3, Plate IX).

The orthodomes consist of four faces parallel to the ortho-axis b, while cutting the other two axes. This form is usually terminated by the clinopinacoid (Fig. 4, Plate IX).

The clinodomes consist of four faces parallel to the clino-axis a, while cutting the other two axes. The ordinary termination is the orthopinacoid (Fig. 5, Plate IX).

The pyramids are really hemipyramids, consisting of four faces only in each form, with two complementary pyramids being necessary to make a closed form, since they replace the solid angles, of which there are two sets. Each face

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BOND

cuts all three crystallographic axes (Fig. 6, Plate IX).

From the symmetry, it can be seen that there are no closed forms in this system. Each form consists of two or four faces. Various combinations of the forms of the normal class make up the majority of crystal types of the system.

TRICLINIC SYSTEM (Anorthic System)

In crystals of the triclinic system, there are three axes of unequal length, all being oblique to one another. The angle between axes b and c is A, that between a and c is B, and that between a and b is Y (Fig. 1, Plate X). There is no necessary relation between the values of A, B, and Y, and any one may be greater or less than 90° .

In crystals of the normal class, there is a center of symmetry, the point of intersection of the three axes, but there is neither plane nor axis of symmetry.

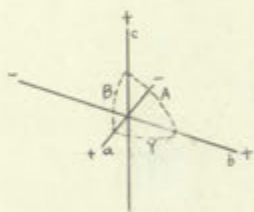
Each of the possible forms consists of two similar faces, parallel to one another and symmetrical with reference to the center of symmetry. The forms are of course open forms. They include the macropinacoid or a-pinacoid, the brachypinacoid or b-pinacoid, the base or c-pinacoid, prisms, macrodomes, brachydomes, and pyramids. In giving the terms macrodomes and brachydome, it is assumed that the

NEW MEALS

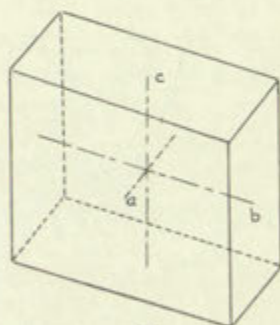


THE NEW MEALS

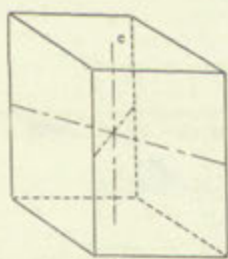
The new meals are designed to provide a balanced and nutritious diet for all. They are prepared using fresh ingredients and are served in a clean and hygienic environment. The menu includes a variety of dishes to cater to different tastes and preferences. The new meals are a testament to our commitment to providing the highest quality of service to our customers.



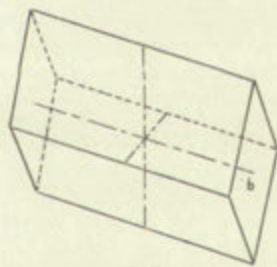
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Triclinic Axes



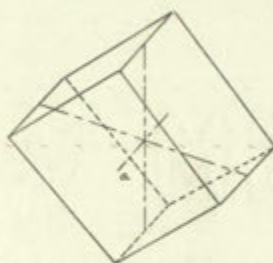
2
Diametral Prism
(Macro-(a), Brachy-(b),
and Basal (c) Pinacoids)



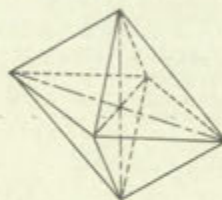
3
Prisms and
Basal Pinacoid



4
Macrodomes and
Brachypinacoid



5
Brachydomes and
Macropinacoid



6
Pyramids

STATE OF TEXAS

County of _____

Know all men by these presents, that _____ of the County of _____ State of Texas, for and in consideration of the sum of _____ Dollars, to _____ in hand paid by _____ the receipt of which is hereby acknowledged, have granted, sold and conveyed, and by these presents do grant, sell and convey unto the said _____ of the County of _____ State of Texas, all that certain _____

Acres, more or less, situated in _____

Acres, more or less, situated in _____

No.	Acres	Value	Remarks
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Witness my hand and seal of office this _____ day of _____ 19____.

Notary Public in and for the State of Texas

unit length of axis a is less than that of axis b. If this is reversed, the terms brachy- and macro- are interchanged.

The macropinacoid or a-pinacoid consists of the two faces parallel to the macro- or b axis and the vertical or c axis, while cutting the a axis (Fig. 2, Plate X).

The brachypinacoid or b-pinacoid consists of the two faces parallel to the brachy- or a axis and the vertical or c axis, while cutting the b axis (Fig. 2, Plate X).

The base or c-pinacoid includes the two faces parallel to the a and b axes, while cutting the c axis (Fig. 2, Plate X).

The diametral prism, bounded by the three pinacoids, is also shown in Fig. 2, Plate X. It is the analogue of the cube of the isometric system, and is bounded by three sets of unlike faces. Here like faces, edges, and solid angles include only a given face, edge, or solid angle, and that opposite to it.

The unit prisms, of which there are two, consist of two faces each, parallel to the c axis, but cutting the a and b axes at unit length. These two together, with the base, make a common form (Fig. 3, Plate X).

The macrodomes, of which there are two, consist of two faces each, parallel to the macro- or b axis, but cutting



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The following information is provided for your reference. This document is intended to provide a clear and concise summary of the project's progress and findings.

The project has been completed and the results are as follows. The data shows a significant increase in the number of participants over the course of the study, indicating a high level of interest and engagement.

The results of the study are consistent with the hypothesis, suggesting that the intervention had a positive impact on the outcome measures. The findings are discussed in detail in the report, which is available for review.

The project was supported by the following organizations and individuals. We would like to express our gratitude to all who provided assistance and resources throughout the project.

The project was completed on schedule and within budget. The results are promising and suggest that the intervention is a viable option for addressing the issue.

The project was a success and we are pleased with the results. The findings are consistent with the hypothesis and suggest that the intervention had a positive impact on the outcome measures.

The project was completed and the results are as follows. The data shows a significant increase in the number of participants over the course of the study, indicating a high level of interest and engagement.

The project was supported by the following organizations and individuals. We would like to express our gratitude to all who provided assistance and resources throughout the project.

the a and g axes. These together, usually with the brachypinacoid, make another common form (Fig. 4, Plate X).

The brachydomes include two forms also, each consisting of two faces parallel to the brachy- or a axis, while cutting the b and g axes. These are usually terminated by the macropinacoid (Fig. 5, Plate X).

The pyramids, of which there are four, corresponding to the four sets of solid angles of the diametral prism, cut all three of the axes. The four together make a closed form (Fig. 6, Plate X).

The majority of crystal types of this system are combinations of the above forms of the normal class. Triclinic crystals are very difficult to orient, because of their low grade of symmetry, and it is perhaps fortunate that minerals crystallizing in this system are comparatively rare.

1904

January 1st - New Year's Day
February 1st - Groundhog Day
March 1st - St. Patrick's Day
April 1st - April Fool's Day
May 1st - Labor Day
June 1st - Father's Day
July 1st - Independence Day
August 1st - Back to School
September 1st - Labor Day
October 1st - Halloween
November 1st - Thanksgiving
December 1st - Christmas

Compound or Twin Crystals. Crystals are very seldom found singly, but rather almost always occur in groups. Usually, the relations among individual crystals are irregular, depending upon chance. In some cases, however, the relations of individual crystals to one another are definite, conforming to definite law. If all faces and edges of one crystal are parallel to all faces and edges of another of the same species, they are said to exhibit parallel growth or parallel grouping. If, on the other hand, only a part of their similar faces, edges, etc., are in parallel position, they are said to form a twin crystal or twin group.

A twin crystal, then, is an intergrowth of two or more individual crystals in such a way that certain similar parts of the two individuals are parallel, while other parts are in reverse position with respect to each other. Sometimes symmetrical examples are found; more often the twinning is demonstrated by the reversed arrangement of some of the faces, in striae on the surface, and in reentrant angles, which are lacking in normal single crystals. A typical example of a twin crystal is a twinned cube of fluorite (Fig. 1, Plate XI).

The component parts of a twin crystal are related to each other, either as mirror-images (as if one were derived from the other by reflection over a common plane), or as if one were derived from the other by a revolution of 180°

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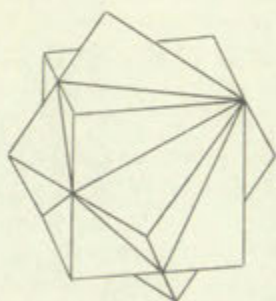
1

about some axis common to both, or as if both processes took place together. The plane and axis referred to above are the twinning-plane and twinning-axis. These have simple and rational relations to the crystal axes. It is to be observed that no plane of symmetry of an individual crystal can be a twinning-plane in the compound form, since the two halves of a crystal divided by a plane of symmetry are already either mirror-images of one another, or could have been derived by a rotation of 180° by half the crystal, on an axis of symmetry normal to the plane of symmetry. Further, no axis of even symmetry (binary, tetragonal, hexagonal) can be a twinning-axis, since a revolution of 180° by half the crystal on the axis produces exactly the same form as before.

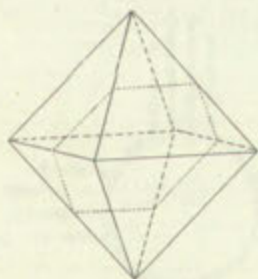
The plane by which the two crystals are united is the composition-plane. In most cases, it coincides with the twinning-plane; if not, it is commonly at right angles to the twinning-plane, that is, parallel to the axis of revolution.

Twin crystals are of two general types: contact-twins, when the two halves are simply united with one another by the composition-plane; and penetration-twins, when the two individuals actually interpenetrate, with a common center which is the center of the axial system for both individuals. This latter case is true in the fluorite twin in Fig. 1,



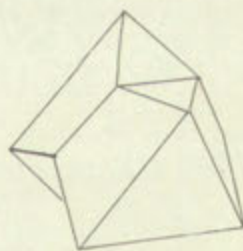


1
Twinned Cubes
of Fluorite

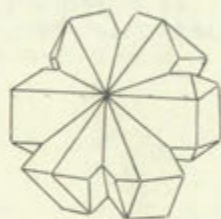


2

Contact-Twinned
Octahedron

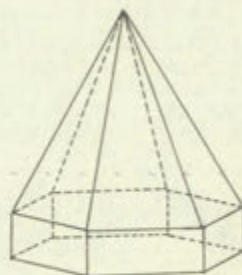


3



4

Staurolite Trilling



5

Hemimorphic Form
Zincite

THE UNIVERSITY OF CHICAGO

DEPARTMENT OF CHEMISTRY

LABORATORY OF ORGANIC CHEMISTRY

REPORT OF RESEARCH

Reaction of
Diethylmalonate

with

Diethylmalonate

Diethylmalonate

Diethylmalonate

Diethylmalonate

Plate XI. In Fig. 3, same plate, a simple contact-twinned octahedron is shown, derived by a revolution of 180° of half the crystal on the plane indicated by dotted lines in Fig. 2, same plate.

In some cases, extremely thin parallel layers are deposited in crystal growth, each succeeding layer having faces of the kind opposite to those in the preceding layer. This is known as polysynthetic twinning; it leads to fine striations on the plane at right angles to the lamellae. This type of twinning is often observed in the triclinic feldspars.

In certain cases of repeated twinning, the successively reversed individuals are not parallel, and the result is called symmetrical twinning. This type of twinning leads to six-rayed, ten-rayed, etc., twin crystals, known as trillings, fivelings, etc. A trilling of staurolite is shown in Fig. 4, Plate XI.

Holohedral and Hemihedral Forms. A holohedral form is a crystal form which has all the faces having like geometrical positions with respect to the crystallographic axes. Crystals of the normal class in each of the systems are holohedral forms.

A hemihedral form is one belonging to a class of lower symmetry than the normal class, having only one-half of the

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faces of the corresponding normal type. Thus the octahedron is a holohedral form of the normal class of the isometric system. The tetrahedron has but half the faces required for normal symmetry; it is a hemihedral form (Figs. 3, 4, and 5, Plate II). The positive and negative tetrahedrons together have all the faces necessary for normal symmetry. This proposition is true for all hemihedral forms: there are two complementary hemihedral forms, positive and negative, which may be considered as derived by enlargement of alternating faces of the normal form. Together, the complementary forms have all the faces required for normal symmetry.

If a form has only one-fourth of the faces necessary for normal symmetry, it is known as a tetartohedral form; four such complementary forms together have all the faces necessary for normal symmetry. Fig. 4 and Fig. 5, Plate VII, show two trigonal trapezohedrons, half of the tetartohedral forms necessary to yield, when combined, the normal dihexagonal pyramid.

Hemimorphic Forms. In hemimorphic forms, one-half of the faces necessary for normal symmetry are present, but in this case the faces present are only those belonging to one extremity of an axis of symmetry and crystallographic axis (Fig. 5, Plate XI). These forms have no center of symmetry, while hemihedral forms do possess a center of symmetry.

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Irregularities of Crystals. It has been mentioned previously that ideal crystals are seldom encountered, due to various causes. Most crystals are irregular, and their irregularities may be grouped under four heads: (1) Variation in form and dimensions; (2) Imperfections of surface; (3) Variation of angles; and (4) Internal imperfections and inclusions.

(1) Variation in Form and Dimensions. This type of irregularity is called distortion, and may be regular or symmetrical. The former case is more common. The latter case, while not common, is interesting because symmetrical distortion may produce forms of symmetry different from that of the group to which the crystals belong.

An irregularly distorted quartz crystal, consisting of a prism (m) terminated by positive (r) and negative (g) rhombohedrons, is shown in Fig. 1, Plate XII. A regularly distorted octahedron is shown in Fig. 2, same plate.

(2) Imperfections of Surface. Certain species are characterized by the presence of parallel ridges or furrows on certain crystal faces. These are striae or striations, and the crystal face is said to be striated. This phenomenon may be due to repeated (polysynthetic) twinning, as explained above, or it may be due to alternate occurrence of different faces, due in turn to regular interruption, during growth, of the causes tending to produce a certain face, and

THE HISTORY OF THE

The first part of the history of the world is the history of the human race. It is a story of struggle and progress, of triumph and defeat, of hope and despair. It is a story that has been told in many different ways, by many different people, in many different languages. But the story is the same. It is the story of our common humanity.

The second part of the history of the world is the history of the human mind. It is a story of discovery and invention, of knowledge and wisdom, of beauty and art. It is a story that has been told in many different ways, by many different people, in many different languages. But the story is the same. It is the story of our common intellect.

The third part of the history of the world is the history of the human heart. It is a story of love and compassion, of courage and sacrifice, of faith and hope. It is a story that has been told in many different ways, by many different people, in many different languages. But the story is the same. It is the story of our common emotions.

The fourth part of the history of the world is the history of the human spirit. It is a story of freedom and justice, of peace and harmony, of unity and brotherhood. It is a story that has been told in many different ways, by many different people, in many different languages. But the story is the same. It is the story of our common aspirations.

The fifth part of the history of the world is the history of the human future. It is a story of possibility and potential, of hope and dreams, of faith and belief. It is a story that has been told in many different ways, by many different people, in many different languages. But the story is the same. It is the story of our common destiny.

The sixth part of the history of the world is the history of the human present. It is a story of reality and truth, of life and death, of joy and sorrow. It is a story that has been told in many different ways, by many different people, in many different languages. But the story is the same. It is the story of our common existence.

The seventh part of the history of the world is the history of the human past. It is a story of memory and tradition, of culture and heritage, of identity and belonging. It is a story that has been told in many different ways, by many different people, in many different languages. But the story is the same. It is the story of our common roots.

The eighth part of the history of the world is the history of the human soul. It is a story of mystery and wonder, of awe and reverence, of transcendence and divinity. It is a story that has been told in many different ways, by many different people, in many different languages. But the story is the same. It is the story of our common essence.

the substitution of causes tending to produce a different face. This is known as oscillatory combination. It is well shown in quartz, in which the prism faces are often striated horizontally, due to alternating combination of the prismatic and rhombohedral faces.

Crystal faces are often irregular, due to various agents, among which are etching by chemical agents or by erosion, or irregularities in crystal growth. There may be minute elevations and depressions caused by oscillatory combination of two or more faces. Oftentimes these minute irregularities are of great importance in revealing the true symmetry of a crystal. Artificial etching is often resorted to in the laboratory to establish the identity of doubtful crystals.

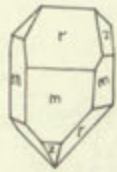
Curved surfaces may result from oscillatory combination on a very fine scale, from independent molecular conditions producing curvature in the lamellae, or from mechanical causes.

(3) Variations in Angle. Most distortions have no effect on the interfacial angles of crystals. Those which produce curved or striated surfaces, however, result in changes of angles. Heat and pressure during formation may result in some changes in angles, as well as producing distortion. The presence of impurities may have a like effect. Pressure during metamorphism may result in change

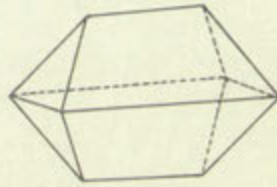


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1
Irregularly Distorted
Quartz Crystal



2
Regularly Distorted
Octahedron

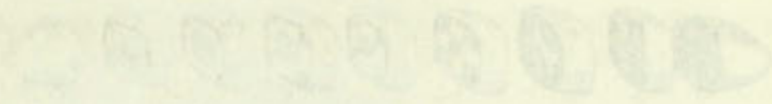


3
Impurities in
Chiastolite



Amphibole

Amphibole



Amphibole

Amphibole

of angles of completed crystals.

Pseudomorphs of a species may vary in angle, due to irregular changes during replacement of the old crystal.

With these somewhat rare exceptions, then, the law of constancy of interfacial angles may be regarded as valid.

There may be a slight difference in the angles of a crystal from those of another crystal of the same species without accidental cause, due to changes in chemical composition. Further, the changes in chemical composition occurring when isomorphous species grade into one another often result in slight but regular changes in interfacial angles.

(4) Internal Imperfections and Inclusions. The perfect transparency of crystals is often affected by disturbances in crystallization, by impurities taken up during crystallization, or by inclusion of foreign matter resulting from a partial chemical alteration. The term inclusion is given to any foreign body enclosed within a crystal, whatever its origin. Inclusions may often be explained by assuming rapid crystallization.

Liquid or gaseous inclusions are often seen, especially in quartz crystals. In some cases, cavities may occur without filling; if regular in form, and conforming to the symmetry of the species, they are called negative crystals.

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Solid inclusions vary widely, from purely mechanical admixtures such as sand grains, to separate particles of different minerals, such as magnetite in mica.

Microscopic crystals as inclusions are often of doubtful specific character, and are thus often called micro-lites. If the minute bodies do not have the regular form of crystals, but are evidently not truly amorphous, they are referred to as crystalloids.

Inclusions are more often regularly than irregularly arranged within the body of the crystal host. A very striking example of this is the regular arrangement of carbonaceous impurities in the variety of andalusite known as chiastolite, as shown in Fig. 3, Plate XII.

Pseudomorphs. While every mineral species is characterized, if crystallized, by a definite external form, crystals are occasionally encountered which have the form, in angles and habit, of a certain species, yet differ entirely in chemical composition. The interior of these crystals is usually granular or waxy, and there is no regular cleavage. Further, optical characters do not conform with those required by the outward symmetry of the crystal.

From these evidences, it is assumed that the material is a different mineral from the original, and has replaced the original, either molecule by molecule, or else by filling a

Two-fold experiments were carried out, the first being
designed to determine the effect of the concentration of
the solution on the rate of reaction. The second was
designed to determine the effect of the temperature on
the rate of reaction. In the first experiment, the
concentration of the solution was varied while the
temperature was kept constant. In the second
experiment, the temperature was varied while the
concentration was kept constant. The results of
these experiments are shown in the following tables.
Table 1 shows the effect of concentration on the
rate of reaction. The rate of reaction increases
as the concentration of the solution increases.
Table 2 shows the effect of temperature on the
rate of reaction. The rate of reaction increases
as the temperature increases.

cavity left by the removal of a crystal of the original mineral. These forms are called pseudomorphs.

Crystalline Aggregates: Structure of Minerals. It will be remembered that minerals, while not always occurring in definite crystals, are for the most part at least crystalline in internal structure.

The following terms are used in describing the manner in which crystalline individuals occur in groups. The individual grains, which may be thought of as imperfectly crystallized minerals, are usually included in one of the following three groups: (1) Columns, or fibers, in which case the structure is columnar or fibrous. (2) Thin laminae or lamellae, producing lamellar structure. (3) Grains, producing granular structure.

(1) Columnar and Fibrous Structure. If the elongated individuals are very thin, the structure is fibrous, as in asbestos or satin-spar gypsum. The fibers may or may not be easily separable, and there is a considerable variation in coarseness. Fibrous minerals often have a silky luster.

If the individuals are thick in comparison to those called fibers, the structure is referred to as columnar. If the columns are flattened, the structure is bladed.

If the fibers or columns cross in various directions, forming a net-like appearance, the structure is reticulated.

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If they radiate from a center in all directions and produce star-like forms, the structure is referred to as stellated.

If the individuals radiate from a center without producing star-like forms, the structure is simply radiated or divergent.

(2) Lamellar Structure. This type of structure occurs when the mineral consists of flat plates or leaves. The leaves may be straight or bent, and so produce straight lamellar or curved lamellar structure. If the plates are nearly parallel around a common center, the structure is concentric. If the laminae are very thin and separable, the structure is said to be foliaceous or foliated. Since the micas exhibit this structure to such a high degree, the term micaceous is often used.

(3) Granular structure. The individual grains of a mineral possessing granular structure differ a great deal in size in different specimens, and so the structure ranges from coarse granular to fine granular, and, when the individual grains are too small to be observed by the naked eye, to impalpable.

The terms phanero-crystalline and crypto-crystalline are also used to indicate grain size, the former when the grains are large enough, the latter when they are too small,

It is evident from a study of all directions and
 various star-like forms, the structure is referred to as

Star-like.

If the individual radii from a center without any
 form of star-like form, the structure is simply referred to
 as divergent.

(6) Irregular Structure. This type of structure occurs
 when the central portion of the plate or leaves. The
 leaves may be straight or bent, and no pattern exists.
 Instead of curved irregular structures. If the plates are
 nearly parallel around a common center, the structure is
irregular. If the leaves are very thin and separate,
 the structure is said to be irregular or collapsed. Since
 the plates outside this structure to such a high degree, the
 form irregular is often used.

(7) Granular Structure. The individual grains of a
 nearly spherical granular structure differ a great deal in
 size in different specimens, and so the structure ranges
 from granular to irregular, and when the individual
 grains are too small to be observed by the naked eye, so

irregular.

The above names—irregular and irregular
 are also used to indicate grain size, the former when the
 grains are large enough, the latter when they are too small.

to be seen by the naked eye.

If granular minerals are easily crumbled by the fingers, they are said to be friable.

Imitative Shapes. A great many minerals occur in the massive state, when they are compact and homogeneous, yet reveal true crystalline structure when examined under the microscope. The following are the standard terms used in describing various structure types of massive minerals.

Reniform: kidney-shaped. The internal structure may be radiated or concentric.

Botryoidal: when the mineral consists of a group of rounded prominences, resembling a bunch of grapes.

Mammillary; resembling botryoidal structure, but with larger prominences.

Globular: spherical or nearly so, with radiated or concentric structure. If attached to a rock, they are referred to as implanted globules.

Nodular: in tuberosc shapes, or with irregular projections on the surface.

Amygdaloidal: almond-shaped; the term is often applied to a rock containing almond-shaped nodules.

Coralloidal: consisting of interlaced branchings, like some coral.

Mossy: having the structure or appearance of moss.

Filiform or Capillary: consisting of very long and

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1. Introduction

2. Methodology

3. Results

4. Discussion

5. Conclusion

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7. Appendix

8. Acknowledgements

9. Contact Information

10. Disclaimer

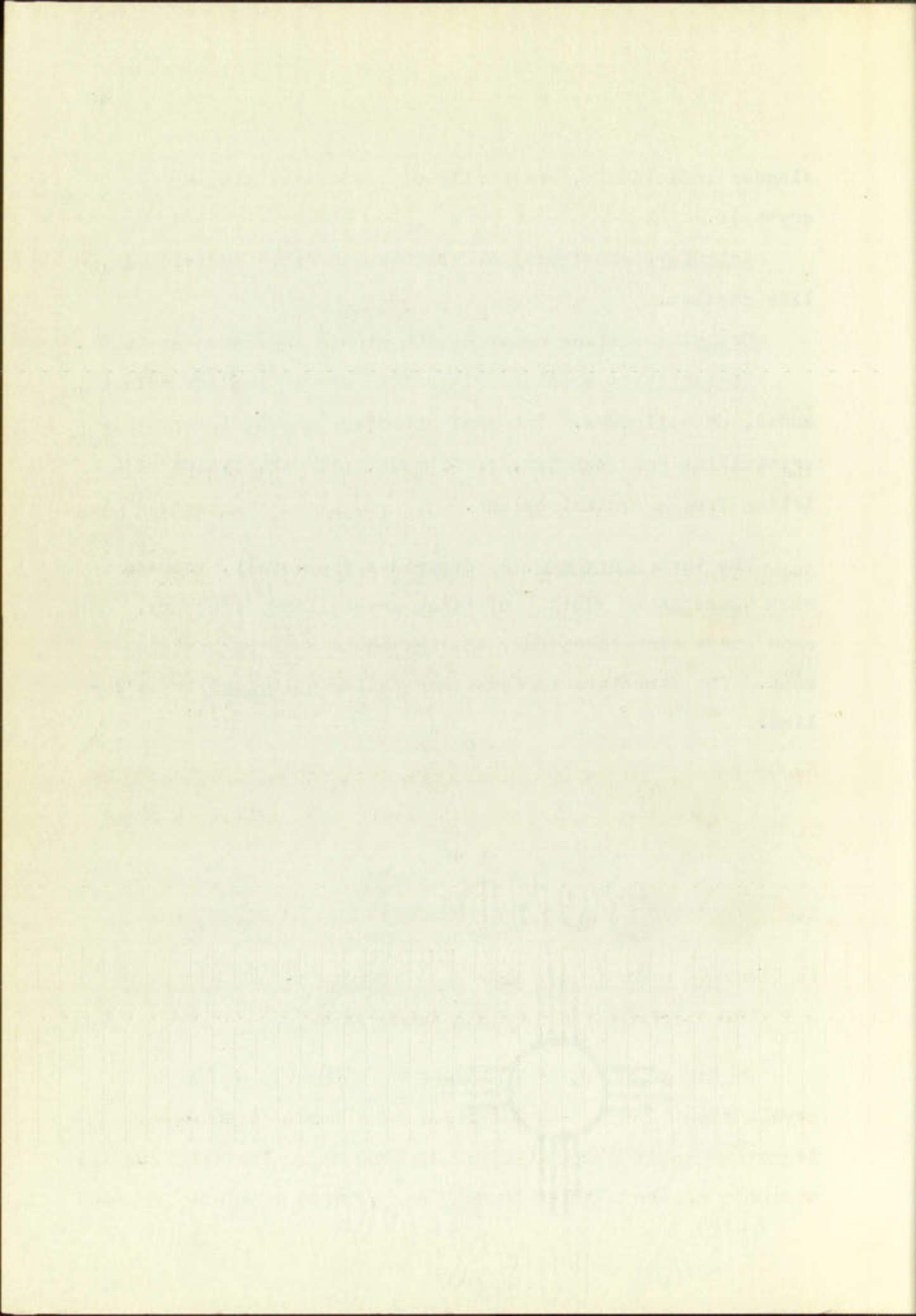
slender individuals, ordinarily of successive minute crystals.

Acicular: consisting of slender and rigid individuals, like needles.

Drusy: a surface covered with minute implanted crystals.

Stalactitic: when the mineral occurs in pendent columns, cones, or cylinders. Internal structure may be imperfectly crystalline and granular, or fibrous, with the fibers radiating from a central column.

The term amorphous, as described previously, is used when there is no visible distinct crystalline structure, even under the microscope, and the whole mass is homogeneous. The structure is sometimes called colloidal or jelly-like.



III. PHYSICAL MINERALOGY

Physical characteristics of minerals fall under the following heads:

- A. Characters depending upon Cohesion and Elasticity:
cleavage, fracture, tenacity, hardness, elasticity, etc.
- B. Specific Gravity, or the Density compared with that of water.
- C. Characters depending upon Light: color, luster, degree of transparency, special optical properties, etc.
- D. Characters depending upon Heat: heat-conductivity, change of form and of optical characters with change of temperature, fusibility, etc.
- E. Characters depending upon Electricity and Magnetism.
- F. Characters depending upon the reaction of the senses to the mineral: taste, odor, feel, etc.

In the majority of specimens of minerals, definite crystalline form is not developed to a degree high enough to permit ready identification in this way. For this reason, minerals are more often identified by means of their physical



characteristics. It must not be assumed that crystal form and physical characteristics are separate and distinct, for they are closely related. Most physical characters are related to the molecular structure, which in turn is responsible for the crystal form.

All properties of a mineral depend, directly or indirectly, both on the character of the chemical elements making the mineral up, and perhaps more especially on the manner in which the atoms are arranged.

Of the characters listed above, the specific gravity not only indicates the atomic mass of the elements present, but also the state of molecular aggregation. As an example of the first factor, all lead minerals are heavy because lead is heavy. As a demonstration of the latter, the same element may exist in different states of aggregation, leading to different specific gravities, as with diamond and graphite, both pure carbon, yet differing greatly in specific gravity, that of graphite being about 2, while that of diamond is about 3.5.

Specific gravity, and the characters under F, are the only characters which do not vary according to the direction in the crystal. For all other characters, it is true that directions which are crystallographically identical have like physical characters.

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The converse proposition, that unlike crystal directions have unlike characters, holds true only in certain cases, those characters which involve the propagation of light and radiant heat, change of volume with temperature change, electric radiation, magnetic induction, etc., being excepted. The proposition does hold true for characters of class A.

Optical properties of crystals are in general agreement with the symmetry, but they do not show all the variations in the symmetry, which are shown by certain other properties. Thus, while all directions are optically similar in isometric crystals (which are thus isotropic), the molecular cohesion is not similar in all directions, as is shown by cleavage in certain directions in some species.

A. Characters Depending upon Cohesion and Elasticity.

The term cohesion refers to the force of attraction between the molecules of a certain body, through which they tend to resist any attempt to separate them, as by breaking or scratching.

Elasticity is the force which tends to return the molecules to their original positions after they have been moved, as by change of shape or volume, under pressure.

Cleavage. Cleavage is the tendency of a crystalline mineral to break in certain definite directions, yielding more or



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less smooth surfaces. It shows a minimum of cohesion between the molecules on one side of the cleavage-plane and those on the other.

Planes of cleavage are always planes of crystalline structure, and as such are always parallel to possible crystal faces. The crystal planes have simple relations to the crystallographic axes, and usually are seen as common forms on the crystal in question, though there are important exceptions to this. For example, the mineral calcite, with rhombohedral cleavage, seldom shows rhombohedral faces. In general, however, cleavage takes place in a direction parallel to common crystal faces.

Cleavage is the same in all directions in a crystal which are crystallographically identical. For example, if cleavage exists parallel to one cubic plane in an isometric mineral, it must also exist, with equal development, in the other two cubic planes.

Since cleavage-planes are commonly parallel to some fundamental crystal face, they may often be used in orienting a crystal, when crystal faces are poorly developed.

Cleavage is defined in two ways: according to the direction, as cubic, rhombohedral, prismatic, basal, etc.; and also according to the ease with which it is obtained, and the smoothness of the resulting surface. It is said to be

form smooth surfaces. It shows a similarity of character between the surfaces on one side of the cleavage-plane and those on the other.

Planes of cleavage are always planes of crystallization, and as such are always parallel to the crystal faces. The crystal planes have their orientation to the crystallographic axes, and remain the same in form on the crystal in position, though they may be broken up into fragments. For example, the cleavage of mica is always parallel to the crystal faces, and the cleavage of mica is always parallel to the crystal faces.

Cleavage is the same in all directions in a crystal which are crystallographically identical. The cleavage is always parallel to one or more of the crystal faces. It may also exist, with one or more other two or three planes.

These cleavage-planes are usually parallel to one or more of the crystal faces, and may be broken up into fragments. For example, the cleavage of mica is always parallel to the crystal faces, and the cleavage of mica is always parallel to the crystal faces.

Cleavage is defined as the breaking of a crystal into fragments, and is always parallel to one or more of the crystal faces. It may also exist, with one or more other two or three planes.

perfect or eminent when very easily obtained, affording smooth surfaces, as in calcite and mica. Other grades are spoken of as distinct, indistinct or imperfect, interrupted, in traces, difficult, etc.

In some species, cleavage is better developed in certain varieties of the species than in other varieties of the same species, depending largely on the structure.

The common types of cleavage in the various systems are given below. In all cases, the adjective denoting the type of cleavage is derived from the name of the faces to which it is parallel.

1. Isometric System: cubic, octahedral, and dodecahedral, in order of frequency of occurrence.

2. Tetragonal System: basal, prismatic (parallel to first or second order prisms, or both), and pyramidal.

3. Hexagonal System:

Hexagonal Division: basal, prismatic, and rarely pyramidal.

Rhombohedral Division: basal, prismatic, and rhombohedral.

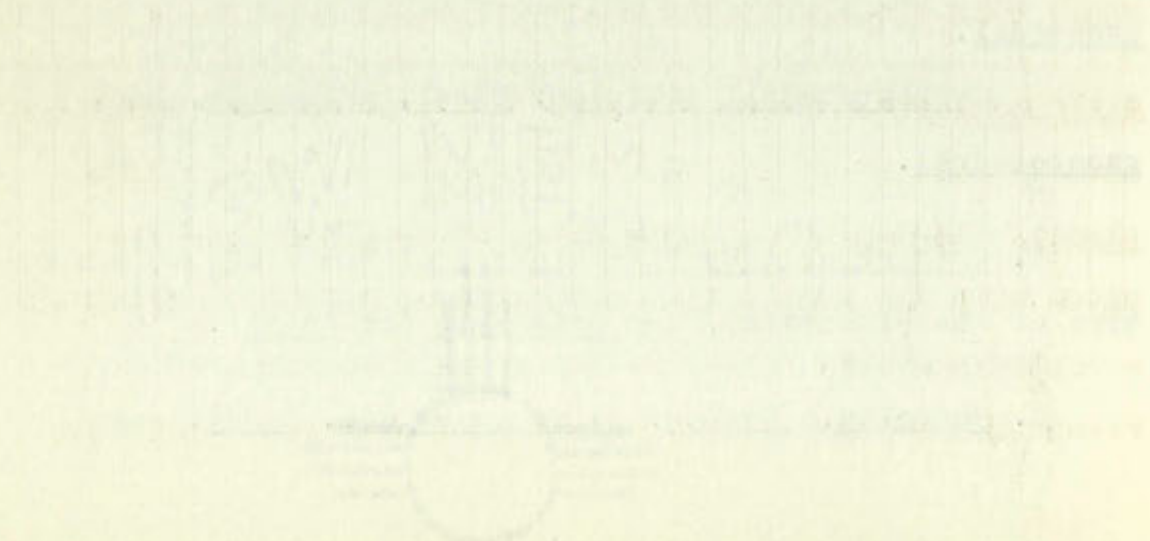
4. Orthorhombic System: pinacoidal (parallel to one or more of the pinacoids), and prismatic (or domal).

5. Monoclinic System: clinopinacoidal, basal, and

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The work has been carried out in accordance with the programme of work approved by the Council of the Institute. It has been a year of hard work and many achievements have been made. The results of the work are set out in the following pages.

The first part of the report deals with the general situation of the country and the progress of the work during the year. It is followed by a detailed account of the various projects and the results achieved. The report concludes with a summary of the work done and the plans for the future.



prismatic.

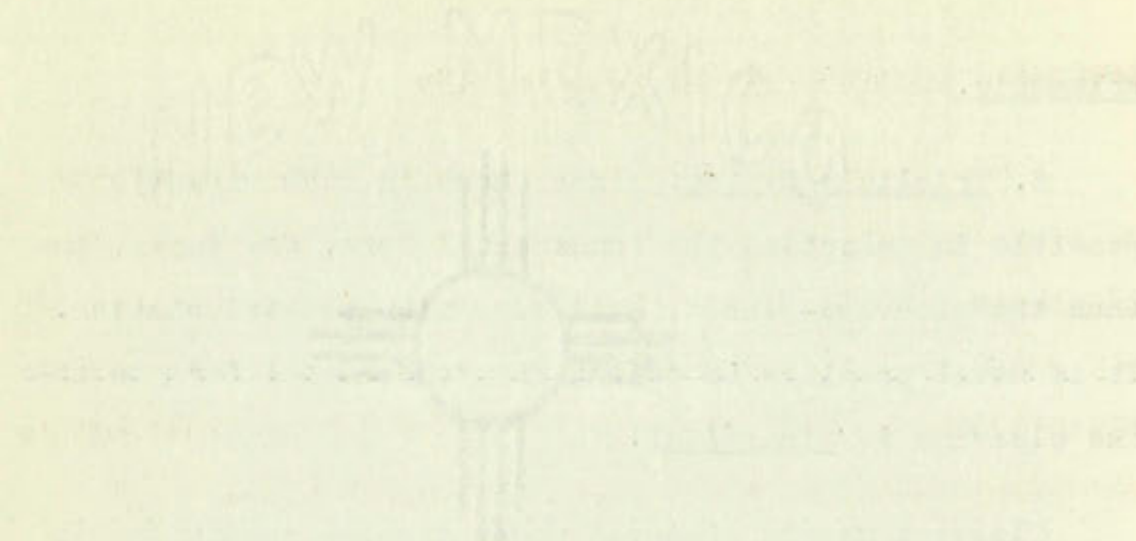
6. Triclinic System: since there is much variation possible in selecting the fundamental form, the faces, and thus the cleavage-planes, will vary with the orientation. It is usual practice to orient the fundamental form so that the cleavage is pinacoidal.

Cleavage may be observed under special conditions in some cases, when it is not apparent under casual observation. Sudden changes of temperature, or a sharp blow, may bring out hidden cleavage, not obtainable by simple breaking.

When cleavage is parallel to a closed form (cube, octahedron, etc.), pieces resembling crystals may be broken out of a crystalline individual, but may usually be distinguished from true crystals by the splintery nature of the cleavage faces as compared with crystal faces.

Cleavage-planes may have a pearly or iridescent luster, where thin cleavage plates have partially separated.

Gliding-planes. There are certain planes in most crystals, closely related to cleavage directions, called gliding-planes. Molecular slipping along these planes may take place with the application of pressure, resulting either in a separation into layers in the given direction, or in a revolution of the molecules into a new twinning position,



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producing secondary twinning-lamellae.

These secondary twinning-planes are often directions of easy separation, called parting to distinguish it from cleavage. Parting may also occur along gliding-planes. It may occur only on certain planes, those of secondary twinning-lamellae, while cleavage may occur in any plane having the given relation to the crystallographic axes.

Fracture. The term fracture is used to denote the form obtained by breaking a mineral in a direction other than that of cleavage. When the cleavage is perfect in several directions, as in calcite, fracture is not readily obtainable.

Fracture is defined as:

(a) Conchoidal, when the mineral breaks with curved concavities, resembling the interior of a clam shell. It is well illustrated by crystalline quartz. If the depressions are small, the fracture is referred to as small-conchoidal; if only partially distinct, as subconchoidal.

(b) Even, when the fracture surface approximates a plane, though rough and with numerous elevations and depressions.

(c) Uneven, when the surface is entirely irregular, as is true of most minerals.



THE [illegible] COMPANY

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(d) Hackly, when the elevations are sharp or jagged.

Various other terms, such as earthy, splintery, etc., are also used.

Hardness. The hardness of a mineral is the resistance which a smooth surface offers to abrasion. The degree of hardness is determined by observing the comparative ease or difficulty with which one mineral can be scratched by another material.

There are a great many grades of hardness among minerals, from that of extremely soft minerals, like talc, easily scratched by the finger-nail, to that of diamond, the hardest of known substances. The Mohs scale of hardness, standard for ordinary hardness determinations, consists of ten minerals of progressive degree of hardness. Beginning with the softest, the scale is as follows:

1. Talc.
2. Gypsum.
3. Calcite.
4. Fluorite.
5. Apatite.
6. Orthoclase.
7. Quartz.
8. Topaz.
9. Corundum.
10. Diamond.

This is not an absolute scale; that is, fluorite is not four times as hard as talc, or diamond five times as hard as gypsum. Measured in terms of absolute hardness, the diamond is several thousand times harder than talc. The difference

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I have the honor to acknowledge the receipt of your letter of the 14th inst. in relation to the matter mentioned therein.

The same has been forwarded to the proper authorities for their consideration.

I am, Sir, very respectfully,
Your obedient servant,

J. H. [Name]

[Address]

[City, State]

[Date]

[Signature]

[Title]

[Organization]

[Address]

[City, State]

[Post Office]

in hardness between any two adjacent members of the series is roughly equal to that between any two others, however. The scale was so chosen because the minerals, with the exception of course of diamond, are fairly common, and usually occur in convenient form for making tests. A set consisting of the first nine minerals is entirely adequate, since corundum is next to diamond in hardness among the minerals.

The approximate relative hardness of minerals may be determined in the field by comparing the hardness of the mineral with that of ordinary materials, the hardness of some of which, in terms of the Mohs scale, are as follows:

Finger-nail	2.25- 2.5
Copper penny	3.0
Ordinary cutlery steel	5.0
Ordinary window glass	5.5

There is some connection between the hardness of a mineral and its chemical composition, although there are exceptions to the general rule. Usually, however, the following statements hold true:

1. Compounds of the heavy metals, such as silver, copper, mercury, lead, etc., are soft, the hardness being usually less than 2.5- 3.0. Sulphides, arsenides, and oxides of iron, nickel, and cobalt are usually hard.

2. Most sulphides are soft (except as noted above), also most of the carbonates, sulphates, and phosphates.

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3. Hydrous salts are usually soft.

4. The very hard minerals are chiefly oxides and silicates, many of them containing aluminum.

In determining hardness, care should be taken to use fresh, smooth, crystalline surfaces for the determination, as far as possible. Altered surfaces are usually much softer than those of the fresh mineral. Distinguish between crushing of granular minerals and actual scratching. Do not confuse a white ridge, left on a hard mineral by a softer one, with a scratch. It is not necessary to use a large surface for the determination.

Tenacity. The term tenacity as applied to minerals refers to the manner in which they break or are distorted. They may be:

(a) Brittle, when the mineral falls to pieces or powder on the application of pressure, or on being struck with a hammer.

(b) Sectile, when pieces may be cut off with a knife, but the mineral still breaks under a hammer.

(c) Malleable, when pieces may be cut off and flattened under a hammer without breaking.

(d) Flexible, when the mineral will bend without breaking, and remain bent after pressure is removed.

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Elasticity. This term expresses the resistance of a solid to being changed in shape or volume with application of pressure, and also the tendency to return to the original shape after the pressure is removed. Every solid material has a limit of elasticity. If this limit is passed, the material will not return to its original form after pressure is removed, but will remain permanently bent, due to the establishment of new molecular positions under pressure.

Minerals display a wide range in elasticity, mica being thought of as a highly elastic mineral, while talc is flexible, but not elastic.

B. Specific Gravity or Relative Density.

The specific gravity of a mineral is the ratio of its density to that of water at a temperature of 4° Centigrade. This is often expressed as the ratio of the weight of a fragment of the mineral to the weight of a quantity of water equal in volume to the fragment. For example, one cubic inch of a mineral with a specific gravity of 3.0 weighs exactly 3 times as much as one cubic inch of pure water.

While accurate determinations of specific gravity require great care, very close determinations may be made with various simple instruments. In the field, very approximate determinations may be made by "weighing" the mineral in the hand. Experience in the lifting of minerals of known specific gravity will soon enable the collector to guess the

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specific gravity of an unknown mineral within one unit.

The average specific gravity of non-metallic minerals (minerals with non-metallic luster) is low, 2.6- 3.0. Non-metallic minerals with specific gravity over 3.5 are relatively heavy, and usually contain a heavy metal, though retaining their non-metallic luster.

The metallic minerals (those with metallic luster) are heavy, the average specific gravity being about 5.0.

Specific gravity is a good identifying characteristic in many cases. It is constant as long as structure and chemical composition in the species remain constant.

C. Characters depending upon Light.

While optical mineralogy is one of the most important fields in the study of minerals, and has furnished most of the evidence in the establishment of the presence of the definite molecular structure which is responsible for many of the other physical characteristics of minerals, it is beyond the scope of the present work to consider the principles of optics. The field is largely one for the specialist, and we shall do no more than mention some of the phenomena in minerals due to the action of light. For a concise discussion of optics as applied to mineral study, the reader is again referred to Dana's "Textbook of Mineralogy."

WATER



The water molecule is a polar molecule. The oxygen atom is more electronegative than the hydrogen atoms, so it attracts the shared electrons more strongly. This creates a partial negative charge on the oxygen atom and a partial positive charge on the hydrogen atoms. The resulting dipole moment is responsible for many of the unique properties of water, such as its high boiling point, its ability to form hydrogen bonds, and its role as a universal solvent.

Water is essential for life. It is the primary component of cells and is involved in many biological processes. It is also a major component of the Earth's atmosphere and hydrosphere. The study of water is a central part of chemistry and biology.

The physical characters of minerals resulting from the action of light, and useful in making determinations, are:

1. Diaphaneity: depending on the relative quantity of light transmitted.

2. Color: depending on the kind of light reflected or transmitted, as determined by selective absorption.

3. Luster: depending on the power and manner of reflecting light.

These three characters are discussed briefly in the following paragraphs.

1. Diaphaneity. The term diaphaneity may be more simply expressed as the degree of transparency. It depends on the amount of light transmitted, or, in other words, the amount absorbed in passing through the substance. Absorption is at a minimum in transparent solids, as ice; at a maximum in opaque substances, as iron. The terms commonly used in expressing the degree of transparency of a given mineral are:

(a) Transparent: when the outline of an object seen through the mineral is perfectly distinct.

(b) Subtransparent or semi-transparent: when objects may be seen through the mineral, but the outline is not distinct.



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(c) Translucent: when light is transmitted, but objects are not seen.

(d) Subtranslucent: when only the thin edges of the mineral transmit light.

(e) Opaque: when even thin edges fail to transmit light. This is only a relative term, since any solid object will transmit light of sufficiently thin.

2. Color. Ordinary white light consists of light waves of different wave-lengths, a certain color being produced by the action on the retina of the eye only by waves of a certain length. The color of a mineral depends upon the wave-length of the light reflected to the eye from the surface. Waves which are absorbed by the material do not give color.

The streak of a mineral is the color of its fine powder, usually obtained by rubbing the mineral on an unglazed porcelain tile. Certain minerals, especially metallic minerals, have characteristic streaks which are of value in determining the species.

The fundamental colors used in describing the color of minerals are: white, gray, black, blue, green, yellow, red, and brown. Various combinations of these colors, especially as influenced by luster, are those encountered in minerals. Most of the terms used in the descriptions of the colors of

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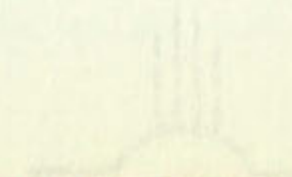
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5. Discussion: [Illegible text]

6. Conclusion: [Illegible text]



minerals to follow are self-explanatory.

3. Luster. The luster of minerals depends on the nature of the surface. Variation in the amount of light reflected produces degrees of intensity of luster. Variation in the nature of the reflecting surface produces different kinds of luster.

The recognized degrees of intensity of luster are as follows:

(a) Splendent: reflecting with brilliancy and giving well-defined images.

(b) Shining: producing images by reflection, but not well-defined ones.

(c) Glistening: affording a general reflection, but no image.

(d) Glimmering: affording only an imperfect reflection.

(e) Dull: when there is a total absence of luster.

The recognized kinds of luster are divided into two classes, metallic and non-metallic.

1. Metallic: the luster of the metals, as silver, copper, gold, etc. Minerals are usually not considered as having true metallic luster unless they are opaque.

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Imperfect metallic luster is described as sub-metallic.

2. Non-metallic.

(a) Adamantine: the hard and brilliant luster of the diamond. If also sub-metallic, it is referred to as metallic-adamantine.

(b) Vitreous: the luster of broken glass. If imperfect, it is called sub-vitreous. These are the most common luster types among minerals.

(c) Resinous: the luster of yellow resin, typified among minerals by most yellow sphalerite.

(d) Greasy: the luster of oily glass, near resinous luster, but to be distinguished from it.

(e) Pearly: the luster of pearl. If united with sub-metallic, the term metallic-pearly is used.

(f) Silky: the luster of silk, the result of fibrous structure.

The kind and degree of luster often vary with the different crystal faces of a single individual of a species.

Play of Colors. Minerals often display a play of colors or change of color when the mineral is rotated under the light.

Opalescence is a milky reflection from the interior of the crystal.

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Iridescence is the exhibition of prismatic colors in the interior or on the exterior of a mineral.

These phenomena are usually due to interference in light rays, caused by the presence of fine cleavage- or twinning lamellae.

Tarnish. A metallic surface is tarnished when its color differs from that of the fresh fracture surface. This is due to a thin film on the surface, derived from decomposition or from foreign sources.

Fluorescence. Certain minerals, notably fluorite, are affected by the action of certain kinds of light waves in such a way as to emit light themselves. If the mineral continues to emit light after the subjection to heat, light, or electric discharge causing the fluorescence, it is said to be phosphorescent.

D. Characters Depending upon Heat. We shall do no more than define the terms used below, since these characters are of little value in ordinary determinations of minerals.

Fusibility. Determination of the approximate relative fusibility of minerals (temperature at which melting or fusing takes place), in the blowpipe laboratory, forms a ready means for assisting in the identification of certain species. There is a wide range of fusibility among the minerals, from those which fuse on the thin edges in a candle

1880

The following is a list of the names of the persons who have been admitted to the membership of the Society since the last meeting of the Council, held on the 15th day of January, 1880.

Admitted on the 15th day of January, 1880.

Admitted on the 1st day of February, 1880.

Admitted on the 15th day of February, 1880.

Admitted on the 1st day of March, 1880.

Admitted on the 15th day of March, 1880.

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Admitted on the 1st day of November, 1880.

Admitted on the 15th day of November, 1880.

Admitted on the 1st day of December, 1880.

Admitted on the 15th day of December, 1880.

THE SECRETARY OF THE SOCIETY.

flame, to those infusible in the hottest flame obtainable with a blowpipe. The temperature of fusing is constant in a given species.

Conductivity. In general, crystallized minerals show differences in the rate of conduction of heat in different crystallographic directions, as well as differences in rate in different species. As far as we are concerned here, this characteristic is of little value in identifying minerals.

Expansion. The increase of volume with rise of temperature is a characteristic common to nearly all solids. The amount of expansion with a given rise in temperature varies with the species of mineral, and within crystals of a given species with the crystal direction. Delicate apparatus is required for these determinations, so we shall not consider the subject further here.

Specific Heat. The specific heat of any substance is the amount of heat required to raise the temperature of one gram of the substance one degree Centigrade. The unit of heat is the calorie, the amount of heat necessary to raise the temperature of one gram of pure water one degree Centigrade.

E. Characters Depending upon Electricity and Magnetism.

1. Electricity. These characters furnish little evidence useful in making ordinary mineral determinations, and so will be treated very briefly.

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Electrical Conductivity. In general, metallic minerals conduct electricity; non-metallic minerals do not. In all crystals except those of isometric minerals, the conductivity may vary with the crystallographic direction.

Frictional Electricity. All minerals become electrically charged by friction, though some species exhibit this phenomenon in a much higher degree than others. Polished surfaces usually become positively charged by friction; rough surfaces become negatively charged.

Pyroelectricity. The term pyroelectricity refers to the development of positive and negative charges of electricity on different parts of the same crystal when heated. Upon cooling, the positive and negative areas exchange places. Substances not crystallized cannot exhibit pyroelectricity, and the phenomenon is further restricted to non-conductors.

Piezoelectricity. If the volume of a crystal is changed by compression or tension, electric charges result, similar to those accompanying change of volume through heat. This is referred to as piezoelectricity. If compression produces a charge of given sign, tension will produce a charge of opposite sign.

Thermoelectricity. The placing in contact of two unlike metals (or two unlike metallic minerals) usually results in the charging of one positively and the other negatively.

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Natural metallic sulphides display a wider range in thermo-electricity than pure metals. The phenomenon, then, is dependent upon chemical composition rather than crystalline form.

2. Magnetism.

Magnetic Minerals. A few minerals in the natural state are capable of being attracted by a steel magnet, and are said to be magnetic. This is especially true for magnetite, the magnetic oxide of iron; pyrrhotite, magnetic sulphide of iron; and some varieties of native platinum.

Some other minerals are slightly magnetic, probably due to admixed magnetite.

If a mineral exhibits not only the property of being attracted by a magnet, but itself shows polarity, it is said to be a natural magnet. Magnetite shows this property in many cases.

All iron minerals are attracted by a sufficiently powerful electromagnet.

F. Characters Depending upon the Action of the Senses.

Taste. Only soluble minerals may have a taste. The various types of taste used for reference are:

(a) Astringent: the taste of vitriol.

(b) Sweetish astringent: the taste of alum.

Natural magnetic minerals display a wide range in their
 classification from weak to strong. The phenomenon, then, is
 dependent upon essential composition rather than crystalline
 form.

2. Magnetite

Magnetite (Fe_3O_4) is a few minerals in the natural state are
 capable of being attracted by a steel magnet, and are said to
 be magnetic. This is especially true for magnetite, the
 magnetic oxide of iron; pyrrhotite, magnetic sulphide of
 iron; and some varieties of nickel sulphide.

Some other minerals are slightly magnetic, probably
 due to minute magnetite.

It is a mineral which not only has property of being
 attracted by a magnet, but itself shows polarity, it is said
 to be a natural magnet. Experiments show this property is
 very common.

All iron minerals are attracted by a magnetism
 powerful enough to lift them.

3. Earth's Magnetism and the Role of the Sun

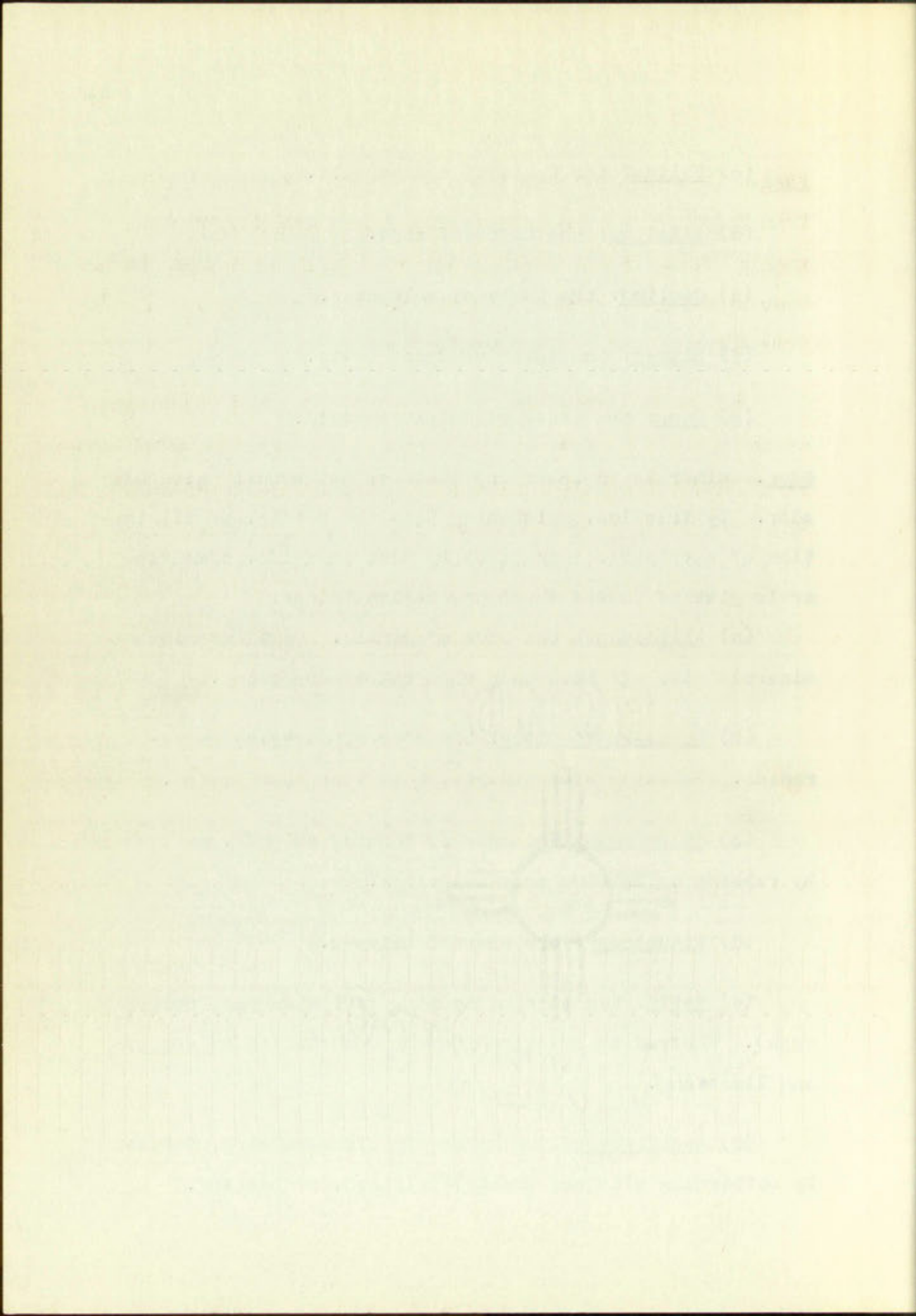
Earth - Our world's magnetic field has a life. The various
 types of rocks and the minerals that
 (a) magnetite, the rock of iron.

(b) Magnetite attraction: the rock of iron.

- (c) Saline: the taste of common salt.
- (d) Alkaline: the taste of soda.
- (e) Cooling: the taste of saltpeter.
- (f) Bitter: the taste of Epsom salts.
- (g) Sour: the taste of sulphuric acid.

Odor. Minerals in their dry state do not usually give off odor. By friction, moistening with the breath, or elimination of a volatile ingredient by heat or acids, some minerals give off odors which are designated as:

- (a) Alliaceous: the odor of garlic. Most arsenic minerals give off this odor when rubbed or heated.
- (b) Horse-radish odor: the odor of decaying horse-radish. Selenium minerals give this odor when heated.
- (c) Sulphurous: the odor of burning sulphur, derived by rubbing or heating many sulphides.
- (d) Bituminous: the odor of bitumen.
- (e) Fetid: the odor of hydrogen sulphide gas (rotten eggs). Derived by friction from some varieties of quartz and limestone.
- (f) Argillaceous: the odor of moistened clay, derived by moistening with the breath, friction, or heating.



Feel. In some minerals, the feel is very characteristics. Thus talc has a greasy feel; sepiolite (meerschaum) has a smooth feel. Other minerals may have harsh or meager feel. Some hygroscopic minerals (those which take up water rapidly from the air) adhere to the tongue.

In general, very few minerals have physical characters of the above types which are useful in making determinations. Those which do, however, are often very easily identified by means of these characters.

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IV. CHEMICAL MINERALOGY.

It has been stated previously that all properties of a mineral depend, either directly or indirectly, upon its chemical composition. For this reason, the determination of the chemical composition plays the most important role in the determination of minerals.

While the present work deals with the identification of minerals mostly by means of their physical characters, the fundamentals of the chemical phase will be treated here. Some knowledge of chemistry is fundamental in mineralogy, just as is some knowledge of crystallography.

Chemical Elements. The science of chemistry recognizes at present ninety-two substances which cannot be decomposed at will. These are the chemical elements.

Atoms and Molecules. The smallest particle of a given element which can play a part in a chemical reaction is the atom. An atom of a given element has a definite and characteristic weight. According to present theory, atoms are composed of positive charges (protons) and negative charges (electrons) of electricity, and the number of charges determines the chemical nature of the atoms, and thus of

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the sum of One Hundred Dollars

for the purchase of a certain quantity of

the same for the use of the State

and for the purchase of a certain quantity of

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the element. The protons have definite mass; the electrons do not supposedly have mass. Each atom supposedly consists of a nucleus of positive charges, surrounded by concentric shells of negative charges; the number of protons is equal to the number of electrons, and this number forms the atomic number of the given element. Thus the characteristics of any given element depend on the atomic number, or the number of protons and electrons, and not on the characters of the protons and electrons, for all are the same.

With rare exceptions, the atom cannot exist alone, but unites with other atoms of the same or different kinds to form the molecule. A molecule is the smallest particle into which a given substance can be divided without changing the chemical nature.

Two or more atoms of the same element may unite with each other to form a molecule of that element; for example, two atoms of oxygen unite to form a molecule of oxygen. Oxygen in the air is in this form. Three atoms of oxygen may unite to form a molecule of ozone, a very unstable form of the element.

Atoms of different elements may unite to form a molecule of a new substance; for example, two atoms of hydrogen unite with one atom of oxygen to form a molecule of water.

Atomic Weight. The relation of the mass of an atom of an



The following is a list of the names of the persons who have been elected to the office of Justice of the Peace for the year 1900. The names are listed in alphabetical order of their surnames. The names are: [The text in this section is extremely faint and illegible, appearing as a list of names.]

element to that of an atom of oxygen is its atomic weight. The atomic weight of oxygen is taken as exactly 16. With improved means of determination, the atomic weights are continually being redetermined. The present authorized atomic weights are given in a table on a later page.

Symbols and Formulas. The symbol of an element is the initial letter or letters, usually of its Latin name, by which it is represented in noting the chemical composition of a substance in which it plays a part. The formula of a substance is the expression, by means of symbols, of its chemical nature. Since the symbol is taken as indicating one atom of the element, and the formula as indicating one molecule of the substance, the formula also expresses the proportion of each element present. If a small sub-numeral follows the symbol of an element in a formula, it indicates that the given number of atoms of the element are present in one molecule of the chemical compound. For example, the symbol of hydrogen is H, and that of oxygen is O. The formula of water is H_2O , since one molecule of water contains two atoms of hydrogen and one atom of oxygen.

The formula of a compound is the simplest representation of its proportional chemical composition. The molecules of a given compound may consist of the number of atoms indicated by the formula, or of twice, three times, four times, etc., this number. Whether or not the molecule is as simple

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as the formula indicates may be determined in the case of volatile substances, but not in the case of non-volatile solid compounds, which means, then, that the true molecular weight of most minerals cannot be determined by means known at present.

Table of the Elements. Of the following elements, only about a dozen play an important part in making up the crust of the earth and the air and water surrounding it. The nine elements making up the bulk of the earth's crust (over 97%) are: oxygen, sulphur, silicon, aluminum, iron, calcium, magnesium, sodium, and potassium. Oxygen is the most abundant element (about 50%). Besides these, hydrogen is present in water, nitrogen in the air, and carbon in organic material.

International Atomic Weights 1933

<u>Name</u>	<u>Symbol</u>	<u>Atomic Number</u>	<u>Atomic Weight</u>
Alabamine	Ab	85	(221)
Actinium	Ac	89	(227)
Aluminum	Al	13	26.97
Antimony (<u>Stibium</u>)	Sb	51	121.76
Argon	A	18	39.944
Arsenic	As	33	74.91
Barium	Ba	56	137.36
Beryllium, Glucinum	Be	4	9.02
Bismuth	Bi	83	209.00
Boron	B	5	10.82
Bromine	Br	35	79.916
Cadmium	Cd	48	112.41
Caesium	Cs	55	132.91
Calcium	Ca	20	40.08
Carbon	C	6	12.00
Cerium	Ce	58	140.13
Chlorine	Cl	17	35.457

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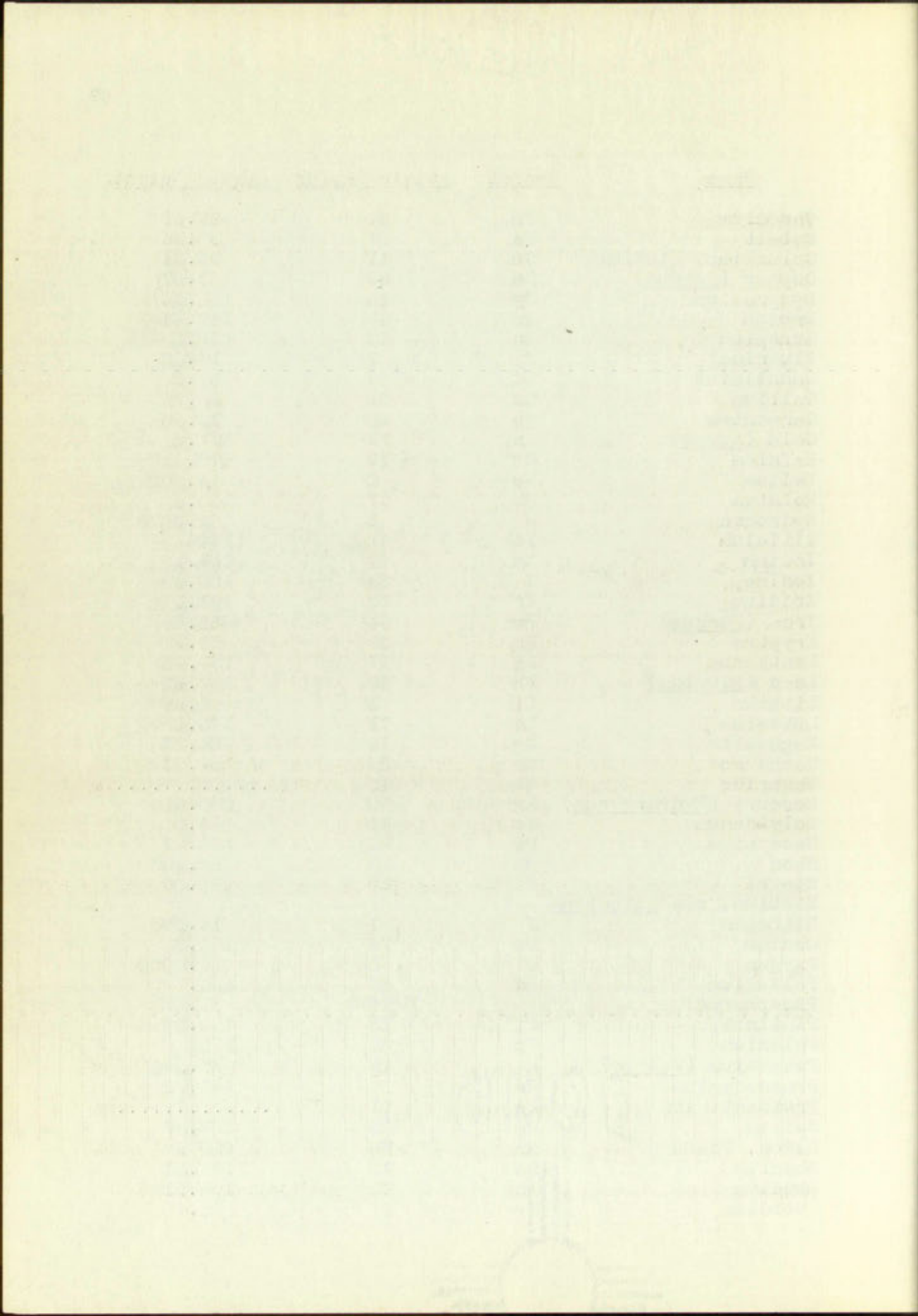
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<u>Name</u>	<u>Symbol</u>	<u>Atomic Number</u>	<u>Atomic Weight</u>
Chromium	Cr	24	52.01
Cobalt	Co	27	58.94
Columbium, Niobium	Cb	41	92.91
Copper (<u>Cuprum</u>)	Cu	29	63.57
Dysprosium	Dy	66	162.46
Erbium	Er	68	167.64
Europium	Eu	63	152.0
Fluorine	F	9	19.00
Gadolinium	Gd	64	157.3
Gallium	Ga	31	69.72
Germanium	Ge	32	72.60
Gold (<u>Aurum</u>)	Au	79	197.2
Hafnium	Hf	72	178.6
Helium	He	2	4.002
Holmium	Ho	67	163.5
Hydrogen	H	1	1.0078
Illinium	Il	61	(146)
Indium	In	49	114.76
Iodine	I	53	126.92
Iridium	Ir	77	193.1
Iron (<u>Ferrum</u>)	Fe	26	55.84
Krypton	Kr	36	83.7
Lanthanum	La	57	138.92
Lead (<u>Plumbum</u>)	Pb	82	207.22
Lithium	Li	3	6.940
Lutecium	Lu	71	175.0
Magnesium	Mg	12	24.32
Manganese	Mn	25	54.93
Masurium	Ma	43
Mercury (<u>Hydrargyrum</u>)	Hg	80	200.61
Molybdenum	Mo	42	96.0
Neodymium	Nd	60	144.27
Neon	Ne	10	20.183
Nickel	Ni	28	58.69
Niobium, see <u>Columbium</u>			
Nitrogen	N	7	14.008
Osmium	Os	76	191.5
Oxygen	O	8	16.0000
Palladium	Pd	46	106.7
Phosphorus	P	15	31.02
Platinum	Pt	78	195.23
Polonium	Po	84	(210)
Potassium (<u>Kalium</u>)	K	19	39.096
Praseodymium	Pr	59	140.92
Protoactinium	Pa	91
Radium	Ra	88	225.97
Radon, Niton	Rn	86	222
Rhenium	Re	75	186.31
Rhodium	Rh	45	102.91
Rubidium	Rb	37	85.44

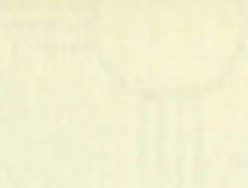


<u>Name</u>	<u>Symbol</u>	<u>Atomic Number</u>	<u>Atomic Weight</u>
Ruthenium	Ru	44	101.7
Samarium	Sm	62	150.43
Scandium	Sc	21	45.10
Selenium	Se	34	78.96
Silicon	Si	14	28.06
Silver (<u>Argentum</u>)	Ag	47	107.880
Sodium (<u>Natrium</u>)	Na	11	22.997
Strontium	Sr	38	87.63
Sulphur	S	16	32.06
Tantalum	Ta	73	181.4
Tellurium	Te	52	127.61
Terbium	Tb	65	159.2
Thallium	Tl	81	204.39
Thorium	Th	90	232.12
Thulium	Tm	69	169.4
Tin (<u>Stannum</u>)	Sn	50	118.70
Titanium	Ti	22	47.90
Tungsten (<u>Wolframium</u>)	W	74	184.0
Uranium	U	92	238.14
Vanadium	V	23	50.95
Virginium	Vi	87	(224)
Xenon	Xe	54	131.3
Ytterbium	Yb	70	173.04
Yttrium	Y	39	88.92
Zinc	Zn	30	65.38
Zirconium	Zr	40	91.22

For significance of atomic number, see p. 64. Atomic weights in parentheses have not been accurately determined. Names of elements in parentheses are the Latin or Greek names from which the symbol is derived.

Metals and Non-metals. The elements may be divided into two classes, the metals and the non-metals. There are also several elements with characters of both metals and non-metals, called semi-metals.

The true metals possess typical metallic physical characteristics, such as malleability, ductility, opacity, metallic luster, good conduction of heat and electricity, etc. Chemically, they play the part of the positive or basic



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element in simple compounds. Typical examples of metals are platinum, gold, iron, sodium, etc.

The non-metals, such as sulphur, carbon, oxygen, chlorine, etc., are, if solid, brittle, often transparent, poor conductors of heat and electricity, etc. Chemically, they act as the negative or acid element in compounds.

The semi-metals or metalloids, such as arsenic, antimony, and bismuth, have most of the physical characteristics of metals, except that they are more or less brittle. They often act as amphoteric substances; that is, they may play the part of either acid or basic elements.

In solution, the elements of simple chemical compounds usually occur as ions, which bear electric charges. The basic elements bear positive charges; the acidic elements bear negative charges. When positive ions of one element and negative ions of another, bearing equal charges, are brought close together, they unite, forming electrically neutral molecules. Thus sodium, a metal, bears a positive charge in solution, indicated thus: Na^+ . Chlorine, an acid element, bears in solution a negative charge of equal strength, indicated thus: Cl^- . When the two ions are brought close together, as by concentration or evaporation of the solution, they unite, neutralizing the electric charges, to form a molecule of the salt sodium chloride, NaCl .



Depending upon the character of the solution in which a compound is formed, a semi-metal may act as either a positive or negative element in a compound. Thus arsenic, As, may act as a positive element in one case, forming the compound As_2O_3 with oxygen (which is always negative). In another case, arsenic may act as an acid element, forming for example the compound $FeAs_2$ with the basic element iron.

The Periodic Law. While elements are entirely distinct from one another in physical and chemical properties, certain ones may resemble others in many characters, and so elements as a whole fall into so called isomorphous groups, in each of which all the elements are chemically similar, though not identical. When the elements are arranged according to their atomic numbers, they fall more or less into groups consisting of eight elements each, and the elements in each group have corresponding properties. This is known as the periodic law. The elements are thus arranged in the periodic table, which is largely the work of D. Mendeléeff. The reader is referred to any standard textbook of chemistry for examination of the table.

It is highly interesting to note that, in several instances, gaps were left in the table due to the fact that the elements which should be present had not been isolated and identified. From the position of the missing element in the table, the atomic number, atomic weight, and characters

1875

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of the element could be predicted, and this was done in several cases, even to the naming of the element, which had not even been discovered. When the element itself was isolated, it was found to correspond almost exactly to the predicted characters.

Combining Weight. It has been proved that the actual mass of a given element entering into a compound is always proportional either to its atomic weight or to some simple multiple of this; the atomic weight is thus also called the combining weight. It is the weight of the element in grams which will combine with 8 grams of oxygen, or with an equivalent weight of some other element.

In sodium chloride (common salt), NaCl , the masses of sodium and chlorine involved are found by analysis to be 39.4 and 60.6 parts respectively in 100 parts. These numbers are proportional to 23 and 35.4, the atomic weights of sodium and chlorine respectively; it is thus concluded that one atom of each is present in a molecule of the compound, and the formula is, therefore, NaCl .

Molecular Weight. The molecular weight is the weight of the molecule of the given substance, expressed in terms of the oxygen atom as 16. Thus the molecular weight of sodium chloride is $23 + 35.4 = 58.4$; that of water is $2 + 16 = 18$, etc. In gases, the exact molecular weight may be calculated, for 22.4 liters of any gas under standard conditions



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(temperature 0° C., pressure 760 mm.) has a weight, in grams, equal to the molecular weight. In solids, where the exact molecular weight cannot be determined, it is taken as the molecular weight derived from the simplest formula giving the true proportions of the elements present. The molecular weight is thus the combined weight of all the atoms present.

Valence. The valence of an element is given by a number representing the capacity of its atoms to combine with the atoms of a unit element like hydrogen or chlorine. Since one atom of sodium combines with one atom of chlorine, sodium has a valence of one; it is univalent. Since most elements will combine directly either with chlorine or hydrogen, their valences may be determined in the same way. If an element will not combine with either of these two, it will usually combine with oxygen. Oxygen has a valence of two, since two atoms of hydrogen are necessary to combine with one atom of oxygen. Knowing this, the valence of the unknown may be determined.

The valence itself is determined by the number of electrons in the outermost ring or shell in the atom. In positive elements, the number of electrons present in the outer shell is equal to the valence; in negative elements, the number of electrons lacking in the outermost shell (the number necessary to give the shell its maximum number) is equal to the valence. The maximum number of electrons

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possible, in any element, is two in the first shell (next to the nucleus), eight in the second shell, eight in the third, eighteen in each of the fourth and fifth shells, and thirty-two in the sixth (outermost) shell. Thus sodium, with the atomic number 11, has two electrons in the first shell, eight in the second, and one in the third; it thus has a positive valence of one. Chlorine, with the atomic number 17, has two electrons in the first shell, eight in the second, and seven in the third. Since the maximum for the third or outermost shell is eight, chlorine is lacking one; it thus has a negative valence of one. An element which may be either positive or negative has a definite positive valence when acting as a positive element, and a definite negative valence when acting as a negative element, but the two valences always add up to eight.

The elements seek to give away or to take on electrons so as to arrive at a state where there are no electrons missing in the outer shell; that is, all shells possible in the given element are filled. Thus positive elements, as sodium, with extra electrons in the outer shell, give them up and become positively charged. Negative elements, as chlorine, take on extra electrons to fill the outer shell, and so become negatively charged. Sodium can give up one electron, and so bears a unit positive charge; chlorine can take in an extra electron, and so bears a unit negative charge. Since positive and negative charges attract each



other, the two electrically charged ions come together, and, since their charges are equal, unite to form an electrically neutral molecule.

Many elements may have different valences in different compounds. Thus iron may have a positive valence of two or three, in FeCl_2 and FeCl_3 respectively. This is due to the fact that an atom of iron may give up two or three electrons, depending upon the nature of the solution in which the compound is formed.

Ionization. Simple chemical compounds in solution always separate to some extent into electrically charged ions. For example, molecules of sodium chloride, when dissolved in water, separate into Na and Cl ions. This is called ionization, and the degree differs highly in different compounds. In general, salts (compounds containing a metal as the positive element and an acid-former as the negative element) are freely ionized in solution. Acids (compounds yielding hydrogen (H^+) ions in solution) and bases (compounds yielding hydroxyl (OH^-) ions in solution) may ionize freely or little, depending on the acid or basic element. The best acid-forming elements are fluorine, chlorine, etc.; the best base-forming elements are the metals caesium, sodium, potassium, lithium, etc.; when best means that the compounds are freely ionized in solution.

Chemical Reaction. Substances in solution frequently react

other, the two electrically charged ions come together, and since their charges are equal, with a force an electrically neutral molecule.

Many elements may have different valences in different compounds. Thus iron may have a positive valence of two or three, in ferric and ferrous respectively. This is due to the fact that an atom of iron may give up two or three electrons, depending upon the nature of the solution in which the compound is formed.

Iron, like chemical compounds in solution always exists to some extent into electrically charged ions. For example, solution of sodium chloride, when dissolved in water, separates into Na and Cl ions. This is called ionization, and the degree differs slightly in different compounds. In general, salts (compounds containing a metal as the positive element and an acid-former as the negative element) are freely ionized in solution. Salts (compounds yielding hydrogen ions) form in solution and form low acids yielding hydroxyl ions in solution and form low acids or bases, depending on the acid or base formed. The only acid-forming elements are chlorine, sulfur, and the first two-forming elements are the acids carbonic, silicic, phosphoric, arsenic, and boron. When light waves pass through a transparent medium, they are ionized. The ionization varies

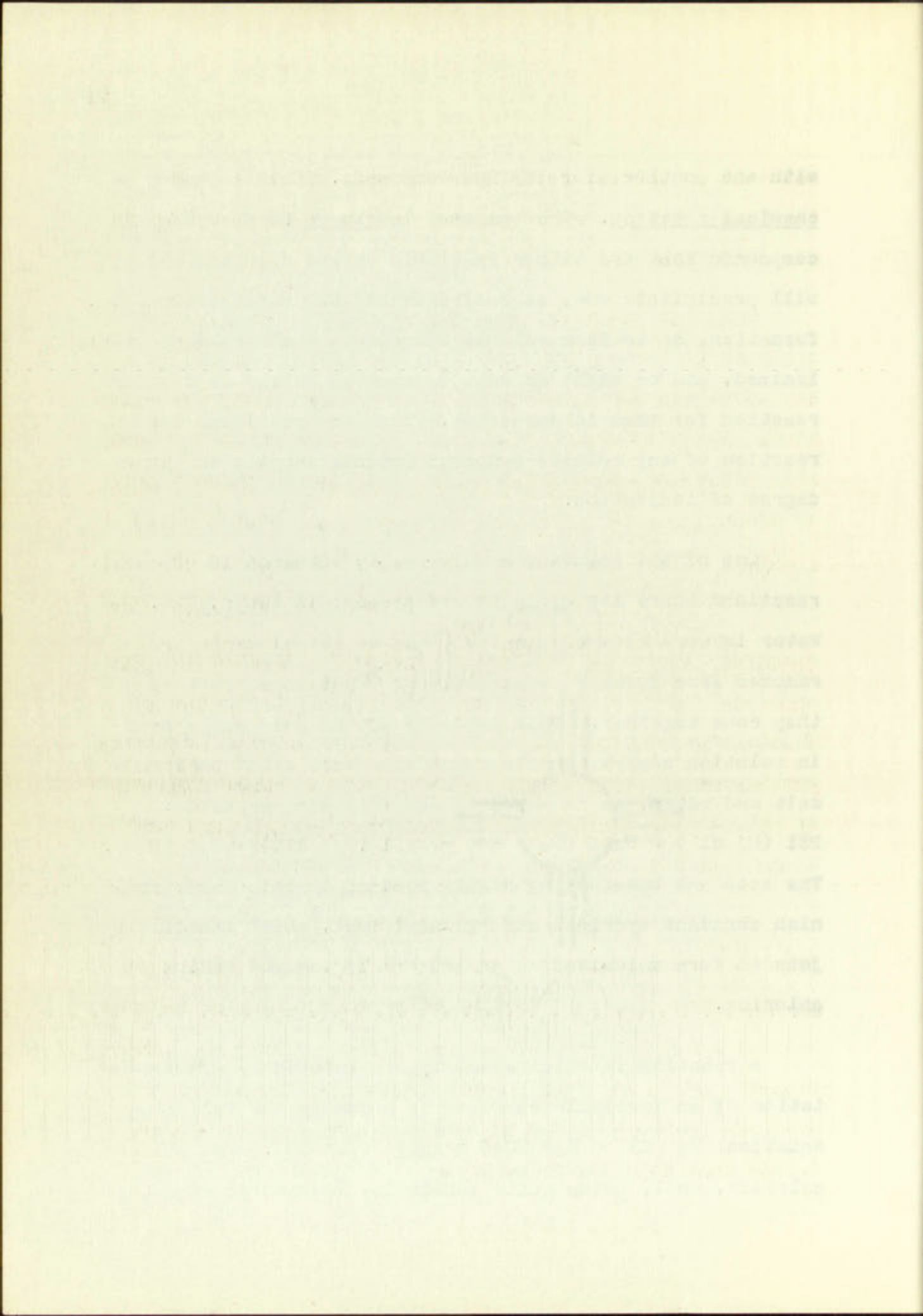
with one another, forming new compounds. This is known as chemical reaction. The tendency is always to form new compounds that are either insoluble in the solution and will precipitate out, as is frequently the case in mineral formation, or to form soluble substances that are very little ionized, and so might as well be removed as far as further reaction for them is concerned. Thus the readiness for reaction of any soluble compound depends largely on the degree of ionization.

One of the substances universally obtained in chemical reactions where its elements are present is water, H_2O . Water is very slightly ionized, and so its elements are removed from further possibility of reaction as fast as they come together. This explains why an acid and a base in solution always tend to react with each other to form a salt and water, as is shown in the following equation:

$$HCl (H^+ Cl^-) + NaOH (Na^+ OH^-) = NaCl (Na^+ Cl^-) + H_2O (HOH).$$

The acid and base, being highly ionized in this case, furnish abundant hydrogen and hydroxyl ions, which immediately join to form unionized water and freely ionized sodium chloride.

A reaction in which elements are removed by precipitation of an insoluble compound is shown by the following equation: $Na^+ Cl^- + Ag^+ NO_3^- = \underline{AgCl} + Na^+ NO_3^-$. The silver chloride, $AgCl$, being quite insoluble, is removed from the



solution as fast as the silver and chloride ions come together, leaving freely ionized sodium nitrate, NaNO_3 , in the solution.

Chemical equations give the quantities of compounds involved in a reaction, and indicate that the weight of all the substances involved is equal before and after the reaction. Thus $23 + 35.4 = 58.4$ grams of sodium chloride reacts with $107.8 + 14 + 48 = 169.8$ grams of silver nitrate, a total of 228.2 grams of substance, to form $107.8 + 35.4 = 143.2$ grams of silver chloride and $23 + 14 + 48 = 85$ grams of sodium nitrate, a total again of 228.2 grams of substance.

Chemical compounds. As stated previously, a chemical compound is a combination of two or more elements united by chemical attraction, and the elements are present either in proportion of their atomic weights or some simple multiple of these. Any substance not satisfying these requirements is a mechanical mixture, not a chemical compound.

The chemical compounds which occur in the form of minerals are divided into various classes. Examples are: oxides, combinations of oxygen with other elements, usually metals; sulphides (selenides, tellurides, arsenides, antimonides, etc), in which sulphur (selenium, tellurium, arsenic, antimony, etc.) is combined with another element in the same capacity as oxygen.

... as the other ...
... leaving ...
... the ...

Chemical ...
... involved in a ...
... the substance ...

... Thus $25 + 25 = 50$...
... with $107.5 - 14 + 25 = 118.5$...
... of 252.3 grams of ...

grams of silver ...
... sodium nitrate, a ...

Chemical
... found in a ...
... chemical ...

proportion of their ...
... of these, any ...
... is a ...

The chemical ...
... elements are ...
... exhibit ...

...; ...
...; ...
...; ...

... in the ...
...
...

Other chemical compounds which play a part in mineral formation are classed as acids, bases, and salts. As mentioned previously, acids in solution yield hydrogen ions; bases in solution yield hydroxyl ions; and salts in solution yield both acid and basic ions.

Acids as minerals are not important, with the one important exception of the mineral quartz, SiO_2 , which may be considered as dehydrated silicic acid. A few bases occur as minerals, such as brucite, $\text{Mg}(\text{OH})_2$.

Most minerals are classed as salts. The common types of salts, together with examples of minerals, are:

Chlorides, salts of hydrochloric acid, HCl : halite, NaCl ; pyrargyrite, AgCl , etc.

Nitrates, salts of nitric acid, HNO_3 : niter, KNO_3 ; soda niter, NaNO_3 , etc.

Carbonates, salts of carbonic acid, H_2CO_3 : calcite, CaCO_3 ; magnesite, MgCO_3 , etc.

Sulphates, salts of sulphuric acid, H_2SO_4 : gypsum, $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$; barite, BaSO_4 , etc.

Phosphates, salts of phosphoric acid, H_3PO_4 : rock phosphate, $\text{Ca}_3(\text{PO}_4)_2$, etc.

Silicates, salts of the various silicic acids, the most important of which are metasilicic acid, H_2SiO_3 , a salt of

The first part of the report deals with the general situation of the country and the progress of the work done during the year. It is followed by a detailed account of the various projects undertaken and the results achieved. The report concludes with a summary of the work done and a list of the names of the staff members who have been engaged in the work.

The second part of the report deals with the financial statement of the year. It shows the total income and expenditure and the balance carried forward. It also shows the details of the various items of income and expenditure and the reasons for the variations from the budget.

The third part of the report deals with the personnel statement of the year. It shows the total number of staff members employed and the details of their salaries and allowances. It also shows the details of the various items of expenditure on staff and the reasons for the variations from the budget.

The fourth part of the report deals with the general remarks on the work done during the year. It discusses the various problems encountered and the steps taken to overcome them. It also discusses the various suggestions and recommendations made by the staff members and the reasons for accepting or rejecting them.

which is rhodonite (MnSiO_3); and orthosilicic acid, H_4SiO_4 , a salt of which is tephroite (Mn_2SiO_4).

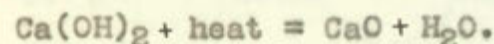
Normal, Acid, and Basic Salts. A normal salt is a neutral salt, in which all the hydrogen of the acid has been replaced by metallic or other positive ions. Thus K_2SO_4 is the normal potassium salt of sulphuric acid.

In acid potassium sulphate, KHSO_4 , only half the hydrogen of the acid has been replaced by the positive element potassium; it is an acid salt.

A basic salt is one in which the basic bonds of the compound are not all satisfied by the acid. Thus the mineral malachite, with the formula $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$, is a basic salt.

Most minerals are not simple salts, but are more or less complex double salts containing several metallic elements.

Water of Crystallization. Many minerals contain the elements of water in actual combination in the molecule of the mineral, and give up the water when heated, usually to a high temperature. Thus calcium hydroxide, $\text{Ca}(\text{OH})_2$, gives off water when heated and becomes unslaked lime, thus:



In some minerals, water is present which readily comes

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off when the mineral is heated to a moderately high temperature. The water here is not an integral part of the molecule. It is called water of crystallization, and is indicated as such in the formula, as in gypsum, $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$. The water may be necessary as far as the physical characters of the mineral are concerned. Gypsum which has lost its water of crystallization becomes an entirely different mineral, anhydrite, CaSO_4 . Chemically, the two minerals are alike in solution, explaining the previous statement that the water of crystallization is not an integral part of the molecule.

Isomorphism. Minerals which have analogous composition and closely related crystal form are said to be isomorphous. These minerals may be put into isomorphous groups, and the members of a group frequently grade into one another as the variable chemical element is replaced by another. One such group is the Aragonite Group, consisting of the minerals aragonite, CaCO_3 , witherite, BaCO_3 , strontianite, SrCO_3 , and cerussite, PbCO_3 .

Chemical Examination of Minerals. It has been stated already that, since the chemical composition of a mineral is its fundamental and important character, the determination of the chemical composition is the ultimate step in mineral identification, and must be resorted to when all other methods of determination have failed.

The first part of the report deals with the general situation of the country and the progress of the work done during the year. It is followed by a detailed account of the various projects and the results achieved. The report concludes with a summary of the work done and a list of the names of the staff members who have been engaged in the work.

The second part of the report deals with the financial statement of the year. It shows the total income and expenditure and the balance carried over to the next year. It also shows the details of the various items of income and expenditure.

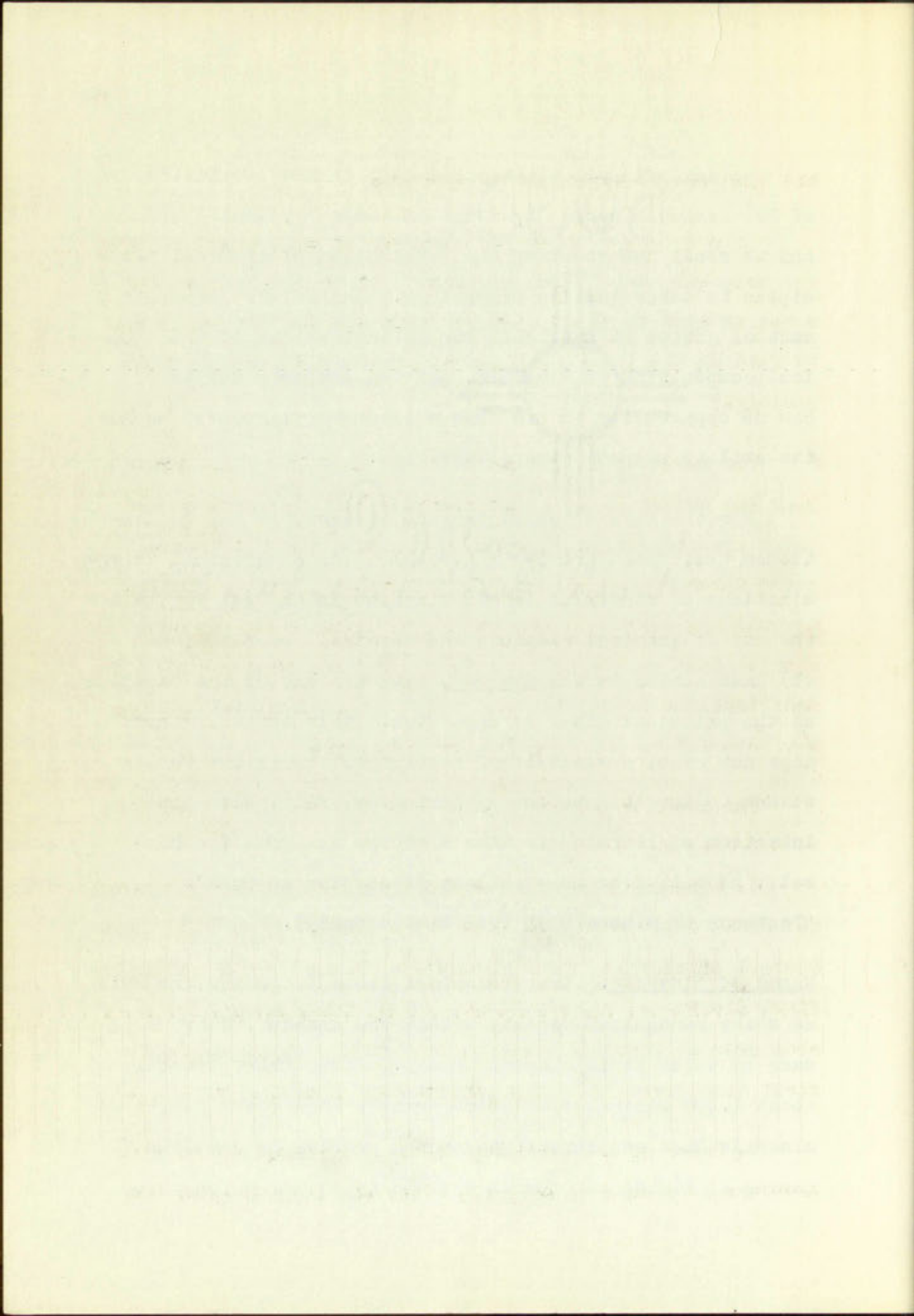
The third part of the report deals with the accounts of the various projects. It shows the progress of each project and the results achieved. It also shows the details of the various items of income and expenditure for each project.



We are primarily interested here in the identification of New Mexico minerals by means of their physical characters, and so shall not consider the application of chemical principles to determinative mineralogy. A chemistry laboratory must of course be available for determinations of the chemical composition of minerals, and the ordinary collector has no opportunity to use such a laboratory, even if he has the ability to make mineral analyses.

For the sake of completeness, however, it may be mentioned that there are two general methods of chemical determinations of minerals: (a) Examination in the wet way, with the use of chemical reagents and chemical apparatus; and (b) Examination in the dry way, with the use of the blowpipe as the principal piece of apparatus. This latter method does not require specialized knowledge, and if the reader wishes to investigate the subject more fully, with the intention of learning to make blowpipe analyses for himself, he will find an excellent discussion in Dana's "Textbook of Mineralogy" (see bibliography).

Names of Minerals. Every distinct mineral species, as well as every recognized variety within the species, bears a name by which it is commonly known. Since there are only about 1,200 mineral species at present known, the naming of minerals does not constitute such a problem as does the naming of living and fossil organic types, of which there



are hundreds of thousands of species.

In many cases, minerals have two or more names in common use, but usually one of them is to be preferred. The names as used in this paper for such species are those used by Ford in the fourth edition of Dana's "Textbook of Mineralogy."

The names of all minerals discovered in recent years bear the suffix ite. A few common minerals, named in the early days of mineralogy, still retain their old names. Among these are quartz, beryl, orthoclase, topaz, gypsum, tourmaline, corundum, amphibole, pyroxene, etc. In some species (and varieties) the old names have been replaced by modifications ending in ite, such as almandine and havvne, now referred to as almandite and havvnite.

The names of minerals have been derived from a variety of sources, as follows:

1. Locality names; after the locality where the mineral was first discovered, or where it is particularly well developed: andalusite, first discovered in Andalusia; cubanite, first discovered at Barracanao, Cuba; franklinite, found in abundance at Franklin Furnace, New Jersey; vesuvianite, first discovered in ancient extrusives from Mt. Vesuvius.

2. Names of men, usually famous mineralogists or discoverers of minerals: bornite, after the mineralogist von

the number of specimens of minerals.
 In many cases, minerals have not been named in the
 past, but usually one of them is to be preferred. The
 names are used in this paper for such species and their
 by the first edition of Dana's *System of Mineralogy*.

The names of all minerals discovered in recent years
 have the suffix *ite*. A few common minerals, named in the
 early days of mineralogy, still retain their old names.
 These are quartz, feldspar, mica, calcite, gypsum,
 hematite, magnetite, pyrite, arsenic, stibnite, etc. In
 species (and varieties) the old names have been replaced by
 modifications ending in *ite*, such as *aluminite* and *berylite*.
 Now referred to as *aluminum* and *beryllium*.

The names of minerals have been derived from a variety
 of sources, as follows:

1. Locally named after the locality where the mineral
 was first discovered, or where it is particularly well
 developed. First discovered in Arkansas; *arkansite*.
 First discovered in Massachusetts; *massicotite*.
 First discovered in England; *English spar*, *English
 lead*, *English tin*.
2. Named in honor of some distinguished person
 connected with the discovery, or the name of the
 discoverer.

Born; sillimanite, after Prof. Benjamin Silliman, famous mineralogist; smithsonite, after James Smithson, founder of the Smithsonian Institution; willemitte, after William I, a king of the Netherlands; wollastonite, after the English chemist W. H. Wollaston.

3. From the chemical composition: arsenopyrite, iron sulpharsenide; barite, barium sulphate; calcite, calcium carbonate; columbite, iron and manganese carbonate; cuprite, cuprous oxide; halite, sodium chloride (chlorine is one of the halogens); magnesite, magnesium carbonate; vanadinite, lead chloride and vanadate; zincite, zinc oxide.

4. From some characteristic physical property: azurite, from the azure-blue color; magnetite, from the strong magnetism; pistacite (var. epidote), from the pistachio-green color; satin spar (var. gypsum), from the luster; tetrahedrite, from the crystal habit.

5. From Greek or Latin names indicating some property or association of the mineral: argentite, silver sulphide, from the Latin name for silver; graphite, from the Greek verb meaning "To write", referring to its use in lead pencils; orthoclase, from the Greek words referring to its regular right-angled cleavage; sphalerite, from the Greek word for "treacherous", referring to the fact that it was often mistaken for galena; gypsum, from the Greek words for "earth" and "cook", referring to the calcining of gypsum

From the etymology of the word "crystal" we know that it is derived from the Greek word "kratos" meaning "power" or "strength". This is because crystals are formed by the growth of atoms or molecules in a regular, repeating pattern, which gives them a strong, rigid structure.

The word "crystal" is also used to describe a clear, transparent material that has a regular, repeating atomic structure. This is because the atoms or molecules in a crystal are arranged in a regular, repeating pattern, which allows light to pass through the material without being scattered or absorbed.

In addition to its use in describing a material, the word "crystal" is also used in a figurative sense to describe a person who is clear, transparent, and strong. This is because a crystal is a material that is both clear and strong, and a person who is clear and strong is a person who is both honest and resilient.

The word "crystal" is also used in a technical sense to describe a material that has a regular, repeating atomic structure. This is because the atoms or molecules in a crystal are arranged in a regular, repeating pattern, which gives them a strong, rigid structure. This is in contrast to a material that is amorphous, which does not have a regular, repeating atomic structure.

in making Plaster of Paris; pyroxene, from the Greek words for "fire" and "stranger", from the early idea that the mineral was not of igneous origin; pyrite, also from the Greek for "fire", referring to the fact that pyrite often yields sparks when struck.

Classification of Minerals. The first scientific classification of minerals was made by James Dwight Dana in his "System of Mineralogy", published in 1837. The sixth edition of the System appeared in 1892, but three appendices have been published since then, the last in 1915, and a new edition of the complete work will probably be published within a year or two. The "System of Mineralogy" is the most complete and comprehensive work on the classification of minerals in the English language.

The method of classification used in the System is that which groups similar chemical compounds together in a common class, and further arranges the species into groups within the classes according to less fundamental relations existing among them, in chemical composition, crystalline form and other physical properties.

Dana's Scheme of Classification

- I. Native Elements.
- II. Sulphides, Selenides, Tellurides, Arsenides, Antimonides.
- III. Sulpho-salts: Sulpharsenites, Sulphantimonites, Sulphobismuthites.

in regard to the history of the word "system", the word "system" is derived from the Greek "systēma", which means "arrangement" or "order". The word "system" is used in various senses, but in the present context it refers to a set of principles or rules governing a particular subject.

Classification of Systems

The classification of systems is based on the nature of the elements and the relationships between them. Systems can be classified into several categories, such as open systems, closed systems, and isolated systems. Each category has its own characteristics and properties.

Properties of Systems

Systems possess certain properties that distinguish them from other entities. These properties include stability, adaptability, and the ability to evolve over time. Understanding these properties is essential for analyzing and designing systems.

Applications of Systems

- I. Systems in the natural world.
- II. Systems in the social sciences.
- III. Systems in the physical sciences.

- IV. Haloids: Chlorides, Bromides, Iodides, Fluorides.
- V. Oxides.
- VI. Oxygen Salts.
 - 1. Carbonates.
 - 2. Silicates, Titanates.
 - 3. Columbates, Tantalates.
 - 4. Phosphates, Arsenates, Vanadates, Antimonates,
Nitrates.
 - 5. Borates, Uranates.
 - 6. Sulphates, Chromates, Tellurates.
 - 7. Tungstates, Molybdates.
- VII. Salts of Organic Acids: Oxalates, Mellates.
- VIII. Hydrocarbon Compounds.

The following table gives the systematic classification of the New Mexico species, with their chemical composition, according to Dana's method. In Part II, the actual descriptions of the species are given in alphabetical order, for convenience in reference. The classification begins on the next page.

- IV. United States, 1875-1914, 250 pages.
- V. China.
- VI. Japan, 1868-1894, 120 pages.
- 1. Meiji, 1868-1894.
- 2. Meiji, 1868-1894.
- 3. Meiji, 1868-1894.
- 4. Meiji, 1868-1894.
- 5. Meiji, 1868-1894.
- 6. Meiji, 1868-1894.
- 7. Meiji, 1868-1894.
- VII. Main of Empire, 1875-1914, 110 pages.
- VIII. Japanese Empire.

The following table gives the number of specimens of the new United States, and the number of specimens according to the author's method, in each of the divisions of the species in each collection. The specimens mentioned in reference to the author's method are given on the next page.

Division	Number of specimens	Number of specimens according to author's method
I.		
II.		
III.		
IV.		
V.		
VI.		
VII.		
VIII.		

SYSTEMATIC CLASSIFICATION OF NEW MEXICO MINERALSI. NATIVE ELEMENTS.

Diamond, C
 Graphite, C
 Sulphur, S
 Tellurium, Te
 Bismuth, Bi
 Gold, Au
 Silver, Ag
 Copper, Cu
 Lead, Pb
 Platinum, Pt
 Iridium, Ir

II. SULPHIDES, SELENIDES, TELLURIDES, ARSENIDES, ANTIMONIDES.I. Sulphides, Selenides, Tellurides of the Semi-Metals.Stibnite Group

Stibnite, Sb_2S_3
 Bismuthinite, Bi_2S_3

 Tetradyomite, $Bi_2(Te,S)_3$
 Molybdenite, MoS_2

II. Sulphides, Selenides, Tellurides, Arsenides, Antimonides of the Metals.A. Basic Division.

Domeykite, Cu_3As
 Rickardite, Cu_4Te_3

B. Monosulphides, Monotellurides, etc.1. Isometric.Galena Group

Galena, PbS
 Cuproplumbite, $Cu_2S \cdot 2PbS(?)$
 Altaite, $PbTe$

Argentite Group

Argentite, Ag_2S
 Hessite, Ag_2Te
 Petzite, $(Ag,Au)_2Te$

STATEMENT OF INVESTIGATION OF THE UNITED STATES

I. NATIVE ELEMENTS

- Blanche, C.
- Blanche, D.
- Blanche, E.
- Blanche, F.
- Blanche, G.
- Blanche, H.
- Blanche, I.
- Blanche, J.
- Blanche, K.
- Blanche, L.
- Blanche, M.
- Blanche, N.
- Blanche, O.
- Blanche, P.
- Blanche, Q.
- Blanche, R.
- Blanche, S.
- Blanche, T.
- Blanche, U.
- Blanche, V.
- Blanche, W.
- Blanche, X.
- Blanche, Y.
- Blanche, Z.

II. PERSONNEL OF THE BUREAU OF INDIAN AFFAIRS

- Blanche, C.
- Blanche, D.
- Blanche, E.
- Blanche, F.
- Blanche, G.
- Blanche, H.
- Blanche, I.
- Blanche, J.
- Blanche, K.
- Blanche, L.
- Blanche, M.
- Blanche, N.
- Blanche, O.
- Blanche, P.
- Blanche, Q.
- Blanche, R.
- Blanche, S.
- Blanche, T.
- Blanche, U.
- Blanche, V.
- Blanche, W.
- Blanche, X.
- Blanche, Y.
- Blanche, Z.

III. PERSONNEL OF THE BUREAU OF LAND MANAGEMENT

- Blanche, C.
- Blanche, D.
- Blanche, E.
- Blanche, F.
- Blanche, G.
- Blanche, H.
- Blanche, I.
- Blanche, J.
- Blanche, K.
- Blanche, L.
- Blanche, M.
- Blanche, N.
- Blanche, O.
- Blanche, P.
- Blanche, Q.
- Blanche, R.
- Blanche, S.
- Blanche, T.
- Blanche, U.
- Blanche, V.
- Blanche, W.
- Blanche, X.
- Blanche, Y.
- Blanche, Z.

IV. PERSONNEL OF THE BUREAU OF RECLAMATION

- Blanche, C.
- Blanche, D.
- Blanche, E.
- Blanche, F.
- Blanche, G.
- Blanche, H.
- Blanche, I.
- Blanche, J.
- Blanche, K.
- Blanche, L.
- Blanche, M.
- Blanche, N.
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- Blanche, P.
- Blanche, Q.
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- Blanche, S.
- Blanche, T.
- Blanche, U.
- Blanche, V.
- Blanche, W.
- Blanche, X.
- Blanche, Y.
- Blanche, Z.

- Blanche, C.
- Blanche, D.
- Blanche, E.
- Blanche, F.
- Blanche, G.
- Blanche, H.
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- Blanche, J.
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- Blanche, P.
- Blanche, Q.
- Blanche, R.
- Blanche, S.
- Blanche, T.
- Blanche, U.
- Blanche, V.
- Blanche, W.
- Blanche, X.
- Blanche, Y.
- Blanche, Z.

2. Chalcocite Group.

Chalcocite, Cu_2S
 Stromeyerite, $(\text{Ag}, \text{Cu})_2\text{S}$
 Cubanite, $\text{Cu}_2\text{S} \cdot \text{Fe}_4\text{S}_5$
 Sternbergite, AgFe_2S_3

3. Sphalerite Group.

Sphalerite, ZnS

 Alabandite, MnS

4. Rhombohedral or Hexagonal Group.

Greenockite, CdS
 Niccolite, NiAs
 Pyrrhotite, Fe_5S_6 to $\text{Fe}_{16}\text{S}_{17}$
 Covellite, CuS

C. Intermediate Division.

Bornite, Cu_5FeS_4
 Chalcopyrite, CuFeS_2

D. Disulphides, Diarsenides, etc.Pyrite Group

Pyrite, FeS_2
 Smaltite-Chloanthite, $(\text{Co}, \text{Ni})\text{As}_2$
 Skutterudite, CoAs_3

Marcasite Group

Marcasite, FeS_2
 Arsenopyrite, FeAsS

 Sylvanite, $(\text{Au}, \text{Ag})\text{Te}_2$
 Calaverite, AuTe_2

III. SULPHO-SALTS.I. Sulpharsenites, Sulphantimonites, Sulphobismuthites.A. Acidic Division.B. Meta-Division.Zinkenite Group

1. *Staphylococcus aureus*

Staphylococcus aureus
Staphylococcus aureus
Staphylococcus aureus
Staphylococcus aureus

2. *Staphylococcus epidermidis*

Staphylococcus epidermidis
Staphylococcus epidermidis
Staphylococcus epidermidis

3. *Staphylococcus saprophyticus*

Staphylococcus saprophyticus
Staphylococcus saprophyticus
Staphylococcus saprophyticus
Staphylococcus saprophyticus

4. *Staphylococcus sciuri*

Staphylococcus sciuri
Staphylococcus sciuri
Staphylococcus sciuri

5. *Staphylococcus carnosus*

Staphylococcus carnosus
Staphylococcus carnosus
Staphylococcus carnosus
Staphylococcus carnosus

6. *Staphylococcus hyalinus*

Staphylococcus hyalinus
Staphylococcus hyalinus
Staphylococcus hyalinus
Staphylococcus hyalinus

7. *Staphylococcus saprophyticus*

Staphylococcus saprophyticus

Miargyrite GroupMiargyrite, $Ag_2S \cdot Sb_2S_3$ C. Intermediate Division.Jamesonite GroupCosalite, $2PbS \cdot Bi_2S_3$ D. Ortho-Division.Bournonite GroupBournonite, $2PbS \cdot Cu_2S$ Pyrargyrite GroupPyrargyrite, $3Ag_2S \cdot Sb_2S_3$ Proustite, $3Ag_2S \cdot As_2S_3$ Pyrostilpnite, $3Ag_2S \cdot Sb_2S_3$ Xanthoconite, $3Ag_2S \cdot As_2S_3$ Tetrahedrite GroupTetrahedrite, $3Cu_2S \cdot Sb_2S_3$ Tennantite, $Cu_2S \cdot As_2S_3$ E. Basic Division.Stephanite, $5Ag_2S \cdot Sb_2S_3$ Polybasite GroupPolybasite, $9Ag_2S \cdot Sb_2S_3$ Pearceite, $9Ag_2S \cdot As_2S_3$ II. Sulpharsenites, Sulphantimonites.Enargite, $3Cu_2S \cdot As_2S_5$ III. Sulphostannates, etc.IV. HALOIDS- CHLORIDES, BROMIDES, IODIDES; FLUORIDES.I. Anhydrous Chlorides, Bromides, Iodides; Fluorides.Halite Group

Halite, NaCl

Sylvite, KCl

THE UNIVERSITY OF CHICAGO

PHYSICS DEPARTMENT

RESEARCH REPORT

NO. 100

1950

BY

J. R. OPPENHEIM

AND

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PHYSICS DEPARTMENT

UNIVERSITY OF CHICAGO

CHICAGO, ILLINOIS

Cerargyrite Group

Cerargyrite, AgCl
 Embolite, $\text{Ag}(\text{Br}, \text{Cl})$
 Bromyrite, AgBr

 Iodyrite, AgI

Fluorite Group

Fluorite, CaF_2

II. Oxychlorides, Oxyfluorides.III. Hydrous Chlorides, Hydrous Fluorides, etc.

Carnallite, $\text{KMgCl}_3 \cdot 6\text{H}_2\text{O}$

V. OXIDES.I. Oxides of Silicon.

Quartz, SiO_2
 Tridymite, SiO_2
 Opal, $\text{SiO}_2 \cdot n\text{H}_2\text{O}$

II. Oxides of the Semi-Metals; also Molybdenum, Tellurium.

Cervantite, $\text{Sb}_2\text{O}_3 \cdot \text{Sb}_2\text{O}_5$
 Stetefeldite, uncertain

III. Oxides of the Metals.A. Anhydrous Oxides.I. Protoxides.

Cuprite, Cu_2O

Periclase Group

Manganosite, MnO
 Zincite, ZnO

 Massicot, PbO
 Tenorite, CuO

II. Sesquioxides.Hematite Group

Corundum, Al_2O_3
 Hematite, Fe_2O_3
 Ilmenite, FeTiO_3

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II. General's Office, General's Office

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III. Intermediate Oxides.Spinel GroupAluminum SpinelsGahnite, $ZnAl_2O_4$ Iron SpinelsMagnetite, $FeO \cdot Fe_2O_3$ Franklinite, $(Fe, Zn, Mn)O \cdot (Fe, Mn)_2O_3$ Chromium SpinelHausmannite, $MnO \cdot Mn_2O_3$ Minium, $2PbO \cdot PbO_2$ Braunite, $3MnMnO_3 \cdot MnSiO_3$ IV. Dioxides.Rutile GroupCassiterite, SnO_2 Rutile, TiO_2 Plattnerite, PbO_2 Octahedrite, TiO_2 Brookite, TiO_2 Pyrolusite, MnO_2 B. Hydrous Oxides.Diaspore GroupDiaspore, $Al_2O_3 \cdot H_2O$ Goethite, $Fe_2O_3 \cdot H_2O$ Manganite, $Mn_2O_3 \cdot H_2O$ Limonite, $2Fe_2O_3 \cdot 3H_2O$ Bauxite, $Al_2O_3 \cdot 2H_2O$ Brucite GroupChalcophanite, $(Mn, Zn)O \cdot 2MnO_2 \cdot 2H_2O$ Psilomelane, MnO_2

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VI. OXYGEN SALTS.1. Carbonates.A. Anhydrous Carbonates.1. Calcite Group.

Calcite, CaCO_3
 Dolomite, $\text{CaMg}(\text{CO}_3)_2$
 Ankerite, $\text{CaCO}_3 \cdot (\text{Mg, Fe, Mn})\text{CO}_3$
 Magnesite, MgCO_3
 Siderite, FeCO_3
 Rhodochrosite, MnCO_3
 Smithsonite, ZnCO_3

2. Aragonite Group.

Aragonite, CaCO_3
 Witherite, BaCO_3
 Cerussite, PbCO_3

 Barytocalcite, $\text{BaCO}_3 \cdot \text{CaCO}_3$
 Phosgenite (?), $\text{PbCO}_3 \cdot \text{PbCl}_2$

B. Acid, Basic, and Hydrous Carbonates.

Malachite, $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$
 Azurite, $2\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$
 Aurichalcite, $2(\text{Zn, Cu})\text{CO}_3 \cdot 3(\text{Zn, Cu})(\text{OH})_2$
 Hydrozincite, $2\text{ZnCO}_3 \cdot 3\text{Zn}(\text{OH})_2$

 Trona, $\text{Na}_2\text{CO}_3 \cdot \text{NaHCO}_3 \cdot 2\text{H}_2\text{O}$

 Zaratite, $\text{NiCO}_3 \cdot 2\text{Ni}(\text{OH})_2 \cdot 4\text{H}_2\text{O}$?
 Bismutite, $\text{Bi}_2\text{O}_3 \cdot \text{CO}_2 \cdot \text{H}_2\text{O}$?

2A. Silicates.Sec. A. Chiefly Anhydrous Silicates.I. Disilicates, Polysilicates.

Petalite, $\text{LiAl}(\text{Si}_2\text{O}_5)_2$

Feldspar GroupMonoclinic Section

Orthoclase, KAlSi_3O_8

Triclinic Section

Microcline, KAlSi_3O_8
 Anorthoclase, $(\text{Na, K})\text{AlSi}_3\text{O}_8$

VI. WATER TABLE

1. General

A. General Description

1. General

Location, Date
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Location, Date
Location, Date
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B. General Description

Location, Date
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C. General Description

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D. General

Sec. A. General Description

1. General

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2. General

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3. General

Location, Date

Location, Date

Albite-Anorthite Series: Plagioclase
Feldspars

Albite, $\text{NaAlSi}_3\text{O}_8$

Intermediate Plagioclase Feldspars

Oligoclase, $\text{NaAlSi}_3\text{O}_8 \cdot \text{CaAl}_2\text{Si}_2\text{O}_8$

Andesine, $\text{NaAlSi}_3\text{O}_8 \cdot \text{CaAl}_2\text{Si}_2\text{O}_8$

Labradorite, $\text{NaAlSi}_3\text{O}_8 \cdot \text{CaAl}_2\text{Si}_2\text{O}_8$

Bytownite, $\text{NaAlSi}_3\text{O}_8 \cdot \text{CaAl}_2\text{Si}_2\text{O}_8$

Anorthite, $\text{CaAl}_2\text{Si}_2\text{O}_8$

II. Metasilicates.

Leucite Group

Leucite, $\text{KAl}(\text{SiO}_3)_2$

Pyroxene Group

Orthorhombic Section

Hypersthene, $(\text{Fe}, \text{Mg})\text{SiO}_3$

Monoclinic Section

Pyroxene, RSiO_3

Acmite (Aegirite), $\text{Na}_2\text{O} \cdot \text{Fe}_2\text{O}_3 \cdot 4\text{SiO}_2$

Jadeite, $\text{NaAl}(\text{SiO}_3)_2$

Spodumene, $\text{LiAl}(\text{SiO}_3)_2$

Triclinic Section

Rhodonite, MnSiO_3

Wellstonite, CaSiO_3

Pectolite, $\text{HNaCa}_2(\text{SiO}_3)_3$

Amphibole Group

Orthorhombic Section

Monoclinic Section

Amphibole, RSiO_3

Beryl, $\text{Be}_3\text{Al}_2(\text{SiO}_3)_6$

Cordierite, $\text{Mg}_2\text{Al}_4\text{Si}_5\text{O}_{18}$

1. The first part of the report

2. The second part of the report

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6. The sixth part of the report

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8. The eighth part of the report

9. The ninth part of the report

10. The tenth part of the report

11. The eleventh part of the report

12. The twelfth part of the report

III. Orthosilicates.Nephelite GroupNephelite, $\text{NaAlSi}_3\text{O}_8$ Sodalite GroupSodalite (?), $3\text{NaAlSi}_3\text{O}_8 \cdot \text{NaCl}$ Hauynite, $3\text{NaAlSi}_3\text{O}_8 \cdot \text{CaSO}_4$ Noselite (?), $3\text{Na}_2\text{Al}_2\text{Si}_2\text{O}_8 \cdot \text{Na}_2\text{SO}_4$ Helvite GroupGarnet GroupGarnet, $3\text{RO} \cdot \text{R}_2\text{O}_3 \cdot 3\text{SiO}_2$ Chrysolite GroupChrysolite, $(\text{Mg}, \text{Fe})_2\text{SiO}_4$ Phenacite GroupWillemitte, Zn_2SiO_4 Dioptase, H_2CuSiO_4 Scapolite GroupWernerite, $(\text{CaCO}_3 \cdot 3\text{CaAl}_2\text{Si}_2\text{O}_8) \cdot$
 $(\text{NaCl} \cdot 3\text{NaAlSi}_3\text{O}_8)$ Vesuvianite, $\text{Ca}_6(\text{Al}(\text{OH}, \text{F}))\text{Al}_2(\text{SiO}_4)_5$ Zircon GroupZircon, ZrSiO_4 Danburite-Topaz GroupAndalusite, Al_2SiO_5 Sillimanite, Al_2SiO_5 Kyanite, Al_2SiO_5 Datolite GroupDatolite, HCaBSiO_5 Euclase, HBeAlSiO_5 Gadolinite, $\text{Be}_2\text{Fe}_2\text{Si}_2\text{O}_{10}$

Epidote Group

Zoisite, $\text{HCa}_2\text{Al}_3\text{Si}_3\text{O}_{13}$
 Epidote, $\text{HCa}_2(\text{Al}, \text{Fe})_3\text{Si}_3\text{O}_{13}$

Prehnite, $\text{H}_2\text{Ca}_2\text{Al}_2(\text{SiO}_4)_3$

IV. Subsilicates.Humite Group

Ilvaite, $\text{CaFe}_2(\text{FeOH})(\text{SiO}_4)_2$
 Melanotekite, $3\text{PbO} \cdot 2\text{Fe}_2\text{O}_3 \cdot 3\text{SiO}_2$

Calamine, H_2ZnSiO_5

Tourmaline, $\text{H}_3\text{Al}_3(\text{B}, \text{OH})_2\text{Si}_4\text{O}_{19}$
 Dumortierite, $8\text{Al}_2\text{O}_3 \cdot \text{B}_2\text{O}_3 \cdot 6\text{SiO}_2 \cdot \text{H}_2\text{O}$
 Staurolite, $\text{HFeAl}_5\text{Si}_2\text{O}_{13}$

Sec. B. Chiefly Hydrous Silicates.I. Zeolite Division.1. Introductory Subdivision.

Okenite, $\text{H}_2\text{CaSi}_2\text{O}_6 \cdot \text{H}_2\text{O}$

2. Zeolites.Mordenite GroupHeulandite Group

Heulandite, $(\text{Ca}, \text{Na}_2)\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 6\text{SiO}_2 \cdot 5\text{H}_2\text{O}$

Phillipsite Group

Stilbite, $(\text{Na}_2, \text{Ca})\text{Al}_2\text{Si}_6\text{O}_{16} \cdot 6\text{H}_2\text{O}$

Chabazite Group

Analcite, $\text{NaAlSi}_2\text{O}_6 \cdot \text{H}_2\text{O}$

Natrolite Group

Natrolite, $\text{Na}_2\text{Al}_2\text{Si}_3\text{O}_{10} \cdot 2\text{H}_2\text{O}$

Thomsonite, $(\text{Ca}, \text{Na}_2)\text{Al}_2\text{Si}_2\text{O}_8 \cdot 2\frac{1}{2}\text{H}_2\text{O}$

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II. Mica Division.

1. Mica Group.

Muscovite, $H_2KAl_3(SiO_4)_3$
 Paragonite, $H_2NaAl_3(SiO_4)_3$
 Roscoelite, $H_2K(Al,V)(SiO_4)_3$
 Lepidolite, $(OH,F)_2KLiAl_2Si_3O_{10}$
 Biotite, $H_2K(Mg,Fe)_3Al(SiO_4)_3$
 Phlogopite, $H_2KMg_3Al(SiO_4)_3$

2. Clintonite Group.

3. Chlorite Group

Species undetermined

Appendix to Mica Division- Vermiculites.

III. Serpentine and Talc Division.

Serpentine, $H_4Mg_3Si_2O_9$

Talc, $H_2Mg_3(SiO_3)_4$

Sepiolite, $H_4Mg_2Si_3O_{10}$

Iddingsite, $MgO.Fe_2O_3.3SiO_2.4H_2O$

Glauconite, hydrous silicate of
Fe and K

IV. Kaolin Division.

Kaolin Minerals

Kaolinite, $H_4Al_2Si_2O_9$

Hydrous Aluminum Silicates

Halloysite, $(Al_2O_3.2SiO_2)nH_2O$

Leverrierite, hydrous Al silicate

Montmorillonite, $(Mg,Ca)O.Al_2O_3.-$
 $5SiO_2.nH_2O$

Allophane, $Al_2SiO_5.nH_2O$

Hydrous Iron Silicates

Hydrous Manganese Silicates

II. State Division

Director, State Division
Assistant Director
Administrative Services
Investigative Services
Legal Services
Public Relations
Training Services
Records Management

III. Administrative Services

A. Office of Management

Assistant to the Director - Administration

III. Personnel and Training

Director, Personnel
Assistant Director
Training Services
Recruitment Services
Compensation Services
Employee Relations
Labor Relations

IV. Health Division

Director, Health Division
Assistant Director

Health Services Division

Director, Health Services
Assistant Director
Public Health Services
Mental Health Services
Substance Abuse Services
Epidemiology Services

Health Services Division

Health Services Division

Hydrous Copper SilicatesChrysocolla, $\text{CuSiO}_3 \cdot 2\text{H}_2\text{O}$ Silicates Containing Various Other
Acid RadicalsSpurrite, $2\text{Ca}_2\text{SiO}_4 \cdot \text{CaCO}_3$ Uranophane, $\text{CaO} \cdot 2\text{UO}_3 \cdot 2\text{SiO}_2 \cdot 7\text{H}_2\text{O}$ 2B. Titano-Silicates, Titanates.Titanite, CaTiSiO_5 3. Columbates, Tantalates.Microlite, $\text{Ca}_2\text{Ta}_2\text{O}_7$ Columbite-Tantalite, $(\text{Fe}, \text{Mn})(\text{Cb}, \text{Ta})_2\text{O}_6$ Samarskite, $(\text{Fe}, \text{Ca}, \text{UO}_2)_3(\text{Ce}, \text{Y})_2(\text{Cb}, \text{Ta})_6\text{O}_{21}$ Aeschynite, columbate and titanate
of the cerium metals4. Phosphates, Arsenates, Vanadates, Antimonates.A. Anhydrous Phosphates, Arsenates, Vanadates, Antimonates.Monazite, $(\text{Ce}, \text{La}, \text{Nd}, \text{Pr})\text{PO}_4$ Triphylite GroupApatite GroupApatite, $(\text{CaF})\text{Ca}_4(\text{PO}_4)_3$ Pyromorphite, $(\text{PbCl})\text{Pb}_4(\text{PO}_4)_3$ Mimetite, $(\text{PbCl})\text{Pb}_4(\text{AsO}_4)_3$ Vanadinite, $(\text{PbCl})\text{Pb}_4(\text{VO}_4)_3$ Wagnerite GroupB. Basic Phosphates.Olivenite GroupLibethenite, $\text{Cu}_3\text{P}_2\text{O}_8 \cdot \text{Cu}(\text{OH})_2$ Descloizite, $(\text{Pb}, \text{Zn}, \text{Cu})_2\text{V}_2\text{O}_8 \cdot$
 $(\text{Pb}, \text{Zn}, \text{Cu})(\text{OH})_2$ Dufrenite, $\text{FePO}_4 \cdot \text{Fe}(\text{OH})_3$

Hydrogen Cyanide
Cyanide, HCN

Aluminum Cyanide
Aluminum, Cyanide
Aluminum, Cyanide

Aluminum Cyanide
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C. Normal Hydrous Phosphates, etc.Vivianite GroupErythrite, $\text{Co}_3\text{As}_2\text{O}_8 \cdot 8\text{H}_2\text{O}$ Annabergite, $\text{Ni}_3\text{As}_2\text{O}_8 \cdot 8\text{H}_2\text{O}$ Zepharovichite, $\text{AlPO}_4 \cdot 3\text{H}_2\text{O}$ Acid Hydrous Phosphates, etc.Basic Hydrous Phosphates, etc.Turquoise, $\text{CuO} \cdot 3\text{Al}_2\text{O}_3 \cdot 2\text{P}_2\text{O}_5 \cdot 9\text{H}_2\text{O}$ Uranite GroupTorbernite, $\text{Cu}(\text{UO}_2)_2\text{P}_2\text{O}_8 \cdot 12\text{H}_2\text{O}$ Autunite, $\text{Ca}(\text{UO}_2)_2\text{P}_2\text{O}_8 \cdot 8\text{H}_2\text{O}$ Carnotite, $\text{K}_2\text{O} \cdot 2\text{U}_2\text{O}_3 \cdot \text{V}_2\text{O}_5 \cdot 2\text{H}_2\text{O}$ Antimonates; also Antimonites, ArsenitesPhosphates or Arsenates with Carbonates,Sulphates, BoratesLueneburgite, $3\text{MgO} \cdot \text{B}_2\text{O}_3 \cdot \text{P}_2\text{O}_5 \cdot 8\text{H}_2\text{O}$ NitratesSoda Niter, NaNO_3 Gerhardtite, $\text{Cu}(\text{NO}_3)_2 \cdot 3\text{Cu}(\text{OH})_2$ 5. Borates, Uranates.BoratesBorax, $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$ UranatesUraninite, uranate of uranyl, lead,
etc.Gummite, alteration product of
uraninite, doubtful

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6. Sulphates, Chromates, Tellurates.A. Anhydrous Sulphates, etc.

Thenardite, Na_2SO_4
 Glauberite, $\text{Na}_2\text{SO}_4 \cdot \text{CaSO}_4$
 Langbeinite, $\text{K}_2\text{Mg}_2(\text{SO}_4)_3$

Barite Group

Barite, BaSO_4
 Celestite, SrSO_4
 Anglesite, PbSO_4

 Anhydrite, CaSO_4
 Zinkosite, ZnSO_4

Sulphates with Chlorides, Carbonates, etc.--In Part Hydrous

Kainite, $\text{MgSO}_4 \cdot \text{KCl} \cdot 3\text{H}_2\text{O}$

B. Acid and Basic Sulphates.

Brochantite, $\text{CuSO}_4 \cdot 3\text{Cu}(\text{OH})_2$
 Caledonite, $2(\text{Pb}, \text{Cu})\text{O} \cdot \text{SO}_3 \cdot \text{H}_2\text{O}$
 Linarite, $(\text{Pb}, \text{Cu})\text{SO}_4 \cdot (\text{Pb}, \text{Cu})(\text{OH})_2$

C. Normal Hydrous Sulphates.

Mirabilite, $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$
 Kieserite, $\text{MgSO}_4 \cdot \text{H}_2\text{O}$
 Gypsum, $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

Epsomite Group

Epsomite, $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$
 Goslarite, $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$

Melanterite Group

Melanterite, $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$
 Mallardite, $\text{MnSO}_4 \cdot 7\text{H}_2\text{O}$

 Chalcanthite, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
 Bloedite, $\text{MgSO}_4 \cdot \text{Na}_2\text{SO}_4 \cdot 4\text{H}_2\text{O}$
 Leonite, $\text{MgSO}_4 \cdot \text{K}_2\text{SO}_4 \cdot 4\text{H}_2\text{O}$
 Polyhalite, $2\text{CaSO}_4 \cdot \text{MgSO}_4 \cdot \text{K}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$

1. General Information

Name: _____
Address: _____
City: _____

2. Personal History

Age: _____
Sex: _____
Date of Birth: _____

3. Medical History

Present Illness: _____
Past Illnesses: _____

4. Family History

Parents: _____
Siblings: _____

5. Social History

Occupation: _____
Education: _____

6. Physical Examination

General: _____
Vital Signs: _____

7. Laboratory Tests

Test	Result
Complete Blood Count	
Urinalysis	
X-ray	
ECG	
Other	

8. Summary and Recommendations

Diagnosis: _____
Treatment: _____

Alum GroupTschermigite, $(\text{NH}_4)\text{Al}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ Pickeringite, $\text{MgSO}_4 \cdot \text{Al}_2(\text{SO}_4)_3 \cdot 22\text{H}_2\text{O}$ Picroallumogene, $2\text{MgSO}_4 \cdot \text{Al}_2(\text{SO}_4)_3 \cdot 28\text{H}_2\text{O}$ Halotrichite, $\text{FeSO}_4 \cdot \text{Al}_2(\text{SO}_4)_3 \cdot 22\text{H}_2\text{O}$ Alunogen, $\text{Al}_2(\text{SO}_4)_3 \cdot 16\text{H}_2\text{O}$ Basic Hydrrous SulphatesCopiapite, $\text{Fe}_4(\text{OH})_2(\text{SO}_4)_5 \cdot 18\text{H}_2\text{O}$ Utahite, $3\text{Fe}_2\text{O}_3 \cdot 3\text{SO}_3 \cdot 4\text{H}_2\text{O}$ Alunite GroupAlunite, $\text{K}_2\text{Al}_6(\text{OH})_{12}(\text{SO}_4)_4$ Jarosite, $\text{K}_2\text{Fe}_6(\text{OH})_{12}(\text{SO}_4)_4$ Natrojarosite, $\text{Na}_2\text{Fe}_6(\text{OH})_{12}(\text{SO}_4)_4$ Plumbojarosite, $\text{PbFe}_6(\text{OH})_{12}(\text{SO}_4)_4$ Tellurates; also Tellurites, SelenitesDurdenite, $\text{Fe}_2(\text{TeO}_3)_3 \cdot 4\text{H}_2\text{O}$ 7. Tungstates, Molybdates.Wolframite GroupWolframite, $(\text{Fe}, \text{Mn})\text{WO}_4$ Scheelite GroupScheelite, CaWO_4 Cuprotungstite, CuWO_4 Wulfenite, PbMoO_4 Ferrimolybdate, $\text{Fe}_2\text{O}_3 \cdot 3\text{MoO}_3 \cdot 8\text{H}_2\text{O}$ VII. SALTS OF ORGANIC ACIDS.

Alma Mater

Alma Mater, (1910-1915), 1915

Alma Mater, (1915-1920), 1920
Alma Mater, (1920-1925), 1925
Alma Mater, (1925-1930), 1930

Alma Mater, (1930-1935), 1935

Alma Mater (1935-1940)

Alma Mater, (1935-1940), 1940
Alma Mater, (1940-1945), 1945

Alma Mater (1945-1950)

Alma Mater, (1945-1950), 1950
Alma Mater, (1950-1955), 1955
Alma Mater, (1955-1960), 1960
Alma Mater, (1960-1965), 1965

Alma Mater (1965-1970)

Alma Mater, (1965-1970), 1970

Alma Mater (1970-1975)

Alma Mater, (1970-1975), 1975
Alma Mater, (1975-1980), 1980

Alma Mater (1980-1985)

Alma Mater, (1980-1985), 1985
Alma Mater, (1985-1990), 1990
Alma Mater, (1990-1995), 1995

Alma Mater, (1995-2000), 2000

VII. ALMA MATER (2000-2005)

VIII. HYDROCARBON COMPOUNDS.1. Simple Hydrocarbons.2. Oxygenated Hydrocarbons.

Resin, composition variable
Wheelerite, $(C_5H_6O)_n$

WILLIAM HENNINGSEN
J. HENNINGSEN

2. Generalized Hydrolysis
Hydrolysis of esters
Hydrolysis of amides

V. ORIGIN, MODE OF OCCURRENCE, AND ASSOCIATION OF MINERALS

Since we are interested in the individual mineral species from the standpoint of the collector, and since the field of origin, occurrence, and association of minerals properly belongs to the field of Geochemistry and Geophysics, we shall not treat it in great detail, but shall include the fundamentals for the sake of completeness.

Chief Modes of Mineral Origin.

(1) From Fusion. The greater part of the minerals that form the crust of the earth have been formed by solidification of fused material; that is, they are, or were originally, constituents of igneous rocks.

(2) From Solution. Many minerals have been formed by crystallization from a solution. This is especially true for the group of saline minerals, but it also holds true for minerals found lining or filling fissures in rocks (vein minerals). Many vein minerals cannot be formed from solution in the laboratory, since it is impossible to duplicate the conditions of temperature, pressure, and associated materials that occur in nature.

(3) From a Vapor. Some minerals may be formed by direct

... the ... of ...

V. ORIGIN, MODE OF OCCURRENCE

Since we are interested in the ... from the standpoint of the ... origin, occurrence, and ... belongs to the ... not ... is ... remains for the ...

Chief Modes of Occurrence

(1) From Fusion. The ... from the ... origin of fused ... finally, ...

(2) From Solution

... crystallization from a ... for the group of ... for ... (3) ... in the laboratory, ... the conditions of ...

(4) From a Vapor

...

crystallization from a gas, without an intervening liquid stage. These minerals are most commonly found associated with volcanic fumaroles, etc.

While these three modes of origin seem very distinct, it must be emphasized that the boundaries between them are really very indefinite, since molten rock matter may be considered as a very concentrated solution, and a vapor as a very dilute solution.

Formation of Minerals From Fusion. Igneous rocks have their origin in fused masses of rock constituents known as magmas. A magma may be considered as a very dense solution in which the elements are more or less free to circulate and join to form mineral molecules upon solidification of the mass. The composition of the whole magma will of course determine what minerals will compose the resulting rock. All magmas are composed essentially (about 99%) of the elements oxygen, silicon, aluminum, iron, magnesium, calcium, sodium, and potassium. The elements of course occur in different proportions in different magmas.

The conditions under which the various minerals are formed are very complex. In general, minerals crystallize out in order of their solubilities, insoluble minerals first, but variation in the chemical nature of the solution produces wide variation in the solubility of any certain mineral, and so only a very general prediction may be made of the order of crystallization of minerals from various magmas.

crystallization from a gas, without an intervening liquid
stage. These minerals are most commonly found associated
with volcanic formations, etc.

While these three modes of origin seem very distinct,
it will be recognized that the transition between them are
usually very indistinct, and often occur in any one
considered as a very unimportant solution, and a vapor as a
very dilute solution.

Formation of Minerals from Gases. Minerals which have their
origin in gaseous sources of such conditions known as gases.
A vapor may be considered as a very dense solution in which
the elements are more or less free to diffuse and join to
form mineral solutions upon solidification of the mass. The
composition of the early vapor will of course determine that
minerals will compose the resulting rock. All vapors are
composed essentially (about 90%) of the elements oxygen,
nitrogen, hydrogen, iron, magnesium, calcium, sodium, and
potassium. The elements of various origin in different pro-
portions in different vapors.

The conditions under which the various elements are
formed are very peculiar. In general, minerals crystallize
out in order of their solubility, and the most soluble
are retained in the vapors, and only at the highest pressures
will separate in the solution of the vapors, and
as only a very general procedure can be made of the order
of crystallization of minerals from these vapors.

The fluidity of the magma and the temperature at which various minerals will crystallize out are greatly influenced by the presence of small quantities of substances called mineralizers, these being usually water vapor, carbon dioxide, fluorine, boric acid, sulphur, and chlorine. These mineralizers, besides occasionally entering into the composition of certain minerals, are often necessary to permit the crystallization of minerals into which they do not enter as necessary constituents. These minerals, if forming from dry fusion, would not occur as crystals.

Formation of Minerals From Solution.

(1) By the Evaporation of Saline Waters. Lake and ocean waters contain salts in solution in varying amounts. These are precipitated as crystalline minerals when the water is evaporated, the more insoluble constituents first. The normal order of crystallization is: carbonates of calcium and magnesium, calcium sulphate, sodium chloride, magnesium chloride and sulphate, potassium sulphate and chloride, etc. While this order is rather constantly adhered to, varying conditions of concentration, temperature, and proportions of the elements present sometimes alter it.

(2) By Precipitation From Ground Waters. There are numerous openings of various sizes and shapes in the rocks of the earth's crust. Below the water table, and extending to a considerable distance underground, these openings are

The stability of the nucleus and the dependence of the rate of crystallization on the concentration of the crystallizable component are discussed. It is shown that the rate of crystallization is determined by the presence of small amounts of impurities, which act as nucleating agents. The rate of crystallization is also affected by the presence of certain minerals, and it is shown that the crystallization of minerals can be used as a means of controlling their growth. These minerals, if present in the fusion, would not occur as crystals.

Formation of Minerals from Solutions

(1) In the crystallization of minerals from solutions, the rate of crystallization is determined by the presence of small amounts of impurities, which act as nucleating agents. The rate of crystallization is also affected by the presence of certain minerals, and it is shown that the crystallization of minerals can be used as a means of controlling their growth. These minerals, if present in the fusion, would not occur as crystals.

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filled with water, most of which has seeped down from the surface, while a small part may have come from igneous intrusions. At great depths, the water is hot and under high pressure, and under these conditions is an effective solvent. It circulates slowly through the rocks, dissolving many soluble constituents. When it comes to larger fissures and commences to rise toward the surface, it comes into regions of lower temperature and pressure. Under these conditions, some of the dissolved constituents crystallize out in the form of vein minerals. As was stated above, many of these minerals are not soluble in water under conditions capable of being produced in the laboratory, but there is no doubt that they were actually precipitated from water in nature.

Occasionally, much of the mineral matter may remain in solution until the water reaches the surface, where it usually emerges in the form of a hot spring, and the mineral matter is crystallized out in the form of travertine, geyserite, etc. Sometimes ground waters ascend to the surface by capillary action and evaporate, leaving deposits of sodium and calcium salts, commonly called alkali or caliche.

Formation of Minerals From Vapors. This type of mineral formation is restricted to volcanic regions where mineral gases are discharged from fumaroles. The deposits are not numerous, and are usually small in extent. The ordinary

filled with water, some of which has seeped down from the surface, while a small part may have come from the intrusion. At great depths, the water is hot and under high pressure, and under these conditions is an effective solvent. It dissolves things through the rocks, dissolving many soluble constituents. When it comes to larger distances and coarser to the surface the surface, it comes into regions of lower temperature and pressure. Under these conditions, some of the dissolved constituents crystallize out in the form of salts, minerals, etc. as was stated above. Some of these minerals are not soluble in water under conditions capable of being produced in the laboratory, but there is no doubt that they were actually precipitated from water in nature.

Generally, most of the mineral matter now visible in solution will be the water soluble salts, where it usually emerges in the form of a hot spring, and the mineral matter is crystallized out in the form of minerals, such as sulfur, etc. Some of the mineral matter found in the surface by solution is not soluble in water under conditions and is usually called salts or minerals. This type of mineral formation is restricted to volcanic regions where mineral gases are discharged from the craters. The deposits are not numerous, but are usually called salts, etc.

minerals deposited are sulphur, tellurium, arsenic sulphides, boric acid, various chlorides, etc.

Occurrence and Association of Minerals. Only a few of the more than one thousand mineral species occur in sufficient quantity to be called common; these are the rock minerals or rock-making minerals. Most mineral species occur in isolated deposits, alone or with other minerals, and are not considered as making up rocks.

The association of minerals with each other is of great interest to mineralogists. The actual association is known as their paragenesis. By a thorough study of the paragenesis of minerals, a great deal may be learned about the history of the deposit in which they occur.

In the following paragraphs, the more important modes of occurrence, and the characteristic types of mineral association, are given briefly.

Rock Minerals. The following relatively short list of mineral species includes all those that can be called common. They are the important minerals in making up the bulk of the rocks of the earth's crust, and some occur only in rare rock types. They are: quartz, the feldspars, nephelite, sodalite, laucita, the micas, the pyroxenes, the amphiboles, chrysolite, kaolin, the chlorites, serpentine, talc, calcite, and dolomite.

minerals deposited are... various... minerals...

...minerals... deposited... various... minerals...

The association of minerals with each other is... history of the deposit in which they occur.

The following... the... minerals...

The following... minerals... are given...

That are the... minerals... in... of the... minerals...

...minerals... the... minerals...

There is another group of minerals commonly occurring in rocks, usually in scattered grains and seldom forming one of the prime constituents. These are known as accessory rock-making minerals. Only a few are common enough to be included here. They are: garnet, epidote, staurolite, kyanite, zircon, titanite, and apatite. Still rarer accessory minerals are the following: rutile, iolite, scapolite, andalusite, and sillimanite. The iron minerals magnetite, hematite, ilmenite, and pyrite may also occur as accessory rock minerals.

Igneous Rocks. Igneous rocks are those formed by the cooling and solidification of a molten magma. In the solidification, there is a general order of crystallization of minerals, as follows: iron oxides first, then ferromagnesian minerals (pyroxene, amphibole, chrysolite), next the plagioclase feldspars, then potash feldspars, and finally quartz.

The minerals formed from a magma of course depend on the chemical composition of the magma. If it is acidic (containing excess silicic acids), then the resulting rock will have abundant free quartz, and will be light in color and specific gravity. If the magma is basic (containing enough of the bases iron, magnesium, etc. to balance the silicic acids), the rock will be dark in color and rather heavy.

The rate of cooling of a magma is of great importance

in determining the texture, and thus the appearance, of the resulting rock. It may also influence the mineral composition, since some minerals require a long time in forming, and will not be formed if cooling is rapid. The general rule is: rapid cooling = fine grain size; slow cooling = large grain size. This is obvious from the following consideration: if a magma cools quickly, there is little opportunity for the gathering of elements into molecular groups, and thus for the formation of minerals, at least in large crystals. If the cooling is slow, as when deep-seated intrusive bodies are formed, there is ample time for the arrangement of elements into molecules, and thus for crystallization of minerals, and the resulting rock will have a coarse texture. A coarse-textured rock is called phaneritic; a fine-grained rock is called aphanitic. Intrusive rocks are usually phaneritic; extrusive (volcanic) rocks are usually aphanitic. In general, the limit of visibility of individual grains with the naked eye is taken as the boundary between phaneritic and aphanitic texture.

The following are the important igneous rocks, with their characteristic minerals:

A. Intrusive, Coarse-Grained Rocks.

1. Granite. Chiefly quartz and orthoclase feldspar, with small amounts of mica and hornblende. If plagioclase feldspar is abundant in the rock, the rock is called a quartz monzonite; if the plagioclase is present in larger

in determining the position, and thus the appearance, of the
 resulting form. It may also influence the internal struc-
 ture, since some elements require a long time in settling
 and will not be forced to settle so rapidly. The general
 rule is: large particles - long settling time
small particles - short settling time. This is obvious from the following
 illustration: If a suspension of a heavy solid is left to settle
 slowly for the gathering of elements into molecular groups,
 and then for the formation of elements, at least in large
 quantities. If the settling is slow, as when deep-seated
 particles settle are forced, there is ample time for the
 arrangement of elements into molecules, and thus for the
 alignment of elements, and the resulting form will be
 more regular. A coarse-textured form is called granular
 a fine-grained form is called colloidal. These two
 are usually characterized by their (colloidal) forms and
 usually granular. In general, the limit of stability of
 individual grains with the naked eye is taken as the limit
 any between granular and colloidal forms.

The following are the important factors which, with
 their characteristic influences:
 • Temperature, Time, Stirring
 • Particle Size, Gravity, Surface Area, Viscosity
 with each element of size and composition. In addition,
 factors are included in the form, the form is called
 granular material if the particles are large and

amount than the orthoclase, the rock is known as a granodiorite. Granite is a very common rock type.

2. Syenite. Chiefly feldspar, with more or less mica, hornblende, or pyroxene, but little quartz. Often contains nephelite, in nephelite-syenite. Resembles granite. Not a common type.

3. Diorite. Chiefly plagioclase feldspar and some ferromagnesian mineral, as biotite, hornblende, or pyroxene, with plagioclase exceeding the dark minerals in amount. Quartz may be present, in quartz-diorite. Diorite is a common rock type.

4. Gabbro. Chiefly some ferromagnesian mineral (hornblende, pyroxene, chrysolite) with plagioclase feldspar, with the ferromagnesian minerals making up the greater part of the rock. Not a very common type.

5. Dolerite. The name given to fine-grained varieties of dark-colored igneous rocks that cannot be distinguished with the naked eye.

6. Peridotite. Chiefly olivine, pyroxene, or hornblende, and referred to as dunite, pyroxenite, and amphibolite respectively. Not a very common type.

B. Extrusive, Fine-Grained Rocks.

1. Felsite. Fine-grained, with a stony texture, and

ground from the perspective, the work is done in a special

1913a. The work is done in a special way, and it is

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1913k. The work is done in a special way, and it is

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1913n. The work is done in a special way, and it is

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1913p. The work is done in a special way, and it is

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1913s. The work is done in a special way, and it is

1913t. The work is done in a special way, and it is

1913u. The work is done in a special way, and it is

1913v. The work is done in a special way, and it is

including all colors except dark gray, dark green, and black. Chiefly quartz and feldspar. A very common type, occurring as near-surface intrusions and lava flows.

2. Basalt. The fine-grained, dark green or black extrusives, consisting of ferromagnesian minerals and plagioclase feldspars chiefly.

3. Glassy Rocks. Made up partly or wholly of volcanic glass, in which no distinct minerals can be recognized, even microscopically. Usually with an excess of silica (an acid rock). Called obsidian if entirely glassy; pitchstone, when the luster is dull; perlite, if made up of small spheroids; and pumice, if distinctly cellular in structure.

C. Porphyritic Structure; Magmatic Segregations.

Some igneous rocks show a relatively fine-grained groundmass in which are embedded larger crystals known as phenocrysts. These rocks are called porphyries. The structure is due to peculiar conditions during formation, which allowed crystals of certain minerals to grow to considerable size before the groundmass solidified. The most common minerals occurring as phenocrysts are quartz and feldspar.

When a magma is beginning to solidify, certain heavy minerals are usually the first to crystallize. If their constituents form a considerable percentage of the mass, enough of the minerals may form to sink slowly downward

including all colors except dark grey, dark green, and black. Chiefly quartz and talc. A very common type, occurring as dark-colored intrusions and lava flows.

3. Basalt. The fine-grained, dark green to black extrusives, consisting of *Andesitoides*, *Andesitoides*, and *Andesitoides*.

4. Granite. One of the most typical of volcanic rocks, in which no distinct minerals are recognizable, even microscopically. Usually with an excess of silica (an acid rock). Called *granite* because of its granular texture, the name is derived from the Latin *granum*, meaning grain, and *granum*, meaning grain, in structure.

5. Andesite. A dark-colored, fine-grained volcanic rock.

6. Basalt. A dark-colored, fine-grained volcanic rock, in which are embedded larger crystals known as *phenocrysts*. These rocks are called *basalts*. The structure is due to partial solidification during eruption, which allows crystals of certain minerals to grow to considerable size before the remaining solidified. The most common minerals occurring in *basalts* are quartz and talc.

There is a group in *basalts* known as *alkali*, which is usually the first to crystallize. It usually crystallizes from a *basaltic* magma, and is the most abundant of the minerals in *basalts*. It is the most abundant of the minerals in *basalts*.

through the mass, forming large, irregular masses known as magmatic segregations. This is often true in the case of the minerals magnetite, ilmenite, and cassiterite, and important ore bodies of these minerals have been formed in this manner.

Sedimentary Rocks. Sedimentary rocks are always secondary in origin, having been formed by the deposition and solidification of material transported from a decaying and disintegrating rock mass. These rocks are divided into two classes, depending on whether the material was transported in solution or mechanically. Sedimentary rocks are characterized by a parallel or stratified structure. The major types are:

1. Sandstone. Consisting chiefly of grains of quartz, cemented with calcium carbonate, silica, or iron oxides. Usually light in color, yellow or red. If coarse-grained, consisting of weathered pebbles of other rocks, the term conglomerate is used. A breccia is a similar type in which the pebbles are angular. If unweathered feldspar is present, the rock is known as an arkose.

2. Shale. Consisting chiefly of very fine grains of some kaolin mineral or mica, the grains being too small to be seen by the naked eye as individuals. Usually gray to black in color. A thinly laminated structure is typical.

3. Limestone. Consisting chiefly of calcite, though dolomite is sometimes important. Usually gray in color.

through the nose. During the process of breathing, the air is drawn into the lungs through the nostrils. This is often done in the case of the alveolar sacs, the alveoli, and the capillaries, which are important for the exchange of gases. This process is called respiration.

Respiratory System: The respiratory system is the system of organs that takes in oxygen from the air and transports it to the cells of the body. It also removes carbon dioxide from the cells and transports it back to the atmosphere. The respiratory system consists of the trachea, bronchi, bronchioles, and alveoli. The trachea is the windpipe, and the bronchi are the main airways. The bronchioles are the smaller airways, and the alveoli are the tiny air sacs where the exchange of gases takes place.

1. Trachea: The trachea is the windpipe, and it is located in the neck. It is made of cartilage and is about 12 cm long. It has a diameter of about 2.5 cm. The trachea is supported by C-shaped cartilaginous rings. The trachea is lined with a mucous membrane. The trachea is the main airway that carries air from the larynx to the bronchi.

2. Bronchi: The bronchi are the main airways that branch off from the trachea. They are located in the chest. They are made of cartilage and are about 25 cm long. They have a diameter of about 1.5 cm. The bronchi are lined with a mucous membrane. The bronchi are the main airways that carry air from the trachea to the bronchioles.

Limestone ranges in texture from the typical fine-grained types to the coarse-grained, crystalline types. Chalk is a friable, fine-grained limestone composed of the skeletons of minute, one-celled marine animals.

4. Other Sedimentary Formations. Rock salt occurs in beds of considerable size, as does gypsum. Anhydrite also may make up large beds. Silica occurs in various forms as other sedimentary types than sandstone: as geyserite, deposited from hot springs; diatomaceous earth or diatomite, similar to chalk except that the siliceous skeletons are of one-celled marine plants. Iron ores often occur in sedimentary beds, especially hematite and limonite. There are sedimentary beds of phosphate rock of considerable extent in some parts of the United States.

Metamorphic Rocks. Metamorphic rocks are rocks which have undergone a physical or chemical change since their original formation, due to the action of geological processes operating within the earth. The changes involve formation of new minerals that are stable under a new set of physical and chemical conditions which affect the rock. Certain minerals are very characteristic of metamorphic rocks. They are listed on a later page.

Metamorphic rocks are usually easily recognized as such, because high pressures have generally caused flattening of mineral grains and the development of a laminated

Enderbury ranges in texture from fine grained to coarse grained
 types to the coarse-grained, crystalline types. It is
 typical, fine-grained limestone composed of the calcite
 or aragonite, one called matrix minerals.

 4. Other sedimentary formations. These are
 beds of sandstone, shale, or limestone, or
 any some up large beds. They occur in various
 other sedimentary types than mentioned as separate
 they have not uniform distribution rates of thickness.
 The first of these is that the limestone is
 one called matrix limestone. It is
 very beds, especially massive and fossiliferous.
 sedimentary beds of limestone rock of crystalline
 In some parts of the United States.

 Sedimentary rocks are rocks which are
 produced by physical or chemical changes since their
 formation, due to the action of geological processes
 which occur in the earth. The changes involve
 minerals that are stable under a new set of physical
 conditions. These are rocks which are
 the very characteristic of sedimentary rocks.

 Sedimentary rocks are usually easily distinguished
 from igneous and metamorphic rocks because of
 their of mineral grains and the development of fossils.

structure.

The principal types of metamorphic rocks are:

1. Gneiss. Coarse-grained, roughly foliated. Consists chiefly of quartz, feldspar, and some mica. The various types are described with respect to the structure, with respect to the normal igneous rock to which they are similar in composition, or with respect to the dominant mineral, if other than quartz, feldspar, or mica. The gneisses are the most common metamorphic rocks.

2. Mica-schist. A finer-grained, more finely foliated type than gneiss, consisting largely of quartz and a mica. Characteristic accessory minerals are often present. Next to the gneisses, mica-schists are the most common metamorphic types.

3. Quartzite. Consisting essentially of quartz, and derived from a sandstone by intense metamorphism. Light in color; very firm and compact. A common type.

4. Slate. A very fine-grained, finely foliated type, capable of being split into thin sheets. Commonly formed by the metamorphism of a shale. A quite common type.

5. Other Schists. Certain schists do not contain quartz and mica as the dominant minerals. They are usually formed by the metamorphism of ferromagnesian igneous rocks. The common types are talc-schist, chlorite schist, etc.

1. *Staphylococcus aureus*. This is the most common staphylococcus. It is a spherical bacterium, usually found in pairs or small groups. It is highly resistant to heat and disinfectants. The principal type of staphylococcus found in the nose is *S. aureus*.
2. *Staphylococcus epidermidis*. This is a common staphylococcus, usually found in pairs or small groups. It is highly resistant to heat and disinfectants. The principal type of staphylococcus found in the nose is *S. aureus*.
3. *Staphylococcus saprophyticus*. This is a common staphylococcus, usually found in pairs or small groups. It is highly resistant to heat and disinfectants. The principal type of staphylococcus found in the nose is *S. aureus*.
4. *Staphylococcus sciuri*. This is a common staphylococcus, usually found in pairs or small groups. It is highly resistant to heat and disinfectants. The principal type of staphylococcus found in the nose is *S. aureus*.
5. *Staphylococcus carnosus*. This is a common staphylococcus, usually found in pairs or small groups. It is highly resistant to heat and disinfectants. The principal type of staphylococcus found in the nose is *S. aureus*.
6. *Staphylococcus hyalinus*. This is a common staphylococcus, usually found in pairs or small groups. It is highly resistant to heat and disinfectants. The principal type of staphylococcus found in the nose is *S. aureus*.
7. *Staphylococcus albus*. This is a common staphylococcus, usually found in pairs or small groups. It is highly resistant to heat and disinfectants. The principal type of staphylococcus found in the nose is *S. aureus*.
8. *Staphylococcus citreus*. This is a common staphylococcus, usually found in pairs or small groups. It is highly resistant to heat and disinfectants. The principal type of staphylococcus found in the nose is *S. aureus*.
9. *Staphylococcus gelatinosus*. This is a common staphylococcus, usually found in pairs or small groups. It is highly resistant to heat and disinfectants. The principal type of staphylococcus found in the nose is *S. aureus*.
10. *Staphylococcus lentiginosus*. This is a common staphylococcus, usually found in pairs or small groups. It is highly resistant to heat and disinfectants. The principal type of staphylococcus found in the nose is *S. aureus*.
11. *Staphylococcus epidermidis*. This is a common staphylococcus, usually found in pairs or small groups. It is highly resistant to heat and disinfectants. The principal type of staphylococcus found in the nose is *S. aureus*.
12. *Staphylococcus aureus*. This is a common staphylococcus, usually found in pairs or small groups. It is highly resistant to heat and disinfectants. The principal type of staphylococcus found in the nose is *S. aureus*.

6. Marble. Consisting of calcite, and formed by the metamorphism of a limestone or dolomite. Varies in texture from very fine granular to very coarse crystalline.

Contact Metamorphic Minerals. When igneous rocks are intruded into the earth's crust, they cause more or less intense alteration in the surrounding rocks, depending upon the temperature of the intrusive body and the kind and amount of mineralizers. The alteration is manifested in the development of new minerals in the contact zone, both in the igneous body and especially in the country rock. The changes are most striking when the intruded rock is an impure limestone. A pure limestone when intruded is converted into a marble, but if impurities of iron, aluminum, magnesium, carbon, etc., are present, they enter into the composition of new minerals. The most typical contact metamorphic minerals are: graphite, spinel, corundum, wollastonite, tremolite, pyroxene, and the calcium garnets grossularite and andradite.

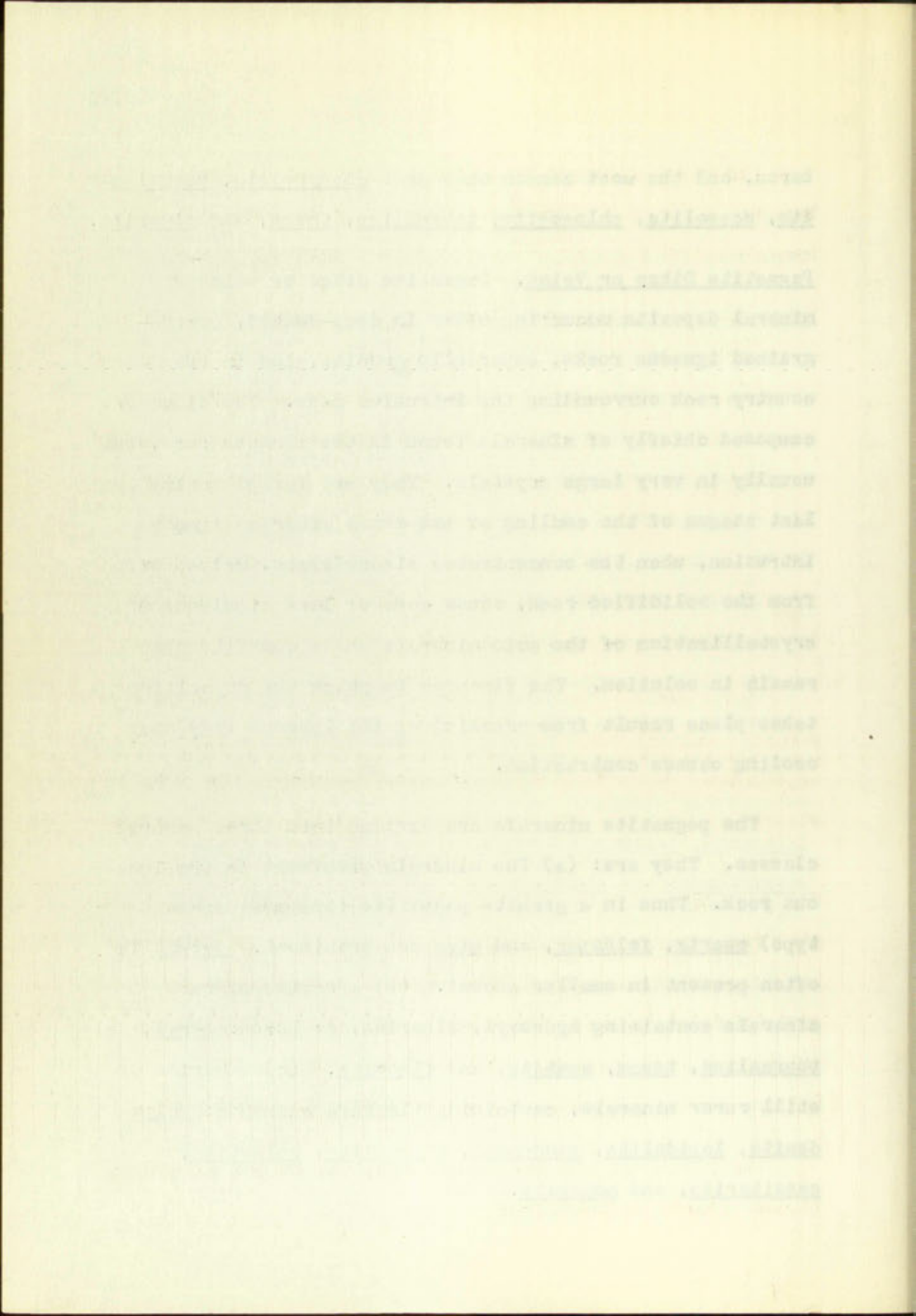
Igneous rocks on cooling give off large quantities of the so-called mineralizing vapors. These consist largely of water vapor, but also include boron and fluorine gases. Under the influence of these agents, minerals are often formed in the contact zone of a limestone, these being known as pneumatolytic minerals. They are chiefly calcium and aluminum silicates containing hydroxyl, fluorine, or

... of the ... consisting of ... and formed by the
 metamorphism of a limestone on dolomite. ... in texture
 from very fine granular to very coarse crystalline.
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 metamorphic minerals are: talc, actinolite, hornblende, acti-
 nolite, tremolite, pyroxene, and the various garnets
 and amphiboles.
 Igneous rocks on cooling give off large quantities of
 the so-called mineralizing vapors. These consist largely
 of water vapor, but also include hydrocarbons and various gases.
 Under the influence of these vapors, minerals are often
 formed in the contact zone of a limestone, these being
 known as contact metamorphic minerals. They are chiefly carbon-
 aceous minerals and include hydrocarbons, limestone, etc.

boron, and the most common ones are: chondrodite, vesuvianite, scapolite, phlogopite, tourmaline, topaz, and fluorite.

Pegmatite Dikes or Veins. Pegmatite dikes or veins are mineral deposits occurring often in deep-seated, coarse-grained igneous rocks, especially granite, and in the country rock surrounding the intrusive mass. The dikes are composed chiefly of minerals found in the igneous rock, but usually in very large crystals. They are formed during the last stages of the cooling of the magma after an igneous intrusion, when the concentrated mineralizers, driven off from the solidified rock, cause more or less simultaneous crystallization of the acid minerals whose constituents remain in solution. The fissures in which the deposition takes place result from cracking of the igneous body when cooling causes contraction.

The pegmatite minerals are divided into three general classes. They are: (a) The minerals prominent in the igneous rock. Thus in a granite pegmatite (the most common type) quartz, feldspar, and mica are prominent. Garnet is often present in smaller amount. (b) A series of rare minerals containing hydroxyl, fluorine, or boron: beryl, tourmaline, topaz, apatite, and fluorite. (c) A series of still rarer minerals, containing the rare elements: molybdenite, lepidolite, spodumene, triphylite, columbite, cassiterite, and monazite.



These deposits are of peculiar interest to mineralogists, because of the rare minerals which occur in them, and also because large and well-formed crystals frequently occur.

Veins and Vein Minerals. Most of the valuable ore minerals occur in veins, where they have been deposited by the action of heated ground waters. Veins vary in shape according to whether the rock containing them is firm and compact, easily shattered, or soft and easily dissolved. A typical vein occurs in a definite fissure, and fills it from wall to wall. In some deposits, there has been replacement of minerals in the wall rock by ore minerals, forming a more or less irregular replacement deposit.

The kinds of minerals occurring in veins depend on the chemical constituents of the solution from which they are deposited. While many minerals occur in veins, the most characteristic ones are the sulphides pyrite, FeS_2 , chalcopyrite, CuFeS_2 , galena, PbS , sphalerite, ZnS , chalcocite, Cu_2S , bornite, Cu_5FeS_4 , marcasite, FeS_2 , arsenopyrite, FeAsS , stibnite, Sb_2S_3 , tetrahedrite, $\text{Cu}_6\text{Sb}_2\text{S}_7$, etc. In addition to these, certain non-metallic minerals often occur as a groundmass or gangue. The common ones are quartz, SiO_2 , calcite, CaCO_3 , dolomite, $\text{CaMg}(\text{CO}_3)_2$, siderite, FeCO_3 , barite, BaSO_4 , fluorite, CaF_2 , rhodochrosite, MnCO_3 , etc.

The following are the common types of veins, according to the mineral composition:

These deposits are of granitic nature in composition, because of the fact that they consist of quartz, feldspar, mica, and also other minerals. The veins are usually irregular in shape and are found in the granite. They have been deposited by the action of heated water. The veins vary in depth according to the amount of water that has been deposited. A typical vein is shown in the following illustration, and this is from one of the veins in the granite. It has been observed that in some deposits, there has been a replacement of mica in the walls of the veins, forming a zone of replacement. This is shown in the following illustration.

The kind of minerals occurring in veins depend on the composition of the solution from which they are deposited. This may contain iron, manganese, and other elements. In some cases, the veins contain iron, manganese, and other elements. In some cases, the veins contain iron, manganese, and other elements. In some cases, the veins contain iron, manganese, and other elements. In some cases, the veins contain iron, manganese, and other elements.

The following are the names of some of the minerals occurring in the veins:

1. Gold-bearing Quartz Veins. The gold occurs finely disseminated, in nests, or in connection with various sulphides. The common sulphides are pyrite, chalcopyrite, and arsenopyrite.

2. Gold- and Silver-bearing Copper Veins. The gold and silver occur associated with various copper sulphides. The common minerals are chalcopyrite, tetrahedrite, bornite, chalcocite, pyrite, and the rarer silver sulphides.

3. Silver-bearing Lead Veins. The silver occurs associated with some lead mineral. The ordinary minerals found in such veins, including both lead minerals and other minerals, are galena, argentite, tetrahedrite, sphalerite, pyrite, calcite, dolomite, rhodochrosite, etc.

4. Lead-zinc veins. Lead and zinc minerals are often associated in veins. The prominent minerals are galena, sphalerite, marcasite, chalcopyrite, smithsonite, calamine, cerussite, calcite, and dolomite.

5. Copper-iron Veins. Copper and iron minerals are often associated with each other, the chief minerals of such veins being pyrite, chalcopyrite, chalcocite, bornite, tetrahedrite, enargite, etc.

Primary and Secondary Vein Minerals; Secondary Enrichment.

In many veins, it is obvious that some of the minerals belong to the original deposit, while others have been formed

1. Chlorophyll a. The main component of the green color in plants, or in extracting with various solvents. The common varieties are Chlorophyll a, Chlorophyll a, Chlorophyll a.

2. Chlorophyll b. The main component of the green color in plants, or in extracting with various solvents. The common varieties are Chlorophyll b, Chlorophyll b, Chlorophyll b.

3. Chlorophyll c. The main component of the green color in plants, or in extracting with various solvents. The common varieties are Chlorophyll c, Chlorophyll c, Chlorophyll c.

4. Chlorophyll d. The main component of the green color in plants, or in extracting with various solvents. The common varieties are Chlorophyll d, Chlorophyll d, Chlorophyll d.

5. Chlorophyll e. The main component of the green color in plants, or in extracting with various solvents. The common varieties are Chlorophyll e, Chlorophyll e, Chlorophyll e.

6. Chlorophyll f. The main component of the green color in plants, or in extracting with various solvents. The common varieties are Chlorophyll f, Chlorophyll f, Chlorophyll f.

subsequently. The two classes are known as primary and secondary minerals, respectively. The primary metallic vein minerals are few in number, the more important ones being pyrite, chalcopyrite, galena, and sphalerite. The secondary minerals have been formed from the primary minerals by a chemical and physical change, brought about usually through the influence of oxidizing waters from the surface, which act on the upper part of the vein. Many of the minerals are thus oxidized compounds.

Since the meteoric waters lose their oxygen at only a slight depth, only the upper parts of a mineral vein are oxidized. At the same time, there is usually a tendency for the valuable metallic minerals to be dissolved, carried down, and reprecipitated at the water table. As erosion removes the upper parts of the vein, the oxidized zone penetrates deeper and deeper, and the solution and reprecipitation of the metallic minerals is repeated, until in time the lower parts of a mineral vein, at and just below the water table, may be very considerably enriched by the addition of metallic minerals brought from above. The whole process is known as secondary enrichment. It must be remembered that it takes place near the water table, and thus within a few hundred feet of the top of the vein. As one descends lower, it is usually seen that the metallic mineral content of the vein gradually returns to the original state, and the minerals may be present in quantities too small to permit profitable

independently. The two classes are known as primary and secondary minerals, respectively. The primary minerals are those which are formed directly from the magma, and the secondary minerals are those which are formed from the primary minerals by a chemical and physical change, usually through the influence of existing water. The water which acts on the upper part of the magma is known as the meteoric water, and this is the water which is responsible for the formation of the secondary minerals. At the same time, there is another source of water, the water which is contained in the magma itself, and this is known as the magmatic water. The water which is contained in the magma is responsible for the formation of the primary minerals, and the water which is contained in the magma is also responsible for the formation of the secondary minerals. The water which is contained in the magma is also responsible for the formation of the primary minerals, and the water which is contained in the magma is also responsible for the formation of the secondary minerals.

mining.

The following paragraphs give the common primary vein minerals, and the secondary minerals derived from them:

1. Iron Minerals. The common primary mineral is pyrite, FeS_2 . Upon oxidation, pyrite commonly yields limonite, the hydrated ferric oxide, $2\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$.

2. Copper Minerals. The only common primary copper mineral is chalcopyrite, CuFeS_2 . Other copper minerals may sometimes occur as primary minerals, but they are usually secondary. The chalcopyrite is decomposed to yield copper sulphide, which is oxidized to copper sulphate, and descends to enrich lower portions of the vein; and iron sulphide, which is oxidized to form limonite. If the vein is in limestone, copper carbonates are frequently formed in the upper parts of the deposit. The secondary copper minerals include chalcocite, Cu_2S , bornite, Cu_5FeS_4 , native copper, Cu , cuprite, Cu_2O , malachite, $(\text{Cu} \cdot \text{OH})_2\text{CO}_3$, azurite, $\text{Cu}(\text{Cu} \cdot \text{OH}) \cdot (\text{CO}_3)_2$, chrysocolla, $\text{CuSiO}_3 \cdot 2\text{H}_2\text{O}$, and chalcanthite, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$.

3. Lead Minerals. The only common primary lead mineral is galena, PbS . The secondary minerals are all oxidized compounds, and include cerussite, PbCO_3 , anglesite, PbSO_4 , pyromorphite, $\text{Pb}_4(\text{PbCl})(\text{PO}_4)_3$, and wulfenite, PbMoO_4 .

4. Zinc Minerals. The common primary zinc mineral is

The following paragraphs give the common primary vein

minerals, and the secondary minerals derived from them:

1. Iron Minerals. The common primary mineral is hematite,

Fe₂O₃. Other common primary minerals are magnetite, Fe₃O₄, and

pyrite, FeS₂. Secondary minerals are hematite, Fe₂O₃, and

limonite, Fe₂(OH)₃·2H₂O.

2. Copper Minerals. The only common primary copper

mineral is chalcocite, Cu₂S. Other common primary minerals are

malachite, Cu₂(OH)₂CO₃, and azurite, Cu₃(OH)₆(CO₃)₂.

Secondary minerals are chalcocite, Cu₂S, and malachite,

Cu₂(OH)₂CO₃. The characteristic secondary mineral is azurite,

Cu₃(OH)₆(CO₃)₂, which is obtained by copper sulphate and ammonia

in solution. It is obtained in iron minerals. If the vein is in

granite, copper sulphate is frequently found in the veins

of the granite. The secondary copper minerals include

malachite, Cu₂(OH)₂CO₃, azurite, Cu₃(OH)₆(CO₃)₂, and

chalcocite, Cu₂S. Other secondary minerals are cuprite,

Cu₂O, and tenorite, CuO.

3. Lead Minerals. The only common primary lead mineral

is galena, PbS. The secondary minerals are all oxidized

products of galena, such as cerussite, PbCO₃, and anglesite,

PbSO₄. Other secondary minerals are lead sulphate, PbSO₄, and

lead carbonate, PbCO₃.

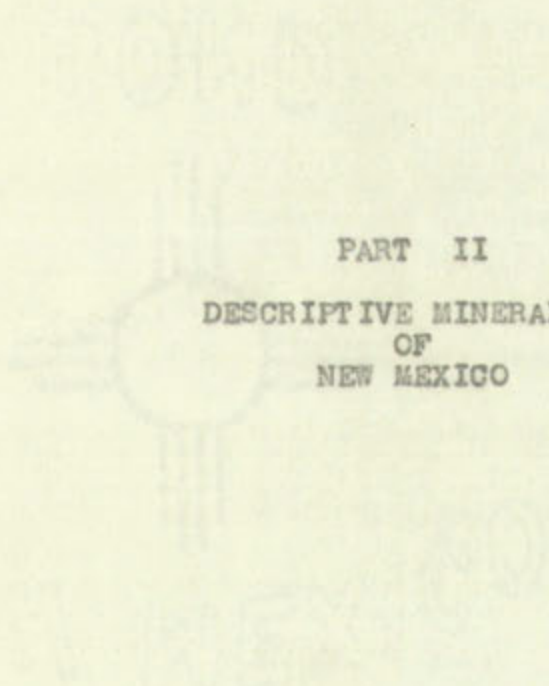
4. Zinc Minerals. The common primary zinc mineral is

sphalerite, ZnS . The secondary minerals include smithsonite, $ZnCO_3$, and calamine, $H_2(Zn_2O)SiO_4$.

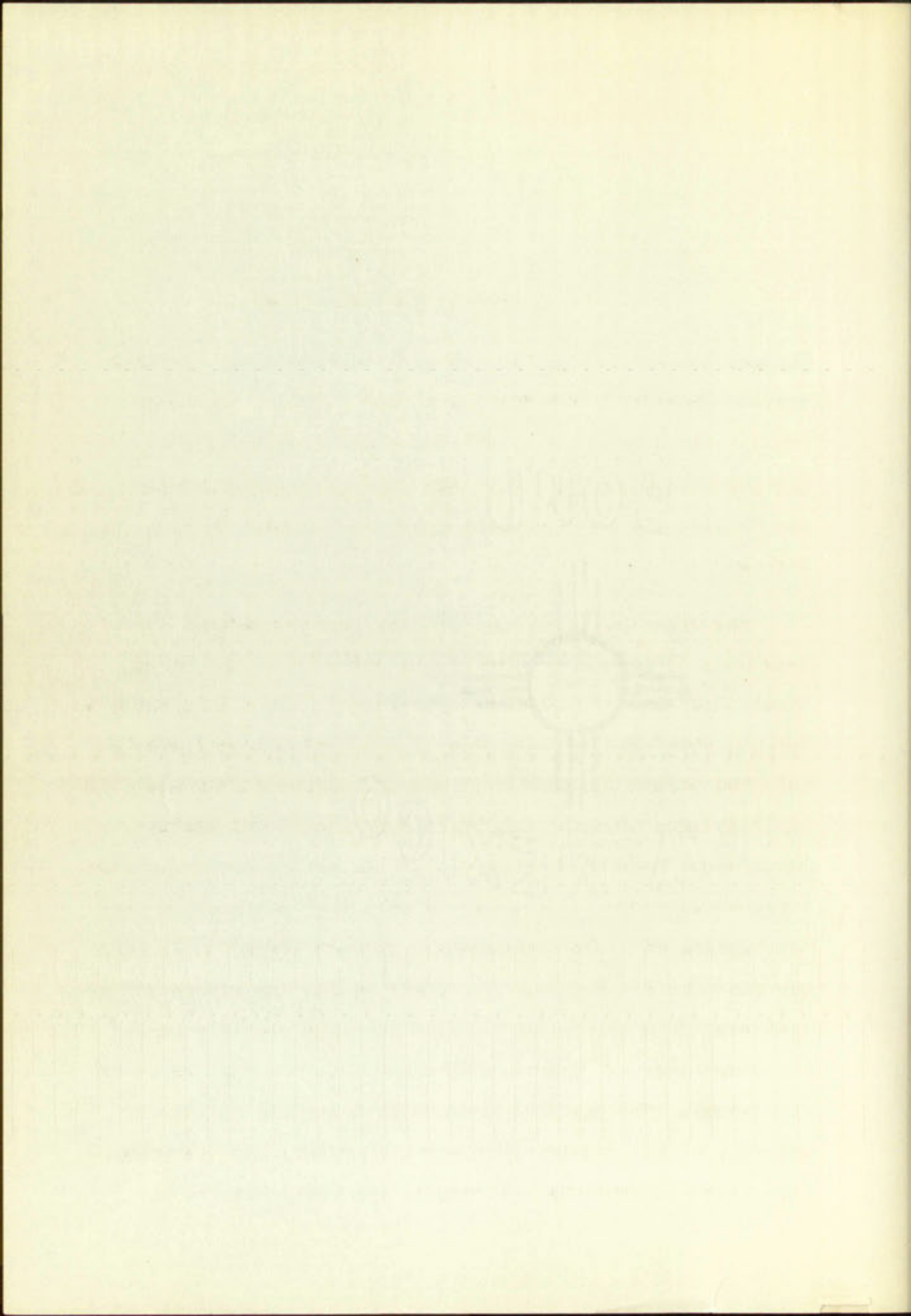
5. Silver Minerals. Most silver sulphide minerals are probably primary. Secondary silver minerals include native silver, Ag , which is also often primary, cerargyrite, $AgCl$, and embolite, $Ag(Cl,Br)$.

1890. The secondary minerals include malachite,
azurite, and chrysocolla.

3. Silver Minerals. These silver sulphide minerals are
usually primary. Secondary silver minerals include silver
chloride, which is also often primary, and silver
and sulphate, etc.



PART II
DESCRIPTIVE MINERALOGY
OF
NEW MEXICO



VI. DESCRIPTIVE MINERALOGY.

Scope. In this paper, the Descriptive Mineralogy for each species includes a description of the physical characteristics, the chemical composition, a description of the distinguishing characters of any varieties occurring in New Mexico, and a list of the known occurrences in the State.

The description of the physical characteristics for each species is essentially that given in the "System of Mineralogy" and "Textbook of Mineralogy" (see bibliography). Certain descriptions have been enlarged or changed, and in this the writer has made free use of available sources. The descriptions, then, are general, and not all New Mexico occurrences include specimens with the color, luster, structure, etc., ranges given. It is felt that restricting the description of a certain mineral, perhaps occurring in only one place in New Mexico, to conform to the characters of the specimens from that single locality, might possibly cause the occurrence of other varieties of the same species to be overlooked. The physical characters described for the majority of the species are: crystal system, typical crystal form (habit), structure, cleavage, fracture, tenacity,

VI. DESCRIPTIVE LITERATURE

In this paper, the descriptive literature on the species includes a description of the physical characters, the chemical composition, a tabulation of the distinguishing characters of any varieties occurring in the Mexico, and a list of the known localities in the State.

The description of the physical characteristics of each species is essentially that given in the "Physical Characters" and "Tabulation of Characters" of the descriptive literature. Some descriptions have been enlarged or changed, and this the writer has made two sets of available characters. The descriptions, then, are general, and not all the characters mentioned include specimens with the color, texture, etc., etc., ranges given. It is felt that a description of a certain mineral, perhaps occurring in any place in the Mexico, is not so much as the mineral itself, but that it is a mineral, with its physical characters, and its occurrence at other localities of the same kind, is of no account. The physical characters, then, are given in the list of the species and are not repeated in the descriptive literature.

hardness, specific gravity, luster, color, streak, transparency, and special characters, in the order named.

No chemical tests are given, since it is impossible for most collectors to make them. Only the chemical composition is included.

The occurrences as given for New Mexico species were taken from a card catalogue prepared by Dr. Stuart A. Northrop, head of the Department of Geology. They are arranged alphabetically by counties, and, within each county, by districts, arranged alphabetically, and regions, also arranged alphabetically. The term district refers to a definite and restricted area, usually a well known mining district. The term region is less definite, and is used where the area is large, or where exact localities are not reported. The lists of occurrences for many species are so long that it is quite impossible to give specific directions for finding particular locations, such as mine dumps, etc. The earnest collector will, however, encounter little difficulty in finding specimens of most of the species if he makes local inquiries when collecting in any of the districts.

This paper is intended not only as a guidebook for the collector, but also as a record of all reported occurrences of minerals in the State, and so there are included descriptions of certain minerals which are no longer obtainable

characters, specific gravity, luster, color, streak, cleavage,
 tenacity, and optical characters, in the order named.
 No chemical tests are given, since it is impossible
 for most collectors to make them. Only the chemical analysis
 is indicated.
 The occurrence is given for the various species very
 fully from a card catalogue prepared by Dr. H. S. Grew,
 Professor, head of the Department of Geology. They are
 arranged alphabetically by counties, and within each county
 by districts arranged alphabetically, and regions, also
 arranged alphabetically. The term "district" refers to a
 detailed and restricted area, usually a well known mining
 district. The term "region" is less detailed, and is used
 where the area is larger, or where exact localities are not
 reported. The lists of occurrences for many species are so
 long that it is quite impossible to give specific districts
 for listing particular localities, such as mine name, etc.
 The names of collectors will, however, be given in the
 locality in listing specimens of most of the species in the
 above localities when collecting in any of the districts.
 This report is intended not only as a guidebook for the
 collector, but also as a record of all reported occurrences
 of minerals in the State, and contains the names of collectors
 and of certain minerals which are no longer reported.

in good specimens at the localities named, even when careful search is made. This is, unfortunately, especially true in the case of several of the rarer minerals.

A question mark after the name of a mineral indicates doubt as to the occurrence of the species in the State. A question mark after a particular occurrence indicates doubt as to its occurrence in a certain locality.

in good treatment at the hospital...
is made. This is, unfortunately, a common...
the case of several of the other cases.

A question may arise after the name of a patient...
is found as to the occurrence of the disease in the...
question may arise after a particular occurrence...
as to its occurrence in a certain locality.

NEW MEXICO MINERALSACMITE. Aegirite.

Physical characteristics. Ordinary acmite is not reported from New Mexico. For aegirite, the characteristics are: Monoclinic. Crystals prismatic, bluntly terminated; twins not common; also in groups of slender acicular to capillary crystals, and in fibrous forms. Cleavage: prismatic, distinct. Fracture uneven. Brittle. H.- 6-6.5. Sp.G.- 3.50-3.55. Luster vitreous, inclining to resinous. Color brownish or reddish brown, green; blackish green on a fracture surface. Streak pale yellowish gray. Subtransparent to opaque.

Chemical composition. Essentially $\text{Na}_2\text{O} \cdot \text{Fe}_2\text{O}_3 \cdot 4\text{SiO}_2$.

Occurrence. Colfax County: Pleasant Valley region.

ACTINOLITE. A variety of Amphibole.

Physical characteristics. Monoclinic. Contact-twins common. Commonly in prismatic crystals, short or long bladed. Also columnar or fibrous; granular massive. Cleavage: perfect in two planes, at angles of 55° and 125° . Fracture subconchoidal, uneven. Brittle. H.- 5-6. Sp.G.- 3-3.2. Luster

THE SPERMATOPHYTES

Section I

Conifers. - A variety of seed-bearing plants from New Britain. The characteristic of most is the presence of woody stems, which are usually branched and woody. They are also found in groups of single stems or in clusters. The leaves are usually needle-like, and are often very small. The flowers are usually small and are often in clusters. The fruits are usually cones or berries. Some are evergreen, and some are deciduous. The seeds are usually small and are often in clusters. The plants are usually found in cool or temperate climates.

Section II. - A variety of seed-bearing plants from New Britain. The characteristic of most is the presence of woody stems, which are usually branched and woody. They are also found in groups of single stems or in clusters. The leaves are usually needle-like, and are often very small. The flowers are usually small and are often in clusters. The fruits are usually cones or berries. Some are evergreen, and some are deciduous. The seeds are usually small and are often in clusters. The plants are usually found in cool or temperate climates.

Section III. - A variety of seed-bearing plants from New Britain. The characteristic of most is the presence of woody stems, which are usually branched and woody. They are also found in groups of single stems or in clusters. The leaves are usually needle-like, and are often very small. The flowers are usually small and are often in clusters. The fruits are usually cones or berries. Some are evergreen, and some are deciduous. The seeds are usually small and are often in clusters. The plants are usually found in cool or temperate climates.

Section IV. - A variety of seed-bearing plants from New Britain. The characteristic of most is the presence of woody stems, which are usually branched and woody. They are also found in groups of single stems or in clusters. The leaves are usually needle-like, and are often very small. The flowers are usually small and are often in clusters. The fruits are usually cones or berries. Some are evergreen, and some are deciduous. The seeds are usually small and are often in clusters. The plants are usually found in cool or temperate climates.

vitreous, pearly on cleavage surfaces; of fibrous varieties often silky. Color bright to grayish green. Streak uncolored, or paler than mineral color. Transparent to translucent. Long green crystals are glassy actinolite. Fibrous forms are called asbestiform actinolite.

Chemical composition. Metasilicate of calcium and magnesium, with iron, $\text{Ca}_2(\text{Mg,Fe})_5(\text{OH})_2(\text{Si}_4\text{O}_{11})_2$.

Varieties. 1. Uralite. Pyroxene altered to amphibole. Crystals, where distinct, retain the form of the original mineral, but have the cleavage of amphibole. Crystals usually made up of amphibole needles or fibers. Conforms in composition most nearly to actinolite, though it may be white (tremolite). Composition characterized by a decrease in calcium and an increase in magnesium from the proportions in the original mineral.

Occurrence. Grant County: Fierro-Hanover district. San Miguel County: Willow Creek district. Socorro County: Jones Camp district.

Var. Uralite. San Miguel County: Willow Creek district.

AESCHYNITE. (?)

Physical characteristics. Pseudo-orthorhombic. Crystals prismatic. Fracture small conchoidal. Brittle. H.- 5-6.

viewed, partly on account of the small amount of iron
contained in the ore. When the ore is treated with
acid, or when the mineral is heated, it gives off
iron. Some green crystals are also obtained. These
crystals are called epidote crystals.

Optical properties. Epidote is a uniaxial mineral
with iron. $\text{Ca}_2(\text{Mg}, \text{Fe})_2(\text{Si}, \text{Al})_2\text{O}_{10}$.

Properties. - Epidote is a uniaxial mineral, whose
crystals, when distinct, exhibit the form of a
rhomb, but have the character of epidote. It
usually made up of crystals which are
isomorphous with the epidote. It is
white (translucent). Epidote is abundant in
granite and in gneiss. It is also found
in the original mineral.

Occurrence. Epidote is found in granite, gneiss,
and other rocks. It is also found in
Oregon district. Epidote is found in
Oregon district.

Ver. Epidote. - See Epidote. Epidote is found in
Oregon district.

APPENDIX

Physical characteristics. Epidote is a uniaxial
mineral. Epidote is found in Oregon district.

Sp.G.— 4.93 (Hittero); 5.168 (Miask). Luster submetallic to resinous, nearly dull. Color nearly black, inclining to brownish yellow when translucent. Streak gray or yellowish brown to nearly black. Subtranslucent to opaque.

Chemical composition. A columbate and titanate (and thorate) of the cerium metals chiefly, with small amounts of iron, calcium, etc. Rammelberg calculates the formula $R_2Cb_4O_{13} \cdot R_2(Ti,Th)_5O_{13}$; where R = the cerium metals.

Occurrence. Rio Arriba County: Petaca district.

ALABANDITE.

Physical characteristics. Isometric. Crystals rare. Granular massive. Cleavage: cubic, perfect. Fracture uneven. Brittle. H.— 3.5–4. Sp.G.— 3.95–4.04. Luster submetallic. Color iron-black. Streak green. Feebly translucent on thin edges.

Chemical composition. Manganese sulphide, MnS.

Occurrence. Santa Fe County: New Placers district. Sierra County: Kingston district.

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ALBITE. Moonstone. A species of Feldspar.

Physical characteristics. Triclinic. Orthoclase-type twins common. Also polysynthetic twinning, leading to thin lamellae and consequent fine striations on the surface. Crystals prismatic and tabular. Also massive, lamellar or granular. Lamellae often curved. Occasionally very fine granular. Cleavage: one direction, perfect; two other directions, less perfect. Fracture uneven to conchoidal. Brittle. H.— 6–6.5. Sp.G.— 2.60–2.62. Luster vitreous, pearly on cleavage surfaces. Color white to faintly tinted. Streak colorless. Transparent to subtranslucent.

Chemical composition. Silicate of sodium and aluminum, $\text{NaAlSi}_3\text{O}_8$. Often contains calcium, sometimes potassium.

Varieties. 1. Cleavelandite. Cleavelandite. A white lamellar variety. 2. Moonstone. Variety with a pearly opalescent luster or delicate play of colors; a microperthitic intergrowth of albite and orthoclase.

Occurrence. Lincoln County: White Oaks district. Luna County: Florida Mountains and Fluorite Ridge districts. Rio Arriba County: Petaca district. Sandoval County: Jemez region. Taos County: Harding Mine district. (Indefinite: near Mora.)

Var. Cleavelandite. Rio Arriba County: Petaca district. Taos County: Harding Mine district.

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Var. Moonstone. Socorro County: San Mateo Mountains region.

ALLOPHANE.

Physical characteristics. Amorphous. In incrustations, usually thin, with a mammillary surface. Fracture imperfectly conchoidal. Very brittle. H.- 3. Sp.G.- 1.85-1.89. Luster vitreous to subresinous. Bright waxy internally. Color pale sky-blue, greenish to deep green, brown, yellow, or colorless. Streak uncolored. Translucent.

Chemical composition. Hydrous aluminum silicate,
 $Al_2SiO_5 \cdot nH_2O$.

Occurrence. Grant County: Fierro-Hanover district. Socorro County: San Jose district.

ALTAITE.

Physical characteristics. Isometric. Crystals rare, cubic or octahedral. Usually massive cleavable. Cleavage cubic. Fracture subconchoidal. Sectile. H.- 3. Sp.G.- 8.16. Luster metallic. Color tin-white, with yellowish tinge, tarnishing to bronze-yellow. Opaque.

Chemical composition. Lead telluride, $PbTe$.

Very common. County of San Diego, California.

ALBERTA

General characteristics. Leaves alternate, ovate, thin, with a serrated margin. Flowers small, pale yellow. Very brittle. Light gray. Color pale yellow. Grown in deep grass, or on rocks. From Alberta, Canada.

General description. Leaves alternate, ovate, thin, with a serrated margin. Flowers small, pale yellow. Very brittle. Light gray. Color pale yellow. Grown in deep grass, or on rocks. From Alberta, Canada.

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ALBERTA

General characteristics. Leaves alternate, ovate, thin, with a serrated margin. Flowers small, pale yellow. Very brittle. Light gray. Color pale yellow. Grown in deep grass, or on rocks. From Alberta, Canada.

General description. Leaves alternate, ovate, thin, with a serrated margin. Flowers small, pale yellow. Very brittle. Light gray. Color pale yellow. Grown in deep grass, or on rocks. From Alberta, Canada.

Occurrence. Dona Ana County: Organ district.

ALUNITE. Alumstone.

Physical characteristics. Hexagonal-rhombohedral. In rhombohedrons, resembling cubes. Also massive, having a fibrous, granular, or impalpable texture. Cleavage: basal, distinct. Fracture flat conchoidal, uneven; of massive varieties splintery, and sometimes earthy. Brittle. H.- 3.5-4. Sp.G.- 2.58-2.752. Luster vitreous, basal plane somewhat pearly. Color white, sometimes grayish or reddish. Streak white. Transparent to subtranslucent.

Chemical composition. Basic hydrous sulphate of aluminum and potassium, $K_2Al_6(OH)_{12}(SO_4)_4$.

Occurrence. Grant County: Santa Rita district.

ALUNOGEN. Alum.

Physical characteristics. Monoclinic or triclinic. Occasionally in rosettes of thin crystals. Usually in delicate fibrous masses or crusts; massive. Fracture uneven. Brittle. H.- 1.5-2. Sp.G.- 1.65. Color white, or tinged with yellow or red. Streak white. Subtranslucent to subtransparent. Taste like that of common alum.

100

PROPERTIES - Good for Country: Green District.

WHITE - ALMONDS

Physical Characteristics - Hexagonal, translucent, in
roundness, resembling sugar. Also granular, having a
fibrous, granular, or irregular texture. Color, white,
distinct. Flavors like almond, sweet, of course,
variation slight, and somewhat oily. Oil -
1.0-1.2 sp. gr. - 0.85-0.95. Lower viscosity, less
residual matter. Color white, sometimes yellow or
greenish white. Translucent to translucent.

Chemical Composition - 50% Hydrogen sulphide of
and potassium. $2Al_2(OH)_2 \cdot 3H_2O$

PROPERTIES - Good for Country: Green District.

ALMOND - ALMONDS

Physical Characteristics - Roundness or elliptical, smooth,
also in shape of thin crystals. Usually in
fibrous mass of small masses. Flavors sweet, bitter,
or 1.0-1.2 sp. gr. - 1.00. Color white, or light yellow
or red. Translucent to translucent.

Chemical composition. Hydrrous aluminum sulphate,
 $Al_2(SO_4)_3 \cdot 18H_2O$.

Occurrence. Catron County: near Glenwood, in Little Dry Canyon. Colfax County: near Springer, on Abbott Ranch. Grant County: Alum Mountain district. Luna County: Cooks Peak district. Mora County: in eastern part, 25 miles east of Wagon Mound. Sandoval County: northwestern part. Taos County: west of Red River. Union County: along Ute Creek. (Indefinite: Bacon Springs region.)

AMPHIBOLE.

Common name for a group of closely related species, as shown by the common prismatic cleavage of 54° to 56° - also in optical characters and chemical composition. Chemically, the amphiboles are metasilicates of calcium, magnesium, and ferrous iron chiefly, but also often containing manganese, sodium, potassium, and hydrogen. Alumina and ferric iron are also often present. The composition in some cases is extremely complex, with extensive replacements among the different metals.

The species of the group form a chemical series parallel to those of the closely allied Pyroxene Group. The Amphibole Group has fewer species than the Pyroxene Group, and these show less variety in form.

Chrysothrix *serotina* (L.) Berk.
 (1801) p. 188.

Chrysothrix *serotina* (L.) Berk.
 Chrysothrix *serotina* (L.) Berk.
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 Chrysothrix *serotina* (L.) Berk.
 Chrysothrix *serotina* (L.) Berk.

Chrysothrix

Chrysothrix is a group of closely related species, as shown by the nearly identical characters of 24° to 26° and in optical characters and chemical composition. Usually, the lichens are characterized by calcium, magnesium, and sodium, potassium, and hydrogen. Aluminum and boron are also often present. The composition is more or less uniformly constant, with extensive variations in the different species.
 The species of the group form a chemical series parallel to those of the closely allied *Chrysothrix* group. The lichens group has been divided into the *Chrysothrix* group, and these show some variety in form.

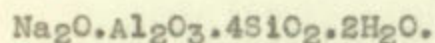
In this paper, the term Amphibole is restricted to the species bearing that name. The varieties of the species occurring in New Mexico are actinolite, tremolite, and hornblende. They are described separately in the text. Asbestos, which may be a phase of several of the varieties, is also described separately.

Occurrence. The following occurrences are of varieties which have not been definitely identified, except as belonging to the species Amphibole: Colfax County: Baldy and Elizabethtown districts. Grant County: Fierro-Hanover district. Luna County: Deming region. Rio Arriba County: Bromide district. San Miguel County: Willow Creek district. Santa Fe County: Santa Fe district. Socorro County: Magdalena district. Taos County: Twining district.

ANALCITE. Analcime.

Physical characteristics. Isometric. Usually in trapezohedrons; also cubes with trapezohedral modifications. Also massive granular; compact with concentric structure. No distinct cleavage. Fracture subconchoidal. Brittle. H.-5-5.5. Sp.G.-2.22-2.29. Luster vitreous. Colorless, white; occasionally grayish, greenish, yellowish, or reddish white. Transparent to nearly opaque.

Chemical composition. $\text{NaAlSi}_2\text{O}_6 \cdot \text{H}_2\text{O}$, or



Occurrence. Colfax County: in four different rocks of the Raton region. McKinley County: Todilto Park region. San Juan County: The Palisades (north of Crystal). San Miguel County: in butte near Las Vegas.

ANDALUSITE.

Physical characteristics. Orthorhombic. Usually in coarse prismatic forms, the prisms nearly square in form. Massive, imperfectly columnar; sometimes radiated and granular. Cleavage: two directions, prismatic, distinct; two others, less distinct. Fracture uneven, subconchoidal. Brittle. H.— 7.5. Sp.G.— 3.16–3.20. Luster vitreous; often weak. Color whitish, rose-red, flesh-red, violet, pearl-gray; reddish brown, olive-green. Streak uncolored. Transparent to opaque, usually subtranslucent.

Chemical composition. Al_2SiO_5 , or $(\text{AlO})\text{AlSiO}_4$, or $\text{Al}_2\text{O}_3 \cdot \text{SiO}_2$.

Occurrence. Socorro County: Iron Mountain No. 2 district (?). Taos County: Glenwoody and Picuris districts.

1885-1886. ALBANY, N.Y.

Geography. - Soil varies in four different parts of the
state, viz.: Albany County; Rensselaer County; Dutchess County;
and Schoharie County. The Hudson (part of Dutchess); the Mohawk
County; is both near the West.

ALBANY, N.Y.

Physical Characteristics. - Generally in some
physical form, the present nearly square in form. Several
important features; including the Hudson;
the Mohawk; Schoharie; and the
Albany; Dutchess; Schoharie;
the Hudson; the Mohawk; Schoharie;
the Hudson; the Mohawk; Schoharie;
the Hudson; the Mohawk; Schoharie;
the Hudson; the Mohawk; Schoharie;
the Hudson; the Mohawk; Schoharie;
the Hudson; the Mohawk; Schoharie;
the Hudson; the Mohawk; Schoharie;
the Hudson; the Mohawk; Schoharie;
the Hudson; the Mohawk; Schoharie;
the Hudson; the Mohawk; Schoharie;
the Hudson; the Mohawk; Schoharie;
the Hudson; the Mohawk; Schoharie;
the Hudson; the Mohawk; Schoharie;

Climate. - Albany, N.Y., or (Albany, N.Y.), or

Albany, N.Y.

Geography. - Albany County; Dutchess County; Schoharie County;
and Schoharie County. The Hudson (part of Dutchess); the Mohawk
County; is both near the West.

ANDESINE. A Plagioclase Feldspar.

Physical characteristics. For general physical characteristics, see Plagioclase Feldspars. Andesine is distinguished chiefly by its cleavage angle ($86^{\circ} 14'$), specific gravity (2.645-2.665), and optical characters (differences in indices of refraction and extinction angles).

Chemical composition. $Ab_{70-50}An_{30-50}$. See table under Plagioclase Feldspars.

Occurrence. Catron County: Mogollon district. Colfax County: in two different rocks of the Raton region. Luna County: Cooks Peak district; in Deming region.

ANGLESITE.

Physical characteristics. Orthorhombic. Crystals usually prismatic, sometimes tabular. Also massive, granular to compact; nodular; stalactitic. Cleavage: three directions, interrupted. Fracture conchoidal. Very brittle. H.- 2.75-3. Sp.G.- 6.3-6.39. Luster highly adamantine to resinous and vitreous. Color white, often tinged yellow, gray, and green. Streak colorless. Transparent to opaque.

Chemical composition. Lead sulphate, $PbSO_4$.

Occurrence. Bernalillo County: Tijeras Canyon district.

Chemical composition. For general physical properties see Physical characteristics. The general physical properties are listed in Table I. The material is chiefly composed of the elements carbon (88.1%), hydrogen (11.9%), and oxygen (0.1%), and is a solid material. It is insoluble in water and other common solvents.

Chemical composition. The material is composed of the elements carbon (88.1%), hydrogen (11.9%), and oxygen (0.1%). It is a solid material and is insoluble in water and other common solvents.

ANALYSIS

Physical characteristics. The material is a solid, colorless to light brown, crystalline substance. It is insoluble in water and other common solvents. It is stable to air and light. The material is a solid, colorless to light brown, crystalline substance. It is insoluble in water and other common solvents. It is stable to air and light.

Chemical composition. The material is composed of the elements carbon (88.1%), hydrogen (11.9%), and oxygen (0.1%). It is a solid material and is insoluble in water and other common solvents.

Colfax County: Baldy district. Dona Ana County: Organ district. Grant County: Central district. Luna County: Cooks Peak district; Victorio district (?). San Miguel County: Willow Creek district. Sierra County: Caballos Mountains, Chloride, Cuchillo Negro, Hermosa, Hillsboro, Kingston, and Macho districts. Socorro County: Hansonburg, Joyita Hills, Magdalena, San Andres Mountains (Mockingbird Gap), and Water Canyon districts.

ANHYDRITE.

Physical characteristics. Orthorhombic. Crystals not common. Usually massive, cleavable, fibrous, lamellar, granular, or impalpable. Cleavage: three directions, yielding rectangular fragments. Fracture uneven, sometimes splintery. Brittle. H.- 3-3.5. Sp.G.- 2.899-2.985. Luster of cleavage surfaces pearly to greasy. Luster of massive varieties vitreous to pearly. Color white, sometimes with a gray, blue, or red tinge. Streak grayish white. Transparent to opaque.

Chemical composition. Anhydrous calcium sulphate, CaSO_4 .

Occurrence. Bernalillo County: Tijeras Canyon district. Eddy County: Carlsbad Potash district. Lincoln County: White Oaks district. Socorro County: Oscura and San Andres Mountains regions. Torrance County: Estancia Salt district.

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Valencia County: Rito region; along Rio Salado, west of Belen.

ANKERITE.

Physical characteristics. Hexagonal-rhombohedral. In rhombohedral crystals. Also crystalline massive, coarse or fine granular, and compact. Cleavage: rhombohedral, perfect. H.— 3.5–4. Sp.G.— 2.95–3.1. Luster vitreous to pearly. Color white, gray, reddish. Translucent to subtranslucent.

Chemical composition. For normal ankerite, $2\text{CaCO}_3 \cdot \text{MgCO}_3 \cdot \text{FeCO}_3$. Often contains manganese in small quantities.

Occurrence. Grant County: Central and Silver City Manganese-Iron districts. Santa Fe County: Cerrillos district. Sierra County: Lake Valley district.

ANNABERGITE.

Physical characteristics. Monoclinic. In capillary crystals. Also massive and disseminated. Cleavage: one direction, perfect. Fracture uneven or earthy. H.— 2.5–3. Sp.G.— 3. Color apple-green. Streak greenish white.

Chemical composition. Hydrrous nickel arsenate, $\text{Ni}_3\text{As}_2\text{O}_8 \cdot 8\text{H}_2\text{O}$.

Valencia County: This region; along Rio Grande, west of
Tular.

AGRICULTURE

Principal agricultural products: wheat, alfalfa, corn, cotton, sugar beets, grapes, citrus fruits, etc. Irrigation is essential for most crops. The climate is semi-arid, with hot summers and cool winters. The principal rivers are the Colorado and the Rio Grande.

Principal occupations: farming, stock raising, mining. The principal cities are Albuquerque, Santa Fe, and Las Alamos.

Principal industries: agriculture, stock raising, mining. The principal cities are Albuquerque, Santa Fe, and Las Alamos.

AGRICULTURE

Principal agricultural products: wheat, alfalfa, corn, cotton, sugar beets, grapes, citrus fruits, etc. Irrigation is essential for most crops. The climate is semi-arid, with hot summers and cool winters. The principal rivers are the Colorado and the Rio Grande.

Principal occupations: farming, stock raising, mining. The principal cities are Albuquerque, Santa Fe, and Las Alamos.

Occurrence. Grant County: Black Hawk district.

ANORTHITE. Indianite. A species of Feldspar.

Physical characteristics. Triclinic. Twins of the albite type common. Crystals usually prismatic. Also massive, cleavable, with granular or lamellar structure. Cleavage: two directions, almost at right angles; one perfect, the other less so. Fracture conchoidal to uneven. Brittle. H.- 6-6.5. Sp.G.- 2.74-2.76. Luster vitreous, somewhat pearly on cleavage surfaces. Color white, grayish, reddish. Streak uncolored. Transparent to translucent.

Chemical composition. A silicate of aluminum and calcium, $\text{CaAl}_2\text{Si}_2\text{O}_8$, or $\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$. Soda often present, increasing as the mineral grades through various stages into albite.

Occurrence. (Indefinite: in various igneous rocks.)

ANORTHOCLASE. Soda-microcline.

Physical characteristics. Triclinic. Form like that of the ordinary feldspars. Twinning as with orthoclase; also polysynthetic twinning. Cleavage: two directions, at angles of nearly 90° , one perfect, one slightly less so. H.- 6-6.5.

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ABSTRACT

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REFERENCES

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Sp.G.-- 2.57-2.60. Luster vitreous, sometimes pearly on a cleavage surface. Color white, also various pale shades as with other feldspars.

Chemical composition. Chiefly a soda-potash feldspar, $\text{NaAlSi}_3\text{O}_8$. KAlSi_3O_8 , the soda molecule usually in larger proportion (2:1, 3:1, etc.), as if consisting of albite and orthoclase molecules. Calcium silicate may be present in very small amounts.

Occurrence. Luna County: Florida Mountains district.

APATITE.

Physical characteristics. Hexagonal-pyramidal. Crystals long to short prismatic to tabular. Also globular and reniform, with fibrous or columnar structure; massive, granular to compact. No distinct cleavage. Fracture conchoidal to uneven. Brittle. H.-- 5, sometimes 4.5 when massive.

Sp.G.-- 3.17-3.23 in crystals. Luster vitreous to subresinous. Color sea-green, bluish green; sometimes violet-blue or white; occasionally yellow, gray, red, flesh-red, and brown. Streak white. Transparent to opaque.

Chemical composition. Calcium fluoride and phosphate, $(\text{CaF})\text{Ca}_4(\text{PO}_4)_3$. Sometimes chlorine replaces part or all of the fluorine.

Sp. 6-17-23. Large, slender, pale greenish yellow.

leaves entire. Only one leaf seen. (See also)

with other labels.

General description. Color greenish yellow.

Sp. 6-17-23. The whole plant is greenish yellow.

propagules (1/2 in. diam.) are very small.

propagules numerous. Color greenish yellow.

very small seeds.

Sp. 6-17-23. Large, slender, pale greenish yellow.

leaves entire. Only one leaf seen. (See also)

with other labels.

ANASTY

General description. Color greenish yellow.

leaves to short petioles to 1/2 in. long. (See also)

form, with tips of entire margins, to 1/2 in. long.

to 1/2 in. long. In distinct clusters. (See also)

leaves. Sp. 6-17-23. Large, slender, pale greenish yellow.

Sp. 6-17-23. In erect. Color greenish yellow.

one. Color red-green, slight white spots, (See also)

or white; occasionally yellow. (See also)

form. Leaves white. (See also)

General description. Color greenish yellow.

(See also) (See also) (See also)

the leaves.

Occurrence. Grant County: Fierro-Hanover district. Luna County: Deming region. Sandoval County: Jemez region. Sierra County: Hillsboro and Lake Valley districts. Socorro County: Magdalena district. Taos County: Harding Mine and Red River districts.

ARAGONITE.

Physical characteristics. Orthorhombic. Crystals often acicular, with acute domes or pyramids. Twins common, sometimes repeated to form pseudo-hexagonal forms. Also globular and reniform; sometimes columnar; stalactitic; incrusting. One distinct cleavage. Fracture subconchoidal. Brittle. H.— 3.5-4. Sp.G.— 2.93-2.95. Luster vitreous, sometimes resinous on fracture surfaces. Color white; also gray, yellow, green, and violet. Streak uncolored. Transparent to translucent.

Chemical composition. Calcium carbonate, CaCO_3 .

Varieties. 1. Flos-ferri. In coralloidal groupings of delicate interlacing stems. Color snow-white.

Occurrence. De Baca County: five miles east of Ramon. Luna County: Cooks Peak district. Sierra County: Chloride and Kingston districts. Socorro County: Magdalena and Water Canyon districts. Valencia County: near Rio Puerco Station

(finely banded onyx in travertine).

Var. Flos-ferri. Dona Ana County: Organ district.

ARGENTITE. Silver Glance.

Physical characteristics. Isometric. Crystals often octahedral, also cubic; often distorted; frequently grouped in reticulated or arborescent forms; also filiform. Massive, embedded; as a coating. No distinct cleavage. Fracture small conchoidal. Perfectly sectile. H.- 2-2.5. Sp.G.- 7.20-7.36. Luster metallic. Color blackish lead-gray. Streak same, shining. Opaque. Often altered on the surface to a black earthy sulphide.

Chemical composition. Silver sulphide, Ag_2S .

Occurrence. Catron County: Mogollon district. Colfax County: Elizabethtown district. Dona Ana County: Organ district. Grant County: Black Hawk, Chloride Flat, Fleming, Georgetown, Lone Mountain, Pinos Altos, Steeple Rock, and Telegraph districts. Hidalgo County: Lordsburg, San Simon, and Steins Pass districts. Luna County: Florida Mountains district. Sandoval County: Cochiti district. San Miguel County: Willow Creek district. Santa Fe County: New Placers and Old Placers districts. Sierra County: Chloride, Hermosa, Hillsboro, Kingston, Lake Valley, and Tierra Blanca districts.

1890

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Socorro County: North Magdalena and Socorro Peak districts.

Taos County: Picuris district.

ARSENOFYRITE. Mispickel.

Physical characteristics. Orthorhombic. Twins and trillings common in crystals. Crystals usually prismatic, flattened vertically. Also columnar, straight and divergent; granular, or compact. One fairly distinct cleavage. Fracture uneven. Brittle. H.— 5.5-6. Sp.G.— 5.9-6.2. Luster metallic. Color silver-white, inclining to steel-gray. Streak dark grayish black. Opaque. Yields arsenical (garlic) odor when struck or rubbed.

Chemical composition. Sulpharsenide of iron, FeAsS , or $\text{FeS}_2 \cdot \text{FeAs}_2$.

Occurrence. Hidalgo County: Lordsburg district. Santa Fe County: Old Placers district.

ASBESTOS. Asbestos. A variety of Amphibole.

Tremolite, actinolite, and other varieties of amphibole, except those high in alumina, pass into fibrous forms, the fibers sometimes long, flexible, and easily separated, much resembling flax. Color varies from white to green and wood-

County, New York, and located near the
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brown. Much of the material commonly called asbestos is chrysotile (see serpentine). The name amianthus is given to the finer, silky varieties of asbestos derived either from amphibole or from serpentine.

Occurrence.

Amphibole Asbestos. Dona Ana County: Organ district. Hidalgo County: Steins Pass district. Rio Arriba County: Petaca district (probable).

Chrysotile Asbestos. Grant County: west side of Gila River above Red Rock, not far from ricolite deposit (which see).

Not specified. Grant County: Georgetown district. Sierra County: Hillsboro district.

AUGITE. Aluminous Pyroxene.

Physical characteristics. Monoclinic. Contact-twins common, sometimes polysynthetic. Crystals usually prismatic, often short and thick, sometimes tabular, and nearly square or eight-sided. Also granular, coarse or fine, rarely fibrous or columnar. Cleavage: two directions, nearly at right angles, nearly perfect, but interrupted. Basal parting sometimes observed. Fracture uneven to conchoidal. Brittle. H.- 5-6. Sp.G.- 3.2-3.6. Luster vitreous,

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inclining to resinous; often dull; sometimes pearly on planes of parting. Color pale to deep green, brownish black and black. Streak white to gray and grayish green. Translucent to opaque.

Chemical composition. Chiefly $\text{CaMgSi}_2\text{O}_6$ with $(\text{Mg,Fe})(\text{Al,Fe})_2\text{SiO}_6$. Titanium and alkalies may be present.

Occurrence. Catron County: Mogollon district. Colfax County: Raton region. Grant County: Fierro-Hanover district. Lincoln County: Nogal district; Milagro Hill region, near Carrizozo. Sandoval County: Cochiti district; Jemez region. Santa Fe County: Cerrillos and Old Placers districts. Valencia County: near Grant.

AURICHALCITE.

Physical characteristics. Monoclinic. Occurs in drusy incrustations. One perfect cleavage. H.- 2. Sp.G.- 3.54-3.64. Luster pearly. Color pale green to sky-blue. Streak pale greenish to bluish. Translucent.

Chemical composition. A basic carbonate of zinc and copper, $2(\text{Zn,Cu})\text{CO}_3 \cdot 3(\text{Zn,Cu})(\text{OH})_2$.

Occurrence. Socorro County: Magdalena district.

inclined to redness; often dull, sometimes grayish
places of yellow. Color pale to deep green, brownish
black and black. Green white to gray and brownish
Transition to orange.

General description. County of Santa Cruz
(California). Transition and alkaline soil or ground.

Geography. Santa Cruz County: Morgan district. Santa
Cruz County: Santa Cruz district. Santa Cruz County: Santa Cruz district.
Santa Cruz County: Morgan district; Morgan Hill district.
Santa Cruz County: Morgan district; Morgan Hill district.
Santa Cruz County: Morgan district; Morgan Hill district.
Santa Cruz County: Morgan district; Morgan Hill district.
Santa Cruz County: Morgan district; Morgan Hill district.

ANALYSIS.

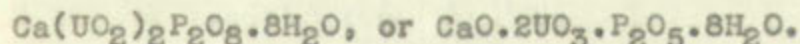
Physical characteristics. Residuum. Greenish brown
formation. The perfect crystals. H. 2.5-3.5.
Soft, lustrous, greenish. Color pale green to yellowish.
This resembles the color of the transition.
Chemical composition. A silica compound of iron and
iron. (Fe, Si, O, H, etc.)

Geography. Santa Cruz County: Morgan district. Santa Cruz County: Morgan district.

AUTUNITE. Lime Uranite.

Physical characteristics. Orthorhombic. In thin tabular crystals, nearly tetragonal in form and similar to torbernite. Also foliated, micaceous. Cleavage: basal, eminent. Also three other cleavages, less perfect. Laminae brittle. H.- 2-2.5. Sp.G.- 3.1. Luster of basal cleavage pearly, elsewhere subadamantine. Color lemon- to sulphur-yellow. Streak yellowish. Transparent to translucent.

Chemical composition. A hydrous phosphate of uranium and calcium, probably analogous to meta-torbernite.



Occurrence. Grant County: White Signal district. Hidalgo County: Hachita district. Socorro County: San Lorenzo district.

AZURITE. Blue Carbonate of Copper. Chessylite.

Physical characteristics. Monoclinic. Crystals varied and highly modified, common. Also massive, often in imitative shapes, having a columnar structure; also dull and earthy. Cleavage: two directions; one perfect but interrupted, the other less perfect. Fracture conchoidal. Brittle. H.- 3.5-4. Sp.G.- 3.77-3.89. Luster vitreous, almost adamantine. Color shades of azure-blue, passing into Berlin-blue.

Section 1
The first section of the report describes the general characteristics of the study area, including the geographical location, climate, and topography. It also provides a brief history of the area and the reasons for the study.

Section 2
The second section of the report describes the methodology used in the study, including the data collection methods, the instruments used, and the statistical analysis techniques.

Section 3
The third section of the report presents the results of the study, including the data collected, the statistical analysis, and the conclusions drawn from the results.

Section 4
The fourth section of the report discusses the implications of the study, including the potential applications of the findings and the limitations of the study.

Section 5
The fifth section of the report provides a summary of the study and a list of references.

Section 6
The sixth section of the report provides a detailed description of the study area, including the geographical location, climate, and topography. It also provides a brief history of the area and the reasons for the study.

Section 7
The seventh section of the report describes the methodology used in the study, including the data collection methods, the instruments used, and the statistical analysis techniques.

Section 8
The eighth section of the report presents the results of the study, including the data collected, the statistical analysis, and the conclusions drawn from the results.

Section 9
The ninth section of the report discusses the implications of the study, including the potential applications of the findings and the limitations of the study.

Section 10
The tenth section of the report provides a summary of the study and a list of references.

Streak blue, paler than color. Transparent to subtranslucent.

Chemical composition. A basic cupric carbonate,
 $2\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$.

Occurrence. Catron County: Mogollon district. Dona Ana County: Hembrillo district. Eddy County: (?). Grant County: Burro Mountains, Central, Fierro-Hanover, Georgetown, Pinos Altos, and Santa Rita districts. Guadalupe County: Pastura district. Hidalgo County: Apache No. 2, Fremont, Hachita, Lordsburg, and San Simon districts. Lincoln County: Estey and Jicarilla districts. Mora County: Coyote Creek district. Otero County: Sacramento and Tularosa districts. Rio Arriba County: Abiquiu, Bromide, and Gallina districts. Sandoval County: Jemez Springs, Nacimiento, and Placitas districts. San Miguel County: Rociada and Tecolote districts. Santa Fe County: Glorieta, La Bajada, and New Placers districts. Sierra County: Caballos Mountains, Chloride, Cuchillo Negro, Hermosa, Hillsboro, and Kingston districts. Socorro County: Chupadero, Hansonburg, Ladrones Mountains, Magdalena, Rayo, San Andres Mountains (Mockingbird Gap, Salinas Peak), Scholle, Socorro Peak (?), and Water Canyon districts. Valencia County: Zuni Mountains.

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BARITE. Heavy Spar.

Physical characteristics. Orthorhombic. Crystals commonly tabular, in divergent groups; sometimes prismatic. Also globular, fibrous or lamellar, crested; coarsely laminated, laminae convergent and sometimes curved. Granular, resembling marble, and earthy. Colors sometimes banded. Cleavage: three directions, at right angles, perfect. Fracture uneven. Brittle. H.— 2.5-3.5. Sp.G.— 4.3-4.6. Luster vitreous to resinous, sometimes pearly on cleavage surfaces. Color white, also inclining to yellow, gray, blue, red, and brown. Streak white. Transparent to translucent to opaque. Sometimes gives fetid odor when rubbed.

Chemical composition. Barium sulphate, $BaSO_4$.

Varieties. 1. Barytocelestite. Barite containing varying amounts of strontium sulphate, $SrSO_4$.

Occurrence. Bernalillo County: Tijeras Canyon district. Dona Ana County: Organ, Rincon Manganese, and Tonuco Mountain Fluorspar districts. Grant County: Black Hawk, Central, Georgetown, Pinos Altos, and Silver City Manganese-Iron districts. Hidalgo County: Lordsburg district. Luna County: Little Florida Mountains district. Otero County: Tularosa district. Rio Arriba County: Gallina and Petaca (Ojo Caliente) districts. Sandoval County: Placitas district. Sierra County: Caballos Mountains and Chloride districts.

WHITE HORSE BRAND.

Physical characteristics. Crystals white, lustrous and

soluble in nitrogen gas; insoluble in water, alcohol,

glycerine, nitric acid, concentrated sulphuric acid,

hydrofluoric acid and caustic potash.

Color white, and anhydrous.

at first dissolves, at right angles, in water.

White. M. P. 160-165. (G. L. K.

White to yellow, sometimes greenish or brownish.

Color white, also containing the yellow, green or

brown. Translucent to transparent in

thin layers, white when

Chemical composition. Various

Isomers. 1. Isomorphous.

Examples of isomorphous

Isomorphism. Sulphuric Acid

and Sulphuric Acid, Barium Sulphate, and

Barium Sulphate.

Geometric, Prism, Crystal, and Sulphuric Acid

Crystal, Barium Sulphate, Sulphuric Acid

Sulphuric Acid, Barium Sulphate, Sulphuric Acid

Sulphuric Acid, Barium Sulphate, Sulphuric Acid

Sulphuric Acid, Barium Sulphate, Sulphuric Acid

Sulphuric Acid, Barium Sulphate, Sulphuric Acid

Socorro County: Chupadero, Council Rock, Hansonburg, Joyita Hills, Lemitar Mountains, Magdalena, North Magdalena, San Andres Mountains (Lava Gap, Mockingbird Gap), Socorro Peak, and Water Canyon districts. Taos County: region east of Wheeler Peak. Valencia County: Zuni Mountains district. (Indefinite: near Fort Wallace.)

Var. Barytocelestite. Socorro County: Oscura Mountains region.

BARYTOCALCITE.

Physical characteristics. Monoclinic. In crystals; also massive. Cleavage: two directions, perfect; another direction, less so. Cleavage planes at angles near those of rhombohedral cleavage planes of calcite. Fracture uneven to subconchoidal. Brittle. H.- 4. Sp.G.- 3.64-3.66. Luster vitreous, inclining to resinous. Color white, grayish, greenish, or yellowish. Streak white. Transparent to translucent.

Chemical composition. Carbonate of barium and calcium, $BaCO_3 \cdot CaCO_3$.

Occurrence. Socorro County: Oscura Mountains region.

1880s: Georgia, Florida, Louisiana, Mississippi, Alabama, South Carolina, North Carolina, Virginia, West Virginia, Kentucky, Tennessee, Missouri, Arkansas, Louisiana, Texas, Oklahoma, Kansas, Nebraska, Iowa, Minnesota, Wisconsin, Illinois, Indiana, Michigan, Ohio, Pennsylvania, Maryland, Delaware, New Jersey, New York, Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire, Maine, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland, Labrador, Yukon, Northwest Territories, Nunavut, Alaska, Hawaii.

Var. *hirsutissima*. Georgia, Florida, Louisiana, Mississippi, Alabama, South Carolina, North Carolina, Virginia, West Virginia, Kentucky, Tennessee, Missouri, Arkansas, Louisiana, Texas, Oklahoma, Kansas, Nebraska, Iowa, Minnesota, Wisconsin, Illinois, Indiana, Michigan, Ohio, Pennsylvania, Maryland, Delaware, New Jersey, New York, Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire, Maine, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland, Labrador, Yukon, Northwest Territories, Nunavut, Alaska, Hawaii.

DESCRIPTION

Annual or biennial. Leaves alternate, ovate to elliptic, base cuneate, apex acuminate, venation pinnate. Flowers small, tubular, white or pinkish. Fruit a capsule, dehiscent, opening at the apex.

Chenopodium. *Chenopodium* of the family Chenopodiaceae.

BAUXITE. Beauxite. (?)

Physical characteristics. In round concretionary disseminated grains. Also massive, oolitic; and earthy, clay-like. Sp.G.— 2.55. Color whitish, grayish, to ocheryellow, brown, and red.

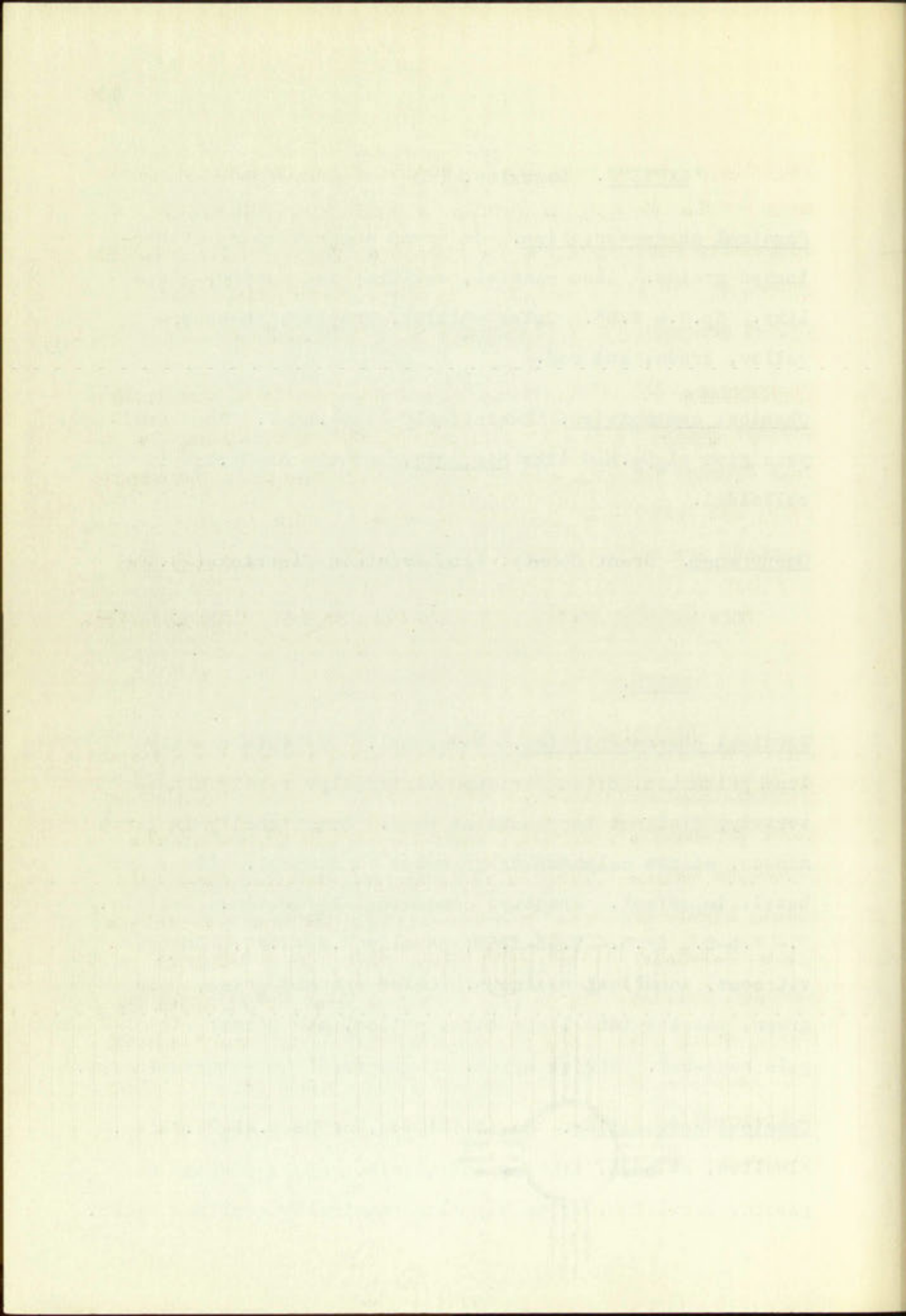
Chemical composition. Essentially $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$. Some analyses give $\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$ like diaspore, but the $\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$ is colloidal.

Occurrence. Grant County: Alum Mountain district (?).

BERYL.

Physical characteristics. Hexagonal. Crystals usually long prismatic, often striated vertically, rarely transversely; distinct terminations rare. Occasionally in large masses, coarse columnar or granular to compact. Cleavage: basal, imperfect. Fracture conchoidal to uneven. Brittle. H.— 7.5–8. Sp.G.— 2.63–2.80; usually 2.69–2.70. Luster vitreous, sometimes resinous. Color emerald-green, pale green, passing into light blue, yellow, and white; also pale rose-red. Streak white. Transparent to subtranslucent.

Chemical composition. $\text{Be}_3\text{Al}_2(\text{SiO}_3)_6$; or $3\text{BeO} \cdot \text{Al}_2\text{O}_3 \cdot 6\text{SiO}_2$. Alkalies, as soda, lithia, and caesia, may be present replacing beryllium, up to 5%; also chemically combined water.



Varieties. 1. Aquamarine. A bluish green variety of ordinary beryl. 2. Caesium Beryl. A pinkish yellow variety containing caesia, Cs_2O . 3. Emerald. Color bright emerald-green, due to the presence of a little chromium; a highly prized gem-stone when clear and free from flaws.

Occurrence. Rio Arriba County: Petaca district. Santa Fe County: Emerald reported from gravel beds near Santa Fe. Taos County: Harding Mine district (recorded as microscopic only; new record for crystals). At this locality the crystals are called "emerald", but really are aquamarine.

Var. Caesium Beryl. Taos County: Harding Mine district.

BIOTITE. Black Mica.

Physical characteristics. Monoclinic. Crystals tabular or short prismatic. Crystals often apparently rhombohedral. Mica-type twins. Often in disseminated scales. Cleavage: basal, highly perfect. Elastic in thin plates. H.— 2.5-3. Sp.G.— 2.7-3.1. Luster splendid, pearly on a cleavage surface, sometimes submetallic when black. Color green to black, often deep black in thick crystals, and sometimes in thin laminae. Very thin laminae green, blood-red, or brown by transmitted light. Rarely white. Streak uncolored. Transparent to opaque.

Chemical composition. Probably $H_2K(Mg,Fe)_3Al(SiO_4)_3$.

Occurrence. Bernalillo County: Tijeras Canyon district. Grant County: Burro Mountains district. Rio Arriba County: Bromide, Hopewell, and Petaca districts. San Miguel County: Willow Creek district. Santa Fe County: New Placers district. Sierra County: Hillsboro district. Taos County: Red River district.

BISMUTH.

Physical characteristics. Hexagonal-rhombohedral. Natural crystals rare and usually indistinct. Usually reticulated, arborescent, foliated or granular. Cleavage: basal, perfect. Brittle, but somewhat malleable when heated. H.-2-2.5. Sp.G.-9.70-9.83. Luster metallic. Color and streak silver-white, with a reddish hue, subject to tarnish. Opaque.

Chemical composition. Pure bismuth, Bi, with occasional traces of arsenic, sulphur, and tellurium.

Occurrence. Dona Ana County: Organ district. Grant County: Burro Mountains district. Hidalgo County: Fremont district. Rio Arriba County: Petaca district. Socorro County: San Andres Mountains district (Grandview Canyon).

Chemical composition. - Usually white, but may be yellowish or reddish. It is composed of calcium carbonate, with small amounts of magnesium carbonate, iron carbonate, and other salts. It is found in the form of nodules, and is often associated with other minerals. It is a common constituent of the soil, and is found in many rocks. It is also found in the form of nodules in the soil, and is often associated with other minerals.

Properties. - It is a white, crystalline solid, and is soluble in water. It is also soluble in dilute acids, and is precipitated by the addition of sodium carbonate. It is a common constituent of the soil, and is found in many rocks. It is also found in the form of nodules in the soil, and is often associated with other minerals.

Medical uses. - It is used as a source of calcium, and is also used as a source of carbon dioxide. It is a common constituent of the soil, and is found in many rocks. It is also found in the form of nodules in the soil, and is often associated with other minerals.

BISMUTHINITE. Bismuth Glance.

Physical characteristics. Orthorhombic. Rarely in acicular crystals. Usually massive, foliated or fibrous. Cleavage: one direction, perfect. Somewhat sectile. H.- 2. Sp.G.- 6.4-6.5. Luster metallic. Color and streak lead-gray, inclining to tin-white, with a yellowish or iridescent tarnish. Opaque.

Chemical composition. Bismuth trisulphide, Bi_2S_3 .

Occurrence. Catron County: Wilcox district. Dona Ana County: Gold Camp and Organ districts. Grant County: 41 miles northwest of Silver City. Luna County: Florida Mountains district. San Miguel County: El Porvenir district. Socorro County: San Andres Mountains district (Grandview Canyon).

BISMUTITE.

Physical characteristics. Amorphous. Incrusting, or earthy and pulverulent. Also massive, columnar. H.- 4-4.5. Sp.G.- 6.86-6.9. Luster vitreous when pure, sometimes dull. Color white, green, yellow, and gray. Streak greenish gray to colorless. Subtranslucent to opaque. Easily fusible.

Chemical composition. A basic bismuth carbonate, exact composition doubtful, perhaps $\text{Bi}_2\text{O}_3 \cdot \text{CO}_2 \cdot \text{H}_2\text{O}$.

DESCRIPTION - Chemical composition - Physical characteristics - Occurrence - Uses - References

Chemical composition - Physical characteristics - Occurrence - Uses - References

Chemical composition - Physical characteristics - Occurrence - Uses - References

Chemical composition - Physical characteristics - Occurrence - Uses - References

Chemical composition - Physical characteristics - Occurrence - Uses - References

Chemical composition - Physical characteristics - Occurrence - Uses - References

DESCRIPTION - Chemical composition - Physical characteristics - Occurrence - Uses - References

Chemical composition - Physical characteristics - Occurrence - Uses - References

Chemical composition - Physical characteristics - Occurrence - Uses - References

Chemical composition - Physical characteristics - Occurrence - Uses - References

Chemical composition - Physical characteristics - Occurrence - Uses - References

Occurrence. Dona Ana County: Organ district. Grant County: Burro Mountains district; Camp Kithil region. Rio Arriba County: Petaca district. Socorro County: San Andres Mountains district (Grandview Canyon). Taos County: Harding Nine district.

BLOEDITE. Blöditte.

Physical characteristics. Monoclinic. In short prismatic crystals. Also massive granular or compact, also somewhat fibrous. No cleavage. H.— 2.5. Sp.G.— 2.22–2.28. Luster vitreous. Colorless transparent to bluish green, reddish yellow and translucent, also flesh- to brick-red. Easily fusible. Taste faint, saline and bitter.

Chemical composition. $MgSO_4 \cdot Na_2SO_4 \cdot 4H_2O$.

Occurrence. Eddy County: Carlsbad Potash district. Torrance County: Estancia Salt district.

BORAX.

Physical characteristics. Monoclinic. Crystals prismatic, sometimes large; resembling pyroxene in habit and angles. Cleavage: two directions, one perfect, one less so. Fracture conchoidal. Rather brittle. H.— 2–2.5. Sp.G.— 1.69–1.72.

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Luster vitreous to resinous; sometimes earthy. Color white; sometimes grayish, bluish, or greenish. Streak white. Translucent to opaque. Taste sweetish alkaline, feeble.

Chemical composition. $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$, or $\text{Na}_2\text{O} \cdot 2\text{B}_2\text{O}_3 \cdot 10\text{H}_2\text{O}$.

Occurrence. Dona Ana-Otero Counties: west of White Sands in Alkali Flat region.

BORNITE. Peacock Ore. Erubescite.

Physical characteristics. Isometric. In cubic crystals, faces rough or curved, but crystals are rare. Usually massive, structure granular or compact. No distinct cleavage. Fracture small conchoidal to uneven. Brittle. H.- 3. Sp.G.- 4.9-5.4. Luster metallic. Color between copper-red and light brown on fresh surfaces, speedily tarnishing to iridescent blue or purple. Streak pale grayish black. Opaque.

Chemical composition. A sulphide of copper and iron, Cu_5FeS_4 .

Occurrence. Catron County: Mogollon district. Dona Ana County: Organ district. Grant County: Central, Santa Rita, and Steeple Rock districts. Guadalupe County: Pastura district. Hidalgo County: Lordsburg, San Simon, and Steins Pass districts. Lincoln County: Estey district. Otero

lower stratum in limestone, which was partly, color white
 contains quartz, mica, or kaolin. Green shale
 Treatment in oxygen. These contain alkaline, ferric,
 chemical composition, $SiO_2, Al_2O_3,$ or $Fe_2O_3, CaO,$
 Magnesian. Some are also composed of white sand in
 Alkali flat region.

MINERAL - *Section on, Nebraska.*

Chemical composition, ferric, in white crystals,
 from rough or curved, but crystals are rare. Usually red-
 die, structure granular or compact. No distinct cleavage.
 fracture small conchoidal to wavy. Brittle. $H - 5.$
 $Sp. G. 4.8 - 5.5.$ Under microscope. Color between copper-
 red and light brown on fresh surfaces, gradually changing to
 reddish blue or purple. Tenax like physical black.
 Quartz.

Chemical composition. A mixture of copper and iron
 Oxide. *Section on, Nebraska.*
 Occurrence. Grant County, Dakota; Grant County, South Dakota;
 Grant County, North Dakota; Grant County, Nebraska; Grant
 and Douglas townships. *Section on, Nebraska.*
 Grant County, Nebraska; Grant County, South Dakota;
 Grant County, North Dakota; Grant County, Nebraska.

County: Sacramento district. Rio Arriba County: Gallina district. Sandoval County: Nacimiento Mountains district. San Miguel County: Rociada, Tecolote, and Willow Creek districts. Santa Fe County: indefinite. Sierra County: Cabellos Mountains, Chloride, Hermosa, Hillsboro, Hot Springs, and Kingston districts. Socorro County: Joyita Hills, Ladrones Mountains, Magdalena, Mill Canyon, San Andres Mountains (Goodfortune Creek), and Scholle districts. Taos County: Picuris and Twining districts.

BOURNONITE. Wheel Ore.

Physical characteristics. Orthorhombic. Twins common, twinning often repeated, forming cruciform or wheel-shaped twins. Also massive; granular, compact. No distinct cleavage. Fracture subconchoidal to uneven. Rather brittle. H.- 2.5-3. Sp.G.- 5.7-5.9. Luster metallic, brilliant. Color and streak steel-gray, inclining to blackish lead-gray or iron-black. Opaque.

Chemical composition. A sulphide of lead, copper, and antimony, $2\text{PbS} \cdot \text{Cu}_2\text{S} \cdot \text{Sb}_2\text{S}_3$.

Occurrence. Grant County: Central district. Santa Fe County: Cerrillos district.

BRAUNITE. (?)

Physical characteristics. Tetragonal. Commonly in octahedron-like forms, nearly isometric in angle. Also massive. Cleavage: pyramidal, perfect. Fracture uneven to subconchoidal. Brittle. H.- 6-6.5. Sp.G.- 4.75-4.82. Luster submetallic. Color and streak dark brownish black to steel-gray.

Chemical composition. $3\text{MnMnO}_3 \cdot \text{MnSiO}_3$.

Occurrence. Socorro County: Socorro Peak district (?).

BROCHANTITE.

Physical characteristics. Orthorhombic. In groups of prismatic acicular crystals and drusy crusts; massive with reniform structure. Cleavage: one direction, very perfect. Fracture uneven. H.- 3.5-4. Sp.G.- 3.9. Luster vitreous, a little pearly on the perfect cleavage surface. Color emerald-green, blackish green. Streak paler green. Transparent to translucent.

Chemical composition. A basic sulphate of copper,
 $\text{CuSO}_4 \cdot 3\text{Cu}(\text{OH})_2$.

Occurrence. Dona Ana County: Organ district. Socorro County: Magdalena district.

BRONZITE (7)

Physical characteristics. (Tetragonal). Commonly in bot-
tom-like form, nearly isotropic in angle. Also in
divergent pyramidal, prismatic. Fracture uneven to subcon-
choidal. Brittle. H. 5-6. G. 3.75-4.1. Lustre
vitreous. Color and streak dark brownish black to olive
gray.

Chemical composition. $Si_2O_3 \cdot 2FeO \cdot 2Fe_2O_3$

Occurrences. Bessey County, Nebraska (see list p. 121).

BRONZITE

Physical characteristics. Orthorhombic. In groups of
prismatic colorless crystals and druse crystals; also in
radial structure. Cleavage one direction, very perfect.
Fracture uneven. H. 5-6. G. 3.9. Lustre vitreous.
A little gray on the perfect cleavage surface. Color
olive-green, blackish green. Streak pale green. Trans-
parent to translucent.

Chemical composition. $Si_2O_3 \cdot 2FeO \cdot 2Fe_2O_3$

$Si_2O_3 \cdot 2FeO \cdot 2Fe_2O_3$

Occurrences. Bessey and Gosport: Grant District, Nebraska;
County: Nebraska District.

BROMYRITE.

Physical characteristics. Isometric. Crystals rare.

Usually in small concretions. Cleavage none. Fracture uneven. Sectile. H.- 2-3. Sp.G.- 5.8-6. Luster resinous to adamantine. Color, when pure, bright yellow to amber-yellow, slightly greenish; often grass- or olive-green externally, little altered on exposure. Transparent to translucent.

Chemical composition. Silver bromide, AgBr.

Occurrence. Catron County: Mogollon district. Grant County: Georgetown district. Rio Arriba County: Bromide district (?). Sierra County: Chloride, Hermosa, and Tierra Blanca districts.

BROOKITE.

Physical characteristics. Orthorhombic. Occurs only in crystals, of varied habit. No distinct cleavage. Fracture subconchoidal to uneven. Brittle. H.- 5.5-6. Sp.G.- 3.87-4.08. Luster metallic-adamantine to submetallic. Color brown, yellowish, reddish; reddish brown, and translucent. Also brown to iron-black, opaque. Streak uncolored to grayish or yellowish.

Chemical composition. Titanium dioxide, TiO₂.

Occurrence. Taos County: Picuris district.

BYTOWNITE. A Plagioclase Feldspar.

Physical characteristics. For general physical characteristics, see Plagioclase Feldspars. Bytownite is distinguished chiefly by its cleavage angle ($85^{\circ} 56'$), specific gravity (2.695-2.73), and optical characters (differences in indices of refraction and extinction angles). It is an uncommon mineral.

Chemical composition. $Ab_{30-10}An_{70-90}$. See table under Plagioclase Feldspars.

Occurrence. Sandoval County: Jemez region. Sierra County: indefinite (?).

CALAMINE. Smithsonite. Hemimorphite.

Physical characteristics. Orthorhombic-hemimorphic. Crystals often tabular; also prismatic; tabular faces vertically striated. Usually implanted and showing one extremity only. Often in sheaf-like forms and forming drusy surfaces in cavities. Also stalactitic, mammillary, botryoidal, and fibrous forms; massive and granular. Cleavage: two directions, perfect; two other directions, less so. Fracture

Geology. - Van County: Lewis District.

HYDROLOGY. - A Geological Report.

Physical characteristics. - The general physical characteristics, see Geological Features. - The general physical characteristics are defined chiefly by the average angle (25° 30'), specific gravity (2.65-2.75), and optical characters (birefringence in indices of refraction and extinction angles). It is an unusual mineral.

Mineral composition. - See table under

Geological Features.

Geology. - Randolph County: James Region. State County

Index (7).

PALEONTOLOGY. - Paleontological.

Physical characteristics. - The paleontological characteristics are defined chiefly by the average angle (25° 30'), specific gravity (2.65-2.75), and optical characters (birefringence in indices of refraction and extinction angles). It is an unusual mineral.

uneven to subconchoidal. Brittle. H.— 4.5–5, the latter when crystallized. Sp.G.— 3.40–3.50. Luster vitreous, one face subpearly and sometimes adamantine. Color white, sometimes with a delicate bluish or greenish shade; also yellowish to brown. Streak white. Transparent to translucent.

Chemical composition. Hydrous zinc silicate, H_2ZnSiO_5 , or $(ZnOH)_2SiO_3$, or $H_2O.2ZnO.SiO_2$.

Occurrence. Dona Ana County: Organ district. Grant County: Central, Fierro–Hanover, and Pinos Altos districts. Luna County: Tres Hermanas district. Sierra County: Cuchillo Negro, Hillsboro, Kingston, and Macho districts. Socorro County: Magdalena and Ojo Caliente districts.

GALAVERITE. (?)

Physical characteristics. Monoclinic. In small lath-shaped crystals striated parallel to their lengths. Also massive granular to crystalline. Fracture uneven, inclining to subconchoidal. Brittle. H.— 2.5. Sp.G.— 9.043. Color silver-white with often a faint yellow tinge. Streak yellowish gray.

Chemical composition. A gold telluride, $AuTe_2$, with smaller amounts of silver than sylvanite.

Occurrence. Sierra County: Tierra Blanca district (?).

system to be considered. It is to be noted that the
 same system is also used in the case of the
 face of the earth and the surface of the
 moon with a slight difference in the
 direction of the force. The system is
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(17) APPENDIX

The system is also used in the case of the
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The system is also used in the case of the
 atmosphere of the earth and the
 atmosphere of the moon.

Taos County: Anchor (?), and Red River (?) districts.

CALCITE. Calc Spar.

Physical characteristics. Hexagonal-rhombohedral. Habit of crystals highly varied, obtuse to acute rhombohedral; thin tabular to long prismatic; and scalenohedral of many types, often highly modified. Calcite crystals exhibit a greater variety of forms and habits than any other mineral. Twins common. Also fibrous, coarse and fine; sometimes lamellar; often granular; from coarse to impalpable, and compact to earthy. Also stalactitic, tuberoso, nodular, and other imitative forms. Cleavage: rhombohedral, highly perfect. Fracture conchoidal, obtained with difficulty due to perfect cleavage. Brittle. H.- 3, but varying with direction on the cleavage face; earthy varieties softer. Sp.G.- 2.710 in pure crystals, but varying rather widely in impure forms. Luster vitreous to subvitreous to earthy; silky in fibrous forms. Color white or colorless, also various shades of gray, red, green, blue, violet, yellow; also brown to black when impure. Streak white or grayish. Transparent to opaque. Some varieties phosphoresce upon heating, and others luminesce on being exposed to sunlight or radium emanations.

Chemical composition. Calcium carbonate, CaCO_3 . Small

The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry should be clearly documented and supported by appropriate evidence. This ensures transparency and accountability in the financial process.

Furthermore, it is noted that regular audits are essential to identify any discrepancies or errors. By conducting these audits frequently, potential issues can be addressed promptly, preventing them from escalating into larger problems. This proactive approach is crucial for maintaining the integrity of the financial system.

In addition, the document highlights the need for clear communication between all parties involved. Regular meetings and reports should be used to keep everyone informed of the current status and any changes that may occur. This collaborative effort is key to achieving the organization's financial goals.

The second section of the document focuses on the implementation of internal controls. These controls are designed to prevent fraud, reduce the risk of errors, and ensure that resources are used efficiently. By establishing a strong framework of internal controls, the organization can protect its assets and maintain the trust of its stakeholders.

It is also mentioned that the organization should regularly review and update its internal controls to reflect changes in its operations and the external environment. This ongoing process is necessary to ensure that the controls remain effective and relevant.

Finally, the document concludes by stating that a commitment to ethical financial practices is fundamental to the organization's success. This includes adhering to all applicable laws and regulations, as well as acting with honesty and integrity in all financial dealings. By fostering a culture of ethical behavior, the organization can build a strong reputation and ensure long-term sustainability.

quantities of magnesium, iron, manganese, zinc, and lead may be present replacing the calcium.

Varieties. 1. Anthraconite. Colored black by carbonaceous impurities; in massive rock formations. 2. Manganiferous calcite. Manganoalcite. Containing varying amounts of manganese carbonate, $MnCO_3$. Usually pinkish; may turn dark on exposure. 3. Onyx. True onyx is a variety of quartz. Mexican Onyx and Oriental Onyx-Marble may be included as varieties of calcite. Massive, with banded colors. 4. Zincocalcite. Containing zinc carbonate, $ZnCO_3$.

Occurrence. Bernalillo County: Tijeras Canyon district; Rio Puerco Valley region (concretions). Catron County: Mogollon and Taylor Creek Tin districts. Colfax County: Baldy, Cimarroncito, and Elizabethtown districts. Dona Ana County: Organ and Rincon Manganese districts; in Woolfer Canyon at southern end of Caballos Mountains. Eddy County: Carlsbad Caverns (dripstone and pisolites). Grant County: Alum Mountain, Black Hawk, Burro Mountains, Carpenter, Chloride Flat, Fierro-Hanover, Georgetown, Gold Hill, Juniper, Lone Mountain, Meerschaum, Pinos Altos, Santa Rita, Silver City Manganese-Iron, Steeple Rock, and Telegraph districts. Hidalgo County: Apache No. 2, Fremont, Hachita, Lordsburg, San Simon, and Steins Pass districts. Lincoln County: Estey, Jicarilla, Nogal, and White Oaks districts. Luna County: Cooks Peak, Cooks Range Manganese, Little

Florida Mountains, Tres Hermanas, and Victorio districts. Otero County: Orogrande and Tularosa districts. Rio Arriba County: Bromide, Hopewell, and Petaca (Ojo Caliente) districts. Sandoval County: Jemez Springs district (oolites and pisolites in Soda Dam); Placitas district; Rio Puerco Valley region (concretions). San Miguel County: Rociada district. Santa Fe County: Cerrillos, New Placers, and Old Placers districts. Sierra County: Caballos Mountains, Chloride, Cuchillo Negro, Derry Manganese, Hermosa, Hillsboro, Kingston, Lake Valley, Macho, Pittsburg, and Tierra Blanca districts. Socorro County: Council Rock, Iron Mountain No. 2, Joyita Hills, Luis Lopez Manganese, Magdalena, Mill Canyon, North Magdalena, San Andres Mountains (Grandview Canyon, Lava Gap, Mockingbird Gap), San Jose, San Lorenzo, Socorro Peak, and Water Canyon districts. Taos County: Red River and Twining districts.

Var. Anthraconite. Sandoval County: Tejon Grant at northeast end of Sandia Mountains, between Placitas and Golden. Valencia County: Rito region.

Var. Manganiferous Calcite. Catron County: Mogollon district. Dona Ana County: Rincon Manganese district. Grant County: Fierro Manganese and Silver City Manganese-Iron districts. Hidalgo County: Lordsburg district. Luna County: Cooks Range Manganese, Florida Mountains, and Little Florida Mountains districts. Sierra County: Derry Manganese,

Florida ...
State ...
County ...
District ...
City ...
Town ...
Village ...
Hamlet ...
Census ...
Population ...
Area ...
Density ...
Elevation ...
Climate ...
Vegetation ...
Soil ...
Water ...
Industry ...
Agriculture ...
Transportation ...
Education ...
Health ...
Government ...
History ...
Culture ...
Language ...
Religion ...
Ethnicity ...
Demographics ...
Economy ...
Environment ...
Quality of Life ...
Future ...

Hillsboro, Kingston, and Lake Valley districts. Socorro County: Council Rock, Luis Lopez Manganese, Magdalena Mountains Manganese, San Jose, and Socorro Peak districts.

Var. Mexican Onyx. Dona Ana County: Organ district. Grant County: near Silver City. Luna County: four miles west of Columbus; near Mirage. Otero County: near Alamogordo. Valencia County: near Rio Puerco Station (finely banded aragonite in travertine).

Var. Zincocalcite. Socorro County: Magdalena district.

CALEDONITE.

Physical characteristics. Orthorhombic. Crystals prismatic, usually minute; sometimes in divergent groups. Cleavage: basal, perfect; one prismatic cleavage, less perfect. Fracture uneven. Rather brittle. H.- 2.5-3. Sp.G.- 6.4. Luster resinous. Color deep verdigris-green or bluish green; inclining to mountain-green in small crystals. Streak greenish white. Translucent. Easily fusible.

Chemical composition. A basic sulphate of lead and copper, perhaps $2(\text{Pb,Cu})\text{O} \cdot \text{SO}_3 \cdot \text{H}_2\text{O}$. Said at times to contain CO_2 .

Occurrence. Dona Ana County: Organ district.

Illinois, Wisconsin, and Lake Valley districts, counties

County; County East, Lake Valley Mountains, Lapeer

Mountains Mountains, San Jose, and Superior, Lake Superior

for, Madison County, Oneida County, Jefferson County

Great County; near River City, Lake County; for also

west of Columbia; near Niles, Lake County; near

Alamogordo, Val Verde County; near Rio Grande Station

(This is the name appearing in literature)

for, Lincoln County, Superior County, Superior District

MINERALS

Extensive quantities of, Wisconsin, Superior District, Superior

mineral; contains in different groups, Superior

iron, copper, and various elements, Lake Superior

found in various places, Superior District, N. 2-3-5, 10-11-14

found in various places, Superior District, N. 2-3-5, 10-11-14

found in various places, Superior District, N. 2-3-5, 10-11-14

found in various places, Superior District, N. 2-3-5, 10-11-14

Extensive quantities of, Superior District, Superior

perhaps this is the same, Lake of Superior, Superior

Superior, Superior County, Superior District

CARNALLITE.

Physical characteristics. Orthorhombic. Crystals rare. Commonly massive, granular. No distinct cleavage. Fracture conchoidal. Brittle. H.- 2.5. Sp.G.- 1.60. Luster shining, greasy. Color milk-white, often reddish. Transparent to translucent. Strongly phosphorescent. Taste bitter. Deliquescent.

Chemical composition. $\text{KMgCl}_3 \cdot 6\text{H}_2\text{O}$, or $\text{KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}$.

Occurrence. Eddy County: Carlsbad Potash district.

CARNOTITE.

Physical characteristics. Orthorhombic. Sometimes in crystalline plates. Also in the form of powder. Basal cleavage. Color yellow.

Chemical composition. Approximately $\text{K}_2\text{O} \cdot 2\text{U}_2\text{O}_3 \cdot \text{V}_2\text{O}_5 \cdot 2\text{H}_2\text{O}$.

The amount of water is uncertain, varying with the moisture content of the atmosphere.

Occurrence. Catron County: Carrizo Mountains (error?).

Sandoval County: Cochiti district. Socorro County: Scholle district.

CHARACTERISTICS

Chemical characteristics: ...
Physical characteristics: ...
Solubility: ...
Stability: ...

PREPARATION

Preparation: ...
Yield: ...
Purification: ...
Characterization: ...

CASSITERITE. Tin-stone.

Physical characteristics. Tetragonal. Twins common, often repeated. Crystals low pyramidal, also prismatic with acute terminations. Sometimes acicular. Prism faces vertically striated. Often reniform, structure fibrous divergent; also massive, granular or impalpable; in rolled grains. No distinct cleavage. Fracture subconchoidal to uneven. Brittle. H.— 6-7. Sp.G.— 6.8-7.1. Luster adamantine, and crystals usually splendid. Color brown or black, sometimes red, gray, white, or yellow. Streak white, grayish, brownish. From nearly transparent to opaque.

Chemical composition. Tin dioxide, SnO_2 . Tantalum and iron oxides sometimes present.

Occurrence. Catron County: Taylor Creek Tin district. Rio Arriba County: Petaca district. Sierra County: Chloride, Cuchillo Negro, and San Mateo Mountains (?) districts; (also Taylor Creek Tin district).

CELESTITE. Coelestine.

Physical characteristics. Orthorhombic. Crystals resembling those of barite in habit; commonly tabular or prismatic. Also fibrous and radiated, sometimes globular; occasionally granular. Cleavage: one direction, perfect; one less per-

LABRILETTA 710-710

(Faint text describing the species, including its distribution and characteristics. Mentions "Cystitis" and "Labriletta".)

(Faint text, possibly a sub-section or specific note.)

(Faint text, possibly a sub-section or specific note.)

(Faint text, possibly a sub-section or specific note.)

fect; another less distinct; all at right angles, and yielding rectangular fragments. Fracture uneven. H.- 3-3.5. Sp.G.- 3.95-3.97. Luster vitreous, sometimes inclining to pearly. Color white, often faint bluish, and sometimes reddish. Streak white. Transparent to subtranslucent.

Chemical composition. Strontium sulphate, SrSO_4 . Calcium and barium are sometimes present.

Varieties. 1. Calciocelastite. Containing calcium in considerable amount.

Occurrence. Socorro County: Oscura Mountains and San Andres Mountains.

Var. Calciocelastite. Socorro County: Oscura Mountains region.

CERARGYRITE. Horn Silver.

Physical characteristics. Isometric. Habit cubic. Usually massive and resembling wax or horn; sometimes columnar; often in crusts. Cleavage none. Fracture somewhat conchoidal. Highly sectile. H.- 1-1.5. Sp.G.- 5.552. Luster resinous to adamantine. Color pearl-gray, grayish green, whitish to colorless, rarely violet-blue. On exposure to the light turns violet-brown. Transparent to translucent.

The first part of the report is devoted to a description of the
 various types of plants which are found in the region. It is
 found that the vegetation is very diverse and that the
 plants are very hardy and able to withstand the
 severe conditions of the climate. The plants are
 very hardy and able to withstand the severe
 conditions of the climate. The plants are very
 hardy and able to withstand the severe conditions
 of the climate.

The second part of the report is devoted to a description of the
 various types of animals which are found in the region. It is
 found that the animal life is very diverse and that the
 animals are very hardy and able to withstand the
 severe conditions of the climate. The animals are
 very hardy and able to withstand the severe
 conditions of the climate. The animals are very
 hardy and able to withstand the severe conditions
 of the climate.

CONCLUSION

The results of the investigation show that the
 vegetation and animal life of the region are
 very diverse and that the plants and animals
 are very hardy and able to withstand the
 severe conditions of the climate. The plants
 are very hardy and able to withstand the
 severe conditions of the climate. The plants
 are very hardy and able to withstand the
 severe conditions of the climate.

Chemical composition. Silver chloride, AgCl. May contain mercury in some varieties.

Occurrence. Catron County: Mogollon district. Colfax County: Baldy district. Dona Ana County: Organ district. Grant County: Black Hawk, Burro Mountains, Chloride Flat, Fleming, Georgetown, Lone Mountain, Pinos Altos, and Telegraph districts. Hidalgo County: Apache No. 2, Fremont, Hachita, Lordsburg, and Steins Pass districts. Luna County: Florida Mountains district. Rio Arriba County: Bromide district. Santa Fe County: "San Ysidro Mountain"- (may refer to New Placers district). Sierra County: Chloride, Cuchillo Negro, Hermosa, Hillsboro, Hot Springs, Kingston, Lake Valley, and Tierra Blanca districts. Socorro County: San Jose and Socorro Peak districts. Taos County: Picuris district.

CERUSSITE. Cerusite. White Lead Ore.

Physical characteristics. Orthorhombic. Simple crystals often tabular, prismatic, or pyramidal. Twins common, often repeated, yielding six-rayed stellate groups. Crystals grouped in clusters, and aggregates. Rarely fibrous, often granular massive and compact; earthy. Sometimes stalactitic. Cleavage: four directions, distinct. Fracture conchoidal. Very brittle. H.- 3-3.5. Sp.G.- 6.46-6.574. Luster

Chemical composition. Silver chloride, AgCl. May contain

mercury in some varieties.

Chlorite. Carbon County, Michigan district, Calif.

County, Calif. district. Also in County, Oregon district.

Great Smoky, Black Hawk, Santa Monica, Colorado 124.

Yakima, Georgetown, Iowa Mountain, Pine Bluff, and

Tolperry districts. Michigan County, Quebec No. 2, Vermont,

Madison, Lehigh, and Stearns Pass districts. Iowa County,

Florida Mountain district. Rio Arriba County, Nevada dis-

trict. Santa Fe County, "San Ysidro Mountain" (see text).

San Ysidro district. Santa County, Colorado, Colorado

County, Kansas, Wilkes, New Springs, Kingston, Lake

Valley, and Santa Clara districts. Nevada County, San

Juan and Nevada Pass districts. Yuba County, Florida

district.

CHLORITE. Chlorite. White Lead Ore.

Chemical composition. $2\text{PbCO}_3 \cdot \text{Pb(OH)}_2$. Light crystals

often tabular, prismatic, or pyramidal. Twin common, often

repeated, rhombohedral, and other groups. Crystal

groups in rhombs, and aggregates. Hard, brittle, dense

fracture conchoidal and uneven; surface "conchoidal" metallic.

Disseminated in limestone, dolomite. Occurs in nodules.

Very white. $\text{Pb} = 87.5$, $\text{CO}_2 = 12.5$, $\text{OH} = 0.0$. $\text{Pb} = 87.5$, $\text{CO}_2 = 12.5$, $\text{OH} = 0.0$.

adamantine, inclining to vitreous, resinous, and pearly; sometimes submetallic. Color white, gray, grayish black, sometimes tinged blue or green by copper. Streak uncolored. Transparent to subtranslucent.

Chemical composition. Lead carbonate, $PbCO_3$.

Occurrence. Colfax County: Baldy district. Dona Ana County: Organ district. Grant County: Central, Fierro-Hanover, Georgetown, Gold Hill, Pinos Altos, and Santa Rita districts. Hidalgo County: Fremont, Hachita, Lordsburg, and San Simon districts. Luna County: Cooks Peak, Florida Mountains, and Victorio districts. Sandoval County: Nacimiento Mountains district. San Miguel County: Willow Creek district. Santa Fe County: Cerrillos and New Placers districts. Sierra County: Caballos Mountains, Chloride, Cuchillo Negro, Hermosa, Hillsboro, Kingston, Lake Valley, and Macho districts. Socorro County: Hansonburg, Magdalena, North Magdalena, Ojo Caliente, San Andres Mountains (Mockingbird Gap), Socorro Peak, and Water Canyon districts.

CERVANTITE.

Physical characteristics. Orthorhombic. In acicular crystals. Also massive; as a crust, or a powder. H.— 4-5. Sp.G.— 4.084. Luster greasy or pearly, also bright or earthy. Color yellow to white, sometimes reddish. Streak

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APPENDIX

... ..

yellowish white to white.

Chemical composition. Sb_2O_4 , or $Sb_2O_3.Sb_2O_5$.

Occurrence. Grant County: Central district. Luna County: "near Deming".

CHALCANTHITE. Blue Vitriol.

Physical characteristics. Triclinic. Crystals commonly flattened. Also massive, stalactitic, reniform, sometimes with fibrous structure. No distinct cleavage. Fracture conchoidal. Brittle. H.- 2.5. Sp.G.- 2.12-2.30. Luster vitreous. Color Berlin- to sky-blue, of different shades; sometimes a little greenish. Streak uncolored. Subtransparent to translucent. Taste metallic and nauseous.

Chemical composition. Hydrus cupric sulphate, $CuSO_4.5H_2O$.

Occurrence. Grant County: Central district. San Miguel County: Willow Creek district. Socorro County: Magdalena district.

CHALCOCITE. Copper Glance. Redruthite.

Physical characteristics. Orthorhombic. Crystals rare, pseudo-hexagonal. Usually massive, structure granular to

yellowish white to white. ...
 Botanical description: ...
 Occurrence: Great Lakes; Central district; ...
 "new finding".

EMULGATORIA, Miss Victor.

Botanical description: ...
 Occurrence: ...
 Botanical description: ...
 Occurrence: ...
 Botanical description: ...
 Occurrence: ...

Great Lakes; Central district; ...
 County; ...
 district.

...
 Botanical description: ...
 Occurrence: ...

compact and impalpable. No distinct cleavage. Fracture conchoidal. Rather sectile. H.— 2.5–3. Sp.G.— 5.5–5.8. Luster metallic. Color and streak blackish lead-gray, often tarnished blue or green, dull. Opaque.

Chemical composition. Cuprous sulphide, Cu_2S .

Occurrence. Catron County: Mogollon district. Dona Ana County: Hembrillo and Organ districts. Eddy County: (?) Grant County: Burro Mountains, Central, Fierro-Hanover, Santa Rita, and Silver City Manganese-Iron districts. Guadalupe County: Pastura district. Hidalgo County: Apache No. 2, Hachita, Lordsburg, and Steins Pass districts. Lincoln County: Estey and Jicarilla districts. Mora County: Coyote Creek district. Otero County: Orogrande, Sacramento, and Tularosa districts. Rio Arriba County: Abiquiu district. Sandoval County: Jemez Springs and Nacimiento Mountains districts. San Miguel County: Rociada, Tecolote, and Willow Creek districts. Santa Fe County: Glorieta and La Bajada districts. Sierra County: Caballos Mountains, Chloride, Hermosa, and Hillsboro districts. Socorro County: Hansonburg, Hop Canyon, Jones Camp, Joyita Hills, Ladrones Mountains, Magdalena, Mill Canyon, North Magdalena, Rayo, San Andres Mountains (Goodfortune Creek, Mockingbird Gap), Scholle, and Water Canyon districts. Taos County: Picuris district. Valencia County: Zuni Mountains district.

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Political organizations

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CHALCOPHANITE. Hydrofranklinite.

Physical characteristics. Hexagonal-rhombohedral. In druses of minute tabular rhombohedral crystals, sometimes octahedral in aspect. Also in foliated aggregates, stalactitic and plumose. Cleavage: basal, perfect. H.— 2.5. Sp.G.— 3.907. Luster metallic, brilliant. Color bluish black to iron-black. Streak chocolate-brown, dull. Translucent.

Chemical composition. $(\text{Mn}, \text{Zn})\text{O} \cdot 2\text{MnO}_2 \cdot 2\text{H}_2\text{O}$.

Occurrence. Socorro County: Magdalena district.

CHALCOPYRITE. Copper Pyrites.

Physical characteristics. Tetragonal-sphenoidal. Crystals commonly tetragonal in aspect. Sometimes octahedral in form. Twins common, sometimes repeated. Often massive, compact, sometimes botryoidal or reniform. No distinct cleavage. Fracture uneven. Brittle. H.— 3.5-4. Sp.G.— 4.1-4.3. Luster metallic. Color brass-yellow, often tarnished or iridescent. Streak greenish black. Opaque.

Chemical composition. A sulphide of copper and iron, CuFeS_2 .

Occurrence. Catron County: Mogollon district. Colfax

SYMBIOTIC ORGANISMS

Local characteristics. Symbiotic organisms are found in many different habitats, but they are most common in aquatic environments. They are also found in soil, air, and plants. Symbiotic organisms are often found in association with other organisms, and they can be either mutualistic or parasitic. Some symbiotic organisms are obligate, meaning they cannot survive without their host, while others are facultative, meaning they can live independently. Symbiotic organisms are found in all major groups of life, including bacteria, fungi, and animals.

Global characteristics

Symbiotic organisms are found in all major groups of life.

Local characteristics

Local characteristics. Symbiotic organisms are found in many different habitats, but they are most common in aquatic environments. They are also found in soil, air, and plants. Symbiotic organisms are often found in association with other organisms, and they can be either mutualistic or parasitic. Some symbiotic organisms are obligate, meaning they cannot survive without their host, while others are facultative, meaning they can live independently. Symbiotic organisms are found in all major groups of life, including bacteria, fungi, and animals.

Global characteristics

Symbiotic organisms are found in all major groups of life.

County: Baldy, Cimarroncito, and Elizabethtown districts.
 Dona Ana County: Gold Camp and Organ districts. Grant
 County: Burro Mountains, Central, Fierro-Hanover, Pinos
 Altos, Santa Rita, Steeple Rock, and White Signal districts.
 Hidalgo County: Apache No. 2, Fremont, Hachita, Lordsburg,
 San Simon, and Steins Pass districts. Lincoln County: Estey
 and Nogal districts. Luna County: Florida Mountains dis-
 trict. Otero County: Orogrande, Sacramento, and Tularosa
 districts. Rio Arriba County: Bromide and Hopewell dis-
 tricts. Sandoval County: Cochiti district. San Miguel
 County: El Porvenir, Rociada, Tecolote, and Willow Creek
 districts. Santa Fe County: Cerrillos, La Bajada, New
 Placers, Old Placers, and Santa Fe districts. Sierra County:
 Caballos Mountains, Chloride, Hermosa, Hillsboro, Hot
 Springs, Kingston, and Tierra Blanca districts. Socorro
 County: Hansonburg, Joyita Hills, Lemitar Mountains,
 Magdalena, Mill Canyon, North Magdalena, San Andres Moun-
 tains (Goodfortune Creek, Grandview Canyon, Salinas Peak),
 Scholle, and Water Canyon districts. Taos County: Picuris,
 Red River, and Twining districts. Valencia County: Zuni
 Mountains district.

CHLORITE.

Common name for a group of mineral species, taking its
 name from the green color common in silicates in which

County: Seely, Clearwater, and Alameda districts.
 County: Gold Camp and Green districts, Grant
 County: South Mountain, Central, West-Southern, Pine
 Albee, Santa Rita, Apache Park, and White Signal districts.
 Hidalgo County: Apache No. 2, Fremont, Goodwin, Fortson,
 San Juan, and Union Pass districts, Lincoln County: Lakey
 and Royal districts, Luna County: Florida Mountains dis-
 trict, Otero County: Organ, Sacramento, and Tularosa
 districts, Rio Arriba County: Bernalillo and Huerfano dis-
 tricts, Sandoval County: Goodwin district, San Miguel
 County: El Torrey, Goodwin, Goodwin, Goodwin, and Wilson Creek
 districts, Santa Fe County: Corralito, La Bajada, New
 Lincoln, Old Lincoln, and Santa Fe districts, Sierra County:
 Catalina Mountains, Catalina, Catalina, Catalina, New
 Mexico, Kirtland, and Santa Fe districts, Socorro
 County: Ramonero, Santa Rita, Santa Rita Mountains,
 Magdalena, Mill Canyon, North Magdalena, San Andres Man-
 agos (Goodwin-Creek, Goodwin-Canyon, Galena Creek),
 Gadsden, and West Canyon districts, Tusas County: Florida
 Red River, and Spring districts, Yuma County: Kila-
 weau district.

APPENDIX

Common name for a group of related species, having the
 same from the same area as indicated in text.

ferrous iron is prominent. The species are closely related in many respects to the micas. They are monoclinic, in part distinctly so, and in part with rhombohedral symmetry. The micaceous basal cleavage is prominent in crystallized forms, but the laminae are tough and inelastic.

The chlorites are silicates of aluminum with ferrous iron and magnesium and chemically combined water. Ferric iron and chromium may replace the aluminum, those forms with chromium being pink in color. Calcium and alkalies are absent, or present in small amounts. The chlorites are alteration products of micas, due to hydrothermal agents or weathering. Several distinct species are known, but are difficult to distinguish, and are generally grouped together and referred to as chlorite.

Occurrence. Bernalillo County: Tijeras Canyon district. Catron County: Mogollon district. Colfax County: Baldy district. Dona Ana County: Tonuco Mountains Fluorspar district. Grant County: Burro Mountains and Santa Rita districts. Hidalgo County: Lordsburg district. Rio Arriba County: Bromide and Hopewell districts. San Miguel County: Rociada and Willow Creek districts. Santa Fe County: Old Placers district. Sierra County: Hillsboro and Macho districts. Socorro County: Magdalena and San Andres Mountains (Sulphur Canyon) districts. Taos County: Red River and Twining districts.

The objective of this study is to determine the effect of the proposed system on the overall performance of the system. The study is divided into two main parts: a theoretical analysis and a practical implementation. The theoretical analysis is based on the principles of system design and optimization. The practical implementation is based on the use of the proposed system in a real-world environment. The results of the study are presented in the following sections.

The first section of the study is a theoretical analysis of the proposed system. This section is divided into two main parts: a description of the system and a discussion of its performance. The description of the system is based on the principles of system design and optimization. The discussion of its performance is based on the results of the theoretical analysis.

The second section of the study is a practical implementation of the proposed system. This section is divided into two main parts: a description of the implementation and a discussion of its performance. The description of the implementation is based on the principles of system design and optimization. The discussion of its performance is based on the results of the practical implementation.

The results of the study are presented in the following sections. The first section is a summary of the results. The second section is a discussion of the results. The third section is a conclusion.

CHRYSOCOLLA.

Physical characteristics. Cryptocrystalline; often with opal-like or enamel-like texture; earthy. Crystals are known, the only recorded occurrence being in Idaho. In-crusting or filling seams. Sometimes botryoidal. Fracture conchoidal. Rather sectile; translucent varieties brittle. H.- 2.4. Sp.G.-- 2-2.24. Luster vitreous, shining, earthy. Color various shades of green and bluish green, passing into sky-blue and turquoise-blue; brown to black when impure. Streak white when pure. Translucent to opaque.

Chemical composition. A hydrous copper silicate,
 $CuSiO_3 \cdot 2H_2O$.

Varieties. 1. Copper-pitch Ore. A mixture of chrysocolla and limonite, dark in color.

Occurrence. Catron County: Mogollon district. Colfax County: Baldy and Elizabethtown districts. Dona Ana County: Organ district. Grant County: Burro Mountains and Santa Rita districts. Guadalupe County: Pastura district. Hidalgo County: Apache No. 2, Lordsburg, San Simon, and Steins Pass districts. Lincoln County: Jicarilla district. Otero County: Orogrande district. Sandoval County: Nacimiento Mountains district. San Juan County: Navajo Reservation (indefinite). San Miguel County: Willow Creek district. Santa Fe County: Santa Fe Mountains region.

Sierra County: Hillsboro district. Socorro County: Joyita Hills, Ladrones Mountains, Magdalena, Mill Canyon, North Magdalena, Ojo Caliente, San Andres Mountains (Mockingbird Gap, Sulphur Canyon), and San Lorenzo districts; indefinite: Oscura Mountains region. Taos County: Picuris district.

Var. Copper-pitch Ore. Catron County: Mogollon district. Grant County: Burro Mountains district. Hidalgo County: Fremont district. Otero County: Orogande district. Socorro County: Magdalena district.

CHRYSLITE. Olivine. Peridot.

Physical characteristics. Orthorhombic. Crystals often flattened, less often elongated. Massive, compact, or granular; in embedded grains. Cleavage: two directions, at right angles, fairly distinct. Fracture conchoidal. Brittle. H.- 6.5-7. Sp.G.- 3.27-3.37. Luster vitreous. Color commonly olive-green, sometimes brownish, grayish red, grayish green, becoming yellowish brown or red by oxidation of the iron. Streak usually uncolored, rarely yellowish. Transparent to translucent.

Chemical composition. $(Mg,Fe)_2SiO_4$, or $2(Mg,Fe)O.SiO_2$. The ratio of Mg:Fe varies widely.

Occurrence. Catron County: Mogollon district. Colfax

1911

1. The first part of the report deals with the general conditions of the country, and the second part with the details of the various districts.

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County: Raton region. Luna County: in Deming region (near Fort Cummings; near Black Mountain). McKinley County: Fort Wingate region. Zuni Reservation. Rio Arriba County: Abiquiu district. Sandoval County: Rio Grande Valley region. San Juan County: Navajo Reservation (southwest corner). Santa Fe County: Old Placers district. (Indefinite: Fort Craig region.)

COLUMBITE-TANTALITE.

Physical characteristics. Orthorhombic. Heart-shaped contact-twins sometimes occur. Crystals short prismatic, often rectangular prisms; also thin tabular. Also in large groups of parallel crystals, and massive. Two fairly distinct cleavages, at right angles. Fracture subconchoidal to uneven. Brittle. H.- 6. Sp.G.- 5.3-7.3, varying with composition. Luster submetallic, often very brilliant, subresinous. Color iron-black, grayish and brownish black, opaque; rarely reddish brown and translucent; frequently iridescent. Streak dark red to black.

Chemical composition. Columbate and tantalate of iron and manganese, $(Fe,Mn)(Cb,Ta)_2O_6$, passing gradually from normal columbite, the nearly pure columbate, to normal tantalite, the nearly pure tantalate. Tin and tungsten also present

1907-1908
 Fort Campbell; new line between Fort Campbell and
 single region. This structure. No other county
 single district. Central County; Rio Grande Valley
 region. No line drawn. Single reservation (southern
 county). Count in County Rio Grand District, Green-
 land four single region.

PLANT-GEOGRAPHY

physical characteristics. Generalized. West-southwest
 normal-lain rainfall zone. Highland region. Climate
 often transitional between high latitudes. Also in large
 groups of general climate, and winter. The latter dis-
 tinct character of this region. Structure predominantly
 to south. Climate. E. of Rio. E. of Rio. E. of Rio. E. of Rio
 composition. Local conditions, often very different.
 conditions. Soil low-salt. High and lower mountains.
 typical. Very fertile. Soil and vegetation. Generally
 different. Great care not to be taken.

chemical composition. Different. Not certain of how and
 amount. (The Rio Grande). General topography; low central
 elevation. The low elevation. E. of Rio. E. of Rio. E. of Rio
 the west. Low elevation. E. of Rio. E. of Rio. E. of Rio

in small amounts. The iron may be largely replaced by manganese. The specific gravity is low for columbite, high for tantalite.

Occurrence. Rio Arriba County: Petaca district (both at Las Tablas and Petaca). San Miguel County: "mountains near Las Vegas". Taos County: Harding Mine district.

COPIAPITE.

Physical characteristics. Orthorhombic. Usually in loose aggregations of crystalline scales, or granular massive; incrusting. Cleavage: one direction, parallel to tabular surfaces of scales. H.- 2.5. Sp.G.- 2.103. Luster pearly. Color sulphur-yellow, citron-yellow. Translucent.

Chemical composition. A basic ferric sulphate, perhaps $\text{Fe}_4(\text{OH})_2(\text{SO}_4)_5 \cdot 18\text{H}_2\text{O}$.

Occurrence. San Miguel County: Las Vegas region.

COPPER.

Physical characteristics. Isometric. Common forms tetrahedrons, also in octahedral plates. Distinct crystals rare. Frequently irregularly distorted and passing into twisted and wirelike forms, filiform and arborescent.

in small amounts. The iron may be present as iron pyrites, or
as magnetite. The specific gravity is low for magnetite, but
for pyrites.

Location. The above occurs in various districts (see p. 10)
of the State and is also found in the following localities:
Las Vegas, Yuma County, Northern Rio Grande.

COAL

Several characteristics. Occurrence. Coal is found
in various districts of crystalline rocks, or granitic rocks,
forming. Occurrence and direction, parallel to the
surface of rocks. S. W. 1/4, T. 2. S., R. 1. W., Sec. 10.

Location. A small district in the
State of Colorado. See also Colorado, Las Vegas region.

COAL

Several characteristics. Location. Occurs in
various districts, also in the following localities:
Las Vegas, Yuma County, Northern Rio Grande.

Massive; as sand. Twins very common, flattened and elongated. At times in pseudomorphs, after cuprite, azurite, chalcopryite, calcite, aragonite, etc. Cleavage none. Fracture hackly. Highly ductile and malleable. H.- 2.5-3. Sp.G.- 8.8-8.9. Luster metallic. Color copper-red. Streak metallic, shining. Opaque. An excellent conductor for heat and electricity.

Chemical composition. Pure copper, Cu, sometimes with small amounts of iron, silver, bismuth, tin, lead, or antimony.

Occurrence. Grant County: Burro Mountains, Central, Fierro-Hanover, Georgetown, Pinos Altos, and Santa Rita districts. Hidalgo County: Lordsburg district. Rio Arriba County: Bromide district. Sandoval County: Jemez Springs and Nacimiento Mountains districts. Santa Fe County: Old Placers district. Sierra County: Hillsboro district. Socorro County: Magdalena, San Andres Mountains (Mockingbird Gap), San Lorenzo, and Water Canyon districts. Valencia County: Zuni Mountains district.

CORDIERITE. Iolite. Dichroite.

Physical characteristics. Orthorhombic. Twins as pseudo-hexagonal forms. Habit short prismatic. As embedded grains; also massive, compact. Cleavage, one direction, prismatic, distinct. Crystals often show a lamellar

sensitive; on each side, the very narrow, flattened and
 green. At times in pseudocarpium - slender, (1.5-2.5)
 cylindrical, pale, axillary, etc. (1.5-2.5)
 Prismatic, highly branched and flattened, etc.
 10-15-20-30. Lateral, axillary, etc. (1.5-2.5)
 Green, axillary, axillary, etc. (1.5-2.5)
 for heat and electricity.

Chemical composition. The weight of the substance is
 amount of iron, silver, etc. (1.5-2.5)
 Prismatic, green, etc. (1.5-2.5)
 Prismatic, green, etc. (1.5-2.5)
 Prismatic, green, etc. (1.5-2.5)
 Prismatic, green, etc. (1.5-2.5)
 Prismatic, green, etc. (1.5-2.5)
 Prismatic, green, etc. (1.5-2.5)
 Prismatic, green, etc. (1.5-2.5)
 Prismatic, green, etc. (1.5-2.5)

REMARKS

Prismatic, green, etc. (1.5-2.5)
 Prismatic, green, etc. (1.5-2.5)
 Prismatic, green, etc. (1.5-2.5)
 Prismatic, green, etc. (1.5-2.5)

structure parallel to the base, especially when altered. Fracture subconchoidal. Brittle. H.- 7-7.5. Sp.G.- 2.60-2.66. Luster vitreous. Color various shades of blue, light or dark, smoky blue. Transparent to translucent.

Chemical composition. $Mg_2Al_4Si_5O_{18}$. This is the composition of artificial material with the characters of cordierite. The natural mineral contains ferrous iron replacing a part of the magnesium; calcium and hydroxyl are also present.

Occurrence. Taos County: Glenwoody and Picuris districts.

CORUNDUM.

Physical characteristics. Hexagonal-rhombohedral. Polysynthetic twins with lamellar structure sometimes occur. Crystals usually rough and rounded. Also massive, with rectangular parting (pseudo-cleavage); granular, coarse or fine. Fracture uneven to conchoidal. Brittle, but very tough when compact. H.- 9. Sp.G.- 3.95-4.10. Luster adamantine to vitreous, on basal parting plane sometimes pearly. Occasionally shows asterism. Color blue, red, yellow, brown, gray, and nearly white. Streak uncolored. Transparent to translucent.

Chemical composition. Alumina, Al_2O_3 . Variations in color perhaps due to minute quantities of ferric, chromic, and

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manganese oxides.

Varieties. 1. Sapphire. A very pure variety, transparent or translucent; color blue. The term sapphire is also used to indicate gem corundum of any color except red.

Occurrence. Taos County: Glenwoody and Picuris districts.

Var. Sapphire. Santa Fe County: in gravels near Santa Fe.

COSALITE.

Physical characteristics. Orthorhombic. Usually massive, with indistinct crystalline structure; fibrous or radiated. Fracture uneven. Brittle. H.- 2.5-3. Sp.G.- 6.39-6.75. Luster metallic. Color lead-gray, steel-gray. Streak black. Opaque.

Chemical composition. $Pb_2Bi_2S_5$; or $2PbS.Bi_2S_3$. Silver and copper may occur, replacing part of the lead.

Occurrence. Dona Ana County: Organ district.

COVELLITE.

Physical characteristics. Hexagonal. Crystals usually thin hexagonal plates. Often massive. Cleavage: basal,

various colors.

Yucca. A very large variety, sometimes of translucent color. The form appears to also be in the form of a very large variety.

Yucca. Very large variety, sometimes of translucent color. The form appears to also be in the form of a very large variety.

Yucca

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Yucca

Yucca. Very large variety, sometimes of translucent color. The form appears to also be in the form of a very large variety.

perfect. Flexible in thin laminae. H.- 1.5-2. Sp.G.- 4.6. Luster submetallic to resinous. Color indigo-blue or darker. Sometimes has a purple tarnish. Often shows fine purple color when moistened with water. Streak lead-gray to black. Opaque. In very thin plates translucent.

Chemical composition. Cupric sulphide, CuS .

Occurrence. Catron County: Mogollon district. Grant County: Burro Mountains and Central districts. Hidalgo County: Lordsburg district. Lincoln County: Estey district. Otero County: Orogrande district. Rio Arriba County: Bromide district. Sandoval County: Nacimiento Mountains district. Sierra County: Chloride and Hermosa districts. Socorro County: Hansonburg, Joyita Hills, Ladrones Mountains, Magdalena, Mill Canyon, North Magdalena, San Andres Mountains (Goodfortune Creek), Scholle, and Water Canyon districts.

CUBANITE. Chalmersite.

Physical characteristics. Isometric. In thin prisms, vertically striated. Twins common. Also massive. Cleavage: cubic, distinct. H.- 3.5-4. Sp.G.- 4.7. Color brass- to bronze-yellow. Streak dark reddish bronze, black. Strongly magnetic.

Chemical composition. $Cu_2S.Fe_4S_5$.

particular. It is in this position that the
lateral commissure is situated. The lateral
commissure has a purple tinge. It is
color when stained with carmalum. It is
opaque. In very old plants the color is
faded.

Optical examination. Cells are
isodiametric. Cell walls are
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acute. Cells are stained
brownish and central
lacunae distinct. Lateral
commissure distinct. Cell
corners are stained. Cells
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are stained brownish and
central lacunae distinct.
(Cochlearium Green, 1911, p. 112)

Optical examination.

Cells are isodiametric. Cell
walls are thickened. Cell
corners are acute. Cells
are stained brownish and
central lacunae distinct.
Cells are stained brownish and
central lacunae distinct.
Cells are stained brownish and
central lacunae distinct.

Optical examination.

Occurrence. Grant County: Fierro-Hanover district.

CUPRITE. Red Copper Ore.

Physical characteristics. Isometric. Commonly in octahedrons; also in cubes and dodecahedrons, often highly modified. At times in capillary crystals. Also massive, granular; sometimes earthy. Cleavage: octahedral, interrupted. Fracture conchoidal, uneven. Brittle. H.— 3.5-4. Sp.G.— 5.85-6.15. Luster adamantine or submetallic to earthy. Color red, of various shades, particularly cochineal-red, sometimes almost black; occasionally crimson-red by transmitted light. Streak several shades of brownish red, shining. Subtransparent to subtranslucent.

Chemical composition. Cuprous oxide, Cu_2O .

Varieties. 1. Chalcotrichite. Flush Copper Ore. In capillary or acicular crystallizations, which may be elongated cubes.

Occurrence. Catron County: Mogollon district. Colfax County: Baldy and Elizabethtown districts. Dona Ana County: Organ district. Grant County: Burro Mountains, Fierro-Hanover, and Santa Rita districts. Hidalgo County: Lordsburg district. Lincoln County: Jicarilla district. Rio Arriba County: Bromide and Hopewell districts. Sandoval

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County: Cochiti district. San Miguel County: Rociada district. Sierra County: Caballos Mountains, Cuchillo Negro, Hillsboro, and Kingston districts. Socorro County: Ladrones Mountains, Magdalena, Mill Canyon, San Andres Mountains (Mockingbird Gap), San Lorenzo, and Water Canyon districts. Taos County: Picuris district.

Var. Chalcotrichite. Grant County: Santa Rita district. Sierra County: Hillsboro district.

CUPROFLUMBITE.

A doubtful mineral, massive in structure, varying in characters from those of galena to those of chalcocite and covellite.

Chemical composition. Formula uncertain, $Cu_2S \cdot 2PbS$. May be an alteration product and not a homogeneous mineral.

Occurrence. Sierra County: Chloride district.

CUPROTUNGSTITE.

Physical characteristics. Cryptocrystalline. Crystalline-granular, fibrous; also in crusts. One distinct cleavage. H.- 4.5-5. Luster highly vitreous. Color pistachio-green, passing into olive- and leek-green. Streak light greenish

gray to greenish yellow.

Chemical composition. Cupric tungstate, CuWO_4 , sometimes containing calcium (cuproscheelite).

Occurrence. Rio Arriba County: Rinconada district. Socorro County: San Andres Mountains district (?).

DATOLITE.

Physical characteristics. Monoclinic. Crystals varied in habit; usually short prismatic; sometimes tabular; also of other types, and often highly modified. Also botryoidal and globular, with columnar structure; divergent and radiating; sometimes massive, granular to compact and cryptocrystalline. Cleavage not observed. Fracture conchoidal to uneven. Brittle. H.- 5-5.5. Sp.G.- 2.9-3.0. Luster vitreous, rarely subresinous on a fracture surface. Color white; sometimes grayish, pale green, yellow, red, or amethystine, rarely dirty olive-green or honey-yellow. Streak white. Transparent to translucent; rarely opaque white.

Chemical composition. A basic orthosilicate of boron and calcium, empirically HCaBSiO_5 , or $\text{H}_2\text{O} \cdot 2\text{CaO} \cdot \text{B}_2\text{O}_3 \cdot 2\text{SiO}_2$, or $\text{Ca}(\text{BOH})\text{SiO}_4$.

Occurrence. Catron or Grant County: "head of the Gila River".

Chemical composition. The following table contains values for the various elements present in the material. The values are given in per cent of the dry weight of the material.

TABLE I

Physical characteristics. The material is a white, crystalline solid; usually very hard, but sometimes soft and brittle. It is soluble in water, and also in many other liquids. The crystals are usually small and irregular in shape, with sharp edges and flat faces. The crystals sometimes show a characteristic habit, and are sometimes found in clusters. The crystals are usually transparent, and have a glassy luster. The crystals are usually very hard, and are often used as abrasives. The crystals are usually very brittle, and are often used as fillers in plastics. The crystals are usually very hard, and are often used as abrasives. The crystals are usually very brittle, and are often used as fillers in plastics.

Chemical composition. The following table contains values for the various elements present in the material. The values are given in per cent of the dry weight of the material.

DESCLOIZITE.

Physical characteristics. Orthorhombic. Crystals usually small, short prismatic or pyramidal. Faces seldom perfectly smooth, often striated. Crystals form drusy surfaces and crusts, also in stalactitic aggregates. Also massive, fibrous radiated with mammillary surface. Cleavage none. Fracture small conchoidal to uneven. Brittle. H.- 3.5. Sp.G.- 5.9-6.2. Luster greasy. Color columbine- or cherry-red, brownish red, hair-brown, reddish chestnut-brown, blackish brown, black. Streak orange to brownish red or yellowish. Transparent to nearly opaque.

Chemical composition. $R_3V_2O_8 \cdot R(OH)_2$, or $4RO \cdot V_2O_5 \cdot H_2O$, where R = lead and zinc chiefly and usually approximately in the ratio of 1:1. Copper is also sometimes present; and also arsenic, replacing vanadium.

Varieties. 1. Cuprodescloizite. A variety in which zinc is replaced partly by copper, the ratio Zn:Cu being 1:1 approximately. Mottramite and psittacinite are terms sometimes used for this variety. Color brown, dark brown, and black.

Occurrence. Grant County: Georgetown district. Sierra County: Caballos Mountains, Hillsboro, and Lake Valley districts. Socorro County: North Magdalena and Socorro Peak districts.

Var. Cuprodescloizite. Grant County: Central district.

DESCRIPTION

Plants are... flowers... fruit... seeds... leaves... stems... roots... flowers... fruit... seeds... leaves... stems... roots... flowers... fruit... seeds... leaves... stems... roots...

Chemical analysis... $C_{15}H_{10}O_4$... $C_{15}H_{10}O_4$... $C_{15}H_{10}O_4$... $C_{15}H_{10}O_4$... $C_{15}H_{10}O_4$... $C_{15}H_{10}O_4$... $C_{15}H_{10}O_4$... $C_{15}H_{10}O_4$... $C_{15}H_{10}O_4$... $C_{15}H_{10}O_4$...

History... origin... collection... description... analysis... results... conclusions... recommendations... further work... references... acknowledgments... appendix... bibliography... index... glossary... abbreviations... symbols... units... conversions... tables... figures... plates... maps... diagrams... drawings... photographs... micrographs... x-rays... spectra... chromatograms... electrophoretograms... autoradiograms... electron micrographs... electron diffraction patterns... infrared spectra... ultraviolet spectra... mass spectra... nuclear magnetic resonance spectra... x-ray diffraction patterns... electron spin resonance spectra... Mössbauer spectra... neutron diffraction patterns... neutron scattering patterns... neutron reflectivity patterns... neutron tomography patterns... neutron microscopy patterns... neutron spectroscopy patterns... neutron diffraction patterns... neutron scattering patterns... neutron reflectivity patterns... neutron tomography patterns... neutron microscopy patterns... neutron spectroscopy patterns...

References... 1. ... 2. ... 3. ... 4. ... 5. ... 6. ... 7. ... 8. ... 9. ... 10. ... 11. ... 12. ... 13. ... 14. ... 15. ... 16. ... 17. ... 18. ... 19. ... 20. ... 21. ... 22. ... 23. ... 24. ... 25. ... 26. ... 27. ... 28. ... 29. ... 30. ... 31. ... 32. ... 33. ... 34. ... 35. ... 36. ... 37. ... 38. ... 39. ... 40. ... 41. ... 42. ... 43. ... 44. ... 45. ... 46. ... 47. ... 48. ... 49. ... 50. ... 51. ... 52. ... 53. ... 54. ... 55. ... 56. ... 57. ... 58. ... 59. ... 60. ... 61. ... 62. ... 63. ... 64. ... 65. ... 66. ... 67. ... 68. ... 69. ... 70. ... 71. ... 72. ... 73. ... 74. ... 75. ... 76. ... 77. ... 78. ... 79. ... 80. ... 81. ... 82. ... 83. ... 84. ... 85. ... 86. ... 87. ... 88. ... 89. ... 90. ... 91. ... 92. ... 93. ... 94. ... 95. ... 96. ... 97. ... 98. ... 99. ... 100. ...

Otero County: Sacramento district. Sierra County: Caballos Mountains, Hillsboro, and Lake Valley districts. Socorro County: Hansonburg district.

DIAMOND.

Physical characteristics. Isometric. Commonly in octahedrons and hexoctahedrons; faces frequently rounded or striated and with triangular depressions on the octahedral face. Twins common. Crystals often distorted. In spherical forms; massive. Cleavage: octahedral, highly perfect.

Fracture conchoidal. Brittle. H.— 10. Sp.G.— 3.516—3.525 in crystals. Luster adamantine to greasy. Color white or colorless, occasionally various pale shades of yellow, red, orange, green, blue, brown; rarely deeply colored; sometimes black. Usually transparent; also translucent and opaque.

Chemical composition. Pure carbon, C, except in the variety carbonado which yields a slight ash on combustion.

Occurrence. Santa Fe County: "in gravel beds".

DIOPSIDE. Malacolite. Alalite. Calcium-magnesium Pyroxene.

Physical characteristics. Monoclinic. Twins both as contact- and penetration-twins. Crystals prismatic, short and

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The first main section of text is located in the upper middle part of the page. It appears to be a paragraph of text, but the words are too light to read.

The middle section of the page contains several paragraphs of text. The layout is somewhat irregular, with varying line lengths and spacing, suggesting a list or a series of short paragraphs. The text is extremely faint and cannot be transcribed.

The lower middle section of the page contains another block of text, possibly a separate section or a continuation of the previous one. Like the rest of the page, the text is illegible.

There is a small block of text near the bottom of the page, which might be a signature or a date, but it is not legible.

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stout, square or eight-sided; also often slender. Also granular, and columnar to lamellar massive. Cleavage: two directions, nearly at right angles, almost perfect, but interrupted. Basal parting sometimes observed. Fracture uneven to conchoidal. Brittle. H.- 5-6. Sp.G.- 3.2-3.38. Luster vitreous to resinous; often dull; sometimes pearly on planes of parting. Color white, yellowish, grayish white to pale green, dark green and nearly black. May be transparent and colorless. Streak white to pale grayish green. Transparent to opaque.

Chemical composition. $\text{CaMg}(\text{SiO}_3)_2$. Iron is present in small amount, and it thus grades toward hedenbergite.

Varieties. 1. Chrome-diopside. Chrome-pyroxene. Contains chromium (1%-2.8% Cr_2O_3), often a bright green in color.
2. Malacolite. A pale-colored translucent variety.

Occurrence. Colfax County: Elizabethtown district. Dona Ana County: Organ district. Grant County: Fierro-Hanover district. Hidalgo County: Hachita and San Simon districts. Luna County: Tres Hermanas district. Otero County: Orogrande district. Santa Fe County: New Placers district. Socorro County: Magdalena district.

Var. Chrome-diopside. McKinley-San Juan Counties: Navajo Reservation.

Var. Malacolite. Grant County: on Gila River, 40 miles

other, occurs in light-colored clay shales, also
 granular, and contains in smaller amount, clayey
 shales, mostly of clay color, almost white, but
 interstratified, thin, yellowish shales, texture
 coarse to somewhat, brittle, 2-4, 5-6, 8-10, 12-15,
 larger shales to shales; also thin, brownish gray
 to black of color, color shales, yellowish gray
 with to pale green, dark gray and nearly black, but so
 transparent and calcareous, these shales to pale grayish
 green, transparent to opaque.

Local composition. This is present in
 small amount, and is thin green to brown shales.

Section 1. Green shales. Green-green, brownish
 shales (12-15, 16-18, 19-21, 22-24) with green to color.

Section 2. Mainly. A pale-colored translucent shales.
Section 3. Color brown, siliceous shales, thin
 and coarse, green shales, thin, coarse, light brown
 shales, shaly, coarse, shales and thin shales.
 Thin, coarse, fine brown shales, thin, coarse, shaly
 shales, coarse to coarse, the finest shales, coarse
 coarse, shaly shales.

21. Interstratified. Shaly to shaly
 shaly shales.
 22. Shaly. Thin, coarse, shaly shales, to thin

west of Silver City.

DIOPTASE. Emeraudine.

Physical characteristics. Hexagonal-rhombohedral. Commonly in prismatic crystals. Also in crystalline aggregates; massive. Cleavage: rhombohedral, perfect. Fracture conchoidal to uneven. Brittle. H.- 5. Sp.G.- 3.28-3.35. Luster vitreous. Color emerald-green. Streak green. Transparent to subtranslucent.

Chemical composition. Hydrrous copper silicate, H_2CuSiO_4 , or $H_2O.CuO.SiO_2$.

Occurrence. Grant County: Santa Rita district. Otero County: Orogrande district.

DOLomite. Pearl Spar.

Physical characteristics. Hexagonal-rhombohedral. Habit rhombohedral. Rhombohedral faces commonly curved or made up of sub-individuals, and thus passing into saddle-shaped forms. Twins common, sometimes polysynthetic. Also granular, coarse or fine, resembling ordinary marble. Cleavage: rhombohedral, perfect. Fracture subconchoidal. Brittle. H.- 3.5-4. Sp.G.- 2.8-2.9. Luster vitreous, inclining to

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pearly in some varieties. Color white, reddish, or greenish white; also rose-red, green, brown, gray, and black. Transparent to translucent.

Chemical composition. Calcium and magnesium carbonate; for normal dolomite $\text{CaMg}(\text{CO}_3)_2$, or $\text{CaCO}_3.\text{MgCO}_3$. Iron and manganese carbonates may replace the magnesium carbonate; the mineral thus grades into ankerite.

Occurrence. Grant County: Black Hawk, Central, and Pinos Altos districts. Lincoln County: Nogal district. Otero County: Tularosa district. Santa Fe County: Cerrillos district. Sierra County: Kingston district. Socorro County: Hansonburg district.

DOMEYKITE.

Physical characteristics. Cryptocrystalline. Reniform and botryoidal; also massive and disseminated. Fracture uneven. H.- 3-3.5. Sp.G.- 7.2-7.75. Luster metallic, but dull on exposure. Color tin-white to steel-gray, with a yellowish to brownish tinge, tarnishing to a dull iridescent purple.

Chemical composition. Copper arsenide, Cu_3As .

Occurrence. Grant County: Central and Pinos Altos districts.

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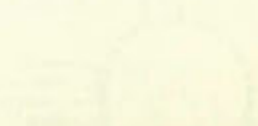
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DUFRENITE. Kraurite.

Physical characteristics. Monoclinic (?). Crystals rare, small, and indistinct. Usually massive, in nodules; radiated fibrous with drusy surface. Cleavage: one direction, perfect; another, nearly at right angles, distinct. H.- 3.5-4. Sp.G.- 3.2-3.4. Luster silky, weak. Color dull leek-green, olive-green, or blackish green; alters on exposure to yellow and brown. Streak siskin-green. Subtranslucent to nearly opaque.

Chemical composition. Doubtful, in part $\text{FePO}_4 \cdot \text{Fe}(\text{OH})_3$, or $2\text{Fe}_2\text{O}_3 \cdot \text{P}_2\text{O}_5 \cdot 3\text{H}_2\text{O}$.

Occurrence. Grant County: Steeple Rock district. Sandoval County: Cochiti district.

DUMORTIERITE.

Physical characteristics. Orthorhombic. Rarely in distinct crystals. Usually in fibrous to columnar aggregates. Cleavage: one direction, distinct. H.- 7. Sp.G.- 3.26-3.36. Luster vitreous. Color bright smalt-blue to greenish blue. Transparent to translucent.

Chemical composition. A basic aluminum borosilicate, perhaps $8\text{Al}_2\text{O}_3 \cdot \text{B}_2\text{O}_3 \cdot 6\text{SiO}_2 \cdot \text{H}_2\text{O}$.

INVERNESS

Practical characteristics. Inverness (7). Crystal clear
well, and indicated. Usually massive, in nodules.
Tinted fibres with grey surface. Discharge: one dis-
charge, positive; another, weakly of weak positive discharge.
No. 20-2 - 20.0 - 20.0. Lower alloy, weak. Color
dull iron-green, olive-green, or blackish green; also on
exposure to yellow and brown. Effect black-green. Dis-
charge: one nearly equal.

Practical characteristics. Inverness, in part 20.0, 20.0, or
20.0, 20.0, 20.0.

Inverness. Great County People Book District, Inverness
County, Scotland.

INVERNESS

Practical characteristics. Inverness. Usually in black
crystals. Usually in fibres to columnar aggregates.
Discharge: one discharge, distinct. No. 20.0 - 20.0 -
20.0. Lower alloy. Color bright black-blue to greenish
blue. Discharge: in translucent.

Practical characteristics. A blackish brown to reddish brown, or-
ange 20.0, 20.0, 20.0.

Occurrence. Luna County: Tres Hermanas district.

DURDENITE.

Physical characteristics. Orthorhombic. In small mammillary forms. H.- 2-2.5. Luster vitreous, dull. Color greenish yellow. Translucent to nearly opaque. Friable.

Chemical composition. Hydrrous ferric tellurite,
 $\text{Fe}_2(\text{TeO}_3)_3 \cdot 4\text{H}_2\text{O}$.

Occurrence. Hidalgo County: Hachita district.

EMBOLITE.

Physical characteristics. Isometric. Rarely in cubes, octahedrons, dodecahedrons, and pyritohedrons. Usually massive, sometimes stalactitic or concretionary on surface. Cleavage none. Fracture uneven. Sectile. H.- 1-1.5. Sp.G.- 5.31-5.43. Luster resinous, somewhat adamantine. Color grayish to yellowish green; yellow, often dark and becoming darker on exposure. Transparent to translucent.

Chemical composition. Chloride and bromide of silver, $\text{Ag}(\text{Cl}, \text{Br})$. The ratio of Cl to Br varies indefinitely, the yellow and deeper green varieties containing the largest proportion of bromine.

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PROPERTY

Physical characteristics: ...
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PROPERTY

Physical characteristics: ...
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Occurrence. Grant County: Chloride Flat district (old reference to "Silver City"); Georgetown district. Sierra County: Hermosa and Lake Valley districts. Socorro County: Socorro Peak district.

ENARGITE.

Physical characteristics. Orthorhombic. Crystals usually small, prismatic faces vertically striated. Twins as star-shaped trillings. Also massive, granular, or columnar. Cleavage: one direction, perfect; two others, distinct. Fracture uneven. Brittle. H.— 3. Sp.G.— 4.43–4.45. Luster metallic. Color grayish black to iron-black. Streak grayish black. Opaque.

Chemical composition. Copper and arsenic sulphide, $3\text{Cu}_2\text{S} \cdot \text{As}_2\text{S}_5$. The formula has also been written $\text{Cu}_2\text{S} \cdot 4\text{CuS} \cdot \text{As}_2\text{S}_3$. Antimony is often present, and enargite grades into the isomorphous mineral famatinite.

Occurrence. Grant County: Central and Pinos Altos districts. Socorro County: Hansonburg district.

EPIDOTE. Pistacite.

Physical characteristics. Monoclinic. Twins common.

Geological Survey of Canada
Department of Energy, Mines and Technical Surveys
Geology Branch
Ottawa, Ontario

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Crystals usually prismatic, passing into acicular forms. Also fibrous, divergent or parallel; granular, particles of various sizes, sometimes fine granular, and forming rock-masses. Cleavage: one direction, perfect. Fracture uneven. Brittle. H.— 6-7. Sp.G.— 3.25-3.5. Luster vitreous, on the perfect cleavage surface pearly or resinous. Color pistachio-green or yellowish green to brownish green, greenish black, and black; sometimes clear red or yellow; also gray and grayish white; rarely colorless. Streak uncolored, grayish. Transparent to opaque; generally sub-translucent.

Chemical composition. $\text{HCa}_2(\text{Al,Fe})_3\text{Si}_3\text{O}_{13}$; or
 $\text{H}_2\text{O}.4\text{CaO}.3(\text{Al,Fe})_2\text{O}_3.6\text{SiO}_2$.

Varieties. 1. Bucklandite. Black, with a tinge of green. Occurs in small crystals, nearly symmetrical instead of elongated.

Occurrence. Bernalillo County: Tijeras Canyon district. Catron County: Mogollon district. Colfax County: Baldy, Cimarroncito, and Elizabethtown districts. Dona Ana County: Modoc and Organ districts. Grant County: Burro Mountains, Fierro-Hanover, and Santa Rita districts. Hidalgo County: Apache No. 2, Hachita, San Simon, and Steins Pass districts. Otero County: Orogrande district. Rio Arriba County: Bromide district. San Miguel County: Rociada and Willow Creek districts. Santa Fe County: New Placers district. Sierra

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County: Chloride and Macho districts. Socorro County: Lemitar Mountains, Magdalena, and Ojo Caliente districts. Taos County: Red River district.

Var. Bucklandite. Santa Fe County: New Placers district.

EPSOMITE. Epsom Salt.

Physical characteristics. Orthorhombic-sphenoidal. Usually in botryoidal masses and fibrous crusts. Cleavage: one direction, very perfect; another, distinct. Fracture conchoidal. H.- 2.0-2.5. Sp.G.- 1.751. Luster vitreous to earthy. Color and streak white. Transparent to translucent. Taste bitter and saline.

Chemical composition. Hydrated magnesium sulphate, $MgSO_4 \cdot 7H_2O$.

Occurrence. Eddy County: Carlsbad Potash district. Torrance County: Estancia Salt district.

ERYTHRITE. Cobalt Bloom.

Physical characteristics. Monoclinic. Crystals prismatic and vertically striated. Also in globular and reniform shapes, having a drusy surface and columnar structure;

County Office and Board of Supervisors
San Francisco, California
The County and State Offices
San Francisco, California
San Francisco, California
San Francisco, California

MEMORANDUM

San Francisco, California
to the Board of Supervisors and the Board of Public Works
subject: very private matter. (Confidential)
Date: 5-10-1910
San Francisco, California
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San Francisco, California
San Francisco, California

MEMORANDUM

San Francisco, California
to the Board of Supervisors and the Board of Public Works
subject: very private matter. (Confidential)
San Francisco, California
San Francisco, California
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sometimes stellate. Also pulvulent and earthy, incrusting. Cleavage: one direction, highly perfect. Sectile. H.- 1.5-2.5, least on the cleavage surface. Sp.G.- 2.95. Luster of cleavage surface pearly; other faces adamantine to vitreous; also dull, earthy. Color crimson- and peach-red, sometimes gray. Streak paler than color. Transparent to subtranslucent.

Chemical composition. Hydrrous cobalt arsenate,
 $\text{Co}_3\text{As}_2\text{O}_8 \cdot 8\text{H}_2\text{O}$.

Occurrence. Grant County: Black Hawk district.

EUCLASE.

Physical characteristics. Monoclinic. Only in crystals; habit prismatic with certain faces vertically striated. Cleavage: one direction, highly perfect. Fracture conchoidal. Brittle. H.- 7.5. Sp.G.- 3.05-3.10. Luster vitreous, sometimes pearly on the cleavage surface. Colorless, pale green, passing into blue and white. Streak uncolored. Transparent; occasionally subtransparent.

Chemical composition. HBeAlSiO_5 , or $\text{Be}(\text{AlOH})\text{SiO}_4$.

Occurrence. Taos County: "in vicinity of Taos".

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FELDSPAR.

Common name for a group of related species, of which the general characters are:

1. Crystallization in the monoclinic or triclinic systems, the crystals of the different species resembling each other closely in angle, in general habit, and in methods of twinning. The prismatic angle in all cases is within a few degrees of 60° and 120° .
2. Cleavage in two similar directions at angles of 90° or nearly 90° .
3. Hardness between 6 and 6.5.
4. Specific gravity varying between 2.5 and 2.9, and mostly between 2.55 and 2.75.
5. Color white or pale shades of yellow, red, or green, less commonly dark.
6. Chemically, silicates of aluminum with either potassium, sodium, or calcium, and rarely barium, while magnesium and iron are always absent.

Besides the several distinct species, there are many intermediate compounds having a certain independence of character and yet connected with each other by insensible gradations, all the members of the series showing a close relationship in composition, crystalline form, and optical

RESULTS

General notes for a group of related papers, of which the general character is:

1. Crystallization in the condensed or crystalline region of the crystals of the different papers is characterized by a close fit with the general theory, and in certain cases the crystalline angle is also within a few degrees of 90° and 120°.

2. Deviation in the smaller crystallites is within a few degrees of 90°.

3. Deviation between 5 and 4.5°.

4. Specific gravity varying between 1.5 and 1.7, and between 1.35 and 1.75.

5. Color white or pale shades of yellow, and of varying density.

6. Chemically, all kinds of elements with which hydrogen, oxygen, or carbon, and rarely nitrogen, will combine, and from which they are always absent.

Behind the general character of the papers, the different crystallites are characterized by a certain degree of order and yet somewhat irregularity in their crystallization. All the crystals of the same paper are related to each other in position, and the same is true of the

characters.

The species of the group are classified, first as to form, and second with reference to composition.

The monoclinic species found in New Mexico include orthoclase, potassium feldspar.

The triclinic species include microcline, also a potash feldspar; and, in the albite-anorthite series of Plagioclase Feldspars, albite, andesine, oligoclase, labradorite, bytownite, and anorthite.

With the exception of perhaps orthoclase, microcline, and albite, the species have been identified only in microscopic sections.

The species are described separately in the text. Members of the albite-anorthite series are described under the heading PLAGIOCLASE FELDSPARS, and also separately.

Occurrence. The following occurrences are of feldspar identified only as such, the species not being given: Colfax County: Baldy and Elizabethtown districts. Grant County: Fierro-Hanover district. Rio Arriba County: Petaca district. San Miguel County: El Porvenir district. Santa Fe County: Cerrillos and Old Placers districts. Sierra County: Hillsboro district. Socorro County: Iron Mountain No. 2 district. Taos County: Harding Mine district.

The species of the group are distributed in the
 low, and second with reference to elevation.
 The remaining species found in the region include
Myrica, Petrus, and others.
 The following species have been identified in the
 region, and in the alpine-forest zone of the
 mountains, alpine, subalpine, alpine, and
 subalpine, and alpine.
 With the exception of certain species, the
 and alpine, the species have been identified only in the
 alpine region.
 The species are described separately in the
 section of the alpine-forest zone and the alpine
 the heading *ALPINE-FOREST ZONE*, and also in the
 section. The following specimens are included
 identified only in the alpine region, and in the
 Colfax County, New Mexico, and Lincoln County,
 County, New Mexico, and Lincoln County, New Mexico,
 the alpine region. The alpine region is located
 State in County, California, and the alpine region
 State, California, and the alpine region, and the
 Mountain N. & Lincoln. Two County, California, and

Valencia County: near Grant.

FERRIMOLYBDITE. Molybdite.

Physical characteristics. Orthorhombic. In crystal fibers, also earthy, pulverulent. One distinct cleavage. H.— 1.5. Sp.G.— 4.5. Color sulphur-yellow.

Chemical composition. $\text{Fe}_2\text{O}_3 \cdot 3\text{MoO}_3 \cdot 8\text{H}_2\text{O}$. The material long known as molybdite, and supposed to be molybdic oxide, MoO_3 , has been shown to be rather a hydrous ferric molybdate. The existence of molybdic oxide as a mineral has not been established.

Varieties. 1. Molybdic Ocher. The earthy variety, occurring as a powder or as an incrustation.

Occurrence. The ordinary mineral ferrimolybdite is not reported from New Mexico.

Var. Molybdic Ocher. San Miguel County: El Porvenir district. Socorro County: San Andres Mountains district (Grandview Canyon). Taos County: Red River district.

FLUORITE. Fluor Spar.

Physical characteristics. Isometric. Habit cubic, less

Valerianic acid, $C_{11}H_{20}O_4$, M_p 100°. It is a colorless, crystalline solid, soluble in alcohol, ether, and benzene. It is formed by the oxidation of valerianic acid.

VALERIANIC ACID, $C_5H_{10}O_2$

Valerianic acid, $C_5H_{10}O_2$, M_p 67°. It is a colorless, crystalline solid, soluble in alcohol, ether, and benzene. It is formed by the oxidation of valerianic acid.

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VALERIANIC ACID, $C_5H_{10}O_2$

Valerianic acid, $C_5H_{10}O_2$, M_p 67°. It is a colorless, crystalline solid, soluble in alcohol, ether, and benzene. It is formed by the oxidation of valerianic acid.

often octahedral or dodecahedral. Cubic crystals sometimes grouped in parallel to form a pseudo-octahedron, the faces of which may have a drusy character. Penetration-twins rather common. Also massive; granular, coarse or fine; rarely columnar; compact. Cleavage: octahedral, perfect. Fracture flat conchoidal, splintery in compact types. Brittle. H.- 4. Sp.G.- 3.01-3.25, 3.18 in crystals. Luster vitreous. Color white, yellow, green, rose- and crimson-red, violet-blue; sky-blue, and brown; wine-yellow, greenish blue, most common; red, rare. Color often varies in different parts of the same specimen, banded parallel to the cubic planes. Streak white. Transparent to subtranslucent. Phosphorescent in some varieties when heated, in others when scratched with a knife blade. Most varieties fluorescent when affected by X-rays.

Chemical composition. Calcium fluoride, CaF_2 .

Occurrence. Bernalillo County: Tijeras Canyon district. Catron County: Mogollon district; near Glenwood-Big Spar prospect. Dona Ana County: Bishop's Cap Fluorspar, Organ, Tonuco Mountains Fluorspar, and Tortugas Fluorspar districts. Grant County: Burro Mountains, Pinos Altos, and Telegraph districts; also Blue Bird Mine, Cooks Range (north end), Cottonwood Canyon, Seventy-four Prospect, Tellurium locality (41 miles northwest of Silver City). Hidalgo County: Apache No. 2 district. Lincoln County:

After treatment on laboratory. This type of laboratory
grouped in parallel to form a parallel-plate. The
of which may have a very different. I would like to
further examine. Also include examples, names of
very relevant; suggest. However, regarding
therefore the conditions, especially in regard to
Harris, H. & C. 2.0-2.2. 2.2 in weight.
Under review. Other white, yellow, brown, red-
orange-red, violet-blue, and green; and
greenish blue, most common; red, blue, and white
in different parts of the same specimen. This
the only names. Brown white. Transparency
factor. Improvement in some varieties
others than revealed with a white stain. This
discovered when attacked by X-rays.

Chemical analysis. Calcium chloride, etc.
Preparation. Vermilion powder; thin layer
Calcium chloride; yellow stain; most common
presence. This and calcium chloride are
Tarnish containing vermilion, and
white. (Some colors) have been
Vermilion (stained) also like
(hard and). Colored
Tarnish usually (all after
Harris County Kansas No. 2.0-2.2. 2.2

White Oaks district. Luna County: Cooks Peak, Cooks Range Manganese, Fluorite Ridge, and Little Florida Mountains districts. Rio Arriba County: Bromide and Petaca (La Madera and Ojo Caliente) districts. Sandoval County: Placitas district. San Miguel County: El Porvenir and Willow Creek districts. Sierra County: Caballos Mountains, Cuchillo Negro, Hillsboro, and Lake Valley districts. Socorro County: Chupadero, Council Rock, Hansonburg, Jones Camp, Joyita Hills, Ladrones Mountains, Lemitar Mountains, Magdalena, North Magdalena, San Andres Mountains (Grandview Canyon, Lava Gap, Mockingbird Gap, Salinas Peak), San Jose, and Socorro Peak districts. Taos County: Red River district. Valencia County: Zuni Mountains district.

FRANKLINITE.

Physical characteristics. Isometric. Habit octahedral, edges often rounded, and crystals passing into rounded grains. Massive, granular, coarse to fine to compact. Octahedral parting as in magnetite (pseudo-cleavage). Fracture conchoidal to uneven. Brittle. H.— 5.5–6.5. Sp.G.— 5.07–5.22. Luster metallic, sometimes dull. Color iron-black. Streak reddish brown or black. Opaque, except in very thin sections. Slightly magnetic.

Chemical composition. $(\text{Fe}, \text{Zn}, \text{Mn})\text{O} \cdot (\text{Fe}, \text{Mn})_2\text{O}_3$, but varying

This is a list of the names of the various
 counties, towns, and cities in the
 State of New York, as they appear in
 the records of the State of New York.
 The names are arranged in alphabetical
 order, and are given in full, with
 the county, town, and city, as the
 case may be. The names are given in
 full, and are not abbreviated. The
 names are given in full, and are not
 abbreviated. The names are given in
 full, and are not abbreviated.

INDEX.

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 names are given in full, and are not
 abbreviated. The names are given in
 full, and are not abbreviated.

quite widely in the relative quantities of the different metals present. Conforms to the general formula of the spinel group.

Occurrence. Grant County: Central district.

GADOLINITE.

Physical characteristics. Monoclinic. Crystals rough and coarse; commonly prismatic and terminated by the base; sometimes by the pyramid. Also in masses. Cleavage none. Fracture conchoidal or splintery. Brittle. H.— 6.5–7. Sp.G.— 4.0–4.5. Luster vitreous to greasy. Color black, greenish black, also brown; in thin splinters nearly transparent, and usually grass-green to olive-green. Streak greenish gray.

Chemical composition. $\text{Be}_2\text{FeY}_2\text{Si}_2\text{O}_{10}$; or $2\text{BeO} \cdot \text{FeO} \cdot 2\text{Y}_2\text{O}_3 \cdot 2\text{SiO}_2$; also written $\text{Be}_2\text{Fe}(\text{YO})_2(\text{SiO}_4)_2$.

Occurrence. Rio Arriba County: Petaca district.

GAHNITE. Zinc Spinel.

Physical characteristics. Isometric. Habit octahedral, often with striated faces; also less commonly in dodecahedrons and modified cubes. Twins rather common. No distinct

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CHARACTERISTICS

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cleavage. Fracture conchoidal to uneven. Brittle. H.— 7.5-8. Sp.G.— 4.0-4.6. Luster vitreous, or somewhat greasy. Color dark green, grayish green, deep leek-green, greenish black, bluish black, yellowish, or grayish brown. Streak grayish. Subtransparent to nearly opaque.

Chemical composition. Zinc aluminate, $ZnAl_2O_4$.

Varieties. 1. Automolite. Zinc Gahnite. Nearly pure zinc aluminate, with perhaps a little iron. Sp.G.— 4.1-4.6.

Occurrence. Santa Fe County: Cerrillos district.

Var. Automolite. Santa Fe County: "Santa Fe Mountains" region.

GALENA. Lead Glance.

Physical characteristics. Isometric. Commonly in cubes, or cubo-octahedrons; less often octahedral. Also in skeleton crystals, reticulated, tabular. Twins: contact and penetration, sometimes repeated. Massive cleavable, coarse or fine granular, to impalpable; occasionally fibrous or plumose. Cleavage: cubic, highly perfect. Also an octahedral parting sometimes. Fracture flat subconchoidal or even. H.— 2.5-2.75. Sp.G.— 7.4-7.6. Luster metallic. Color and streak pure lead-gray. Opaque.

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Chemical composition. Lead sulphide, PbS. Often contains silver, as sulphide or native; also native gold.

Occurrence. Bernalillo County: Tijeras Canyon district. Catron County: Mogollon district. Colfax County: Baldy and Elizabethtown districts. Dona Ana County: Modoc and Organ districts. Grant County: Burro Mountains, Carpenter, Central, Chloride Flat, Fierro-Hanover, Georgetown, Gold Hill, Pinos Altos, Santa Rita, Steeple Rock, and White Signal districts. Hidalgo County: Fremont, Hachita, Lordsburg, Pyramid, San Simon, and Steins Pass districts. Lincoln County: Nogal district. Luna County: Cooks Peak, Florida Mountains, Tres Hermanas, and Victorio districts. Otero County: Sacramento district. Rio Arriba County: Bromide and Hopewell districts. Sandoval County: Cochiti and Flacitas districts. San Miguel County: Rociada and Willow Creek districts. Santa Fe County: Cerrillos, New Placers, Old Placers, and Santa Fe districts. Sierra County: Caballos Mountains, Chloride, Cuchillo Negro, Hermosa, Hillsboro, Kingston, Lake Valley, Macho, and Tierra Blanca districts. Socorro County: Abbey, Chupadero, Council Rock, Hansonburg, Jones Camp, Joyita Hills, Lemitar Mountains, Magdalena, Mill Canyon, North Magdalena, San Andres Mountains (Goodfortune Creek, Mockingbird Gap, Salinas Peak), Socorro Peak, and Water Canyon districts. Taos County: Red River and Twining districts. Valencia County: Zuni Mountains district.

GARNET.

Physical characteristics. Isometric. The dodecahedron and trapezohedron are the common simple forms; also these in combination, or with the hexoctahedron. Cubic and octahedral faces rare. Often in irregular imbedded grains. Also massive; granular, coarse or fine, and sometimes friable; lamellar. Sometimes compact, cryptocrystalline. Cleavage none. Parting: dodecahedral, sometimes distinct. Fracture subconchoidal to uneven. Brittle, sometimes friable when granular massive; very tough when compact cryptocrystalline. H.— 6.5–7.5. Sp.G.— 3.15–4.3, varying with the composition. Luster vitreous to resinous. Color red, brown, yellow, white, apple-green, black; red and green often bright. Streak white. Transparent to sub-translucent.

Chemical composition. An orthosilicate with the general formula $R_3^{\text{II}}R_2^{\text{III}}(\text{SiO}_4)_3$, or $3\text{RO} \cdot \text{R}_2\text{O}_3 \cdot 3\text{SiO}_2$. The bivalent element may be calcium, magnesium, ferrous iron, or manganese; the trivalent element may be aluminum, ferric iron or chromium, rarely titanium. Titanium may replace silicon. Index of refraction and specific gravity vary directly with composition.

Varieties.

A. Almandite. Almandine. Precious garnet in part. Common garnet in part. Iron-aluminum Garnet. Formula

$3\text{FeO} \cdot \text{Al}_2\text{O}_3 \cdot 3\text{SiO}_2$. Ferric iron may replace part of the aluminum. Magnesium may replace the ferrous iron, and thus it grades toward pyrope. Sp.G.— 4.25. Color fine deep red, transparent, in precious garnet; brownish red, translucent or subtranslucent, in common garnet; black. Part of common garnet belongs to andradite.

B. Andradite. Common Garnet. Black Garnet. Calcium-iron Garnet. Formula $3\text{CaO} \cdot \text{Fe}_2\text{O}_3 \cdot 3\text{SiO}_2$. Aluminum may replace the ferric iron; ferrous iron, manganese, and sometimes magnesium, may replace the calcium. Sp.G.— 3.75. Colors various: wine-, topaz-, and greenish yellow, apple-green to emerald-green; brownish red, brownish yellow, grayish green, dark green; brown, grayish black, black.

C. Grossularite. Essonite or Hessonite. Cinnamonstone. Calcium-aluminum Garnet. Formula $3\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 3\text{SiO}_2$. Ferrous iron may replace the calcium, and ferric iron the aluminum, thus grading toward almandite and andradite. Sp.G.— 3.53. Colorless to white; pale green; amber- and honey-yellow; wine-yellow, brownish yellow, cinnamon-brown; rose-red; rarely emerald-green from the presence of chromium.

D. Pyrope. Precious garnet in part. Magnesium-aluminum Garnet. Formula $3\text{MgO} \cdot \text{Al}_2\text{O}_3 \cdot 3\text{SiO}_2$. Calcium and iron may be present, and also chromium. Sp.G.— 3.51. Color deep red to nearly black. Often perfectly transparent

1. *Asplenium platyneuron* L. - Common in wet places, especially in the shade of rocks and trees. It is a fern with long, narrow, lanceolate leaves and a single, upright, branched stem. The fronds are dark green and have a distinct venation. The sori are small and round, and are arranged in a single row along the veins of the leaves.

2. *Asplenium adnigrum* L. - This fern is similar to the one above, but the leaves are broader and more rounded at the tip. The sori are also arranged in a single row, but they are larger and more numerous. The fronds are dark green and have a distinct venation.

3. *Asplenium platyneuron* L. - This fern is similar to the one above, but the leaves are broader and more rounded at the tip. The sori are also arranged in a single row, but they are larger and more numerous. The fronds are dark green and have a distinct venation.

4. *Asplenium platyneuron* L. - This fern is similar to the one above, but the leaves are broader and more rounded at the tip. The sori are also arranged in a single row, but they are larger and more numerous. The fronds are dark green and have a distinct venation.

and then prized as a gem.

Occurrence. The occurrences immediately following are of garnet in which the varieties are not determined: Colfax County: Baldy, Cimarroncito, and Elizabethtown districts. Dona Ana County: Organ district. Grant County: Fierro-Hanover, Pinos Altos, and Santa Rita districts. Hidalgo County: Apache No. 2, Hachita, and San Simon districts. Luna County: Tres Hermanas district. McKinley County: Navajo Reservation and Zuni Reservation. Otero County: Orogrande district. Rio Arriba County: Bromide and Petaca districts. San Juan County: Navajo Reservation (especially southwest corner). San Miguel County: Rociada and Willow Creek districts. Santa Fe County: New Placers and Old Placers districts. Sierra County: Chloride and Cuchillo Negro districts. Socorro County: Iron Mountain No. 2 and Magdalena districts. Taos County: Glenwoody, Harding Mine, and Picuris districts.

Var. Almandite. Santa Fe County: New Placers district.

Var. Andradite. Colfax County: Cimarroncito district. Dona Ana County: Organ district. Otero County: Orogrande district. Santa Fe County: New Placers district. Socorro County: Iron Mountain No. 2 district. Taos County: Glenwoody district.

Var. Grossularite. Dona Ana County: Organ district.

and then printed in a general form. The following are the names of the districts in which the statistics are published: County of Albany, County of Berks, County of Bradford, County of Bucks, County of Chester, County of Columbia, County of Delaware, County of Lancaster, County of Lehigh, County of Luzerne, County of Mersey, County of Montgomery, County of Northampton, County of Northumberland, County of Oxford, County of York, County of Westchester, County of Warren, County of Wayne, County of Wyoming, County of York.

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Grant County: Fierro-Hanover district. Santa Fe County: New Placers district. Sierra County: (not specified).

Var. Pyrope. McKinley County: near Thoreau; Navajo Reservation and Zuni Reservation. San Juan County: Navajo Reservation (southwest corner). Santa Fe County: (not specified). Taos County: (not specified). (Indefinite: near Fort Craig.)

GERHARDTITE.

Physical characteristics. Orthorhombic. In pyramidal crystals, faces striated. Cleavage: basal, highly perfect, yielding flexible laminae. Another less perfect cleavage at right angles. Sectile, fragile. H.— 2. Sp.G.— 3.426. Luster vitreous, brilliant. Color deep emerald green. Streak light green. Transparent. Easily fusible.

Chemical composition. Basic cupric nitrate, $\text{Cu}(\text{NO}_3)_2$, or $4\text{CuO} \cdot \text{N}_2\text{O}_5 \cdot 3\text{H}_2\text{O}$.

Occurrence. Socorro County: Magdalena district.

GLAUBERITE.

Physical characteristics. Monoclinic. In tabular and prismatic crystals. Cleavage: one direction, perfect.

Great County, State of Oregon, 1890. The following is a list of the names of the persons who have been appointed to the office of Justice of the Peace for the term ending on the 31st day of December, 1890.

For the County of Clatsop: John W. ...

For the County of Columbia: ...

For the County of Clatsop: ...

For the County of Columbia: ...

For the County of Clatsop: ...

For the County of Columbia: ...

REMARKS.

The following is a list of the names of the persons who have been appointed to the office of Justice of the Peace for the term ending on the 31st day of December, 1890.

For the County of Clatsop: ...

For the County of Columbia: ...

For the County of Clatsop: ...

For the County of Columbia: ...

For the County of Clatsop: ...

For the County of Columbia: ...

For the County of Clatsop: ...

For the County of Columbia: ...

For the County of Clatsop: ...

For the County of Columbia: ...

REMARKS.

The following is a list of the names of the persons who have been appointed to the office of Justice of the Peace for the term ending on the 31st day of December, 1890.

For the County of Clatsop: ...

For the County of Columbia: ...

Fracture conchoidal. Brittle. H.— 2.5-3. Sp.G.— 2.7-2.85. Luster vitreous. Color pale yellow or gray; sometimes brick-red. Streak white. Taste slightly saline.

Chemical composition. Sodium and calcium sulphate, $\text{Na}_2\text{SO}_4 \cdot \text{CaSO}_4$.

Occurrence. Catron County: Quemado Salt district. Eddy County: Carlsbad Potash district. Torrance County: Estancia Salt district.

GLAUCONITE.

Physical characteristics. Probably both colloidal and crystalline. Usually amorphous, and resembling earthy chlorite. Either in cavities in rocks, or loosely granular massive. Micaceous cleavage. H.— 2. Sp.G.— 2.2-2.4. Luster dull, or glistening. Color olive-green, blackish green, yellowish green, grayish green. Opaque.

Chemical composition. Shows a considerable variation in composition, but is essentially a hydrous silicate of iron and potassium, in which the iron is chiefly ferric.

Occurrence. In the Bliss sandstone of Cambrian age in several mountain ranges in Grant, Luna, and Sierra Counties.

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DISCUSSION

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GOETHITE.

Physical characteristics. Orthorhombic. In prisms vertically striated, and often flattened into scales or tables. Also fibrous; foliated or in scales; massive, reniform and stalactitic, with concentric and radiated structure. Cleavage: one direction, parallel to tabular faces, very perfect. Fracture uneven. Brittle. H.— 5-5.5. Sp.G.— 4.28. Luster imperfect adamantine. Color yellowish, reddish, and blackish brown. Often blood-red by transmitted light. Streak brownish yellow to ocher-yellow.

Chemical composition. FeO(OH) , or $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$.

Occurrence. Socorro County: San Andres Mountains district (Goodfortune Creek).

GOLD.

Physical characteristics. Isometric. Distinct crystals rare, octahedron most common. Filiform, reticulated, and dendritic. Also massive and in thin laminae; often in flattened grains or scales. Cleavage none. Fracture hackly. Very malleable and ductile. H.— 2.5-3. Sp.G.— 15.6-19.3, 19.33 when pure. Luster metallic. Color and streak gold-yellow, sometimes inclining to silver-white and rarely to orange-red. Opaque.

RESULTS

Physical characteristics. The specimens are...
also listed, and often flattened like scales or...
also listed; flattened or in scales;...
specimens, with numerous and...
specimens; not distinct, partial to...
partial. Physical masses. Width...
4.50. Layered layers...
dark, and...
light. Dark brownish yellow to...
dark brownish yellow to...
dark brownish yellow to...
dark brownish yellow to...

DISCUSSION

Physical characteristics. The specimens are...
rare, scattered...
partial. Also...
physical...
dark...
light...
dark...
light...
dark...
light...
dark...
light...
dark...
light...
dark...
light...

Chemical composition. Gold, Au, but usually alloyed with silver in varying amounts and sometimes containing traces of copper or iron.

Occurrence. Reported as lode deposits and as placer deposits.

Lode Deposits. Bernalillo County: Tijeras Canyon district. Catron County: Mogollon district. Chaves County: Guadalupe Mountains region (?). Colfax County: Baldy, Cimarroncito, and Elizabethtown districts. Dona Ana County: Gold Camp, Organ, and Texas districts. Eddy County: Guadalupe Mountains region (?). Grant County: Burro Mountains, Central, Gold Hill, Malone, Pinos Altos, Steeple Rock, and Telegraph districts; Tellurium locality (41 miles northwest of Silver City). Hidalgo County: Fremont, Hachita, Lordsburg, and Steins Pass districts. Lincoln County: Gallinas Mountains, Jicarilla, Nogal, and White Oaks districts. Luna County: Carrizalillo Hills, Tres Hermanas, and Victorio districts. Otero County: Orogrande district. Rio Arriba County: Bromide and Hopewell districts. Sandoval County: Cochiti and Placitas districts. Santa Fe County: New Placers, Old Placers, and Santa Fe districts. Sierra County: Chloride, Hermosa, Hillsboro, Kingston, San Mateo Mountains, and Tierra Blanca districts. Socorro County: Cat Mountain, Hansonburg, Magdalena, Mill Canyon, Rosedale, San Jose, San Lorenzo, and Water Canyon

Chemical analysis of the soil in the vicinity of the mine, showing the presence of lead, zinc, and copper.

Section 1. The soil in the vicinity of the mine is of a heavy, clayey nature, and is highly fertile.

Section 2. The soil in the vicinity of the mine is of a heavy, clayey nature, and is highly fertile.

Section 3. The soil in the vicinity of the mine is of a heavy, clayey nature, and is highly fertile.

Section 4. The soil in the vicinity of the mine is of a heavy, clayey nature, and is highly fertile.

Section 5. The soil in the vicinity of the mine is of a heavy, clayey nature, and is highly fertile.

Section 6. The soil in the vicinity of the mine is of a heavy, clayey nature, and is highly fertile.

Section 7. The soil in the vicinity of the mine is of a heavy, clayey nature, and is highly fertile.

districts. Taos County: Anchor, Glenwoody, Picuris, Red River, and Twining districts.

Placer Deposits. Bernalillo County: Tijeras Canyon district. Chaves County: along Rio Hondo. Colfax County: Baldy, Cimarroncito, Elizabethtown, and Ponil districts. Grant County: Gold Camp, Malone, and Finos Altos districts. Hidalgo County: Hachita and Lordsburg districts. Lincoln County: Gallinas Mountains, Jicarilla, Negal, and White Oaks districts; along Rio Hondo. Otero County: Orogrande district. Rio Arriba County: Abiquiu and Hopewell districts. Sandoval County: Placitas district. San Miguel County: Willow Creek district. Santa Fe County: Cerrillos (along Galisteo Creek), New Placers, Old Placers, and Santa Fe districts. Sierra County: Caballos Mountains, Hillsboro, and Pittsburg districts. Taos County: Glenwoody, Red River, and Twining districts.

GOSLARITE.

Physical characteristics. Orthorhombic. In long acicular crystals. Commonly massive or stalactitic. Cleavage: one direction, perfect. Brittle. H.- 2-2.5. Sp.G.- 1.9-2.1. Luster vitreous. Color white, reddish, yellowish, bluish. Transparent to translucent. Taste astringent, metallic, and nauseous.

districts: Tazewell County, Giles County, Buchanan County, and Putnam County.

Virginia

district: Giles County, Buchanan County, and Putnam County.

County: Buchanan County, Giles County, and Putnam County.

County: Buchanan County, Giles County, and Putnam County.

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Virginia

County: Buchanan County, Giles County, and Putnam County.

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County: Buchanan County, Giles County, and Putnam County.

County: Buchanan County, Giles County, and Putnam County.

County: Buchanan County, Giles County, and Putnam County.

County: Buchanan County, Giles County, and Putnam County.

Chemical composition. Hydrous zinc sulphate, $ZnSO_4 \cdot 7H_2O$.

Varieties. 1. Cuprogoslarite. Containing a considerable quantity of cupric sulphate, $CuSO_4$. Light greenish blue, massive or as an incrustation. 2. Ferrogoslarite. Containing ferrous sulphate, $FeSO_4$.

Occurrence. Grant County: Central district. Sierra County: Kingston district. Socorro County: Magdalena and Water Canyon districts.

Var. Cuprogoslarite. Grant County: Central district.

Var. Ferrogoslarite. Grant County: Central district.

GRAPHITE. Plumbago. Black Lead.

Physical characteristics. Hexagonal-rhombohedral. In six-sided tabular crystals. Commonly in embedded foliated masses, also columnar or radiated; scaly or platy; granular to compact; earthy. Cleavage: basal, perfect. Thin laminae flexible, inelastic. Feel greasy. H.- 1-2. Sp.G.- 2.09-2.23. Luster metallic, sometimes dull, earthy. Color iron-black to dark steel-gray. Opaque. Conducts electricity.

Chemical composition. Carbon, C, often impure.

Occurrence. Bernalillo County: Tijeras Canyon district.

Colfax County: Raton Graphite district. Grant County: Burro

Chemical composition: Hydrogen and oxygen, water, 100%

Section 1. Composition. Contains a small amount of organic matter, but is not a good source of energy or as an insulator. It is a poor conductor of heat.

Section 2. Physical properties. It is a colorless, odorless gas. It is lighter than air and does not support combustion.

Section 3. Chemical properties. It is a very active gas.

Section 4. Uses. It is used as a fuel.

Section 5. Preparation.

Hydrogen is prepared by the action of acids on metals.

It is also prepared by electrolysis of water.

It is a colorless, odorless gas. It is lighter than air and does not support combustion.

It is used as a fuel. It is also used in the manufacture of ammonia.

Section 6. Properties. It is a colorless, odorless gas. It is lighter than air and does not support combustion.

Mountains district. Taos County: "in Taos Range". Valencia County: (not specified).

GREENOCKITE.

Physical characteristics. Hexagonal. Rarely in hemimorphic crystals; also as a coating. Cleavage: prismatic, distinct. Fracture conchoidal. Brittle. H.- 3-3.5. Sp.G.- 4.9-5.0. Luster adamantine to resinous. Color honey-, citron-, or orange-yellow. Streak between orange-yellow and brick-red. Nearly transparent.

Chemical composition. Cadmium sulphide, CdS.

Occurrence. Grant County: Pinos Altos district. Socorro County: Magdalena district.

GUMMITE.

Physical characteristics. Crystalline, perhaps in part amorphous. In rounded or flattened pieces, looking much like gum. H.- 2.5-3. Sp.G.- 3.9-4.20. Luster greasy. Color reddish yellow to orange- or hyacinth-red, reddish brown. Streak yellow. Feebly translucent. Isotropic.

Chemical composition. An alteration product of uraninite, of doubtful composition; perhaps essentially

...in ...

County (see opposite)

BERYLLIUM

Physical characteristics. Beryllium, found in beryllium

oxides; also as a native. Occurs in beryllium, beryllium

fluoride, beryllium chloride, beryllium nitrate, beryllium

acetate, beryllium sulfate, beryllium phosphate, beryllium

silicate, beryllium carbonate, beryllium borate, beryllium

phosphate, beryllium fluoride, beryllium iodide, beryllium

nitrate, beryllium chloride, beryllium bromide, beryllium

iodide, beryllium nitrate, beryllium fluoride, beryllium

phosphate, beryllium borate, beryllium carbonate, beryllium

silicate, beryllium acetate, beryllium sulfate, beryllium

BERYLLIUM

Physical characteristics. Beryllium, found in beryllium

oxides; also as a native. Occurs in beryllium, beryllium

fluoride, beryllium chloride, beryllium nitrate, beryllium

acetate, beryllium sulfate, beryllium phosphate, beryllium

silicate, beryllium carbonate, beryllium borate, beryllium

phosphate, beryllium fluoride, beryllium iodide, beryllium

nitrate, beryllium chloride, beryllium bromide, beryllium

iodide, beryllium nitrate, beryllium fluoride, beryllium

$(\text{Pb,Ca,Ba})\text{U}_3\text{SiO}_{12}\cdot 6\text{H}_2\text{O}$ (Foullon).

Occurrence. Rio Arriba County: Petaca district.

GYPSUM.

Physical characteristics. Monoclinic. Crystals usually simple in habit, commonly flattened or prismatic to acicular. Simple crystals often with warped and curved surfaces. Also foliated massive; lamellar-stellate; often granular massive; and sometimes nearly impalpable. Twins very common, often the familiar swallow-tail or arrowhead twins. Cleavage: one direction, eminent, yielding easily thin polished folia; also two other directions, distinct, one giving a surface with conchoidal fracture, the other a surface with a fibrous fracture. A cleavage fragment has the rhombic form with plane angles of 66° and 114° . H.— 1.5–2. Sp.G.— 2.314–2.328, when in pure crystals. Luster of eminent cleavage surface pearly and shining; other faces subvitreous. Massive varieties often glistening, sometimes dull earthy. Color usually white; sometimes gray, flesh-red, honey-yellow, ocher-yellow, blue; impure varieties often black, brown, red, or reddish brown. Streak white. Transparent to opaque.

Chemical composition. Hydrrous calcium sulphate, $\text{CaSO}_4\cdot 2\text{H}_2\text{O}$.

188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200

201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220

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Physical constants

Varieties. 1. Alabaster. A fine-grained, massive variety, white or delicately shaded. 2. Satin Spar. A fine fibrous variety, with pearly opalescence. 3. Selenite. Crystallized gypsum. Colorless, transparent; in distinct crystals, or broad folia, often large. Usually flexible and yielding a fibrous fracture.

Occurrence. The following occurrences are of gypsum of undetermined variety: Bernalillo County: Tijeras Canyon district. Chaves County: Acme region. Dona Ana County: Organ and Tonuco Mountains Fluorspar districts; region west of White Sands. Eddy County: Carlsbad Potash district; Oriental region. Grant County: Fierro-Hanover and Lone Mountain districts. Guadalupe County: (not specified). Lincoln County: White Oaks district; Ancho region. Luna County: Cooks Peak district. McKinley County: (not specified). Otero County: White Sands region. Quay County: (not specified). Rio Arriba County: near El Rito. Roosevelt County: Elida region. Sandoval County: Nacimiento Mountains region. San Juan County: (not specified). San Miguel County: near Pecos. Santa Fe County: (not specified). Sierra County: Caballos Mountains and Lake Valley districts. Socorro County: Chupadero, Magdalena, North Magdalena, and San Andres Mountains (Lava Gap) districts. Torrance County: Estancia Salt district. Valencia County: Zuni Mountains district; Rito region.

Var. Alabaster. Otero County: Tularosa district.
 Socorro County: Jones Camp district.

Var. Satin Spar. Socorro County: district east of
 Strawberry Peak.

Var. Selenite. De Baca County: Fort Sumnar-Dunlap
 region. Dona Ana County: North Lucero Ranch, west of White
 Sands. Sierra County: Pittsburg district. Torrance County:
 Estancia Salt district. Valencia County: region west of
 Belen, especially in caves.

HALITE. Rock Salt.

Physical characteristics. Isometric. Usually in cubes;
 crystals sometimes distorted, or with cavernous faces.
 Also massive, granular to compact; less often columnar.
 Cleavage: cubic, perfect. Fracture conchoidal. Rather
 brittle. H.- 2.5. Sp.G.- 2.1-2.6; pure crystals 2.164.
 Luster vitreous. Colorless or white, also yellowish, red-
 dish, bluish, purplish. At times shows a deep blue color
 in irregular spots. Transparent to translucent. Soluble,
 taste saline.

Chemical composition. Sodium chloride, NaCl. Commonly
 mixed with calcium sulphate, calcium chloride, magnesium
 chloride, and sometimes magnesium sulphate.

The following are the names of the
 persons who have been appointed
 to the various positions in the
 office of the Secretary of the
 Board of Education, District of
 Columbia, for the year 1900.
 The names of the persons who
 have been appointed to the
 various positions in the office
 of the Secretary of the Board
 of Education, District of
 Columbia, for the year 1900,
 are as follows:

SECRETARY

The following are the names of the
 persons who have been appointed
 to the various positions in the
 office of the Secretary of the
 Board of Education, District of
 Columbia, for the year 1900.
 The names of the persons who
 have been appointed to the
 various positions in the office
 of the Secretary of the Board
 of Education, District of
 Columbia, for the year 1900,
 are as follows:

Varieties. 1. Sylvinite. A mixture of sylvite and halite.

Occurrence. Catron County: Quemado Salt district. Dona Ana County: region west of White Sands. Eddy County: Carlsbad Potash district; saline lakes east of the Pecos River. Otero County: White Sands district. Torrance County: Estancia Salt district. Valencia County: (?)

Var. Sylvinite. Eddy County: Carlsbad Potash district.

HALLOYSITE.

Physical characteristics. Massive. Clay-like or earthy. Fracture conchoidal. Hardly plastic. H.- 1-2. Sp.G.- 2.0-2.20. Luster somewhat pearly, or waxy, to dull. Color white, grayish, greenish, yellowish, bluish, reddish. Translucent to opaque, sometimes becoming translucent or even transparent in water, with an increase of one-fifth in weight.

Chemical composition. A silicate of aluminum, $Al_2O_3 \cdot SiO_2$, like kaolin, but amorphous and containing more water.

Occurrence. Catron County: Mogollon district. Grant County: Burro Mountains, Central, and Santa Rita districts. Santa Fe County: Cerrillos district.

[Illegible text, possibly describing a location or region]

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HALOTRICHITE. Iron Alum.

Physical characteristics. Monoclinic. In silky fibrous forms. H.- 2. Sp.G.- 1.9. Color yellowish white. Taste inky-astringent. Becomes dull and pulverulent on exposure.

Chemical composition. $\text{FeSO}_4 \cdot \text{Al}_2(\text{SO}_4)_3 \cdot 22\text{H}_2\text{O}$.

Occurrence. Grant County: Alum Mountain district.

HAUSMANNITE.

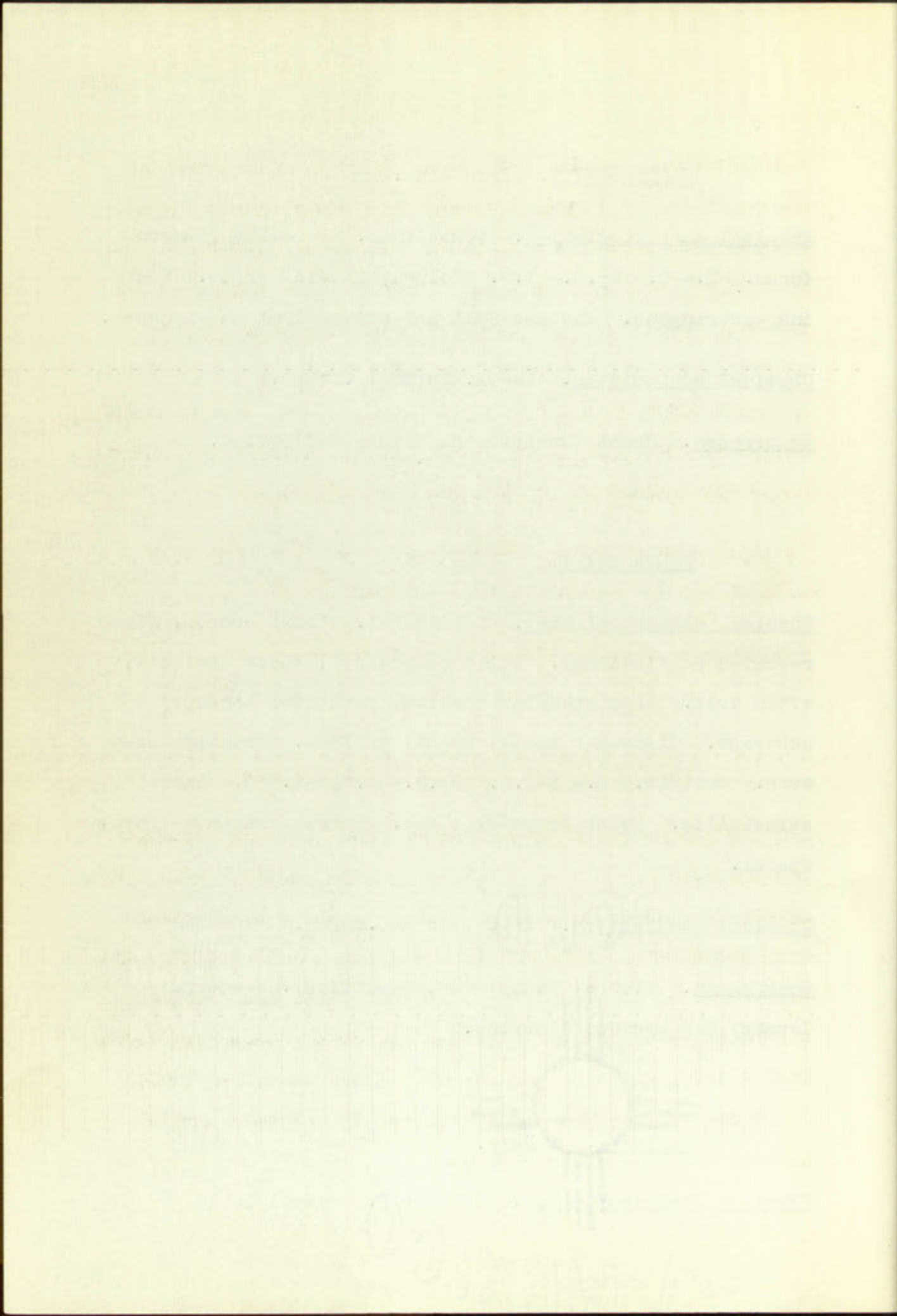
Physical characteristics. Tetragonal. Twins common, often repeated as fivelings. Habit octahedral, faces striated, often dull. Also granular massive, particles strongly coherent. Cleavage: basal, nearly perfect. Fracture uneven. Brittle. H.- 5-5.5. Sp.G.- 4.722-4.856. Luster submetallic. Color brownish black. Streak chestnut-brown. Opaque.

Chemical composition. Mn_3O_4 , or $\text{MnO} \cdot \text{Mn}_2\text{O}_3$.

Occurrence. Sierra County: (not specified). Socorro County: San Lorenzo district.

HAUYNITE. Haüyne.

Physical characteristics. Isometric. Sometimes in



dodecahedrons, octahedrons, etc. Twins both as contact- and penetration-twins. Commonly in rounded grains, often looking like crystals with fused surfaces. Cleavage: dodecahedral, rather distinct. Fracture flat conchoidal to uneven. Brittle. H.- 5.5-6. Sp.G.- 2.4-2.5. Luster vitreous, to somewhat greasy. Color bright blue, sky-blue, greenish blue; asparagus-green, red, yellow. Streak slightly bluish to colorless. Subtransparent to translucent; often enclosing symmetrically arranged inclusions.

Chemical composition. $3\text{NaSiSiO}_4 \cdot \text{CaSO}_4$. Potassium and calcium may be present in small amounts.

Occurrence. Colfax County: Raton region.

HEDENBERGITE. Calcium-iron Pyroxene.

Physical characteristics. Monoclinic. Twins as contact- and penetration-twins. Crystals prismatic, short and stout, square or eight-sided. Also lamellar massive. Cleavage: two directions, nearly at right angles, almost perfect, but interrupted. Basal parting sometimes observed. Fracture uneven to conchoidal. Brittle. H.- 5-6. Sp.G.- 3.5-3.58. Luster vitreous to resinous; often dull; sometimes pearly on planes of parting. Color black. Streak pale grayish green. Translucent to opaque.

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Chemical composition. $\text{CaFe}(\text{SiO}_3)_2$. Hedenbergite forms one end-member of an isomorphous series with diopside; there are numerous transitions between the two, with the general formula $\text{Ca}(\text{Mg},\text{Fe})\text{Si}_2\text{O}_6$. As iron increases, the color becomes darker, and specific gravity increases.

Varieties. 1. Mangan-hedenbergite. Contains manganese up to 6.5%. Color grayish green. Sp.G.— 3.55.

Occurrence. Grant County: Fierro-Hanover district. Hidalgo County: Apache No. 2 district. Sierra County: (not specified). Socorro County: Iron Mountain No. 2 district.

Var. Mangan-hedenbergite. Grant County: Fierro-Hanover district.

HEMATITE.

Physical characteristics. Hexagonal-rhombohedral. Twins usually as polysynthetic twinning-lamellae, producing a fine striation on the basal face, and giving rise to a distinct rhombohedral parting or pseudo-cleavage. Crystals often thick to thin tabular; also in cube-like rhombohedrons. Also columnar to granular, botryoidal, and stalactitic shapes. Also lamellar, lamellae bent; also granular, friable; earthy or compact. No true cleavage; basal and rhombohedral parting. Fracture subconchoidal to uneven.

Physical characteristics. The color of the
 and order of an individual series with individual series are
 numerous transitions between the two, with the general
 into yellowish or reddish, the color becoming
 darker, and specific gravity increases.

Yield. The yield is usually between 10-15%
 of the dry weight of the material. The color of the
 residue is usually yellowish or reddish.

Yield. The yield is usually between 10-15%
 of the dry weight of the material. The color of the
 residue is usually yellowish or reddish.

RESULTS

Physical characteristics. The color of the
 usually as polymers is yellowish or reddish, becoming a
 darker color on the heat treatment, and giving rise to a
 characteristic color of yellowish or reddish. The color of
 the residue is usually yellowish or reddish, and
 also contains some yellowish or reddish color.

Brittle in compact forms; elastic in thin laminae; soft and unctuous in loosely adherent scaly varieties. H.— 5.5-6.5. Sp.G.— 4.9-5.3; as low as 4.2 in some compact varieties. Luster metallic and occasionally splendid, sometimes dull. Color dark steel-gray or iron-black; in very thin particles blood-red by transmitted light; when earthy, red. Impure clays colored by earthy hematite are called red ocher. Streak cherry-red or reddish brown. Opaque, except in very thin laminae.

Chemical composition. Iron sesquioxide, Fe_2O_3 . Sometimes contains titanium and magnesium.

Varieties. 1. Specularite. Specular Hematite. Luster metallic, and often splendid. Structure often foliated or micaceous (micaceous hematite).

Occurrence. Bernalillo County: Tijeras Canyon district. Catron County: Taylor Creek Tin district. Colfax County: Elizabethtown district. Eddy County: Carlsbad Potash district. Grant County: Burro Mountains, Chloride Flat, Fierro-Hanover, Santa Rita, and Silver City Manganese-Iron districts. Hidalgo County: Apache No. 2 district. Lincoln County: Estey district. Rio Arriba County: Bromide district. Sandoval County: Nacimiento Mountains district. Santa Fe County: Glorieta and Old Placers districts. Sierra County: Caballos Mountains, Chloride, Cuchillo Negro, Hillsboro, and Lake Valley districts. Socorro County:

This is in respect to the fact that the
 material is usually obtained from the
 100-150-200 ft. in the upper part of the
 lower section and occasionally also from the
 color dark bluish-gray or iron-black, is very fine
 bedded by horizontal light gray or white
 clay colored by ferric impurities and which
 is also impregnated with carbonaceous matter, and
 this is the case.

The material is from the upper part of the
 contains siliceous and carbonaceous matter.

The material is from the upper part of the
 section, and often contains siliceous and
 carbonaceous matter.

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 The material is from the upper part of the
 section, and often contains siliceous and
 carbonaceous matter.

Council Rock, Iron Mountain No. 2, Jones Camp, and San Andres Mountains (Goodfortune Creek, Mockingbird Gap, Sulphur Canyon) districts. Taos County: Twining district.

Var. Specularite. Bernalillo County: Tijeras Canyon district. Catron County: Mogollon and Taylor Creek Tin districts. Colfax County: Baldy, Cimarroncito, and Elizabethtown districts. Dona Ana County: Organ district. Grant County: Burro Mountains, Central, Fierro-Hanover, Pinos Altos, Santa Rita, and Steeple Rock districts. Hidalgo County: Lordsburg and Steins Pass districts. Luna County: Cooke Peak and Tres Hermanas districts. Otero County: Orogrande district. Rio Arriba County: Bromide and Hopewell districts. Sandoval County: Cochiti district. Santa Fe County: New Placers and Old Placers districts. Sierra County: Chloride, Cuchillo Negro, and Lake Valley districts. Socorro County: Iron Mountain No. 2, Ladrones Mountains, and Magdalena districts. Taos County: Red River district.

HESSITE.

Physical characteristics. Isometric. Crystals not common, habit cubic, octahedral, dodecahedral, etc. Usually massive, compact or fine-grained; rarely coarse granular. Cleavage indistinct. Fracture even. Somewhat sectile.

General Board, from November 1901 to June 1902, and the

and the Executive Committee, from June 1902 to

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H.- 2.5-3. Sp.G.- 8.31-8.45. Luster metallic. Color between lead-gray and steel-gray.

Chemical composition. Silver telluride, Ag_2Te . Gold is often present, replacing part of the silver; it thus grades toward petzite.

Occurrence. Sierra County: Tierra Blanca district.

HEULANDITE. Stilbite some authors.

Physical characteristics. Monoclinic. Crystals sometimes flattened parallel to the surface of pearly luster; form often similar to the orthorhombic. Also in globular forms, granular. Cleavage: one direction, parallel to the tabular face, perfect. Fracture subconchoidal to uneven. Brittle. H.- 3.5-4. Sp.G.- 2.18-2.22. Luster of cleavage surface strong pearly; of other faces vitreous. Color various shades of white, passing into red, gray, and brown. Streak white. Transparent to subtranslucent.

Chemical composition. $(\text{Ca}, \text{Na}_2)\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 6\text{SiO}_2 \cdot 5\text{H}_2\text{O}$. Strontia is usually present in small amount.

Occurrence. Luna County: region near Fort Cummings.

1. $CaSO_4 \cdot \frac{1}{2}H_2O$ (Gypsum) - Colorless to white, crystalline. Soluble in water.

2. $CaSO_4$ (Anhydrite) - Colorless to white, crystalline. Insoluble in water.

3. $CaCO_3$ (Calcite) - Colorless to white, crystalline. Insoluble in water, soluble in acetic acid.

4. $CaCO_3$ (Siderite) - Colorless to black, crystalline. Insoluble in water, soluble in acetic acid.

5. $CaCO_3$ (Malachite) - Green, crystalline. Insoluble in water, soluble in acetic acid.

HYDRATED SULFATES

1. $CaSO_4 \cdot 2H_2O$ (Gypsum) - Colorless to white, crystalline. Soluble in water.

2. $CaSO_4 \cdot \frac{1}{2}H_2O$ (Anhydrite) - Colorless to white, crystalline. Insoluble in water.

3. $CaSO_4 \cdot 2H_2O$ (Bassanite) - Colorless to white, crystalline. Soluble in water.

4. $CaSO_4 \cdot \frac{1}{2}H_2O$ (Selenite) - Colorless to white, crystalline. Insoluble in water.

5. $CaSO_4 \cdot 2H_2O$ (Kieserite) - Colorless to white, crystalline. Soluble in water.

6. $CaSO_4 \cdot 2H_2O$ (Hemihydrate) - Colorless to white, crystalline. Soluble in water.

7. $CaSO_4 \cdot \frac{1}{2}H_2O$ (Dihydrate) - Colorless to white, crystalline. Insoluble in water.

8. $CaSO_4 \cdot 2H_2O$ (Trihydrate) - Colorless to white, crystalline. Soluble in water.

HORNBLENDE. Aluminous Amphibole. Common
Amphibole.

Physical characteristics. Monoclinic. Crystals commonly prismatic, often long and bladed, sometimes short and stout. Also columnar, fibrous, and massive granular. Cleavage: two directions, at angles of 55° and 125° approximately, perfect. Fracture uneven. Brittle. H.- 5-6. Sp.G.- 3.0-3.47. Luster vitreous to pearly on cleavage surfaces; fibrous varieties often silky. Color white to gray and pale green, also colorless; bright green, dark green, bluish green to grayish black and black. Streak uncolored, or paler than color. Translucent to opaque.

Chemical composition. Containing aluminum oxide or ferric iron, and usually both, with ferrous iron (sometimes manganese), magnesium, calcium, and alkalies. General formula $RSiO_3$, where R = various bivalent metals usually.

Occurrence. Bernalillo County: Tijeras Canyon district. Colfax County: Elizabethtown district. Rio Arriba County: Bromide and Petaca districts. San Miguel County: Willow Creek district. Sierra County: (not specified). Socorro County: Magdalena district.

HYDROCARBON.

An unidentified hydrocarbon, mentioned here because it

occurs in an otherwise typical mineral vein. "A black resinous hydrocarbon is intergrown with the vein minerals and occurs also in limestone wallrock." (New Mexico School of Mines, Bulletin 7, p.87.)

Occurrence. Otero County: Tularosa district.

HYDROZINCITE.

Physical characteristics. Monoclinic. Crystals are minute thin blades parallel to a perfect cleavage. Usually massive, fibrous, earthy or compact, as incrustations. At times reniform, pisolitic, stalactitic. H.- 2-2.5. Sp.G.- 3.58-3.8. Luster dull. Color pure white, grayish or yellowish. Streak shining. Usually earthy or chalk-like.

Chemical composition. A copper-free variety of aurichalcite, a basic zinc carbonate, $2ZnCO_3 \cdot 3Zn(OH)_2$.

Varieties. 1. Marionite. In concentric and contorted laminae and botryoidal crusts.

Occurrence. Luna County: Tres Hermanas district. Socorro County: Magdalena district.

Var. Marionite. Socorro County: Magdalena district.

occurs in an otherwise typical normal vein. A black
venous thrombosis is interpreted with the vein normal
and occurs also in fibrous tissue. (See section on
of blood, Bulletin V, p. 27.)

Examination of the venous system.

EXAMINATION

Examination of the venous system. The venous system
is the main parallel to a system of arteries. Usually
also, the venous system is composed, as in mammals, of
two systems, the venous system, and the arterial system.
The venous system is the main parallel to a system of
arteries. Usually the venous system is composed of
two systems, the venous system, and the arterial system.
A complete series of arteries
also a series of veins, and the venous system.

Examination of the venous system. In mammals and
birds, the venous system is composed of two systems,
the venous system, and the arterial system. The venous
system is the main parallel to a system of arteries.
The venous system is the main parallel to a system of
arteries. Usually the venous system is composed of
two systems, the venous system, and the arterial system.

Examination of the venous system. In mammals and birds,

HYPERSTHENE.

Physical characteristics. Orthorhombic. Crystals rare, prismatic or tabular. Usually foliated massive; sometimes in embedded spherical forms. Cleavage: one direction, distinct; one good parting. Fracture uneven. Brittle. H.- 5-6. Sp.G.- 3.40-3.50. Luster somewhat pearly on a cleavage surface, sometimes inclining to metalloidal. Color dark brownish green, grayish black, greenish black, pinchbeck-brown. Streak grayish, brownish gray. Translucent to nearly opaque.

Chemical composition. $(\text{Fe}, \text{Mg})\text{SiO}_3$ with FeO greater than 15%. Alumina may be present (up to 10%), and then the composition is similar to that of the aluminous pyroxenes.

Occurrence. Sandoval County: Jemez region.

IDDINGSITE.

Physical characteristics. Orthorhombic. Structure laminated or foliated. Three pinacoidal cleavages. H.- 3. Sp.G.- 2.5-2.8. Luster on most perfect cleavage bronze-like. Color brown.

Chemical composition. An alteration product of chrysolite, $\text{MgO} \cdot \text{Fe}_2\text{O}_3 \cdot 3\text{SiO}_2 \cdot 4\text{H}_2\text{O}$.

DESCRIPTION

General appearance. The plant is a small, upright, branched shrub, 1-2 m. tall. The leaves are alternate, ovate, 2-4 cm. long, 1-2 cm. wide, with a serrated margin. The flowers are small, white, and arranged in dense, terminal panicles. The fruit is a small, round, red berry.

LOCALITY

The plant is found in the mountains of the region, at an altitude of 1000-1500 m. It grows in a moist, shaded forest, on a soil of volcanic origin. It is common in the region and is used by the local population for medicinal purposes.

COLLECTORS

The plant was collected by the author in the mountains of the region, at an altitude of 1000-1500 m. The collection was made in a moist, shaded forest, on a soil of volcanic origin. The plant is common in the region and is used by the local population for medicinal purposes.

Occurrence. Colfax County: Raton region; at end of San Rafael lava flow. Luna County: Fort Cummings region.

ILMENITE. Menaccanite. Titanic Iron Ore.

Physical characteristics. Hexagonal-rhombohedral. Crystals usually thick tabular, also acute rhombohedral. Often in thin plates or laminae. Massive, compact; in embedded grains, also loose as sand. Fracture conchoidal. H.— 5-6. Sp.G.— 4.5-5. Luster submetallic. Color iron-black. Streak submetallic, powder-black to brownish red. Opaque. Slightly magnetic.

Chemical composition. Probably an iron titanate, $FeTiO_3$, or $FeO.TiO_2$, if normal.

Varieties. 1. Leucoxene. A dull white opaque substance, an alteration product of ilmenite. To be identified for the most part with titanite.

Occurrence. Grant County: Fierro-Hanover district. Lincoln County: Estey district. Luna County: Florida Mountains district. Santa Fe County: Old Placers district. Sierra County: (not specified). Socorro County: Magdalena district.

Var. Leucoxene. Luna County: Fluorite Ridge and Florida Mountains districts. San Miguel County: Willow Creek dis-

Geography - Golden County, Georgia, and of the
Northwest Georgia, and Georgia regions.

IDENTIFICATION - Geography - Golden County, Georgia

Physical characteristics - Golden County, Georgia
Physical characteristics, also some topographical. Often in
this place or location, however, compared in various
states, also known as such. Golden County, Georgia.
20.2 - 4.2 - 1.2. Golden County, Georgia.
Physical characteristics, Golden County, Georgia.
Slightly negative.

Physical characteristics. Golden County, Georgia.
or 20.2, it is...
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an elevation product of... To be identified for
the most part with...

Geography. Golden County, Georgia.
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trict.

ILVAITE. Lievrite. Yenite.

Physical characteristics. Orthorhombic. Commonly in prisms, with prismatic faces vertically striated. Columnar or compact massive. Two rather distinct cleavages at right angles. Fracture uneven. Brittle. H.- 5.5-6. Sp.G.- 3.99-4.04. Luster submetallic. Color iron-black or dark grayish black. Streak black, inclining to green or brown. Opaque.

Chemical composition. $\text{CaFe}_2(\text{FeOH})(\text{SiO}_4)_2$, or $\text{H}_2\text{O} \cdot \text{CaO} \cdot 4\text{FeO} \cdot \text{Fe}_2\text{O}_3 \cdot 4\text{SiO}_2$.

Occurrence. Grant County: Fierro-Hanover and Santa Rita districts.

IODYRITE.

Physical characteristics. Hexagonal-homimorphic. Natural crystals in hexagonal prisms. Also massive, and in thin plates with a lamellar structure. Cleavage: basal, perfect. Sectile, plates flexible. Soft. Sp.G.- 5.60-5.70. Luster resinous to adamantine. Color citron- and sulphur-yellow to yellowish green, sometimes brownish. Streak

yellow. Translucent.

Chemical composition. Silver iodide, AgI.

Occurrence. Grant County: Georgetown district. Sierra County: Lake Valley district.

IRIDIUM. Platiniridium.

Physical characteristics. Isometric. Crystals rare, generally cubes. Usually in angular grains. No distinct cleavage. Fracture hackly. Somewhat malleable. H.— 6-7. Sp.G.— 22.65-22.84. Luster metallic. Color silver-white, with tinge of yellow on surface; gray on fracture.

Opaque.

Chemical composition. Iridium, Ir, alloyed with platinum and other allied metals.

Occurrence. Sierra County: Hillsboro district.

JADEITE.

Physical characteristics. Monoclinic. Usually massive, with crystalline structure. Sometimes granular, also obscurely columnar, fibrous foliated to closely compact. Cleavage: prismatic, at angles of about 93° and 87° .

Police, Tennessee, ...

Chemical composition, Silver ...

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TABLE

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TABLE

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Chemical composition, ...

Fracture splintery. Extremely tough. H.— 6.5–7. Sp.G.— 3.3–3.5. Luster subvitreous, pearly on cleavage faces. Color apple-green to nearly emerald-green, bluish green, leek-green, greenish white, and nearly white. Sometimes white with spots of bright green. Translucent to subtranslucent.

Chemical composition. Metasilicate of sodium and aluminum, $\text{NaAl}(\text{SiO}_3)_2$; or $\text{Na}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 4\text{SiO}_2$.

Occurrence. Lincoln County: Jicarilla district.

JAROSITE.

Physical characteristics. Hexagonal-rhombohedral. Often in druses of minute crystals; also fibrous, granular massive; nodular, or as an incrustation. Cleavage: basal, distinct. Fracture uneven. Brittle. H.— 2.5–3.5. Sp.G.— 3.15–3.26. Luster vitreous to subadamantine; brilliant, also dull. Color ocher-yellow, yellowish brown, clove-brown. Streak yellow, shining.

Chemical composition. $\text{K}_2\text{Fe}_6(\text{OH})_{12}(\text{SO}_4)_4$; or $\text{K}_2\text{O} \cdot 3\text{Fe}_2\text{O}_3 \cdot 4\text{SO}_3 \cdot 6\text{H}_2\text{O}$.

Occurrence. Grant County: Burro Mountains and Central districts. Otero County: Orogrande district. Socorro County: Magdalena and San Andres Mountains (Goodfortune Creek,

1. The first part of the paper is devoted to a general discussion of the problem. It is shown that the problem is equivalent to a problem in the theory of differential equations. The second part of the paper is devoted to a detailed study of the problem. It is shown that the problem is solvable if and only if certain conditions are satisfied. The third part of the paper is devoted to a study of the stability of the solution. It is shown that the solution is stable if and only if certain conditions are satisfied. The fourth part of the paper is devoted to a study of the asymptotic behavior of the solution. It is shown that the solution approaches a certain limit as time goes to infinity.

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Grandview Canyon) districts.

KAINITE.

Physical characteristics. Monoclinic. Crystals not common, tabular, prismatic, and pyramidal. Usually granular massive and in crystalline crusts. Cleavage: one direction, very distinct; another direction, distinct. H.- 3. Sp.G.- 2.1. Luster vitreous. Color white or colorless to dark flesh-red. Easily fusible.

Chemical composition. $MgSO_4 \cdot KCl \cdot 3H_2O$.

Occurrence. Eddy County: Carlsbad Potash district.

KAOLINITE.

Physical characteristics. Monoclinic. In thin rhombic, rhomboidal, or hexagonal scales or plates with angles of 60° and 120° . Usually constituting a clay-like mass, either compact, friable, or mealy. Cleavage: basal, perfect. Plates flexible, inelastic. H.- 2-2.5. Sp.G.- 2.6-2.63. Luster of plates, pearly; of mass, pearly to dull earthy. Color white, grayish white, yellowish, sometimes brownish, bluish, or reddish. Scales transparent to translucent; usually unctuous and plastic.

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TABLE

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Chemical composition. $H_4Al_2Si_2O_9$, or $2H_2O \cdot Al_2O_3 \cdot 2SiO_2$.

Varieties. 1. Lithomarge. Compact kaolin, more or less impure and thus deeper in color than ordinary kaolinite.
2. Common kaolin. A mixture of lithomarge with a little crystalline kaolinite.

Occurrence. Catron County: Mogollon and Taylor Creek Tin districts. Dona Ana County: Organ and Tonuco Mountains Fluorspar districts. Grant County: Burro Mountains, Santa Rita, and Silver City Manganese-Iron districts. Sierra County: Hillsboro and Kingston districts. Socorro County: Magdalena Mountains Manganese, San Andres Mountains (Salinas Peak), and Socorro Peak districts.

Var. Lithomarge. Socorro County: Magdalena district.

KAYSERITE, variety of DIASPORE.

Ordinary varieties of the mineral diaspore are not definitely known in New Mexico. There is a doubtful variety known as kayserite reported in the State, with the following characteristics: Monoclinic. In scaly aggregates. Cleavage micaceous. H.- 5-6.

Chemical composition. $Al_2O_3 \cdot H_2O$, same as diaspore.

Occurrence. Socorro County: Ladrones Mountains district.

General description of the project.

1. Introduction: The purpose of this study is to...

2. Objectives: The main objectives of the study are...

3. Methodology: The study was conducted using...

4. Results: The results of the study indicate...

5. Discussion: The findings of this study have...

6. Conclusion: In conclusion, the study has...

7. References: The following references were used...

8. Appendix: The appendix contains the following...

9. Acknowledgments: I would like to thank...

10. Contact Information: For further information...

KIESERITE.

Physical characteristics. Monoclinic. Rarely in crystals, habit pyramidal. Usually massive, coarse to fine granular, or compact. Cleavage: two directions, pyramidal, perfect; several less perfect cleavages. Friable to firm. H.- 3-3.5. Sp.G.- 2.57. Luster vitreous. Color white, grayish, yellowish. Translucent to opaque. Little soluble. Fusible.

Chemical composition. Hydrous magnesium sulphate, $MgSO_4 \cdot H_2O$.

Occurrence. Eddy County: Carlsbad Potash district.

KYANITE. Cyanite. Disthene.

Physical characteristics. Triclinic. Usually in long bladed crystals, rarely terminated. Also coarsely bladed columnar to subfibrous. Cleavage: one direction, very perfect; another, less perfect; both parallel to the long axis of the bladed crystals; also parting, nearly at right angles to the two cleavages. H.- 5-7.25; the least, 4-5, on the surface of perfect cleavage parallel to the long axis; 6-7 on the same face parallel to the edge between it and the plane of basal parting; 7 on the plane of less perfect cleavage. Sp.G.- 3.56-3.67. Luster vitreous to pearly. Color blue, white; blue along the center of the blades or

ALUMINITE

Hexagonal dodecahedral, usually in crystals,
rarely in masses. Usually massive, never in thin
plates or prisms. Cleavage not distinct. Fracture
conchoidal. Color white. Lustre vitreous. Mohs 3-4.
Streak white. Translucent to opaque. Little or
no. luster.

Chemical composition: $\text{Al}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$.
Occurs in various localities.

HAUTE

Hexagonal dodecahedral. Usually in long
bladed crystals, rarely in masses. Also commonly
colony in earthy form. Cleavage not distinct, very
perfect; surfaces, less perfect; both parallel to the long
axis of the bladed crystals; also perfect nearly at right
angles to the two cleavages. $\text{H} = 3-4$; $\text{H} = 4-5$.
On the surface of perfect crystals parallel to the long
axis; $\text{H} = 3-4$ on the long face parallel to the other
axis and the face of perfect cleavage; $\text{H} = 3-4$ on the
face cleavage. $\text{H} = 3-4$; $\text{H} = 4-5$.
Color white; luster vitreous to pearly.

crystals, with white margins; also gray, green, black.
Streak uncolored. Translucent to transparent.

Chemical composition. Al_2SiO_5 , or $\text{Al}_2\text{O}_3 \cdot \text{SiO}_2$; like andalusite and sillimanite.

Occurrence. Rio Arriba County: Bromide and Petaca districts. Sierra County: (not specified). Taos County: Glenwoody district.

LABRADORITE. A Plagioclase Feldspar.

Physical characteristics. For general physical characteristics, see Plagioclase Feldspars. Labradorite is distinguished chiefly by the cleavage angle ($86^\circ 4'$), specific gravity (2.665-2.695), and optical characters (differences in indices of refraction and extinction angles).

Chemical composition. $\text{Ab}_{50-30}\text{An}_{50-70}$. See table under Plagioclase Feldspars.

Occurrence. Catron County: Mogollon district. Colfax County: Raton region. Hidalgo County: Lordsburg district. Luna County: Florida Mountains district. Sandoval County: Jemez region. Sierra County: (not specified).

...the following is a summary of the work done by the various ...
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APPENDIX I

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APPENDIX II

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LANGBEINITE.

Physical characteristics. Isometric. In highly modified crystals. Fracture conchoidal. H.- 3-4. Sp.G.- 2.81-2.86. Luster greasy to vitreous. Colorless when fresh, but taking up water rapidly when exposed to the air. Tasteless.

Chemical composition. $K_2Mg_2(SO_4)_3$; or $K_2SO_4 \cdot 2MgSO_4$.

Occurrence. Eddy County: Carlsbad Potash district.

LEAD.

Physical characteristics. Isometric. Crystals rare. Usually in thin plates and small globular masses. Very malleable, and somewhat ductile. H.- 1.5. Sp.G.- 11.4. Luster metallic. Color lead-gray. Opaque.

Chemical composition. Nearly pure lead, Pb. Sometimes contains a little silver, also antimony.

Occurrence. Socorro County: Magdalena district.

LEONITE.

Physical characteristics. Monoclinic. In tabular crystals, also commonly massive. No distinct cleavage. Fracture conchoidal. H.- 3. Sp.G.- 2.25. Luster vitreous.

LIMESTONE

Physical characteristics. Limestone. In highly weathered condition. Fracture conchoidal. No. 1-2. Color gray to brown. Luster glassy to siliceous. Contains small pieces of fossils. Weathers rapidly when exposed to the air. Contains.

Chemical composition. CaCO_3 98.5%.

Geography. Very common. Limited to the district.

LIME

Physical characteristics. Limestone. Crystalline. Usually in thin plates and small granular masses. Very malic, and somewhat brittle. No. 1-2. Color light gray. Luster vitreous. Color lead-gray. Fracture.

Chemical composition. Mostly pure lime. No. 1-2. Contains

containing a little silver, also cadmium.

Geography. Found in the district.

LIME

Physical characteristics. Limestone. In thin plates. Also somewhat malic. No. 1-2. Color light gray. Luster vitreous. Fracture conchoidal. No. 1-2. Contains

Colorless, white, or yellowish. Easily fusible.

Chemical composition. $MgSO_4 \cdot K_2SO_4 \cdot 4H_2O$.

Occurrence. Eddy County: Carlsbad Potash district.

LEPIDOLITE. Lithia Mica.

Physical characteristics. Monoclinic. In aggregates of short prisms. Crystals sometimes twins or trillings. Also in cleavable plates, but commonly massive scaly-granular, coarse or fine. Cleavage: basal, highly eminent. H.—2.5–4. Sp.G.—2.8–3.3. Luster pearly. Color rose-red, violet-gray or lilac, yellowish, grayish white, white. Translucent.

Chemical composition. Chiefly $(OH,F)_2KLiAl_2Si_3O_{10}$, but uncertain.

Occurrence. Taos County: Harding Mine district.

LEUCITE. Amphigene.

Physical characteristics. Isometric at about 600° C.; pseudo-isometric under ordinary conditions. Commonly in crystals varying in angle but little from the trapezohedron, sometimes with the cube and dodecahedron as subordinate

Colony, white to yellowish, hairy, ...

Localities: ...

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LEUCOPHYLLA

Localities: ...

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Localities: ...

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Localities: ...

LEUCOPHYLLA

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forms. Faces often showing fine striations due to twinning. Also in disseminated grains; rarely massive granular. No distinct cleavage. Fracture conchoidal. Brittle. H.— 5.5-6. Sp.G.— 2.45-2.50. Luster vitreous. Color white, ash-gray or smoke-gray. Streak uncolored. Translucent to opaque.

Chemical composition. $KAl(SiO_3)_2$, or $K_2O \cdot Al_2O_3 \cdot 4SiO_2$.

Occurrence. Mora County: near Fort Union. McKinley County: Todilto Park region.

LEVERRIERITE.

Physical characteristics. Monoclinic, pseudo-hexagonal. Crystals prismatic. In vermicular aggregates. Cleavage: basal, perfect; micaceous. H.— 1.5. Sp.G.— 2.5-2.6. Luster vitreous to pearly. Colorless to brown.

Chemical composition. A hydrated silicate of aluminum, formula doubtful, perhaps $2Al_2O_3 \cdot 5SiO_2 \cdot 5H_2O$.

Occurrence. McKinley County: Gallup-Zuni Coal Basin.

LIBETHENITE.

Physical characteristics. Orthorhombic. In crystals

form. These often characterise the
 also in distinct...
 also. No distinct...
 the...
 color white, sub-gray or...
 translucent to opaque.

Chemical composition...
 Examples. Some...
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LEUCITE

Chemical composition...
 crystals...
 basal, perfect...
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Chemical composition...
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 Examples...
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LEUCITE

Chemical composition...

usually small, short prismatic; often united in druses. Also globular or reniform and compact. No distinct cleavage. Fracture subconchoidal to uneven. Brittle. H.— 4. Sp.G.— 3.6–3.8. Luster resinous. Color olive-green, generally dark. Streak olive-green. Translucent to sub-translucent.

Chemical composition. Basic copper phosphate,

$\text{Cu}_3\text{P}_2\text{O}_8 \cdot \text{Cu}(\text{OH})_2$, or $4\text{CuO} \cdot \text{P}_2\text{O}_5 \cdot \text{H}_2\text{O}$.

Occurrence. Grant County: Santa Rita district.

LIMONITE. Brown Hematite.

Physical characteristics. Not crystallized. A mineral colloid. Usually in stalactitic and botryoidal or mammillary forms, having a fibrous or subfibrous structure; also concretionary, massive; and occasionally earthy. H.— 5–5.5. Sp.G.— 3.6–4.0. Luster silky, often submetallic; sometimes dull and earthy. Color of fracture surface various shades of brown, commonly dark, and none bright; sometimes with a nearly black varnish-like exterior; when earthy, brownish yellow, ocher-yellow. Impure clay colored by earthy limonite is called yellow ocher. Streak yellowish brown. Opaque.

Chemical composition. Hydrous iron sesquioxide, approxi-

usually small, light-colored, often united in druses.
 also rounded or conical and sessile. No distinct base.
 size. Length 0.5-1.0 mm. Width 0.2-0.4 mm.
 0.5-1.0 mm. Color olive-green. Translucent to sub-
 translucent.

General description. Base upper epidermis.
 Dicotyledonous, or 4-6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

LEAVES - lower leaves

General description. Not crystalline. A simple
 outline. Usually in whorls and petioled or sessile-
 petioled, having a linear or elliptical shape; also
 occasionally, sessile and occasionally entire. 0.5-2.0
 0.5-2.0 mm. Lower side, often pubescent; sometimes
 both the sides. Color of the upper surface yellowish
 or brown, usually dark, and more bright; sometimes with a
 grayish black mottled-like pattern; when entire, brownish
 yellow when young. Veins are either pinnate or
 they are called veins. When yellowish brown.

Opuntia

General description. Not crystalline. Spherical

mately $2\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$. May be considered as the amorphous form of goethite with adsorbed and capillary water.

Occurrence. Bernalillo County: Tijeras Canyon district. Catron County: Mogollon district. Colfax County: Baldy district. Dona Ana County: Organ district. Grant County: Burro Mountains, Carpenter, Chloride Flat, Fierro-Hanover, Fierro Manganese, Georgetown, Gold Hill, Lone Mountain, Pinos Altos, Silver City Manganese-Iron, and Telegraph districts; Cottonwood Canyon Fluorite Prospect. Hidalgo County: Apache No. 2, Fremont, Hachita, Lordsburg, and San Simon districts. Lincoln County: Estey, Gallinas Mountains, Jicarilla, Tecolote Iron, and White Oaks districts. Luna County: Cooks Peak and Victorio districts. Otero County: Crogrande district. Rio Arriba County: Hopewell and Petaca districts; Tres Piedras region. Sandoval County: Cochiti, Nacimiento Mountains, and Placitas districts. San Miguel County: Rociada district; Las Vegas region, Upper Pecos region. Santa Fe County: Glorieta and New Placers districts. Sierra County: Caballos Mountains, Chloride, Cuchillo Negro, Derry Manganese, Hermosa, Hillsboro, Kingston, Lake Valley, Macho, San Mateo Mountains, and Tierra Blanca districts. Socorro County: Gran Quivira, Hansonburg, Jones Camp, Joyita Hills, Magdalena Mountains Manganese, North Magdalena, Ojo Caliente, Rosedale, San Andres Mountains (Mockingbird Gap, Salinas Peak), Socorro Peak, and Water Canyon districts. Valencia County: Zuni

1. The first section describes the general conditions of the survey, including the date, time, and location. It mentions that the survey was conducted on the 15th of the month, at 10:00 AM, in the area of the river.

2. The second section details the methods used for data collection, such as the use of a surveying instrument and the recording of observations. It notes that the data was collected by the author and other assistants.

3. The third section presents the results of the survey, including the measurements of the river's width, depth, and current. It provides a table of the data collected at various points along the river.

4. The fourth section discusses the analysis of the data and the conclusions drawn from it. It notes that the river's width and depth vary significantly along its course, and that the current is generally strong.

5. The fifth section provides a summary of the findings and offers recommendations for further research. It suggests that a more detailed survey be conducted in the future to determine the exact flow of the river.

6. The sixth section contains a list of references and a bibliography of the sources used in the report.

7. The seventh section is a list of the names of the individuals who participated in the survey, including the author and the assistants.

8. The eighth section is a list of the names of the locations where the survey was conducted, including the various points along the river.

9. The ninth section is a list of the names of the instruments and equipment used during the survey.

10. The tenth section is a list of the names of the organizations and institutions that supported the survey.

Mountains district.

LINARITE.

Physical characteristics. Monoclinic. In elongated or tabular crystals. Cleavage: one direction, perfect; another, distinct. Fracture conchoidal. Brittle. H.-- 2.5. Sp.G.-- 5.4. Luster vitreous to adamantine. Color deep azure-blue. Streak pale blue. Translucent. Easily fusible.

Chemical composition. A basic sulphate of lead and copper, $(Pb,Cu)SO_4 \cdot (Pb,Cu)(OH)_2$.

Occurrence. Dona Ana County: Organ district.

LUENEBURGITE. Lüneburgite.

Physical characteristics. Probably monoclinic. Crystals as six-sided plates. In flattened masses, fibrous to earthy structure. Cleavage prismatic. Sp.G.-- 2.05. Colorless. Fusible.

Chemical composition. $3MgO \cdot B_2O_3 \cdot P_2O_5 \cdot 8H_2O$. May contain a little fluorine.

Occurrence. Eddy County: Carlsbad Potash district.

Chemical analysis

RESULTS

Physical characteristics: colorless, crystalline solid, melting point 105°C. Soluble in water, alcohol, ether, benzene, chloroform, carbon tetrachloride, and carbon disulfide. Insoluble in petroleum ether, acetone, and nitrobenzene. Density 1.25 g/cm³. Refractive index 1.45. Optical activity: [α]_D²⁰ +15.5 (c = 1.0, CH₂Cl₂).

Chemical analysis: C, 60.0%; H, 4.0%; N, 36.0%. Found: C, 60.2%; H, 3.8%; N, 35.8%. Molecular weight 100.1.

Elemental analysis: C, 60.0%; H, 4.0%; N, 36.0%. Found: C, 60.2%; H, 3.8%; N, 35.8%. Molecular weight 100.1.

DISCUSSION

Physical characteristics: colorless, crystalline solid, melting point 105°C. Soluble in water, alcohol, ether, benzene, chloroform, carbon tetrachloride, and carbon disulfide. Insoluble in petroleum ether, acetone, and nitrobenzene. Density 1.25 g/cm³. Refractive index 1.45. Optical activity: [α]_D²⁰ +15.5 (c = 1.0, CH₂Cl₂).

Chemical analysis: C, 60.0%; H, 4.0%; N, 36.0%. Found: C, 60.2%; H, 3.8%; N, 35.8%. Molecular weight 100.1.

MAGNESITE.

Physical characteristics. Hexagonal-rhombohedral. Crystals rare, usually rhombohedral, also prismatic. Commonly massive; granular cleavable to very compact; earthy. Cleavage: rhombohedral, perfect. Fracture flat conchoidal. Brittle. H.— 3.5-4.5. Sp.G.— 3.0-3.12, in crystals. Luster vitreous; fibrous varieties sometimes silky. Color white, yellowish, or grayish white, brown. Transparent to opaque.

Chemical composition. Magnesium carbonate, $MgCO_3$. Iron carbonate is often present.

Occurrence. Eddy County: Carlsbad Potash district.

MAGNETITE. Magnetic Iron Ore.

Physical characteristics. Isometric. Most commonly in octahedrons, also in dodecahedrons with striated faces; in dendrites between plates of mica; crystals sometimes highly modified; cubic forms rare. Twins common, sometimes as polysynthetic twinning-lamellae, producing striations on the octahedral face and often parting or pseudo-cleavage. Massive, laminated; granular, coarse or fine; impalpable. Cleavage not distinct; parting octahedral, often highly developed. Fracture subconchoidal, uneven. Brittle.

DESCRIPTION

Physical characteristics. Hexagonal-rhombohedral. Crystals
 rare, usually rhombohedral, also prismatic. Commonly ma-
 gnetic; granular elements to very compact; earthy. Cleav-
 age rhombohedral perfect. Fracture like conchoidal.
 Brittle, $\rho = 4.2-4.5$, $\mu = 3.0-3.15$, in crystals. Low
 refractive; strong anisotropy sometimes slight. Colors
 white, yellowish, or grayish white, brown. Transparency in
 masses.

Chemical composition. Magnetite contains Fe_3O_4 . Iron
 carbonate is often present.

Occurrence. Many localities; common in igneous rocks.

MAGNETITE. Magnetite Iron Ore.

Physical characteristics. Isometric. Most commonly in
 octahedrons, also in dodecahedrons with altered faces; in
 domains between plates of steel magnetic needles highly
 readily on the iron rods. Twin common, consisting of
 polyhedral tetrahedrons. Magnetic attraction on
 the powdered form due to an action on both directions.
 Massive, lamellar, columnar, or fibrous; also in
 crystals and clusters, which are often highly
 magnetic. Fracture conchoidal, rare. Brittle.

H.- 5.5-6.5. Sp.G.- 5.168-5.180 in crystals. Luster metallic and splendid to submetallic and rather dull. Color iron-black. Streak black. Opaque. Strongly magnetic.

Chemical composition. $\text{Fe}^{\text{II}}\text{Fe}^{\text{III}}_2\text{O}_4$, or $\text{FeO}\cdot\text{Fe}_2\text{O}_3$. Sometimes contains titanium, up to 6% TiO_2 .

Occurrence. Colfax County: Baldy, Cimarroncito, and Elizabethtown districts. Dona Ana County: Ordan district. Grant County: Burro Mountains, Chloride Flat, Fierro-Hanover, and Santa Rita districts. Hidalgo County: Apache No. 2 district. Lincoln County: Capitan Mountain, Gallinas Mountains, Jicarilla, and White Oaks districts. Otero County: Orogrande district. Rio Arriba County: Bromide and Hopewell districts. Santa Fe County: New Placers and Old Placers districts. Sierra County: Chloride and Cuchillo Negro districts. Socorro County: Gran Quivira, Iron Mountain No. 2, Jones Camp, and Magdalena districts.

MALACHITE.

Physical characteristics. Monoclinic. Crystals rarely distinct, usually slender, acicular prisms, grouped in tufts and rosettes. Twins common. Commonly massive or incrusting, with surface botryoidal, or stalactitic, and structure divergent; often delicately compact fibrous, and banded in color; frequently granular or earthy. Cleavage: basal,

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perfect; another less perfect cleavage. Fracture subconchoidal, uneven. Brittle. H.— 3.5–4. Sp.G.— 3.9–4.03. Luster of crystals adamantine, inclining to vitreous; of fibrous varieties more or less silky; often dull and earthy. Color bright green. Streak paler green. Translucent to subtranslucent and opaque.

Chemical composition. Basic cupric carbonate, $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$.

Occurrence. Bernalillo County: Tijeras Canyon district. Catron County: Mogollon district. Colfax County: Baldy, Cimarroncito, and Elizabethtown districts. Dona Ana County: Hembrillo and Organ districts. Grant County: Burro Mountains, Central, Fierro–Hanover, Georgetown, Pinos Altos, and Santa Rita districts. Guadalupe County: Pastura district. Hidalgo County: Apache No. 2, Fremont, Hachita, Lordsburg, and San Simon districts. Lincoln County: Estey and Jicarilla districts. Luna County: Florida Mountains district. Mora County: Coyote Creek district. Otero County: Orogrande, Sacramento, and Tularosa districts. Rio Arriba County: Abiquiu, Bromide, and Gallina districts. Sandoval County: Cochiti, Jemez Springs, Nacimiento Mountains, and Placitas districts. San Miguel County: El Porvenir, Rociada, Tecolote, and Willow Creek districts. Santa Fe County: Glorieta, La Bajada, and New Placers districts. Sierra County: Caballos Mountains, Chloride, Cuchillo Negro, Hermosa, Hillsboro, and Kingston districts. Socorro County:

Chupadero, Council Rock, Hansonburg, Hop Canyon, Iron Mountain No. 2, Jones Camp, Joyita Hills, Ladrones Mountains, Magdalena, Mill Canyon, North Magdalena, Ojo Caliente, Rayo, San Andres Mountains (Goodfortune Creek, Grandview Canyon, Mockingbird Gap, Salinas Peak, Sulphur Canyon), San Jose, San Lorenzo, Scholle, Socorro Peak, and Water Canyon districts. Tacos County: Picuris district. Valencia County: Zuni Mountains district.

MALLARDITE.

Physical characteristics. Monoclinic. In crystalline masses with fibrous structure. Also massive. Colorless. Transparent. Easily soluble in water.

Chemical composition. Hydrrous manganese sulphate,
 $MnSO_4 \cdot 7H_2O$.

Occurrence. Sierra County: Lake Valley district.

MANGANITE.

Physical characteristics. Orthorhombic. Crystals commonly prismatic, faces deeply striated vertically; often grouped in bundles. Also columnar, stalactitic. Cleavage: two directions, perfect. Fracture uneven. Brittle. H.- 4.

Sp.G.— 4.2-4.4. Luster submetallic. Color dark steel-gray to iron-black. Streak reddish brown, sometimes nearly black. Opaque; in thin particles sometimes brown by transmitted light.

Chemical composition. Hydrrous manganese sesquioxide, $MnO(OH)$, or $Mn_2O_3 \cdot H_2O$.

Occurrence. Dona Ana County: Rincon Manganese district. Grant County: Fierro Manganese and Silver City Manganese-Iron districts. Luna County: Little Florida Mountains district. Sierra County: Lake Valley district.

MANGANOSITE.

Physical characteristics. Isometric. Usually crystalline, in octahedrons. Cleavage cubic. H.— 5-6. Sp.G.— 5.18. Luster vitreous. Color emerald-green, becoming black on exposure.

Chemical composition. Manganese protoxide, MnO .

Occurrence. Socorro County: San Lorenzo district.

MARCASITE.

Physical characteristics. Orthorhombic. Twins sometimes occur, sometimes in stellate fivelings. Crystals commonly

1913-14-15. Under conditions of low water level
 only to low level. These results are in accordance
 with reports in this period as follows from the
 above light.
 Theoretical maximum. Above maximum of 1913-14-15.
 1913-14-15.

1913-14-15. The above results are in accordance
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 Theoretical maximum. Above maximum of 1913-14-15.
 1913-14-15.

REMARKS

Theoretical maximum. Above maximum of 1913-14-15.
 1913-14-15.

REMARKS

Theoretical maximum. Above maximum of 1913-14-15.
 1913-14-15.

tabular parallel to the base, also pyramidal. Often massive; radiating fibrous; in stalactites; also globular, reniform, and other imitative shapes. No distinct cleavage. Fracture uneven. Brittle. H.- 6-6.5. Sp.G.- 4.85-4.90. Luster metallic. Color pale bronze-yellow, deepening on exposure. Streak grayish or brownish black. Opaque.

Chemical composition. Iron disulphide, like pyrite, FeS_2 , but more subject to tarnish and decomposition than pyrite.

Occurrence. Sierra County: Hermosa district. Socorro County: Jones Camp district. Valencia County: Manzano Mountains region.

MASSICOT.

Physical characteristics. Orthorhombic. Massive, scaly, or earthy. H.- 2. Sp.G.- 8.0; 9.2-9.36 when pure. Luster dull. Color between sulphur- and orpiment-yellow, sometimes reddish. Streak lighter than the color. Opaque. Does not soil the fingers.

Chemical composition. Lead monoxide, PbO , more or less impure.

Occurrence. Grant County: Chloride Flat district. Sierra County: Hillsboro district. Socorro County: Magdalena and Socorro Peak districts. (Indefinite: "Spring Hill District".)

MELANOTEKITE.

Physical characteristics. Orthorhombic. In prismatic crystals. Also massive; cleavable. Cleavage: two directions, distinct. H.— 6.5. Sp.G.— 5.73. Luster metallic to greasy. Color black to blackish gray. Streak greenish gray. Nearly opaque, but translucent in thin sections.

Chemical composition. $(Fe_4O_3)Pb_3(SiO_4)_3$, or $3PbO.2Fe_2O_3.3SiO_2$.

Occurrence. Sierra County: Hillsboro district.

MELANTERITE. Copperas.

Physical characteristics. Monoclinic. Usually capillary, fibrous, stalactitic, and concretionary; also massive, pulvulent. Cleavage: one direction, perfect; another, less so. Fracture conchoidal. Brittle. H.— 2. Sp.G.— 1.89–1.90. Luster vitreous. Color various shades of green, passing into white, becoming yellowish on exposure. Streak uncolored. Subtransparent to translucent. Easily fusible. Taste sweetish, astringent, and metallic.

Chemical composition. Hydrus ferrous sulphate, $FeSO_4.7H_2O$.

Occurrence. Socorro County: Magdalena district.

EXPERIMENTAL

1. Preparation of the sample. The sample was prepared by the following method: ...

2. Measurement of the ...

3. Results and discussion. The results of the measurements are shown in Table I. ...

CONCLUSIONS

The results of the present investigation show that ...

It is concluded that ...

The authors wish to thank ...

MIARGYRITE.

Physical characteristics. Monoclinic. Crystals thick tabular; also prismatic. Also massive. No distinct cleavage. Fracture subconchoidal to uneven. Brittle. H.—2-2.5. Sp.G.—5.1-5.30. Luster metallic-adamantine. Color iron-black to steel-gray, in thin splinters deep blood-red. Streak cherry-red. Nearly opaque.

Chemical composition. $AgSbS_2$, or $Ag_2S.Sb_2S_3$.

Occurrence. Sierra County: Hermosa and Kingston districts.

MICA.

Common name for a group of allied minerals, comprising the separate species muscovite, paragonite, lepidolite, zinnwaldtite, biotite, phlogopite, and lepidomelane. The unimportant species roscoelite is also included. Of these, all except zinnwaldtite and lepidomelane occur in New Mexico. They are described separately in the text.

MICROCLINE. A species of Feldspar.

Physical characteristics. Triclinic. Twins: like orthoclase, also polysynthetic twinning producing lamellar structure. Crystals commonly prismatic, near orthoclase

RESULTS

The first group of species, *Opuntia* and *Cylindropuntia*, are the most common and are found in all areas. The second group, *Cholla*, is found in the same areas but is less common. The third group, *Sarcocolla*, is found in the same areas but is the least common. The fourth group, *Cholla*, is found in the same areas but is the least common.

The fifth group, *Cholla*, is found in the same areas but is the least common. The sixth group, *Cholla*, is found in the same areas but is the least common.

DISCUSSION

The results of this study show that the distribution of cacti is related to the type of soil and the amount of water available. The most common species are found in the most fertile and moist areas, while the least common species are found in the most arid and least fertile areas.

CONCLUSIONS

The results of this study show that the distribution of cacti is related to the type of soil and the amount of water available. The most common species are found in the most fertile and moist areas, while the least common species are found in the most arid and least fertile areas.

in angles and habit. Also massive cleavable to granular compact. Cleavage: two directions, nearly at right angles, perfect. Fracture uneven. Brittle. H.- 6-6.5. Sp.G.- 2.54-2.57. Luster vitreous; on the most perfect cleavage face sometimes pearly. Color white to pale cream-yellow; also red, green. Transparent to translucent.

Chemical composition. Like orthoclase, $KAlSi_3O_8$, or $K_2O \cdot Al_2O_3 \cdot 6SiO_2$.

Varieties. 1. Amazonstone. Amazonite. Bright verdigris-green, sometimes mottled with white.

Occurrence. Rio Arriba County: Petaca district. Sierra County: Caballos Mountains district. Taos County: Harding Mine district.

Var. Amazonstone. Rio Arriba County: Petaca district. Taos County: Harding Mine district.

MICROLITE.

Physical characteristics. Isometric. Habit octahedral; crystals often very small and highly modified. Fracture conchoidal. Brittle. H.- 5.5. Sp.G.- 5.485-5.562. Luster resinous. Color pale yellow to brown, rarely hyacinth-red. Streak pale yellowish or brownish. Transparent to translucent or nearly opaque.

In order to be able to do this, it is necessary to have a certain amount of knowledge of the subject. This is especially true in the case of the study of the history of the country. It is not enough to know the facts, but it is necessary to know the causes and effects of the events. This is why it is so important to have a good teacher who can help you to understand the meaning of the events and to see the connections between them.

The first step in the study of the history of the country is to know the facts. This is done by reading the books and articles which have been written about the subject. It is also necessary to look at the maps and the pictures which show the changes in the country over the years. This will help you to get a clear idea of what has happened and where it has happened.

Next, it is necessary to know the causes and effects of the events. This is done by reading the books and articles which discuss the reasons for the events and the results of the events. This will help you to understand the meaning of the events and to see the connections between them.

Finally, it is necessary to know the connections between the events. This is done by reading the books and articles which discuss the relationships between the events. This will help you to see the big picture and to understand the meaning of the events in the history of the country.

CONCLUSION

The study of the history of the country is a very important part of our education. It helps us to know our past and to understand our present. It also helps us to see the connections between the events and to understand the meaning of the events in the history of the country. This is why it is so important to have a good teacher who can help you to understand the meaning of the events and to see the connections between them.

Chemical composition. Essentially a calcium pyrotantalate, $\text{Ca}_2\text{Ta}_2\text{O}_7$, but containing also columbium, fluorine, and a variety of bases in small amount.

Occurrence. Taos County: Harding Mine district.

MIMETITE. Mimetesite.

Physical characteristics. Hexagonal. Crystals prismatic; sometimes rounded to globular forms. Also in mammillary crusts. No distinct cleavage. Fracture uneven. Brittle. H.- 3.5. Sp.G.- 7.0-7.25. Luster resinous. Color pale yellow, passing into brown; orange-yellow; white or colorless. Streak white or nearly so. Subtransparent to translucent.

Chemical composition. $(\text{PbCl})\text{Pb}_4(\text{AsO}_4)_3$, or $\text{Pb}_3\text{As}_2\text{O}_8 \cdot \text{PbCl}_2$.

Occurrence. Socorro County: Socorro Peak district.

MINIUM.

Physical characteristics. Pulvulent, occasionally in crystalline scales. H.- 2-3. Sp.G.- 4.6. Luster faint greasy or dull. Color vivid red, mixed with yellow. Streak orange-yellow. Opaque.

Chemical composition. Essentially a calcium phosphate, but containing also sodium, fluorine, and a variety of bases in small amount.

Occurrence. From County, Harding and District.

MINERAL - *Stannite*

Physical characteristics. Hexagonal. Crystals rhombohedral, sometimes rounded to prismatic form. Also in massive form. No distinct cleavage. Fracture uneven. Brittle.

H. 5.5. Sp. G. 7.0-7.25. Luster vitreous. Color pale yellow, passing into brown; orange-yellow; white or colorless. Streak white or nearly so. Sublimation to brown liquid.

Chemical composition. $(\text{Fe}, \text{Mn})_3\text{Sn}_2\text{P}_4\text{O}_{14}$ or $\text{Fe}_3\text{Sn}_2\text{P}_4\text{O}_{14}$.

Occurrence. From County, Harding and District.

MINERAL - *Stannite*

MINERAL - *Stannite*

Physical characteristics. Hexagonal, sometimes in prismatic form. No distinct cleavage. Fracture uneven. Brittle.

H. 5.5. Sp. G. 7.0-7.25. Luster vitreous. Color pale yellow, passing into brown; orange-yellow; white or colorless. Streak white or nearly so. Sublimation to brown liquid.

Chemical composition. Pb_3O_4 , or $2PbO.PbO_2$.

Occurrence. Hidalgo County: Hachita district. Sierra County: Hillsboro district. Socorro County: Magdalena (?) and Socorro Peak (?) districts.

MIRABILITE. Glauber Salt.

Physical characteristics. Monoclinic. Crystals prismatic, short and thick, square or eight-sided. Usually in efflorescent crusts. One perfect prismatic cleavage. H.— 1.5–2. Sp.G.— 1.481. Luster vitreous. Color white. Transparent to opaque. Taste cool, then feebly saline and bitter.

Chemical composition. Hydrous sodium sulphate,
 $Na_2SO_4.10H_2O$.

Occurrence. Torrance County: Estancia Salt district.

MOLYBDENITE.

Physical characteristics. Hexagonal. Crystals hexagonal in form, tabular, or short prismatic, slightly tapering and horizontally striated. Commonly foliated, massive or in scales; also fine granular. Cleavage: basal, eminent. Laminae very flexible but not elastic. Sectile. H.— 1–1.5. Sp.G.— 4.7–4.8. Luster metallic. Color pure lead-gray.

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PHYLLOPHYLANTHUS

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Phyllanthus *viridis*. *Phyllanthus* *viridis*.

Streak bluish gray on paper; greenish gray on porcelain.
Opaque. Feel greasy.

Chemical composition. Molybdenum disulphide, MoS_2 .

Occurrence. Colfax County: Baldy district. Dona Ana County: Organ and Texas districts. Grant County: Burro Mountains, Fierro-Hanover, and Santa Rita districts. Hidalgo County: Lordsburg district. Rio Arriba County: Bromide district. San Miguel County: El Porvenir and Rociada districts. Santa Fe County: Old Placers and Santa Fe districts. Sierra County: Hillsboro district. Socorro County: San Andres Mountains district (Salinas Peak). Taos County: Red River and Twining districts.

MONAZITE.

Physical characteristics. Monoclinic. Crystals commonly small, often flattened; sometimes prismatic; also large and coarse. In masses yielding angular fragments; in rolled grains. Cleavage: basal, sometimes perfect (may be parting). One other distinct cleavage. Fracture conchoidal to uneven. Brittle. H.- 5-5.5. Sp.G.- 4.9-5.3. Luster inclining to resinous. Color hyacinth-red, clove-brown, reddish or yellowish brown. Subtransparent to subtranslucent.

Chemical composition. Phosphate of the cerium metals, essentially (Ce,La,Pr,Nd)PO₄. Thoria, ThO₂, and silica, SiO₂, are nearly always present, usually in the proper amounts to form thorium silicate.

Occurrence. Rio Arriba County: Petaca district; indefinite: "Chama River sands". Sierra County: Pittsburg district.

MONTMORILLONITE. A Clay Mineral.

Physical characteristics. Massive, clay-like. Very soft and unctuous. Sp.G.→ 2. Luster feeble. Color white or grayish to rose-red, and bluish; also pistachio-green. Does not usually adhere to the tongue.

Chemical composition. Perhaps (Mg,Ca)O.Al₂O₃.5SiO₂.nH₂O, with n = 5-7. Always an alteration product of some aluminous mineral.

Occurrence. Rio Arriba County: three miles north of the east end of the Tierra Amarilla Grant. Taos County: Harding Mine district.

MUSCOVITE. Common Mica. Potash Mica.

Physical characteristics. Monoclinic. Twins common. Crystals rhombic or hexagonal in outline with plane angles

of 60° or 120° . Habit tabular, passing into tapering forms. Folia often very small and aggregated in stellate, plumose, or globular forms; or in scales, and scaly massive; also crypto-crystalline and compact massive. Cleavage: basal, eminent. Thin laminae flexible and elastic when bent, very tough, harsh to the touch, passing into kinds which are less elastic and have an unctuous feel. H.- 2-2.25. Sp.G.- 2.76-3. Luster vitreous to more or less pearly or silky. Colorless, gray, brown, hair-brown, pale green, and violet, yellow, dark olive-green, rarely rose-red. Streak uncolored. Transparent to translucent.

Chemical composition. For the most part an orthosilicate of aluminum and potassium, $(H,K)AlSiO_4$, or $H_2KAl_3(SiO_4)_3$, when H:K = 2:1, as in the common kinds.

Varieties. 1. Sericite. A fine scaly variety, the scales in fibrous aggregates and characterized by silky luster.

Occurrence. Bernalillo County: Tijeras Canyon district. Dona Ana County: Organ district. Luna County: Florida Mountains district. Mora County: Talco region. Rio Arriba County: Bromide and Petaca districts. San Miguel County: Ribera region (Glorieta Mountains). Santa Fe County: Old Placers district; Nambe region. Sierra County: (not specified). Socorro County: San Andres Mountains district (Mockingbird Gap). Taos County: Glenwoody, Harding Mine, and Red River districts.

Var. Sericite. Catron County: Mogollon district. Dona Ana County: Tonuco Mountain Fluorspar district. Grant County: Burro Mountains, Central, Fierro-Hanover, and Santa Rita districts. Hidalgo County: Hachita and Lordsburg districts. Luna County: Cooks Peak district. San Miguel County: Willow Creek district. Santa Fe County: Cerrillos and Old Placers districts. Sierra County: Caballos Mountains, Hillsboro, and Macho districts. Taos County: Picuris and Red River districts. Valencia County: Zuni Mountains district.

NATROJAROSITE.

Physical characteristics. Hexagonal-rhombohedral. In minute tabular crystals. H.- 3. Sp.G.- 3.2. Color yellow-brown.

Chemical composition. $\text{Na}_2\text{Fe}_6(\text{OH})_{12}(\text{SO}_4)_4$.

Occurrence. Luna County: Cooks Peak district.

NATROLITE.

Physical characteristics. Orthorhombic. Crystals prismatic, usually very slender to acicular; frequently divergent, or in stellate groups. Also fibrous, radiating,

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massive, granular, or compact. Cleavage: two directions, prismatic, at right angles, perfect. Fracture uneven. H.- 5-5.5. Sp.G.- 2.20-2.25. Luster vitreous, sometimes inclining to pearly, especially in fibrous varieties. Color white, or colorless; to grayish, yellowish, reddish, to red. Transparent to translucent.

Chemical composition. $\text{Na}_2\text{Al}_2\text{Si}_3\text{O}_{10}\cdot 2\text{H}_2\text{O}$, or
 $\text{Na}_2\text{O}\cdot\text{Al}_2\text{O}_3\cdot 3\text{SiO}_2\cdot 2\text{H}_2\text{O}$.

Occurrence. Colfax County: Raton region (?). Sandoval County: Jemez region.

NEPHELITE. Nepheline. Elaeolite.

Physical characteristics. Hexagonal. In thick six- or twelve-sided prisms with plane or modified terminations. Also massive compact, and in embedded grains; structure sometimes thin columnar. Cleavage: prismatic, distinct; basal, imperfect. Fracture subconchoidal. Brittle. H.- 5.5-6. Sp.G.- 2.55-2.65. Luster vitreous to greasy; a little opalescent in some varieties. Colorless, white, or yellowish; also, when massive, dark green, greenish or bluish gray, brownish red and brick-red. Transparent to opaque.

Chemical composition. NaAlSiO_4 . This is the composition

massive, granular, or oolitic, or compact. ...
at right angles, ...
Sp. 3. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.

Chemical composition. SiO_2 , Al_2O_3 , FeO , CaO , MgO , K_2O , Na_2O .

Character. Color gray; luster vitreous; fracture conchoidal; ...
locally lens shaped.

MINERALOGY. Orthopyroxene, Enstatite.

Orthopyroxene. ...
also massive oolitic, ...
thin columnar, ...
luster vitreous, ...
Sp. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.

Chemical composition. SiO_2 , Al_2O_3 , FeO , CaO , MgO , K_2O , Na_2O .

of the artificial mineral. The natural mineral always contains varying amounts of excess silica and also small amounts of potash, approximately $\text{Na}_2\text{K}_2\text{Al}_3\text{Si}_9\text{O}_{34}$.

Occurrence. Colfax County: Raton region; Pleasant Valley region; Ciruella region. McKinley County: Zilditloi Mountain (near Todilto Park); in Todilto Park region. Santa Fe County: Old Placers district.

NICCOLITE. Copper Nickel.

Physical characteristics. Hexagonal. Crystals rare.

Usually massive, nearly impalpable; also reniform, columnar; reticulated, arborescent. Fracture uneven. Brittle. H.- 5-5.5. Sp.G.- 7.33-7.67. Luster metallic. Color pale copper-red. Streak pale brownish black. Opaque.

Chemical composition. Nickel arsenide, NiAs , usually with a little iron or cobalt, also sulphur.

Occurrence. Grant County: Black Hawk district.

NOSELITE. (?)

A very doubtful occurrence, in microscopic grains.

Colfax County: Pleasant Valley region (?).

of the artificial islands. The natural islands always con-
tain varying amounts of coarse silica and also small amounts
of potash, approximately 0.5-1.0%.

MADEIRA. Colfax County, eastern region; Pleasant Valley
region; Nevada region. Nevada County; Nevada County
east (near Tule Lake); in Nevada Park region. Santa
Fe County; San Joaquin district.

MINERALI. Copper Mineral.

Geological characteristics. Mineralogical. Crystallography.
Generally massive, rarely tabular; also radiating, columnar,
and fibrous. Coloration. Fracture uneven. Brittle.
H=2-3.5. G=2.5-2.8. Luster metallic. Color pale
copper-red. Greenish blue. Opacity.

Geological occurrence. Mineral occurrence. Mass. usually with
a little iron or cobalt, also silver.

Localities. Grand County; Grand County district.

MINERALI. (3)

A very common mineral in the district.
Colfax County; Pleasant Valley region (3).

OCTAHEDRITE. Anatase.

Physical characteristics. Tetragonal. Commonly octahedral, acute or obtuse; also tabular; rarely in prismatic crystals; frequently highly modified. Cleavage: basal and octahedral, perfect. Fracture subconchoidal. Brittle. H.— 5.5-6. Sp.G.— 3.82-3.95. Luster adamantine or metallic-adamantine. Color various shades of brown, passing into indigo-blue, and black; greenish yellow by transmitted light. Streak uncolored. Transparent to nearly opaque.

Chemical composition. Titanium dioxide, TiO_2 . Commonly contains small amounts of iron oxide.

Occurrence. Grant County: Central district.

OKENITE.

Physical characteristics. Triclinic. In minute bladed or acicular crystals. Commonly fibrous; also compact. Cleavage: one direction, perfect. H.— 4.5-5. Sp.G.— 2.33. Luster subpearly. Color white, with a shade of yellow or blue. Subtransparent to subtranslucent. Frequently opalescent.

Chemical composition. $H_2CaSi_2O_6 \cdot H_2O$.

Occurrence. Grant County: Georgetown district.

CHARACTERISTICS.

Physical characteristics. The crystals are usually colorless, but may be yellowish or brownish; they are also soluble in water and alcohol. The crystals are usually colorless, but may be yellowish or brownish; they are also soluble in water and alcohol. The crystals are usually colorless, but may be yellowish or brownish; they are also soluble in water and alcohol.

Chemical characteristics. The crystals are usually colorless, but may be yellowish or brownish; they are also soluble in water and alcohol. The crystals are usually colorless, but may be yellowish or brownish; they are also soluble in water and alcohol.

Preparation. From the mother liquor.

CHARACTERISTICS.

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OLIGOCLASE. A Plagioclase Feldspar.

Physical characteristics. For general physical characteristics, see Plagioclase Feldspars. Oligoclase is distinguished chiefly by the cleavage angle ($86^{\circ} 32'$), specific gravity (2.625-2.645), and optical characters (differences in indices of refraction and extinction angles).

Chemical composition. $Ab_{90-70}An_{10-30}$. See table under Plagioclase Feldspars.

Occurrence. Catron County: Mogollon district. Grant County: Burro Mountains district. Hidalgo County: Lordsburg district. Sandoval County: Jemez region. Sierra County: (not specified).

OPAL.

Physical characteristics. Amorphous (colloidal). Massive; sometimes small reniform, stalactitic, or large tuberoso. Frequently pseudomorphous after other minerals. Also earthy. Fracture conchoidal. H.- 5.5-6.5. Sp.G.- 1.9-2.3; when pure 2.1-2.2. Luster vitreous, frequently subvitreous; often inclining to resinous, and sometimes to pearly. Color white, yellow, red, brown, green, gray, blue, generally pale; dark colors arise from foreign admixtures; sometimes a rich play of colors, or different colors by refracted and

DESCRIPTION - A 1930-1931

Physical characteristics - For general physical characteristics, see Historical Information. This section is devoted entirely to the physical and chemical characteristics of the material, and is not intended to describe the history of production and utilization.

General description - This section is devoted to the general description of the material.

Chemical composition - This section is devoted to the chemical composition of the material. It should be noted that the chemical composition of the material may vary from lot to lot, and the following information is given for the most common lot.

Physical characteristics - This section is devoted to the physical characteristics of the material.

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reflected light. Streak white. Transparent to nearly opaque.

Chemical composition. Silica, like quartz, with a varying amount of water, $\text{SiO}_2 \cdot n\text{H}_2\text{O}$. The percentage of water is usually small with a maximum of about 10%.

Varieties. 1. Fiorite. Siliceous sinter. Transparent to opaque; grayish, whitish, or brownish in color; in crusts porous to firm in texture, sometimes fibrous and then pearly in luster (Pearl-sinter); deposited from siliceous waters of hot springs. 2. Hyalite. Muller's Glass. Clear as glass and colorless; in globular concretions, and crusts with a globular or botryoidal surface; also translucent and whitish.

Occurrence. Grant County: Central and Santa Rita districts. Luna County: Deming region. Sandoval County: Cochiti district; Rio Puerco Valley region. Sierra County: (not specified).

Var. Fiorite. Grant County: Faywood Hot Springs. Socorro County: Socorro Hot Springs.

Var. Hyalite. Grant County: Central district. Hidalgo County: San Simon district. Sandoval County: Cochiti district.

attached light... treatment is nearly
 equal.

Theoretical consideration... like matter with a certain
 amount of water, 210 and 2. The percentage of water is
 usually small with a maximum of about 10%.

Velocity. 1. Elastic. Allotropic matter. Treatment is
 open; gradual, elastic, or treated in water; in water
 pores in film in texture, sometimes titanium and iron
 partly in water (hydro-soluble); deposited from solution
 nature of hot springs. 2. Elastic. Elastic matter. Glass
 as glass and solutions; in elastic connections, and treated
 with a fibrous or isotropic surface; also treatment and
 elastic.

Structure. Glass County Central and Santa Rita districts.
 Lava County; being region. Central County Central and
 Santa Rita Valley region. Santa Rita County; Lava
 County.

for Elastic. Glass County Central district. Santa
 Rita County; being region. Santa Rita County; Lava
 County.

ORTHOCLASE. Feldspar.

Physical characteristics. Monoclinic. Twins, the common Carlsbad type, either penetration- or contact-twins, common. Crystals often prismatic; rarely tabular. Often massive, coarsely cleavable to granular; sometimes lamellar. Also compact cryptocrystalline, and flint-like or jasper-like. Cleavage: two directions, prismatic, at right angles, perfect. Fracture conchoidal to uneven. Brittle. H.— 6. Sp.G.— 2.56–2.58. Luster vitreous; on the most perfect cleavage face often pearly. Colorless, white, pale yellow and flesh-red common; gray; rarely green. Streak uncolored.

Chemical composition. A silicate of aluminum and potassium, $KAlSi_3O_8$, or $K_2O \cdot Al_2O_3 \cdot 6SiO_2$. Sodium is often present, replacing part of the potassium (soda orthoclase).

Varieties. 1. Adularia. Pure or nearly pure potassium silicate. Usually in crystals; twins common. Sp.G.— 2.565. Transparent or nearly so. Often with pearly opalescent reflection or play of colors; then known as moonstone, which is a microperthitic intergrowth of orthoclase and albite. 2. Microperthite. A laminated intergrowth of orthoclase and albite; structure discernible only under the microscope. 3. Perthite. Same as microperthite, except that the structure may be observed with the unaided eye. 4. Sanidine. Glassy feldspar. In crystals, often transparent and glassy. Habit often tabular; also in square

prisms; Carlsbad twins common. Sodium prominent in most varieties.

Occurrence. Bernalillo County: Tijeras Canyon district. Dona Ana County: Organ district. Grant County: Burro Mountains district. Hidalgo County: Hachita district. Luna County: Fluorite Ridge district. Otero County: Orogrande district. Sandoval County: Jemez region. Sierra County: Caballos Mountains and Hillsboro districts. Taos County: Harding Mine and Red River districts.

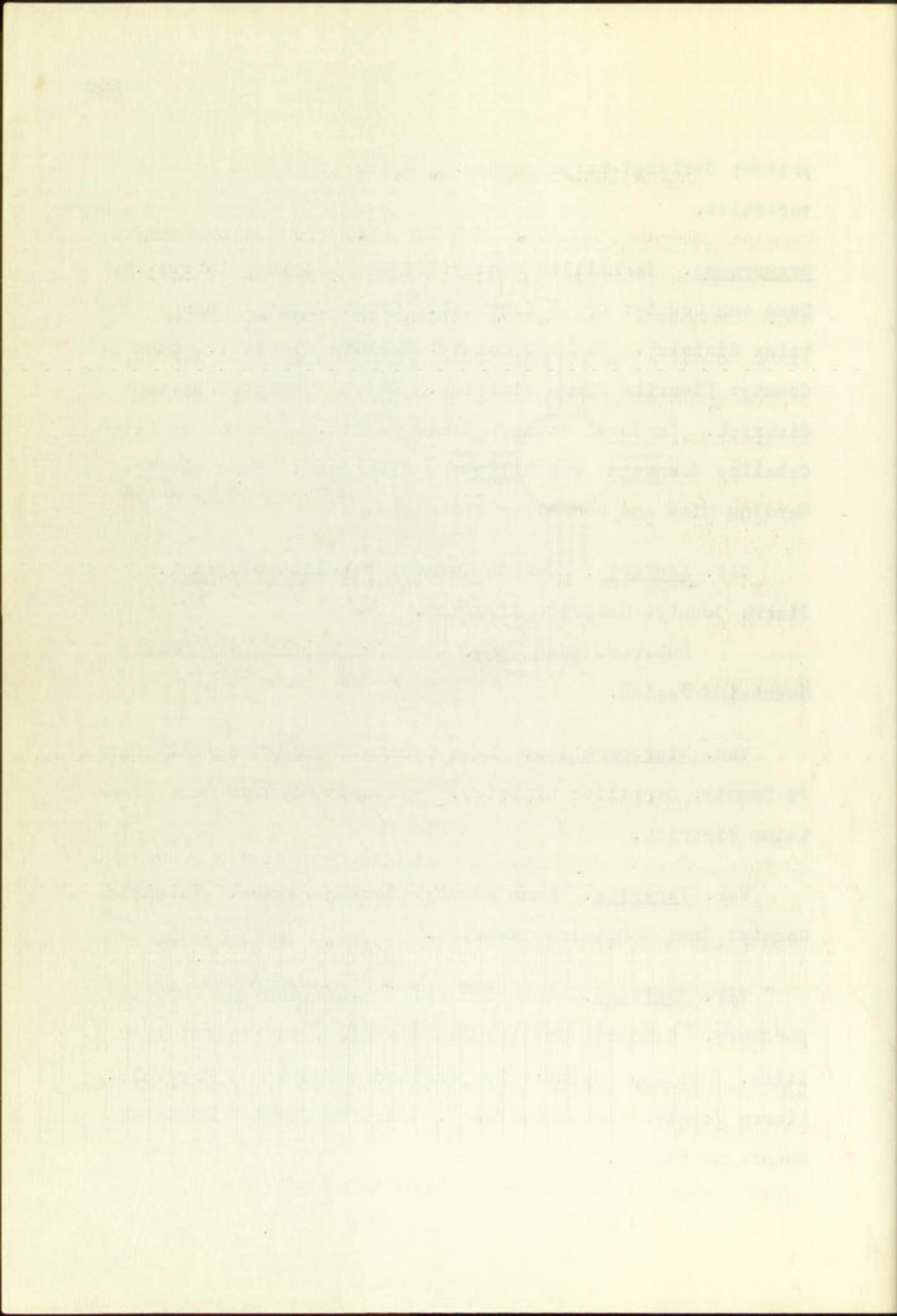
Var. Adularia. Catron County: Mogollon district. Sierra County: Chloride district.

Sub-var. Moonstone. Socorro County: San Mateo Mountains region.

Var. Microperthite. Luna County: Deming region. Santa Fe County: Cerrillos district. Valencia County: Zuni Mountains district.

Var. Perthite. Luna County: Deming region. Valencia County: Zuni Mountains district.

Var. Sanidine. Luna County: in rhyolite and rhyolite porphyry. Sandoval County: Jemez region, at several localities. San Juan County: The Palisades (north of Crystal). Sierra County: (not specified). Socorro County: Magdalena Mountains region.



PARAGONITE. Sodium Mica.

Physical characteristics. Massive, sometimes consisting distinctly of fine pearly scales; also compact. Cleavage: basal, eminent. H.- 2.5-3. Sp.G.- 2.78-2.90. Luster strong pearly. Color yellowish, grayish, grayish white, greenish, light apple-green. Translucent, single scales transparent.

Chemical composition. A sodium mica, corresponding to muscovite in composition, $H_2NaAl_3(SiO_4)_3$, or $2H_2O.Na_2O.3Al_2O_3.6SiO_2$. A little potassium is often present.

Occurrence. Taos County: Glenwoody district.

PEARCEITE. Arsenical Polybasite.

Physical characteristics. Monoclinic, pseudo-rhombohedral. In tabular crystals. Probably twinned according to the mica law. Also massive. Cleavage none. Fracture conchoidal. Brittle. H.- 3. Sp.G.- 6.125-6.166. Luster metallic. Color and streak black. Opaque.

Chemical composition. Ag_9AsS_6 , or $9Ag_2S.As_2S_3$, an arsenical polybasite.

Occurrence. Socorro County: Magdalena district.

EXPERIMENTAL

Physical characteristics: ...
Infrared spectrum: ...
Elemental analysis: ...

Chemical reactions: ...
Solubility: ...
Stability: ...

References: ...

DISCUSSION

The results of the present study ...
are in agreement with those reported ...
by other workers. The infrared ...
spectrum shows characteristic ...
absorption bands for ...

Summary: ...

PECTOLITE.

Physical characteristics. Monoclinic. Commonly in close aggregations of acicular crystals, rarely terminated. Fibrous massive, radiated to stellate. Cleavage: two directions, perfect. Fracture uneven. Brittle. H.- 5. Sp.G.- 2.74-2.88. Luster of the surface of fracture silky or subvitreous. Color whitish or grayish. Subtranslucent to opaque. Often gives out light when struck or broken in the dark.

Chemical composition. $\text{HNaCa}_2(\text{SiO}_3)_3$, or $\text{H}_2\text{O} \cdot \text{Na}_2\text{O} \cdot 4\text{CaO} \cdot 6\text{SiO}_2$.

Occurrence. Taos County: Glenwoody district.

PETALITE. (?)

Physical characteristics. Monoclinic. Crystals rare. Usually massive, foliated cleavable. Cleavage: one direction, perfect; another, easy. Fracture imperfectly conchoidal. Brittle. H.- 6-6.5. Sp.G.- 2.39-2.46. Luster vitreous, on the perfect cleavage surface pearly. Colorless, white, gray, occasionally reddish or greenish white. Streak uncolored. Transparent to translucent.

Chemical composition. $\text{LiAl}(\text{Si}_2\text{O}_5)_2$, or $\text{Li}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 8\text{SiO}_2$.

Occurrence. Taos County: Glenwoody (?), Harding Mine (?),

PLATE 1

The following are the names of the
 specimens of *Amphispiza bilineata*,
 collected by me in the
 State of Arizona, during the
 months of March, April, May,
 June, July, August, and
 September, 1912. The
 number of specimens of each
 sex is given in parentheses.
 The date of collection is
 given in italics.

Arizona: Yuma County: District
 No. 1.

PLATE 2

The following are the names of the
 specimens of *Amphispiza bilineata*,
 collected by me in the
 State of Arizona, during the
 months of March, April, May,
 June, July, August, and
 September, 1912. The
 number of specimens of each
 sex is given in parentheses.
 The date of collection is
 given in italics.

Arizona: Yuma County: District
 No. 1.

and Picuris (?) districts.

PETZITE.

Physical characteristics. Massive, fine granular to compact. Fracture subconchoidal. Slightly sectile to brittle. H.- 2.5-3. Sp.G.- 8.7-9.02. Luster metallic. Color steel- or iron-gray to iron-black; often tarnishing.

Chemical composition. A telluride of silver and gold, $(Ag,Au)_2Te$.

Occurrence. Sierra County: Tierra Blanca district. Taos County: Anchor and Red River districts.

PHLOGOPITE. Magnesium Mica.

Physical characteristics. Monoclinic. Crystals prismatic, tapering; often large and coarse; in scales and plates. Cleavage: basal, highly eminent. Thin laminae tough and elastic. H.- 2.5-3. Sp.G.- 2.78-2.85. Luster pearly, often submetallic on cleavage surface. Color yellowish brown to brownish red, with often a copper-like reflection; also pale brownish yellow, green, white, colorless. Transparent to translucent in thin folia.

Chemical composition. A magnesium mica, near biotite, but

and Florida (V) districts.

FLORIDA.

Physical characteristics. Generally low ground, with
great numbers of swamps and bays. Climate mostly
tropical. Soil mostly red sandstone. Elevations
to 1000 feet to low-lying areas.

Geological formations. A section of silver and gold
mining in the north.

Counties. Alachua, Baker, Bay, Bradford, Brevard,
Calhoun, Collier, Columbia, Duval, Escambia,
Gadsden, Hamilton, Hardee, Hendry, Hernando, Hillsdale,
Jefferson, Lafayette, Lake, Leon, Levy, Madison, Manatee,
Marion, Miami, Monroe, Nassau, Oklawaha, Ocala,
Orange, Osceola, Palm Beach, Pasco, Polk, Putnam,
Santa Fe, Seminole, St. Johns, Suwannee, Taylor,
Union, Volusia, Washington, Walton, and
Wright.

MICHIGAN.

Physical characteristics. Mostly low ground, with
extensive areas of water and swamps. Climate
temperate. Soil mostly red sandstone. Elevations
to 1000 feet to low-lying areas. Major
rivers to the north, with other smaller rivers.
Main cities are Grand Rapids, East Lansing,
Lansing, and Detroit.

Geological formations. A section of silver and gold

with little iron; fluorine is nearly always present in traces. $H_2KMg_3Al(SiO_4)_3$.

Occurrence. Santa Fe County: Nambe region.

PHOSGENITE. (?)

Physical characteristics. Tetragonal. Crystals prismatic; sometimes tabular parallel to the base. Cleavage: prismatic, first and second order, distinct. Also basal. Rather sectile. H.- 2.75-3. Sp.G.- 6.0-6.3. Luster adamantine. Color white, gray, and yellow. Streak white. Transparent to translucent.

Chemical composition. Lead chlorocarbonate, $(PbCl)_2CO_3$, or $PbCO_3.PbCl_2$.

Occurrence. Dona Ana County: Organ district (?).

PICKERINGITE. Magnesia Alum.

Physical characteristics. Monoclinic. In fine acicular crystals; in long fibrous masses; and in efflorescences. H.- 1. Sp.G.- 1.85. Luster silky. Colorless, white, yellow, pale rose-red. Becomes white and pulverulent on exposure. Taste bitter to astringent. Easily fusible.

also little from; therefore the nearly always present in

cases. *Phragmites* (L.)

Phragmites. Same as *Phragmites* (L.)

Phragmites (L.)

Phragmites (L.) *Phragmites* (L.) *Phragmites* (L.)

occasional rather parallel to the base. *Phragmites* (L.)

white, first and second order, distinct, also white.

rather capitate. *Phragmites* (L.) *Phragmites* (L.)

medium. Color white, grey, and yellow. *Phragmites* (L.)

transparent to translucent.

Phragmites (L.) *Phragmites* (L.) *Phragmites* (L.)

or 1000-1000.

Phragmites. Same as *Phragmites* (L.)

Phragmites (L.)

Phragmites (L.) *Phragmites* (L.) *Phragmites* (L.)

capitate; in long narrow masses; and in all directions.

rather capitate. *Phragmites* (L.) *Phragmites* (L.)

rather capitate. *Phragmites* (L.) *Phragmites* (L.)

rather capitate. *Phragmites* (L.) *Phragmites* (L.)

Chemical composition. $MgSO_4 \cdot Al_2(SO_4)_3 \cdot 22H_2O$.

Occurrence. Quay County: Tucumcari region.

PICROALLUMOGENE. Picrallumogene.

Physical characteristics. Stalactitic; in nodular and fibrous radiated masses. Color white, with a rose-red tinge. Streak nearly white. Semi-translucent. Taste acid, bitter.

Chemical composition. $2MgSO_4 \cdot Al_2(SO_4)_3 \cdot 28H_2O$, if homogeneous.

Occurrence. San Miguel County: Las Vegas region.

INTERMEDIATE FLAGIOCLASE FELDSPARS.

The members of this group are not to be regarded as distinct species, but are instead certain sections of the albite-anorthite isomorphous series. The complete series, grading from pure albite ($NaAlSi_3O_8$) to anorthite ($CaAl_2Si_2O_8$), consists of the varieties oligoclase, andesine, labradorite, and bytownite. All of these occur in New Mexico, although bytownite is a rare type, occurring only in certain basic rocks.

Physical characteristics of the species. The body is elongated, with a slender neck and a rounded head. The color is a uniform brownish-grey.



Physical characteristics. This species is characterized by its elongated body and slender neck. The color is a uniform brownish-grey. The head is rounded, and the legs are short and stout.

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The members of this genus are all of a similar size and shape. They are all elongated, with a slender neck and a rounded head. The color is a uniform brownish-grey. The head is rounded, and the legs are short and stout. They are all very similar in appearance, and it is difficult to distinguish between them. The only difference is in the shape of the head, which is more rounded in some species than in others.

Physical characteristics. Triclinic. Crystals as with albite and anorthite. Twinning as with albite. Crystals not common. Usually massive, cleavable, granular, or compact. Cleavage as in albite, the two perfect cleavages more nearly at right angles as the albite end of the series is approached. H.- 5-6. Sp.G.- 2.60-2.75, lower toward the albite end of the series. Color white, gray, greenish, yellowish, brown, reddish; at times colorless. A play of colors is a common character, especially in certain labradorites. Blue and green are the predominant colors, but yellow, fire-red, and pearl-gray also occur. Transparent to subtranslucent.

Chemical composition. The table below gives the proportions of the ALBITE molecule ($\text{NaAlSi}_3\text{O}_8$) to the ANORTHITE molecule ($\text{CaAl}_2\text{Si}_2\text{O}_8$) in the members of the series.

	<u>Albite Molecule</u>	<u>Anorthite Molecule</u>
ALBITE	100 to 90%	0 to 10%
OLIGOCLASE	90 to 70%	10 to 30%
ANDESINE	70 to 50%	30 to 50%
LABRADORITE	50 to 30%	50 to 70%
BYTOWNITE	30 to 10%	70 to 90%
ANORTHITE	10 to 0%	90 to 100%

The two end-species, and the varieties, are described separately in the text.

The first part of the report is devoted to a description of the
 experimental apparatus. The apparatus consists of a
 cylindrical vessel of light metal, 10 cm in diameter and
 20 cm high, in which a certain amount of liquid is
 contained. The vessel is placed on a platform scale,
 and the weight of the vessel and its contents is
 measured. The vessel is then filled with a liquid of
 known density, and the weight is measured again.
 The difference between the two weights is the weight
 of the liquid displaced by the vessel. This weight
 is equal to the weight of the liquid displaced by the
 vessel, and is therefore equal to the weight of the
 vessel. The weight of the vessel is therefore
 determined.

The second part of the report is devoted to a
 description of the experimental results. The results
 show that the weight of the vessel is equal to the
 weight of the liquid displaced by the vessel. This
 result is in agreement with the theory of buoyancy.

Table I

Weight of vessel (g)	Weight of vessel + liquid (g)	Weight of liquid displaced (g)
100.0	150.0	50.0
100.0	160.0	60.0
100.0	170.0	70.0
100.0	180.0	80.0
100.0	190.0	90.0
100.0	200.0	100.0

The results of the experiment show that the weight
 of the vessel is equal to the weight of the liquid
 displaced by the vessel. This result is in agreement
 with the theory of buoyancy. The results also show
 that the weight of the vessel is proportional to the
 weight of the liquid displaced by the vessel. This
 result is also in agreement with the theory of
 buoyancy.

PLATINUM.

Physical characteristics. Isometric. Crystals rare; usually in grains and scales. Cleavage none. Fracture hackly. Malleable and ductile. H.- 4-4.5. Sp.G.- 14-19 native; 21-22 chemically pure. Luster metallic. Color and streak whitish steel-gray; shining. Sometimes magnetic.

Chemical composition. Platinum, Pt, alloyed with iron, iridium, rhodium, palladium, osmium, and other metals.

Occurrence. Lincoln County: Jicarilla district. Rio Arriba County: Bromide district.

PLATTNERITE.

Physical characteristics. Tetragonal. Rarely in crystals, habit prismatic. Usually massive; sometimes in globular or mammillary forms. Cleavage not observed. Fracture subconchoidal to uneven. Brittle. H.- 5-5.5. Sp.G.- 8.5. Luster submetallic. Color iron-black. Streak chestnut-brown. Translucent to nearly opaque.

Chemical composition. Lead dioxide, PbO_2 .

Occurrence. Grant County: Central district. Luna County: Cooks Peak district.

PLATINUM

Platinum is a heavy metal, silvery white, and is found in nature as platinum metal and as platinum compounds. It is one of the most noble of metals, being resistant to attack by acids and alkalis. It is used in jewelry, in electrical contacts, and in the chemical industry. It is also used in the treatment of cancer.

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FLUMBOJAROSITE.

Physical characteristics. Hexagonal-rhombohedral. In minute tabular crystals. Cleavage: rhombohedral. Sp.G.— 3.67. Color dark brown.

Chemical composition. $PbFe_6(OH)_{12}(SO_4)_4$.

Occurrence. Grant County: Central district. Luna County: Cooks Peak district. Sierra County: (not specified). Socorro County: Magdalena and Water Canyon districts.

POLYBASITE.

Physical characteristics. Monoclinic. In short six-sided tabular prisms, with bevelled edges; basal faces with triangular striations; in part repeated twins. No distinct cleavage. Fracture uneven. H.— 2-3. Sp.G.— 6.0-6.2. Luster metallic. Color iron-black, in thin splinters cherry-red. Streak black. Nearly opaque.

Chemical composition. $9Ag_2S.Sb_2S_3$. Silver may be partly replaced by copper, and antimony by arsenic.

Occurrence. Grant County: Telegraph district.

HYDROLYSIS

Phenyl acetate. Formed by hydrolysis of phenyl acetate. Color dark brown.

Phenyl acetate. Formed by hydrolysis of phenyl acetate. Color dark brown.

HYDROLYSIS

Phenyl acetate. Formed by hydrolysis of phenyl acetate. Color dark brown.

Phenyl acetate. Formed by hydrolysis of phenyl acetate. Color dark brown.

POLYHALITE.

Physical characteristics. Triclinic. Usually in compact fibrous or lamellar masses. Cleavage: one direction, distinct. H.— 2.5-3. Sp.G.— 2.78. Luster resinous or slightly pearly. Color flesh- or brick-red, sometimes yellowish. Streak red. Translucent to opaque. Taste bitter and astringent, but very weak. Easily fusible.

Chemical composition. $2\text{CaSO}_4 \cdot \text{MgSO}_4 \cdot \text{K}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$.

Occurrence. Eddy County: Carlsbad Potash district.

PREHNITE.

Physical characteristics. Orthorhombic. Distinct individual crystals rare, tabular or prismatic. Commonly in groups of tabular crystals, often barrel-shaped. Reniform, globular, and stalactitic with a crystalline surface. Structure imperfectly columnar or lamellar, strongly coherent; also compact granular or impalpable. Cleavage: one direction, parallel to tabular faces, distinct. Fracture uneven. Brittle. H.— 6-6.5. Sp.G.— 2.80-2.95. Luster vitreous; on cleavage surface weak pearly. Color light green, oil-green, passing into white and gray; often fading on exposure. Streak uncolored. Subtransparent to translucent.

Chemical composition. An acid orthosilicate of calcium

PHENOL

Physical characteristics. Phenol is a colorless, odorless, crystalline solid at room temperature. It is soluble in water, and its aqueous solution is known as carbolic acid. The melting point is 43°C. (109°F.) and the boiling point is 181°C. (358°F.). It is a weakly acidic substance and acts as a disinfectant and antiseptic.

Chemical composition. C₆H₅O, 94.11% C, 4.91% O.

Occurrence. It is obtained from coal tar.

PHENOL

Physical characteristics. Phenol is a colorless, odorless, crystalline solid at room temperature. It is soluble in water, and its aqueous solution is known as carbolic acid. The melting point is 43°C. (109°F.) and the boiling point is 181°C. (358°F.). It is a weakly acidic substance and acts as a disinfectant and antiseptic.

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Chemical composition. C₆H₅O, 94.11% C, 4.91% O.

and aluminum, $H_2Ca_2Al_2(SiO_4)_3$. Ferric iron may replace aluminum in small amounts.

Occurrence. Colfax County: Raton region.

PROUSTITE. Ruby Silver Ore. Light Red Silver Ore.

Physical characteristics. Hexagonal-rhombohedral. Crystals often acute rhombohedral or scalenohedral. Twins sometimes occur. Also massive, compact. Cleavage: rhombohedral, distinct. Fracture conchoidal to uneven. Brittle. H.— 2-2.5. Sp.G.— 5.57-5.64; 5.57 if pure. Luster adamantine. Color scarlet-vermilion; streak same, also inclined to aurora-red.

Chemical composition. $3Ag_2S.As_2S_3$.

Occurrence. Colfax County: Baldy district. Grant County: Georgetown district. San Miguel County: Willow Creek district. Sierra County: Kingston and Lake Valley districts.

PSILOMELANE.

Physical characteristics. Massive and botryoidal; reniform; stalactitic. H.— 5-7. Sp.G.— 3.3-4.7. Luster submetallic, dull. Streak brownish black, shining. Color iron-black, passing into dark steel-gray. Opaque.

and aluminum, $2Ca_2Al_2Si_2O_{10}(OH)_2$. Ferrite iron ore
aluminum in small amounts.

Geography. Colfax County, New Mexico.

Properties. Very silver gray, lustrous and brittle.
Physical characteristics. Hexagonal-rhombohedral. Cleavage
rarely occurs rhombohedrally or octahedrally. Fracture
times occur. Also massive, conchoidal. Cleavage: rhombo-
hedral, diagonal. Fracture conchoidal to uneven. Lustre
N. - S. S. Sp. G. - 3.27-3.61; D. 37 is good. Hardness
fine. Color earthy-variety; black gray, also black
to brown-red.

Optical characteristics. Birefringent.

Occurrences. Colfax County: Early district, Crown Point
Georgetown district. San Miguel County: Silver Lake
Early. Grant County: Kingston and Lake Valley districts.

Minerals

Physical characteristics. Massive and subhedral; rare
crystals. N. - S. S. Sp. G. - 3.5-4.5. Hardness
Dull. Green brownish black; shining. Color black-
greenish into dark steel-gray. Opacous.

Chemical composition. A manganese oxide containing varying amounts of barium, potassium, and sodium oxides, and water. To be regarded as colloidal MnO_2 with various adsorbed impurities.

Varieties. 1. Wad. In amorphous and reniform masses, earthy or compact; also incrusting and as stains. Usually soft, soiling the fingers; less often hard, to H.— 6. Sp.G.— 3.0-4.26; often loosely aggregated and feeling very light. Color dull black, bluish or brownish black.

Occurrence. Catron County: Mogollon district. Dona Ana County: Rincon Manganese district. Grant County: Burro Mountains, Cap Rock Mountain Manganese, and Silver City Manganese-Iron districts. Luna County: Cooks Range Manganese, Florida Mountains, and Little Florida Mountains districts. Santa Fe County: Santa Fe Manganese district. Sierra County: Caballos Mountains, Derry Manganese, Hermosa, Hillsboro, Hot Springs, Kingston, Lake Valley, Macho, and Pittsburg districts. Socorro County: Luis Lopez Manganese, Magdalena, Magdalena Mountains Manganese, San Lorenzo, and Socorro Peak districts. Taos County: Glenwoody district.

Var. Wad. Dona Ana County: Rincon Manganese district. Grant County: Central, Fierro Manganese, and Silver City Manganese-Iron districts. Luna County: Florida Mountains and Little Florida Mountains districts. Sierra County: Derry Manganese, Hillsboro, Hot Springs, Kingston, and Lake

Phyllanthus. A large number of species are recorded from the mountains of Burma, Indochina, and other regions, and some of them are reported as cultivated in some of the islands.

Phyllanthus. In Burma, it is common in the mountains and in the valleys, and also in the plains. It is also cultivated in some of the islands, and is reported as cultivated in some of the islands.

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Valley districts. Socorro County: Luis Lopez Manganese, Magdalena, Magdalena Mountains Manganese, Ojo Caliente, San Lorenzo, and Socorro Peak districts.

PYRARGYRITE. Ruby Silver Ore. Dark Red Silver Ore.

Physical characteristics. Hexagonal-rhombohedral. Crystals commonly prismatic. Twins common, often multiple. Also massive, compact. Cleavage: rhombohedral, distinct. Fracture conchoidal to uneven. Brittle. H.—2.5. Sp.G.—5.77–5.86; 5.85 if pure. Luster metallic-adamantine. Color black to grayish black; by transmitted light deep red. Streak purplish red. Nearly opaque, but transparent in very thin splinters.

Chemical composition. $3Ag_2S \cdot Sb_2S_3$. Some varieties contain small amounts of arsenic.

Occurrence. Catron County: Mogollon district. Colfax County: Baldy district (?). Grant County: Black Hawk, Georgetown, and Gold Hill districts. Sierra County: Hermosa, Kingston, and Lake Valley districts.

PYRITE. Iron Pyrites.

Physical characteristics. Isometric-pyritohedral. Cube

Valley districts. Occurs however in the ...
Kagblana, Kagblana ...
Lorans, and occurs ...

DESCRIPTION - Body ...
Evolutionary characteristics. ...
Late economy ...
Also massive, compact, ...
Structure ...
5.77-5.85; 5.85 ...
black to grayish black ...
strong purple red, ...
very thin ...

Geological distribution - ...
small amount of ...

Geography - ...
County ...
... and ...
... and ...

Notes - ...
Historical ...

and pyritohedron the common forms; the faces of both often striated and sometimes rounded; octahedron also common. Twins, usually penetration-twins; rarely contact-twins. Frequently massive, fine granular; sometimes subfibrous radiated; reniform, globular, stalactitic. No distinct cleavage. Fracture conchoidal to uneven. Brittle. H.-- 6-6.5. Sp.G.-- 4.95-5.10. Luster metallic, splendent to glistening. Color a pale brass-yellow, nearly uniform. Streak greenish black or brownish black. Opaque.

Chemical composition. Iron disulphide, FeS_2 . Gold is often present in small quantities.

Occurrence. Catron County: Mogollon district. Colfax County: Baldy, Cimarroncito, and Elizabethtown districts. Dona Ana County: Gold Camp, Modoc, Organ, and Texas districts. Eddy County: Carlsbad Potash district. Grant County: Alum Mountain, Black Hawk, Burro Mountains, Carpenter, Central, Fierro-Hanover, Fleming, Gold Hill, Lone Mountain, Pinos Altos, Santa Rita, Steeple Rock, Telegraph, and White Signal districts; Tellurium locality (41 miles northwest of Silver City). Hidalgo County: Apache No. 2, Fremont, Hachita, Lordsburg, San Simon, and Steins Pass districts. Lincoln County: Estey, Jicarilla, Nogal, and White Oaks districts. Luna County: Cooks Peak, Tres Hermanas, and Victorio districts. Otero County: Orogrande and Tularosa districts. Rio Arriba County: Bromide and

and pyritiferous the common form; the lower of which is
abundant and somewhat rounded; occasional also
thin, usually granular, tabular, rarely
irregular massive, fine granular; sometimes subangular
tabular; various, cylindrical, stellate, &c. distinct
cleavage. Fracture subconchoidal to uneven. Brittle.
Sp. G. 4.0-4.5. Lustre vitreous, splendent to
glazinous. Color a pale gray-green, nearly white.
Streak greenish black or brownish black. Opaque.

Chemical composition. - From Minnesota, FeO, 75.0; SiO₂ 1.0;
often present in small quantities.

DISTRIBUTION. - Dorset County, Newfouland district, Wales;
County Kerry, Glenties, and Donegal district,
Ireland; Ann County Gold Camp, North Carolina; and
County Aiken, South Carolina; Blount County, Georgia;
Carroll County, North-Carolina; Meigs, Gold Hill,
and Mountain Pine, North Carolina; Elbert, Elberton, and
Tellico, and White Sulphur Springs, Tennessee; and
the upper part of the Rio Grande, Colorado; and
No. 2, Mount Ricketts, Colorado; the Black Hills,
South Dakota; Lincoln County, New York; Franklin
and Essex counties, New Jersey; and
Essex, and Lincoln districts, West Virginia; and
and Lincoln districts. The entire County Lincoln and

Hopewell districts. Sandoval County: Cochiti and Nacimiento Mountains districts. San Miguel County: Rociada, Tecolote, and Willow Creek districts. Santa Fe County: Cerrillos, New Placers, and Old Placers districts. Sierra County: Caballos Mountains, Chloride, Cuchillo Negro, Hermosa, Hillsboro, Kingston, Lake Valley, Macho, San Mateo Mountains, and Tierra Blanca districts. Socorro County: Ladrones Mountains, Magdalena, Mill Canyon, Rosedale, San Andres Mountains (Goodfortune Creek, Grandview Canyon), San Jose, Scholle, and Water Canyon districts. Taos County: Anchor, Picuris, Red River, and Twining districts. Valencia County: Zuni Mountains district.

PYROLUSITE.

Physical characteristics. Orthorhombic, but pseudomorphous, commonly after manganite. Usually columnar, often divergent; also granular massive, and frequently in reniform coats. Soft, often soiling the fingers. H.— 2-2.5. Sp.G.— 4.73-4.86. Luster metallic. Color iron-black, dark steel-gray, sometimes bluish. Streak black or bluish black, sometimes submetallic. Opaque.

Chemical composition. Manganese dioxide, MnO_2 . Commonly contains a little water, up to 2%.

Occurrence. Catron County: Mogollon district. Grant County:

Burro Mountains, Central, Chloride Flat, Fierro-Hanover, and Silver City Manganese-Iron districts. Hidalgo County: Fremont, Hachita, Lordsburg, and San Simon districts. Lincoln County: White Oaks district. Luna County: Little Florida Mountains and Tres Hermanas districts. Santa Fe County: Santa Fe Manganese and New Placers districts. Sierra County: Derry Manganese, Hillsboro, Kingston, Lake Valley, and Macho districts. Socorro County: Luis Lopez Manganese, Magdalena, Magdalena Mountains Manganese, Mill Canyon, Rosedale, San Andres Mountains (Grandview Canyon, Mockingbird Gap), San Lorenzo, Socorro Peak, and Water Canyon districts.

PYROMORPHITE. Green Lead Ore.

Physical characteristics. Hexagonal-pyramidal. Crystals prismatic, often in rounded barrel-shaped forms; also in branching groups of nearly parallel prismatic crystals, tapering to a slender point. Often globular, reniform, and botryoidal or in wart-like shapes, and usually with a sub-columnar structure; also fibrous, and granular. No distinct cleavage. Fracture subconchoidal, uneven. Brittle. H.— 3.5-4. Sp.G.— 6.5-7.1, mostly, when pure; 5.9-6.5, when containing lime. Luster resinous. Color green, yellow, and brown, of different shades; sometimes wax-yellow to fine orange-yellow; also grayish white to milk-white.

Streak white, sometimes yellowish. Subtransparent to subtranslucent.

Chemical composition. $(\text{PbCl})\text{Pb}_4(\text{PO}_4)_3$, or also written $3\text{Pb}_3\text{P}_2\text{O}_8 \cdot \text{PbCl}_2$. Passes into mimetite as the phosphorus is replaced by arsenic.

Occurrence. Grant County: Central district. Sierra County: Caballos Mountains, Chloride, and Macho districts.

PYROSTILPNITE.

Physical characteristics. Monoclinic. In slender prismatic crystals, usually tabular. Usually grouped in small tufts resembling stilbite. Cleavage: one direction, perfect, parallel to tabular faces. Fracture conchoidal. H.— 2. Sp.G.— 4.2–4.25. Luster adamantine, on tabular faces pearly. Color hyacinth-red. Translucent.

Chemical composition. Same as pyrargyrite, Ag_3SbS_3 , or $3\text{Ag}_2\text{S} \cdot \text{Sb}_2\text{S}_3$.

Occurrence. Grant County: Black Hawk district. Sierra County: Kingston district.

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PROSODIC

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PYROXENE.

Common name for a group of closely related species, falling into three different crystal systems, yet similar in form. The name is restricted here to a single species, Pyroxene, which is monoclinic. The forms occurring in New Mexico are varieties of this species.

In composition and form, the pyroxenes are very similar to the amphiboles, and are distinguished chiefly by a difference in cleavage angle (pyroxene nearly 90° ; amphibole 55° - 125° approx.); and by a difference in crystal form, the pyroxenes occurring in short, stout prismatic crystals; the amphiboles in long, slender, bladed crystals.

Varieties occurring in New Mexico include augite, diopside, and hedenbergite, as well as the sub-varieties chrome-diopside and mangan-hedenbergite. They are described separately in the text.

Occurrence. The following occurrences are of varieties identified only as the species pyroxene: Colfax County: Baldy district. Dona Ana County: Organ district. Grant County: Santa Rita district. Hidalgo County: San Simon district. Otero County: Orogrande district. Socorro County: Magdalena district.

PYRRHOTITE. Magnetic Pyrites.

Physical characteristics. Hexagonal. Distinct crystals rare, commonly tabular; also acute pyramidal. Usually massive, with granular structure. Cleavage none. Parting: basal, sometimes distinct. Fracture uneven to subconchoidal. Brittle. H.— 3.5–4.5. Sp.G.— 4.58–4.64. Luster metallic. Color between bronze-yellow and copper-red, and subject to speedy tarnish. Streak dark grayish black. Magnetic, but varying much in intensity.

Chemical composition. Ferrous sulphide containing variable amounts of dissolved sulphur. Often also contains nickel. Analyses show variations from Fe_5S_6 to $Fe_{16}S_{17}$.

Occurrence. Colfax County: Elizabethtown district. Grant County: Fierro-Hanover and Santa Rita districts. Hidalgo County: Hachita district. San Miguel County: Willow Creek district. Santa Fe County: New Placers and Santa Fe districts. Socorro County: Magdalena district.

QUARTZ.

Physical characteristics. Hexagonal-rhombohedral. Crystals commonly prismatic, with prism faces horizontally striated; terminated commonly by both positive and negative rhombohedrons, in nearly equal development and giving the

PHYSICAL CHARACTERISTICS

Physical characteristics. The terrain is generally level, somewhat hilly, and some mountains. The soil is generally granular and porous. The vegetation is generally sparse and consists of grasses and shrubs. The climate is generally warm and humid. The population is generally low and scattered. The principal cities are ...

Physical characteristics. The terrain is generally level, somewhat hilly, and some mountains. The soil is generally granular and porous. The vegetation is generally sparse and consists of grasses and shrubs. The climate is generally warm and humid. The population is generally low and scattered. The principal cities are ...

CONCLUSION

Physical characteristics. The terrain is generally level, somewhat hilly, and some mountains. The soil is generally granular and porous. The vegetation is generally sparse and consists of grasses and shrubs. The climate is generally warm and humid. The population is generally low and scattered. The principal cities are ...

appearance of a hexagonal pyramid. Often in double six-sided pyramids or quartzoids through the equal development of the two rhombohedrons; when one is relatively large the form then has a cubic aspect. Crystals frequently distorted. Often elongated to acicular forms. Frequently in radiated masses, or in druses. Twins both as contact- and penetration-twins. Massive forms common and in great variety, passing from the coarse or fine granular and crystalline kinds to those which are flint-like or cryptocrystalline. Sometimes mammillary, stalactitic, and in concretionary forms; as sand. Cleavage not distinctly observed. Fracture conchoidal to subconchoidal in crystallized forms, uneven to splintery in some massive kinds. Brittle to tough.

H.- 7. Sp.G.- 2.653-2.660 in crystals; cryptocrystalline forms somewhat lower (to 2.60) if pure; but impure massive forms (as jasper) higher. Luster vitreous, sometimes greasy; splendid to nearly dull. Colorless when pure; often various shades of yellow, red, brown, green, blue, black. Streak of pure varieties white; if impure, often the same as the color, but much paler. Transparent to opaque.

Chemical composition. Silica, or silicon dioxide, SiO_2 . Impure varieties may contain opal, iron oxide, calcium carbonate, clay, sand, and various minerals as inclusions.

Varieties. A. Phenocrystalline or Vitreous. 1. Amethyst.

appearance of a hexagonal crystal. Often in double six-
 sided crystals or aggregates through the usual development
 of the two rhombohedrons; often one is relatively large the
 other thin and a cubic aspect. Crystals frequently doublet.
 Often elongated to rhombic forms. Frequently in radiated
 masses, or in druses; thin both in contact and when
 broken. Residue forms masses and in great variety,
 passing from the coarse to fine granular and crystalline
 kinds to those which are thin-like or spherulitic.
 Occasional acicular, tabular, and in concentric
 forms; as usual. Cleavage not distinctly observed. Fracture
 conchoidal to subconchoidal in crystallized forms, uneven
 to splintery in some massive kinds. Brittle to tough.

Sp. G. - 2.652-2.660 in crystals; very crystalline
 forms somewhat lower (to 2.60) if pure; but impure massive
 forms (as Japan) higher. Lower vitreous, sometimes
 granular; equivalent to nearly dull. Colorless when pure;
 often various shades of yellow, red, brown, green, blue,
 black. Streak of pure varieties white; if impure, often
 the same as the color, but much paler. Transparent to
 opaque.

Crystallography. Rhombohedral, or rhombic division, six-
 sided varieties may exhibit both, some cubic, octahedral,
 six-sided, etc., and various minerals are mentioned.

Varieties. - Hexagonal form of Bismuth. - Japan.

Amethystine Quartz. Clear Purple, or bluish violet. Color perhaps due to manganese.

B. Cryptocrystalline. 1. Agate. Waterstones.

A variegated chalcedony; colors (a) banded; (b) irregularly clouded; (c) due to visible impurities, as moss agate.

Bands white, brown, bluish, etc.; straight, wavy, or concentric circular. 2. Agatized Wood. Wood petrified with clouded agate. 3. Carnelian. Sard. A clear red chalcedony, pale to deep in shade; also brownish red to brown.

4. Chalcedony. Having the luster nearly of wax; transparent or translucent. Sp.G.— 2.6–2.64. Colors varied, varieties often based on color. Often mammillary, botryoidal, stalactitic, and as lining or filling in cavities. Often contains disseminated opal-silica. 5. Flint. More opaque than chalcedony, and of dull colors, usually gray, smoky brown, and brownish black. Exterior often whitish from lime or chalk in which it is embedded. Luster subvitreous. Deep conchoidal fracture. Colored by carbonaceous matter.

6. Jasper. Impure opaque colored quartz; commonly red from iron oxide, also other shades.

Occurrence. Bernalillo County: Tijeras Canyon district. Catron County: Mogollon district. Colfax County: Baldy, Cimarroncito, and Elizabethtown districts. De Baca County: five miles east of Ramon. Dona Ana County: Organ and Texas districts; southern end of Caballos Mountains. Grant County:

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Alum Mountain, Black Hawk, Burro Mountains, Carpenter, Central, Chloride Flat, Fierro-Hanover, Fleming, Georgetown, Gold Hill, Juniper, Lone Mountain, Malone, Meerschaum, Pinos Altos, Santa Rita, Silver City Manganese-Iron, Steeple Rock, and Telegraph districts; at Tellurium locality (41 miles northwest of Silver City); at north end of Cooks Range; at several other localities. Hidalgo County: Apache No. 2, Fremont, Hachita, Lordsburg, San Simon, and Steins Pass districts. Lincoln County: Estey, Jicarilla, Nogal, and White Oaks districts. Luna County: Cooks Peak, Cooks Range Manganese, Little Florida Mountains, Tres Hermanas, and Victorio districts. Otero County: Orogrande and Tularosa districts. Rio Arriba County: Bromide, Hopewell, Petaca, and Rinconada districts. Sandoval County: Cochiti and Flacitas districts. San Miguel County: El Porvenir, Rociada, and Willow Creek districts; region near Las Vegas. Santa Fe County: Cerrillos, New Placers, Old Placers, and Santa Fe districts. Sierra County: Caballos Mountains, Chloride, Cuchillo Negro, Hermosa, Hillsboro, Kingston, Lake Valley, Macho, San Mateo Mountains, and Tierra Blanca districts. Socorro County: Cat Mountain, Council Rock, Hansonburg, Joyita Hills, Ladrones Mountains, Lemitar Mountains, Magdalena, Mill Canyon, North Magdalena, Rosedale, San Andres Mountains (Goodfortune Creek, Grandview Canyon, Mockingbird Gap), San Jose, San Lorenzo, Socorro Peak, and Water Canyon districts. Taos County: Anchor, Glenwoody,

also contains, Black Hawk, Lewis & Clark, Jefferson, Madison, Ohio, Erie, Westchester, Albany, Dutchess, Sullivan, Ulster, and Hamilton counties. The Hudson River, which flows through the county, is one of the largest in the State. The county is bounded on the north by the Dutchess and Sullivan counties, on the east by the Ulster and Hamilton counties, on the south by the Dutchess and Sullivan counties, and on the west by the Dutchess and Sullivan counties. The county is one of the most fertile in the State, and is well adapted for the raising of grain and stock. The principal cities are Catskill, Basher, and Schoharie. The county is one of the most beautiful in the State, and is well adapted for the raising of grain and stock. The principal cities are Catskill, Basher, and Schoharie.

Harding Mine, Picuris, Red River, and Twining districts.

Valencia County: Zuni Mountains district.

Var. Amethyst. Catron County: Mogollon district.

Sierra County: Chloride, Kingston, and Tierra Blanca districts. Socorro County: Council Rock, San Jose, and San Lorenzo districts.

Var. Agate. Sandoval County: Nacimiento Mountains district. General: San Mateo Mountains; Sangre de Cristo Mountains; Russels Canyon on Rio Tularosa.

Var. Agatized Wood. Sandoval County: along Rio Puerco. Santa Fe County: at Sweet's Ranch.

Var. Carnelian. General: in various gravel beds.

Var. Chalcedony. Catron County: Mogollon and Taylor Creek Tin districts. Grant County: Burro Mountains district. Luna County: Deming region. Socorro County: south end of Magdalena Range.

Var. Flint. Sierra County: Lake Valley district.

Var. Jasper. Catron County: Mogollon district. Grant County: Burro Mountains, Cap Rock Mountain Manganese, and Central districts. Lincoln County: two miles north of Ancho. Sandoval County: Jemez region. Sierra County: Caballos Mountains and Hillsboro districts. Socorro County: Joyita Hills district. (Indefinite: at Willow Springs.)

Barling River, Florida, and Fifth, and various other places.

Various Counties: First, Second, and Third.

Ver. ANNE. Various Counties: First, Second, and Third.

Various Counties: Fourth, Fifth, Sixth, and Seventh.

Various Counties: Eighth, Ninth, Tenth, and Eleventh.

Various Counties: Twelfth, Thirteenth, and Fourteenth.

Ver. ANN. Various Counties: Fifteenth, Sixteenth, and Seventeenth.

Various Counties: Eighteenth, Nineteenth, and Twentieth.

Various Counties: Twenty-first, Twenty-second, and Twenty-third.

Ver. ANN. Various Counties: Twenty-fourth, Twenty-fifth, and Twenty-sixth.

Various Counties: Twenty-seventh, Twenty-eighth, and Twenty-ninth.

Ver. ANN. Various Counties: Thirtieth, Thirty-first, and Thirty-second.

Ver. ANN. Various Counties: Thirty-third, Thirty-fourth, and Thirty-fifth.

Various Counties: Thirty-sixth, Thirty-seventh, and Thirty-eighth.

Various Counties: Thirty-ninth, Fortieth, and Forty-first.

Various Counties: Forty-second, Forty-third, and Forty-fourth.

Ver. ANN. Various Counties: Forty-fifth, Forty-sixth, and Forty-seventh.

Ver. ANN. Various Counties: Forty-eighth, Forty-ninth, and Fiftieth.

Various Counties: Fifty-first, Fifty-second, and Fifty-third.

Various Counties: Fifty-fourth, Fifty-fifth, and Fifty-sixth.

Various Counties: Fifty-seventh, Fifty-eighth, and Fifty-ninth.

Various Counties: Sixtieth, Sixty-first, and Sixty-second.

Various Counties: Sixty-third, Sixty-fourth, and Sixty-fifth.

RESIN. Amber.

Common name for a number of oxygenated hydrocarbons, of light yellow to brown color, resinous luster, and low specific gravity, occurring usually in coal beds. When compact and hard, and transparent to translucent, fossil resins are called amber.

Chemical composition. Variable in the different varieties, but high in carbon and hydrogen and low in oxygen.

Occurrence. Colfax County: Raton region. McKinley County: Gallup-Zuni Coal Basin region.

RHODOCHROSITE. Dialogite.

Physical characteristics. Hexagonal-rhombohedral. Distinct crystals not common; usually the rhombohedron. Cleavable, massive to granular-massive and compact. Also globular and botryoidal, with columnar structure, sometimes indistinct; incrusting. Cleavage: rhombohedral, perfect. Fracture uneven. Brittle. H.- 3.5-4.5. Sp.G.- 3.45-3.60 and higher. Luster vitreous, inclining to pearly. Color shades of rose-red; yellowish gray, fawn-colored, dark red, brown. Streak white. Translucent to subtranslucent.

Chemical composition. Manganese protocarbonate, $MnCO_3$. Iron carbonate is usually present even up to 40%, as in

HEMISPHERIC

Common name for a number of aggregated hydrocarbons of light yellow to brown color, resinous luster, and low specific gravity, occurring usually in coal beds. When compact and hard, and translucent to translucent, fossil remains are called asphalts.

Chemical composition. - Variable in the different varieties, but high in carbon and hydrogen and low in oxygen. Composition. Color gray; resinous, shining, brittle; melting 200-250°C.

HEMISPHERIC

Physical characteristics. Hexagonal-rhombohedral. Cleavage octahedral not common; usually the rhombohedral. Cleavage massive to granular-massive and compact. Also cleavage and conchoidal, with columnar structure, sometimes indistinct; lamellar. Cleavage rhombohedral, perfect. Fracture uneven. Specific gravity. 1.2-1.5. Hardness. 2.5-3.5 and higher. Luster vitreous, inclining to pearly. Color shades of rose-red yellowish gray, brown-colored, dark red, brown. Streak white. Translucent to subtransparent.

Chemical composition. Composition.

manganosiderite; also magnesium, zinc, and rarely cobalt. Calcium carbonate may be present, as in manganocalcite.

Varieties. 1. Manganosiderite. Containing ferrous carbonate, FeCO_3 , up to 40%. The molecules of rhodochrosite and siderite are apparently completely miscible and may crystallize together in all proportions.

Occurrence. Catron County: Mogollon district. Colfax County: Baldy district. Grant County: Pinos Altos and Silver City Manganese-Iron districts. Hidalgo County: Lordsburg district. Sierra County: Kingston district. Socorro County: Magdalena district. Taos County: Red River district.

Var. Manganosiderite. Grant County: Silver City Manganese-Iron district. Sierra County: Hillsboro district (?). Socorro County: Socorro Peak district.

RHODONITE.

Physical characteristics. Triclinic. Crystals usually large and rough with rounded edges. Commonly tabular; sometimes resembling pyroxene in habit. Commonly massive, cleavable to compact; also in embedded grains. Cleavage: two directions, perfect; another, less perfect, parallel to tabular faces. Fracture conchoidal to uneven. Very

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DISCUSSION

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tough when compact. H.— 5.5–6.5. Sp.G.— 3.4–3.68. Luster vitreous; on cleavage surfaces somewhat pearly. Color light brownish red, flesh-red, rose-pink; sometimes greenish or yellowish, when impure; often black outside from exposure. Streak white. Transparent to translucent.

Chemical composition. Manganese metasilicate, $MnSiO_3$, or $MnO.SiO_2$. Calcium is always present and may be a necessary constituent, hence the suggested formula $CaMn_5(SiO_3)_6$.

Occurrence. Sierra County: Kingston district. Socorro County: San Lorenzo district.

RICKARDITE.

Physical characteristics. Massive. Fracture irregular. Brittle. H.— 3.5. Sp.G.— 7.54. Luster metallic. Color and streak deep purple, resembling the color of tarnished surfaces of bornite. Opaque.

Chemical composition. A copper telluride, Cu_4Te_3 , or $Cu_2Te.2CuTe$.

Occurrence. Dona Ana County: Organ district.

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ROSCOELITE.

Physical characteristics. In minute scales, often in stellate or fan-shaped groups. Structure micaceous. Cleavage: basal, perfect. H.- 2.5. Sp.G.- 2.92-2.97. Luster pearly. Color dark clove-brown to greenish brown, dark brownish green. Translucent.

Chemical composition. Essentially a muscovite in which aluminum is partly replaced by vanadium, formula doubtful: $H_8K(Mg,Fe)(Al,V)_4(SiO_3)_{12}$ (Genth).

Occurrence. San Juan County: east flank of Carrizo Mountain.

RUTILE.

Physical characteristics. Tetragonal. Twins common, sometimes repeated. Crystals commonly prismatic, vertically striated or furrowed; often slender acicular. Occasionally compact, massive. Cleavage: two directions, at angles of 45° and 135° , distinct. Fracture subconchoidal to uneven. Brittle. H.- 6-6.5. Sp.G.- 4.18-4.25, also to 5.2. Luster metallic-adamantine. Color reddish brown, passing into red; sometimes yellowish, bluish, violet, black, rarely grass-green; by transmitted light deep red. Streak pale brown. Transparent to opaque.

ANALYSIS

Physical characteristics. In minute amount, white to light
tint or tan-colored groups. Structure somewhat fibrous.
Local, part of N. S. S. Sp. O. - 4.10-4.12, also in N. S. S.
Color dark gray-brown to granular brown, dark brownish
green. Translucent.

Chemical composition. Essentially a mixture of water
soluble in part, reported by van der Meer, 1901, to be
C₂₀H₁₂O₇(Al₂V)₂(Si₂O₇)₂ (anal.).

Occurrence. San Juan County and Lake of Geneva
Switzerland.

MINERAL

Physical characteristics. Tetragonal. Twin common, some
lines reported. Crystals commonly prismatic, sometimes
tabular or lamellar; often slender needles. Occasional
compact, massive. Cleavage two directions, at angles of
45° and 135°, distinct. Fracture subconchoidal to uneven.
Specific gravity 4.10-4.12, also in N. S. S.
Color reddish-brown. Color reddish brown, passing
into red; sometimes yellowish, violet, black.
Luster glass-glass; by transmitted light deep red. Translucent
pale brown. Translucent to opaque.

Chemical composition. Titanium dioxide, TiO_2 . A little iron is usually present, sometimes up to 10%.

Occurrence. Grant County: Central and Fierro-Hanover districts. Santa Fe County: Cerrillos district. Sierra County: (not specified). Taos County: Harding Mine district.

SAMARSKITE.

Physical characteristics. Orthorhombic. Crystals rectangular prisms. Faces rough. Commonly massive, and in flattened embedded grains. Cleavage: one direction, parallel to a prism face, perfect. Fracture conchoidal. Brittle. H.— 5-6. Sp.G.— 5.6-5.8. Luster vitreous to resinous, splendent. Color velvet-black. Streak dark reddish brown. Nearly opaque.

Chemical composition. $R_3^{\text{II}}R_2^{\text{III}}(Cb,Ta)_6O_{21}$ with $R^{\text{II}} = Fe, Ca, UO_2$, etc.; $R^{\text{III}} =$ cerium and yttrium metals chiefly.

Occurrence. Rio Arriba County: Petaca district.

SCHEELITE.

Physical characteristics. Tetragonal-pyramidal. Twins, both as contact- and penetration-twins. Habit octahedral,

The first part of the report deals with the general situation in the country. It is noted that the economy is generally stable, but there are some concerns about the future. The government has taken steps to improve the situation, but more needs to be done.

CONCLUSIONS

In conclusion, the report shows that the country is making progress, but there are still many challenges ahead. The government should continue to work on improving the economy and the social situation. It is important to have a clear vision for the future and to take the necessary steps to achieve it.

The second part of the report deals with the specific details of the economy. It is noted that the government has taken steps to improve the situation, but more needs to be done. The report also discusses the role of the private sector and the importance of investment.

RECOMMENDATIONS

The report recommends that the government should continue to work on improving the economy and the social situation. It is important to have a clear vision for the future and to take the necessary steps to achieve it. The report also recommends that the private sector should play a larger role in the economy.

also tabular. Also reniform with columnar structure; massive granular. Cleavage: pyramidal, distinct. Fracture uneven. Brittle. H.- 4.5-5. Sp.G.- 5.9-6.1. Luster vitreous, inclining to adamantine. Color white, yellowish white, pale yellow, brownish, greenish, reddish. Streak white. Transparent to translucent.

Chemical composition. Calcium tungstate, CaWO_4 . Molybdenum is usually present, up to 8%.

Occurrence. Grant County: (?) Hidalgo County: Apache No. 2 and Fremont districts. Lincoln County: White Oaks district. Luna County: Victorio district. Rio Arriba County: Petaca district. San Miguel County: El Porvenir district. Santa Fe County: New Placers district. Socorro County: San Andres Mountains district (Grandview Canyon).

SEPIOLITE. Meerschaum.

Physical characteristics. Compact, with a smooth feel, and fine earthy texture, or clay-like. Microscopically is shown to be a mixture of fine fibrous material and an amorphous substance of apparently the same composition. The fibrous mineral has been called alpha-sepiolite or para-sepiolite; the amorphous material beta-sepiolite; the mixture forms the variety meerschaum. H.- 2-2.5; impressible by the finger-nail. Sp.G.- 2. In dry masses floats on

also known as *Staphylinus*...
 also known as *Staphylinus*...
 also known as *Staphylinus*...
 also known as *Staphylinus*...
 also known as *Staphylinus*...

also known as *Staphylinus*...
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REFERENCES

also known as *Staphylinus*...
 also known as *Staphylinus*...
 also known as *Staphylinus*...
 also known as *Staphylinus*...
 also known as *Staphylinus*...

water. Color grayish white, white, or with a faint yellowish or reddish tinge; bluish green. Opaque.

Chemical composition. $H_4Mg_2Si_3O_{10}$, or $2H_2O.2MgO.3SiO_2$. May contain hygroscopic water. Copper and nickel may replace part of the magnesium.

Occurrence. Grant County: Juniper and Meerschaum districts. San Miguel County: near Sapella.

SERPENTINE.

Physical characteristics. Monoclinic. In distinct crystals, but only as pseudomorphs. Sometimes foliated, folia rarely separable; also delicately fibrous, the fibers often easily separable, and either flexible or brittle. Usually massive, but microscopically finely fibrous and felted, also fine granular to impalpable or cryptocrystalline; slaty. Crystalline in structure, but often nearly isotropic by compensation; amorphous. Cleavage: prismatic (50° angle), in chrysotile (asbestos). Fracture usually conchoidal or splintery. Feel smooth, sometimes greasy. H.— 2.5–4, rarely 5.5. Sp.G.— 2.50–2.65; some fibrous varieties 2.2–2.3. Luster subresinous to greasy, pearly, earthy; resin-like, or wax-like; usually feeble. Color leek-green, blackish green; oil- and siskin-green; brownish red, brownish yellow; none bright; sometimes nearly white.

Color greenish white, white on the sides of the
leaf of reddish white; base green.

Blechnum. Blechnum. Blechnum. Blechnum.
The whole of the plant is green.

Common. Found in the mountains and hills of
the island of Java.

Blechnum

Blechnum. Blechnum. Blechnum. Blechnum.
The whole of the plant is green.

Also the whole of the plant is green.

The whole of the plant is green.

On exposure, often becoming yellowish gray. Streak white, slightly shining. Translucent to opaque.

Chemical composition. A hydrous magnesium silicate, $H_4Mg_3Si_2O_9$, or $3MgO.2SiO_2.2H_2O$.

Varieties. 1. Asbestos. Asbestus. Chrysotile. Delicately fibrous, fibers usually flexible and easily separating; luster silky, or silky metallic; color greenish white, green, olive-green, yellow, and brownish. Sp.G.— 2.219.
2. Ricolite. A banded variety with a fine green color.

Occurrence.

Var. Asbestos. See separate description, p.138.

Var. Ricolite. Grant County: on west side of Gila River, north of Red Rock P.O.

SIDERITE. Chalybite. Spathic Iron.

Physical characteristics. Hexagonal-rhombohedral. Crystals commonly rhombohedral, the faces often curved and built up of sub-individuals like dolomite. Often cleavable massive to coarse or fine granular. Also in botryoidal and globular forms, subfibrous within, occasionally silky fibrous; compact and earthy. Cleavage: rhombohedral, perfect. Fracture uneven or subconchoidal. Brittle. H.— 3.5-4. Sp.G.— 3.83-3.88. Luster vitreous, inclining to pearly.

In autumn, when becoming yellowish gray. In winter, slightly reddish. Translucent to opaque.

Phragmites communis. A vigorous aquatic plant.

Hydrophilous, on damp, boggy soil.

Phragmites communis. *Phragmites communis*. *Phragmites communis*.

Stems, leaves usually flexible and easily separating.

Leaves silky, or silky beneath; color greenish white.

Green, blue-green, yellow, and brownish. 2. 2. 2. 2.

2. *Phragmites*. A sedge variety with a fine green color.

Phragmites

For *Phragmites*. See separate description, p. 155.

Var. *laetifolia*. Great variety on west side of Ohio.

River, north of Red Bank P.O.

Phragmites communis. *Phragmites communis*.

Phragmites communis. *Phragmites communis*. *Phragmites communis*.

Usually *Phragmites*. The leaves often curved and brittle.

of sub-individuals like *Phragmites*. Often also in a massive

to be seen in the *Phragmites*. Also in *Phragmites* and *Phragmites*.

the leaves, sometimes white, occasionally with *Phragmites*.

compact and with *Phragmites*. *Phragmites*. *Phragmites*.

Phragmites communis or *Phragmites communis*. *Phragmites*. 2. 2. 2.

2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.

Color ash-gray, yellowish gray, greenish gray, also brown and brownish red, rarely green; and sometimes white. Streak white. Translucent to subtranslucent.

Chemical composition. Iron protocarbonate, FeCO_3 . Manganese may be present, also magnesium and calcium.

Varieties. 1. Sphaerosiderite. Sphaerosiderite. In globular concretions, either solid or concentric scaly, usually with fibrous structure.

Occurrence. Colfax County: along Canadian Valley. Grant County: Black Hawk and Pinos Altos districts. Hidalgo County: Lordsburg and San Simon districts. Luna County: Victorio district. Rio Arriba County: Bromide and Hopewell districts. Sandoval County: Cochiti district. Santa Fe County: Cerrillos district (along Galisteo Creek), and Old Placers district. Sierra County: Cuchillo Negro and Hillsboro districts. Taos County: Twining district.

Var. Sphaerosiderite. Colfax County: along Canadian Valley. Santa Fe County: Cerrillos district (along Galisteo Creek).

SILLIMANITE. Fibrolite.

Physical characteristics. Orthorhombic. Prismatic faces striated and rounded. Commonly in long slender crystals

Color red-gray, yellowish gray, greenish gray, blue gray
and brownish red, rarely green and sometimes white. The
white. Treatment as before.

Species description. One specimen, 1911. No
name yet known. Also common in the

var. subsp. 1. Subsp. 1. Specimens in the
the collection, either with or without name, with
with three specimens.

Subsp. 2. Color brown; also brownish yellow, brown
brown black and blue black. No name.

Subsp. 3. Color brown and blue black. No name.

Subsp. 4. Color brown and blue black. No name.

Subsp. 5. Color brown and blue black. No name.

Subsp. 6. Color brown and blue black. No name.

Subsp. 7. Color brown and blue black. No name.

REFERENCES

Physical characteristics. Color brown and blue black.
attained and remains. Common in the state of

not distinctly terminated; often in close parallel groups, passing into fibrous and columnar massive forms; sometimes radiating. Cleavage: one direction, prismatic, very perfect. Fracture uneven. H.- 6-7. Sp.G.- 3.23-3.24. Luster vitreous, inclining to subadamantine. Color hair-brown, grayish brown, grayish white, grayish green, pale olive-green. Streak uncolored. Transparent to translucent.

Chemical composition. Al_2SiO_5 , or $(\text{AlO})\text{AlSiO}_4$, like andalusite and kyanite. The most stable of the three forms of aluminum silicate.

Occurrence. Taos County: Glenwoody and Picuris districts.

SILVER.

Physical characteristics. Isometric. Crystals commonly distorted, in acicular forms, reticulated or arborescent shapes; coarse to fine filiform; also massive, in plates and flattened scales. Cleavage none. Ductile and malleable. Fracture hackly. H.- 2.5-3. Sp.G.- 10.1-11.1, pure 10.5. Luster metallic. Color and streak silver-white, often gray to black by tarnish.

Chemical composition. Silver, Ag, with some gold (up to 10%), copper, and sometimes platinum, antimony, bismuth,

and distinctly flattened; often in close parallel groups,
passing into filiform and columnar massive forms; sometimes
radiating. Cleavage and direction. Prismatic, very per-
fect. Fracture uneven. H. 6-7. Sp.G. 2.85-3.00. Luster
vitreous, inclining to subadamantine. Color pale-
brown, grayish brown, grayish white, grayish green, pale
olive-green. Streak uncolored. Transparent to translucent.

Chemical composition. Al_2SiO_5 , or $(AlO)_2Si_2O_7$, etc.
silicic acid and water. The most stable of the three
forms of aluminum silicates.

Localities. Two County, Ontario and New York districts.

SILVER.

Physical characteristics. Lustrous. Crystals commonly
dissected, in acicular forms, radiated or arborescent
groups occur in the fissures; also massive, in plates
and flattened scales. Cleavage none. Ductile and malleable.
Fracture hackly. H. 2.5-3. Sp.G. 10.5-11.5. Luster metallic. Color and silver
white, often gray to black by oxidation.

Chemical composition. Silver, the white metal, for the
100, copper, and sometimes platinum, antimony, bismuth,

and mercury.

Occurrence. Catron County: Mogollon district. Colfax County: Baldy district. Grant County: Black Hawk, Central, Chloride Flat, Fleming, Georgetown, Gold Hill, Lone Mountain, and Pinos Altos districts. Hidalgo County: Lordsburg and San Simon districts. Luna County: Victorio district. Sierra County: Chloride, Hermosa, Hillsboro, Kingston, Lake Valley, and Tierra Blanca districts. Socorro County: Cat Mountain, Magdalena, North Magdalena, San Jose, and Socorro Peak districts. Valencia County: Zuni Mountains district.

SKUTTERUDITE.

Physical characteristics. Isometric-pyritohedral. In crystals; also massive-granular. Cleavage: cubic, distinct. Fracture uneven. Brittle. H.— 6. Sp.G.— 6.5-6.9. Luster bright metallic. Color between tin-white and pale lead-gray.

Chemical composition. Cobalt arsenide, CoAs_3 .

Varieties. 1. Nickel-skutterudite. Massive, granular. H.— 5. Color gray. Streak black. Chemical composition: RAs_3 , where $\text{R} = \text{Ni}:\text{Co}:\text{Fe} = 4:2:1$. "A probably new nickel arsenide from Grant County, New Mexico." (Waller, E., and Moses, A. J., School of Mines Quarterly, 14: 49-51 (1892).

Occurrence. Grant County: Black Hawk district.

Var. Nickel-skutterudite. Grant County: Black Hawk district.

SMALTITE-CHLOANTHITE.

Physical characteristics. Isometric-pyritohedral. Crystals rare. Commonly massive; in reticulated or other imitative shapes. Cleavage indistinct. Fracture granular and uneven. Brittle. H.- 5.5-6. Sp.G.- 5.7-6.8. Luster metallic. Color tin-white, inclining, when massive, to steel-gray, sometimes iridescent, or grayish from tarnish. Streak grayish black. Opaque.

Chemical composition. Smaltite is essentially cobalt diarsenide. Chloanthite is nickel diarsenide. Analyses show considerable variations, RAs_2 representing most nearly the composition, where R = cobalt and (or) nickel.

Occurrence. Grant County: Black Hawk district.

SMITHSONITE. Calamine. Dry-bone Ore.

Physical characteristics. Hexagonal-rhombohedral. Rarely well crystallized; faces curved and rough. Usually reniform,

Geography. Grand County, Black Hawk District.

Var. *trichomanes*. Grand County, Black Hawk

District.

FRUITING PLANTS

Fraxinus americana. Jackson County, Wisconsin. *Cyclops*

var. Commonly sessile; in pedicels or other pedicels

stipules. Stipules indistinct. Fructs greenish and narrow-

ovate. St. 3-4. Sp. 2-3. St. 4-5. St. 5-6. St. 6-7.

Color light, inclining, more sessile, to dark-gray.

Stipules trilobate, or ovate from margin. St. 3-4

grayish black. Sp. 2-3.

Urtica dioica. Stipules in axillary sessile

stipules. Stipules in axillary sessile

stipules. Stipules in axillary sessile

stipules, stipules in axillary sessile

Geography. Grand County, Black Hawk District.

FRUITING PLANTS

Fraxinus americana. Jackson County, Wisconsin. *Cyclops*

var. Commonly sessile; in pedicels or other pedicels

botryoidal, or stalactitic, and in crystalline incrustations; also granular, and sometimes impalpable, occasionally earthy and friable. Cleavage: rhombohedral, perfect. Fracture uneven to imperfectly conchoidal. Brittle. H.— 5.5. Sp.G.— 4.30–4.45. Luster vitreous, inclining to pearly. Color white, often grayish, greenish, brownish white, sometimes green, blue, and brown. Streak white. Subtransparent to translucent.

Chemical composition. Zinc carbonate, $ZnCO_3$. Iron, manganese, cobalt, calcium, and magnesium carbonates usually present in small quantities.

Varieties. 1. Herrerite. A cupriferous variety. Apple-green, with rhombohedral cleavage. 2. Monheimite. Ferriferous Smithsonite. Contains over 20% iron carbonate, $FeCO_3$.

Occurrence. Bernalillo County: "Sandia Mountains" (?). Grant County: Carpenter, Central, Fierro-Hanover, and Pinos Altos districts. Luna County: Cooks Peak, Florida Mountains, and Tres Hermanas districts. San Miguel County: Willow Creek district. Santa Fe County: Cerrillos district. Sierra County: Cuchillo Negro, Hermosa, Hillsboro, Kingston, and Macho districts. Socorro County: Iron Mountain No. 2 (?) (given as "Tenmile district"), Lemitar Mountains, and Magdalena districts.

hydrophilic, or elastin, and in crystalline form, also granular, and sometimes irregular, sometimes with a central nucleus. It is reported to be present in the following tissues: heart, liver, spleen, and various glands. It is also present in the following plants: wheat, corn, and various other cereals. It is also present in the following animals: man, pig, and various other mammals.

Chemical composition. This compound, like other similar compounds, contains carbon, hydrogen, and oxygen, and is present in small quantities.

Yeast. - Yeast is a microscopic organism, which grows with the following characteristics: it is a unicellular organism, it is spherical in shape, and it is present in small quantities.

Yeast is a microscopic organism, which grows with the following characteristics: it is a unicellular organism, it is spherical in shape, and it is present in small quantities.

Yeast is a microscopic organism, which grows with the following characteristics: it is a unicellular organism, it is spherical in shape, and it is present in small quantities.

Yeast is a microscopic organism, which grows with the following characteristics: it is a unicellular organism, it is spherical in shape, and it is present in small quantities.

Yeast is a microscopic organism, which grows with the following characteristics: it is a unicellular organism, it is spherical in shape, and it is present in small quantities.

Var. Herrerite. Socorro County: Magdalena district.

Var. Monheimite. Socorro County: Magdalena district.

SODALITE. (?)

A very doubtful occurrence, in microscopic grains.
Colfax County: Pleasant Valley region (?).

SODA NITER. Chile Saltpeter. (?)

Physical characteristics. Hexagonal-rhombohedral. Usually massive, as an incrustation or in beds. Cleavage: rhombohedral, perfect. Fracture conchoidal, seldom observable. Rather sectile. H.— 1.5–2. Sp.G.— 2.24–2.29. Luster vitreous. Color white; also reddish brown, gray, and lemon-yellow. Transparent. Taste cooling.

Chemical composition. Sodium nitrate, NaNO_3 .

Occurrence. Hidalgo County: (?) (given as "southern New Mexico"; also as near the International Boundary.)

SPHALERITE. Zinc Blende or Blende. Black Jack.
Mock-Lead. False Galena.

Physical characteristics. Isometric-tetrahedral. Often in

Var. brachyptera. - Lower County, Washington District.
Var. umbellata. - Lower County, Washington District.

SECT. (1)

a very distinct character, in microscopic structure.
California County, Washington Valley region (17).

SECT. (2)

Physalis physalis, Physalis physalis, Physalis physalis.
various, as an introduction or in beds. Characteristic
of the Pacific. Physalis physalis, Physalis physalis.
Upper section, N. 1-3-3, N. 1-3-3, N. 1-3-3, N. 1-3-3.
various. Color white; also reddish brown, gray, and black.
various. Physalis physalis. Physalis physalis.

Physalis physalis, Physalis physalis, Physalis physalis.

Physalis physalis, Physalis physalis (17) (given as Physalis physalis)
Mexico, also in near the International Boundary.

PHYSALIS, Physalis physalis, Physalis physalis,
Physalis physalis, Physalis physalis.

Physalis physalis, Physalis physalis, Physalis physalis.

tetrahedrons. Cube, dodecahedron, and tristetrahedron are forms also present at times. Twins common, twinning often repeated, sometimes as polysynthetic lamellae. Crystals often distorted or rounded. Commonly massive cleavable, coarse to fine granular and compact; also foliated, sometimes fibrous and radiated or plumose; also botryoidal and other imitative shapes. Cryptocrystalline to amorphous, the latter sometimes as a powder. Cleavage: dodecahedral, highly perfect. Fracture conchoidal. Brittle. H.— 3.5–4. Sp.G.— 3.9–4.1. Luster resinous to adamantine. Color commonly yellow, brown, black; also red, green to white, and when pure nearly colorless. Streak brownish to light yellow, and white. Transparent to translucent. Some varieties will phosphoresce when scratched.

Chemical composition. Zinc sulphide, ZnS. Often contains iron and manganese, and traces of many other metals.

Varieties. 1. Marmatite. The ferriferous variety, containing up to 20% iron. Color dark brown to black. Sp.G.— 3.9–4.05. The proportion of FeS to ZnS varies from 1:5 to 1:2. 2. Frzibramite. A cadmiferous variety, in which the amount of cadmium is less than 5%.

Occurrence. Bernalillo County: "Sandia Mountains" (?). Catron County: Mogollon district. Colfax County: Baldy district. Dona Ana County: Modoc and Organ districts. Grant County: Burro Mountains, Carpenter, Central, Fierro-Hanover,

Gold Hill, Pinos Altos, Santa Rita, Steeple Rock, and White Signal districts. Hidalgo County: Apache No. 2, Fremont, Lordsburg, and Steins Pass districts. Lincoln County: Nogal district. Luna County: Cooks Peak, Florida Mountains, and Tres Hermanas districts. Rio Arriba County: Bromide and Hopewell districts. Sandoval County: Cochiti district. San Miguel County: Rociada (?) and Willow Creek districts. Santa Fe County: Cerrillos, New Placers, and Santa Fe districts. Sierra County: Chloride, Cuchillo Negro, Hermosa, Hillsboro, Kingston, Lake Valley, and Macho districts. Socorro County: Jones Camp, Lemitar Mountains, Magdalena, San Andres Mountains (Mockingbird Gap), and Water Canyon districts. Taos County: Red River and Twining districts.

Var. Marmatite. Grant County: Central district. San Miguel County: Willow Creek district.

Var. Przibramite. Grant County: Carpenter district.

SPODUMENE. Triphane.

Physical characteristics. Monoclinic. Crystals prismatic, often flattened; the vertical planes striated and furrowed; crystals sometimes very large. Also massive, cleavable. Cleavage: two directions, perfect, one parallel to the tabular face. A lamellar structure parallel to the tabular face sometimes very prominent, a crystal then separating

Gold Hill, Stone Hill, Snake Hill, Olympic Peak, and White
 Horse Peak. Historic County Agency No. 2, Fremont,
 Idaho, and other local districts. Lincoln County
 Agency No. 1, Lemhi County Peak, Kootenai Mountains,
 and Three Mountains districts. Rio Arriba County, New
 Mexico. San Miguel County, Nevada. San Juan County, Nevada.
 San Mateo County, Nevada. San Yacinto, and Santa Fe dis-
 tricts. Sierra County, California. Cochise County, Arizona.
 Winkelman, Kingman, Iron Valley, and White Bluffs.
 Coconino County, Jones Camp, Jackson Mountains, Redoubt,
 San Andres Mountains (Washington Gap), and Water Canyon
 districts. Tooe County, Red River and Teton districts.
 Var. humboldtii. Grant County, Nevada. San
 Miguel County, Silver Peak district.
 Var. boliviana. Grant County, Carpenter district.

DISCUSSION.

Physical characteristics. Heterostichous, upright primordia,
 often flattened; the vertical planes vertical and horizontal;
 upright sometimes very large; also massive, clavate.
 Dissepiment two directions, posterior one parallel to the
 lateral ones. A lamellar structure parallel to the lateral
 ones sometimes very prominent, a vertical line separating

into thin plates. Fracture uneven to subconchoidal. Brittle. H.— 6.5-7. Sp.G.— 3.13-3.20. Luster vitreous, on cleavage surfaces somewhat pearly. Color greenish white, grayish white, yellowish green, emerald-green, yellow, amethystine purple. Streak white. Transparent to translucent.

Chemical composition. $\text{LiAl}(\text{SiO}_3)_2$; or $\text{Li}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 4\text{SiO}_2$. Generally contains a little sodium.

Varieties. 1. Cymatolite. An alteration product of spodumene. Spodumene is altered by soda-bearing solutions to a mixture of eucriptite, LiAlSiO_4 , and albite, $\text{NaAlSi}_3\text{O}_8$. The eucriptite is later changed through the influence of potash salts to muscovite. The mixture of albite and muscovite is known as cymatolite. It has a wavy fibrous structure and silky luster.

Occurrence. Rio Arriba County: Petaca district. Taos County: Harding Mine district.

Var. Cymatolite. Rio Arriba County: Petaca district (Ojo Caliente).

SPURRITE.

Physical characteristics. Probably monoclinic. In granular cleavable masses. Cleavage: two directions, at angles

into this place. Fracture zones are also present. The
 size is 1.5-2.5. Fracture zones are also present. The
 cleavage surfaces are smooth. The cleavage surfaces are
 grayish white, yellowish green, brownish green, yellow.
 translucent purple. Fracture zones are also present. The
 fracture zones are also present. The fracture zones are also present.

General description. The fracture zones are also present. The
 fracture zones are also present. The fracture zones are also present.

Yakima. 1. Yakima. An alteration product of
 mica. The mica is altered by both partial and complete
 a mixture of chlorite, illite, and kaolinite. The
 the mica is altered through the influence of
 potassium ions. The alteration of mica is
 controlled by the amount of potassium. It has a very
 structure and size.

General description. The fracture zones are also present. The
 fracture zones are also present. The fracture zones are also present.

Ver. Yakima. The fracture zones are also present. The
 fracture zones are also present. The fracture zones are also present.

INDEX

General description. The fracture zones are also present. The
 fracture zones are also present. The fracture zones are also present.

of 79° , one good, the second fair. Fracture uneven to splintery. Brittle. H.— 5. Sp.G.— 3. Luster vitreous to resinous. Color pale gray with bluish tinge, or yellow to colorless. Transparent to translucent.

Chemical composition. $2Ca_2SiO_4 \cdot CaCO_3$.

Occurrence. Luna County: Tres Hermanas district.

STAUROLITE. Staurotide.

Physical characteristics. Orthorhombic. Twins cruciform, the crystals crossing nearly at right angles; also crossing at an angle of 60° approx.; also in repeated twins. Crystals commonly prismatic and flattened; often with rough surfaces. Cleavage: one direction, distinct but interrupted. Fracture subconchoidal. Brittle. H.— 7-7.5. Sp.G.— 3.65-3.77. Luster subvitreous, inclining to resinous. Color dark reddish brown to brownish black, and yellowish brown. Streak uncolored to grayish. Translucent to nearly or quite opaque.

Chemical composition. $HFeAl_5Si_2O_{13}$, or $(AlO)_4(AlOH)Fe(SiO_4)_2$, or $H_2O \cdot 2FeO \cdot 5Al_2O_3 \cdot 4SiO_2$.

Occurrence. Taos County: Glenwoody and Picuris districts. Torrance County: in Manzano Mountains (?).

of 70°, not good; the second fair. Transmits water to
spindly. Hyaline. N. 2. Sp. G. 2. Under microscope
transmits. Color pale grey with slight tinge of yellow in
colours. Transmitted to transmission.

Chemical composition. $C_{10}H_{12}O_2$

Geography. Iowa County, Two Harrows district.

SYNOPSIS. Stenonema.

Physical characteristics. Crystalline. Twin crystals,
the crystals occurring nearly at right angles; also occurring
at an angle of 60° approx. also in tabular form. Crystals
fairly commonly prismatic and flattened; often with rough
surfaces. Cleavage not distinct, distinct and later-
tended. Transmits subtranslucent. Hyaline. N. 2-3.
Sp. G. 2.45-2.55. Under microscope, inclining to trans-
mit. Color pale reddish brown to brownish black, and yellowish
brown. Green uncolored to grayish. Transmits
to nearly or quite opaque.

Chemical composition. $C_{10}H_{12}O_2$ or
 $(C_{10}H_{12}O_2)_2$ or $C_{20}H_{24}O_4$

Geography. Two Harrows, Winnebago and Howard districts.
Two Harrows County, in Winnebago district (V).

STEPHANITE. Brittle Silver Ore.

Physical characteristics. Orthorhombic. Crystals usually short prismatic or tabular. Twins, often repeated, pseudo-hexagonal. Also massive, compact and disseminated. No distinct cleavage. Fracture subconchoidal to uneven. Brittle. H.- 2-2.5. Sp.G.- 6.2-6.3. Luster metallic. Color and streak iron-black. Opaque.

Chemical composition. $5Ag_2S.Sb_2S_3$.

Occurrence. Colfax County: Baldy district (?). Hidalgo County: Fremont district (?). Rio Arriba County: Bromide district. Sierra County: Lake Valley district. Socorro County: San Jose district (?).

STERNBERGITE.

Physical characteristics. Orthorhombic. Crystals tabular, parallel to the base. Commonly in fan-like aggregations; twins common. Cleavage: basal, highly perfect. Thin laminae flexible, like tin-foil. H.- 1-1.5. Sp.G.- 4.215. Luster metallic. Color pinchbeck-brown. Streak black. Opaque.

Chemical composition. $AgFe_2S_3$, or $Ag_2S.Fe_4S_5$.

Occurrence. Catron County: Mogollon district. (Indefinite:

STEVENS

Physical characteristics. ...
Color and shape ...

General description

County: ...
County: ...
County: ...

STEVENS

Physical characteristics. ...
Color and shape ...

General description

County: ...

Spring Hill District (?).

STETEFELDITE. (?)

Physical characteristics. Massive. H.— 3.5–4.5. Sp.G.— 4.12–4.24. Color blackish and brown. Streak shining.

Chemical composition. Exact composition uncertain. A deduced analysis gives the following proportions:

Sb₂O₅ 46.47%, S 4.59%, Ag 23.23%, Cu 2.27%, FeO 2.41%,
CuO 13.28%, H₂O 7.75% = 100.00%.

Occurrence. (Indefinite: Spring Hill district. (?).)

STIBNITE. Antimonite. Antimony Glance.

Physical characteristics. Orthorhombic. Crystals prismatic; striated or furrowed vertically; often curved or twisted. The better crystals have very numerous faces. Commonly in confused aggregates or radiating groups of acicular crystals; massive, coarse or fine columnar, commonly bladed, less often granular to impalpable. Cleavage: one direction, prismatic, highly perfect; four other less perfect cleavages. Planes of better cleavage are also gliding-planes, movement on which may yield warped and curved crystals. Fracture small conchoidal. Slightly

Spring Hill (1915)

MINERALOGY (2)

Quartz. - Crystals small, colorless to brownish, often in groups.

4.11-4.22. Color: colorless and brown. Glassy luster.

Orthoclase. - Small, colorless to brownish, often in groups.

Color: colorless and brown. Glassy luster.

4.11-4.22. Color: colorless and brown. Glassy luster.

4.11-4.22. Color: colorless and brown. Glassy luster.

Plagioclase. - Crystals small, colorless to brownish, often in groups.

MINERALOGY (1)

Quartz. - Crystals small, colorless to brownish, often in groups.

Color: colorless and brown. Glassy luster.

4.11-4.22. Color: colorless and brown. Glassy luster.

4.11-4.22. Color: colorless and brown. Glassy luster.

4.11-4.22. Color: colorless and brown. Glassy luster.

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4.11-4.22. Color: colorless and brown. Glassy luster.

4.11-4.22. Color: colorless and brown. Glassy luster.

sectile. H.- 2. Sp.G.- 4.52-4.62. Luster metallic, highly splendid on cleavage or fresh crystalline surfaces. Color and streak lead-gray, inclining to steel-gray; subject to blackish tarnish, sometimes iridescent.

Chemical composition. Antimony trisulphide, Sb_2S_3 . Sometimes auriferous, also argentiferous.

Occurrence. Grant County: Santa Rita district. Hidalgo County: Hachita district. Santa Fe County: Cerrillos district. Taos County: Twining district (?).

STILBITE. Desmine.

Physical characteristics. Monoclinic. Crystals uniformly cruciform penetration-twins, with the appearance of a rhombic pyramid. Usually thin tabular. These compound crystals are often grouped in nearly parallel position, forming sheaf-like aggregates. Also divergent or radiated; sometimes globular and thin lamellar-columnar. Cleavage: one direction, perfect. Fracture uneven. Brittle. H.- 3.5-4. Sp.G.- 2.094-2.205. Luster vitreous; of cleavage surface pearly. Color white; occasionally yellow, brown, or red, to brick-red. Streak uncolored. Transparent to translucent.

Chemical composition. For most varieties,

... 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.

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$(\text{Na}_2, \text{Ca})\text{Al}_2\text{Si}_6\text{O}_{16} \cdot 6\text{H}_2\text{O}$, or $(\text{Na}_2, \text{Ca})\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 6\text{SiO}_2 \cdot 6\text{H}_2\text{O}$.

Occurrence. Colfax County: Baldy district.

STROMEYERITE.

Physical characteristics. Orthorhombic. Rarely in crystals, sometimes twinned. Commonly massive, compact. Fracture subconchoidal. H.— 2.5-3. Sp.G.— 6.15-6.3. Luster metallic. Color and streak dark steel-gray. Opaque.

Chemical composition. Sulphide of silver and copper, $(\text{Ag}, \text{Cu})_2\text{S}$, or $\text{Ag}_2\text{S} \cdot \text{Cu}_2\text{S}$.

Occurrence. Catron County: Mogollon district. Socorro County: "from a region immediately west of the Magdalenas—the 'Sophia'." (?)

SULPHUR.

Physical characteristics. Orthorhombic. Crystals commonly acute pyramidal; sometimes thick tabular. Rarely twinned. Also massive, in reniform shapes, incrusting, stalactitic and stalagmitic; in powder. No distinct cleavage. Fracture conchoidal to uneven. Rather brittle to imperfectly sectile. H.— 1.5-2.5. Sp.G.— 2.05-2.09. Luster resinous. Color sulphur-yellow, straw- and honey-yellow, yellowish

1892. *Journal of the Entomological Society of America*, 3: 1-10.

1893. *Journal of the Entomological Society of America*, 4: 1-10.

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brown, greenish, reddish to yellowish gray. Streak white. Transparent to translucent. A non-conductor of electricity; by friction negatively electrified. A poor conductor of heat.

Chemical composition. Pure sulphur, S; often contaminated with clay, bitumen, etc.

Occurrence. Lincoln County: White Oaks district. Rio Arriba County: in one of the volcanic cones north of Tres Piedras. Sandoval County: Jemez Sulphur district (just above Jemez Springs and at Sulphur Springs). Eddy or Lea County: in southeastern part of the State, near the Texas line.

SYLVANITE. Graphic Tellurium. (?)

Physical characteristics. Monoclinic. Twins common, giving rise to branching arborescent forms resembling written characters; also bladed and imperfectly columnar to granular. Cleavage: one direction, perfect. Fracture uneven. Brittle. H.— 1.5–2. Sp.G.— 7.9–8.3. Luster metallic, brilliant. Color and streak pure steel-gray to silver-white, inclining to yellow.

Chemical composition. Telluride of gold and silver, $(\text{Au,Ag})\text{Te}_2$, with Au:Ag = 1:1.

Occurrence. Sierra County: Tierra Blanca district (?).

SYLVITE.

Physical characteristics. Isometric. Crystals cubes, often with octahedral truncations. Also in granular crystalline masses; compact. Cleavage: cubic, perfect. Fracture uneven. Brittle. H.- 2. Sp.G.- 1.97-1.99. Luster vitreous. Colorless when pure; white, bluish or yellowish red from inclusions. Soluble, taste like that of common salt, but bitter.

Chemical composition. Potassium chloride, KCl. Sometimes contains sodium chloride.

Varieties. 1. Sylvinite. See halite, p.212.

Occurrence. Eddy County: Carlsbad Potash district.

TALC.

Physical characteristics. Orthorhombic or monoclinic. Rarely in tabular crystals, hexagonal or rhombic with a prismatic angle of 60° . Usually foliated massive; sometimes in globular and stellate groups; also granular massive, coarse or fine; fibrous (pseudomorphous); also compact or cryptocrystalline. Cleavage: basal, perfect.

Geography. - North County, North Adams District (77).

MINERAL

Physical characteristics. - Locality. - Crystals often
 often with octahedral projections. Also in granular crys-
 talline masses composed. Discovered in 1850, by
 J. W. Foster, U. S. G. - 1857-1858. Located
 in Adams. Crystals often white, bluish or yellowish
 and from inclosures. Colorless, mass like that of common
 salt, but bitter.

Chemical composition. - Formulae: KCl . Contains
 contains sodium chloride.

Localities. - 1. Adams. - See Adams, p. 121.
Geography. - North County, Adams District.

MIN.

Physical characteristics. - Crystals often in
 rarely in tabular crystals; hexagonal or rhombohedral in
 rhombohedral shape of 60°. Usually foliated masses; some-
 times in granular and white groups; also granular and
 also, color of blue; bluish (pyrochroite); also con-
 sists of orthopyroxene. Discovered in 1850, by

Sectile. Flexible in thin laminae, but not elastic. Feel greasy. H.- 1-1.5. Sp.G.- 2.7-2.8. Luster pearly on cleavage surface. Color apple-green to white, or silvery white; also greenish gray and dark green; sometimes bright green perpendicular to cleavage surface, and brown and less translucent at right angles to this direction; brownish to blackish green and reddish when impure. Streak usually white; of dark green varieties lighter than the color. Subtransparent to translucent.

Chemical composition. An acid metasilicate of magnesium, $H_2Mg_3(SiO_3)_4$, or $H_2O.3MgO.4SiO_2$.

Varieties. 1. Native Ultramarine. A magnesium silicate near talc in composition, in veins and streaks of a bright green color. As separated it is dull and earthy.

2. Steatite. Soapstone. Massive talc, either granular, fine granular, or cryptocrystalline, or hard and slaty. Color grayish green or brownish gray, milk-white in French chalk.

Occurrence. Grant County: Burro Mountains district. Rio Arriba County: Petaca district. Santa Fe County: New Placers (or possibly Old Placers) district. Sierra County: Kingston district. Socorro County: San Andres Mountains district (Salinas Peak).

Var. Native Ultramarine. Grant County: near Silver

City.

Var. Steatite. (Indefinite: reported from "various localities".)

TELLURIUM.

Physical characteristics. Hexagonal-rhombohedral. Crystals commonly minute hexagonal prisms, with the primary rhombohedron, or both primary and secondary rhombohedrons, as terminations. Commonly massive, columnar to fine granular. Cleavage: prismatic, perfect. Somewhat brittle. H.- 2-2.5. Sp.G.- 6.1-6.3. Luster metallic. Color and streak tin-white.

Chemical composition. Pure tellurium, Te, sometimes with a little selenium, also gold, iron, etc.

Occurrence. Catron County: Mogollon (?) and Wilcox districts. Grant County: Burro Mountains district (?); at a prospect 41 miles northwest of Silver City. Hidalgo County: Hachita district. Sierra County: Hillsboro (?) and Tierra Blanca (?) districts.

TENNANTITE.

Physical characteristics. Isometric-tetrahedral. Crystals

Mr. [Name] (Detailed report from [Name]
[Name])

RESULTS

Physical characteristics: [Name]
[Name] [Name] [Name] [Name] [Name] [Name]
[Name] [Name] [Name] [Name] [Name] [Name]
[Name] [Name] [Name] [Name] [Name] [Name]
[Name] [Name] [Name] [Name] [Name] [Name]
[Name] [Name] [Name] [Name] [Name] [Name]
[Name] [Name] [Name] [Name] [Name] [Name]

Chemical analysis: [Name] [Name] [Name] [Name]
[Name] [Name] [Name] [Name] [Name] [Name]

Observations: [Name] [Name] [Name] [Name] [Name] [Name]

Notes: [Name] [Name] [Name] [Name] [Name] [Name]

Proposed [Name] [Name] [Name] [Name] [Name] [Name]

County [Name] [Name] [Name] [Name] [Name] [Name]

and [Name] [Name] [Name] [Name] [Name] [Name]

CONCLUSIONS

Physical characteristics: [Name] [Name] [Name] [Name]

often dodecahedral. Also massive, compact. Cleavage none. Fracture subconchoidal to uneven. Rather brittle. H.- 3-4. Sp.G.- 4.37-4.49. Luster metallic, often splendid. Color and streak blackish lead-gray to iron-black. Opaque.

Chemical composition. Probably $3\text{Cu}_2\text{S} \cdot \text{As}_2\text{S}_3$. The mineral grades into tetrahedrite as arsenic is replaced by antimony.

Occurrence. Grant County: Central and Pinos Altos districts. Hidalgo County: San Simon district (?). Socorro County: Hansonburg district.

TENORITE.

Physical characteristics. Triclinic, pseudo-monoclinic. Often in thin, shining, flexible scales. Earthy; massive; pulvulent. Cleavage: basal, easy. Fracture conchoidal to uneven. H.- 3-4. Sp.G.- 6.5. Luster metallic. Color steel- or iron-gray when in thin scales; black or grayish black when dull and earthy. Ordinarily soils the fingers when massive and pulvulent.

Chemical composition. Cupric oxide, CuO .

Varieties. 1. Melaconite. A black earthy variety, an oxidation product in copper veins. 2. Melanochalcite. A pitchy black material, a variable mixture of tenorite, chrysocolla, and malachite.

Occurrence. Hidalgo County: Fremont district (?). Socorro County: Magdalena and San Lorenzo districts.

Var. Melaconite. Grant County: Burro Mountains (?) and Santa Rita districts. Lincoln County: Estey district. Luna County: in Deming region. Sandoval County: Nacimiento Mountains district. Sierra County: Caballos Mountains, Chloride, and Kingston districts.

Var. Melanochalcite. Grant County: Burro Mountains district (?).

TETRADYMITTE.

Physical characteristics. Hexagonal-rhombohedral. Crystals small, indistinct. Commonly in bladed forms foliated to granular massive. Cleavage: basal, perfect. Laminae flexible, not very sectile. H.—1.5–2; soils paper. Sp.G.—7.2–7.6. Luster metallic, splendid. Color pale steel-gray.

Chemical composition. Consists of bismuth and tellurium, with sometimes sulphur and a trace of selenium; the analyses for the most part afford the general formula $\text{Bi}_2(\text{Te},\text{S})_3$.

Occurrence. Colfax County: Baldy district. Dona Ana County: Organ district. Hidalgo County: Hachita district. Sierra

COCHRAN. - Highland County: Freedom District (V). -
County: Highland and New Lebanon Districts.

Var. halimifolia. - Great County: North Mountain (V)
and some hills districts. Lincoln County: West district.
Low County: In Oglethorpe region. Hancock County: East
Mountain district. Stone County: Galilee Mountain,
Chickadee, and Kingston districts.

Var. halimifolia. - Great County: North Mountain
District (V).

LEUCOMYXIS

Physalis physalis. - Hancock County: North Mountain. (V)
This small, leafless, commonly in shaded areas
to ground level. Cleavage: Oval, purple, leafless
flattened, not very cordate. H. 1.5-2.5. Color pale green-
7.5-7.8. Larger sessile, glabrous. Color pale green-
gray.

Physalis physalis. - Districts of Lincoln and Talbot
with sometimes vulgar and a trace of color for the small
area for the most part of the general form
2.5(1.5-2.5).

Physalis physalis. - Collier County: West district. Low
County: West district. Wilcox County: North district. Stone

County: Hillsboro district.

TETRAHEDRITE. Gray Copper Ore. Fahlerz.

Physical characteristics. Isometric-tetrahedral. Habit tetrahedral. Also massive; granular, coarse or fine; compact. Cleavage none. Fracture subconchoidal to uneven. Rather brittle. H.— 3-4. Sp.G.— 4.4-5.1. Luster metallic, often splendid. Color between flint-gray and iron-black. Streak like color, sometimes inclining to brown and cherry-red. Opaque; sometimes subtranslucent (cherry-red) in very thin splinters.

Chemical composition. Essentially $3\text{Cu}_2\text{S} \cdot \text{Sb}_2\text{S}_3$. Grades into tennantite as antimony is replaced by arsenic.

Occurrence. Catron County: Mogollon district. Colfax County: Baldy district (?). Dona Ana County: Organ district. Grant County: Central, Pinos Altos, and Santa Rita districts. Hidalgo County: Lordsburg and San Simon (?) districts. Rio Arriba County: Bromide district. San Miguel County: Willow Creek district. Sierra County: Chloride, Hermosa, and Kingston districts; near Derry (?). Socorro County: North Magdalena district (Pueblo Springs). Taos County: Picuris district (?).

County Illinois districts.

YUVAH COUNTY, ARIZONA.

Physical characteristics. Immature individuals. White
 lateral. Also mesial; granular, coarse or fine; on
 post. Claws none. Tarsus subventral to base.
 Upper tibia. U-3-4. U-5-6. U-7-8. U-9-10. Lower tibia
 often segmented. Color between black-gray and brown-
 black like color. sometimes inclining to brown and black-
 red. Opacity sometimes subopaque (opaque) in
 very thin specimens.

General description. Essentially U.S.G.P. 1908.
 into *gammalis* as indicated by presence of
 granular. Upper County: local district. Color
 County: local district (?). Does not County: U.S.G.P.
 U.S.G.P. County: Central, Pine, also, and also
 district. Middle County: Laramie and San Juan
 district. Rio Grande County: local district. Rio
 U.S.G.P. County: Willow Creek district. State County
 district, Laramie, and Lincoln district (see U.S.G.P. 1908)
 District County: North Laramie district (see U.S.G.P. 1908)
 U.S.G.P. County: local district (?).

THENARDITE. Anhydrous Sodium Sulphate. (?)

Physical characteristics. Orthorhombic. In pyramidal, short prismatic, or tabular crystals; also in cruciform twins. Cleavage: basal, distinct. Fracture uneven. Brittle. H.- 2.7. Sp.G.- 2.68. Luster vitreous. Color white to brownish. Transparent to translucent. Easily soluble in water.

Chemical composition. Anhydrous sodium sulphate, Na_2SO_4 .

Occurrence. Dona Ana County: in Alkali Flat, between White Sands and San Andres Mountains (?).

THOMSONITE.

Physical characteristics. Orthorhombic. Distinct crystals rare, usually prismatic. Commonly columnar, structure radiated; in radiated spherical concretions; also closely compact. Cleavage: one direction, perfect; another, less so; another, in traces; all at right angles. Fracture uneven to subconchoidal. Brittle. H.- 5-5.5. Sp.G.- 2.3-2.4. Luster vitreous, more or less pearly. Snow-white; reddish green; impure varieties brown. Streak uncolored. Transparent to translucent.

Chemical composition. $(\text{Ca}, \text{Na}_2)\text{Al}_2\text{Si}_2\text{O}_8 \cdot 2\frac{1}{2} \text{H}_2\text{O}$. The ratio Ca:na varies from 3:1 to 1:1.

TRICHOCLADIA. *Trichoclada* (L.) Kuntze (7).

Trichoclada is a genus of the family *Trichocladiaceae*, in the order *Trichocladales*, of the class *Trichocladales*. It is a small genus, with only a few species. The most common species is *Trichoclada* (L.) Kuntze (7). It is a small, green, leafy plant, with a woody stem. It is found in wet, shaded areas, such as swamps and bogs. It is a common plant in the tropics and subtropics. It is used as a food plant for silkworms. It is also used as a source of tannin. It is a member of the order *Trichocladales*, in the class *Trichocladales*. It is a small, green, leafy plant, with a woody stem. It is found in wet, shaded areas, such as swamps and bogs. It is a common plant in the tropics and subtropics. It is used as a food plant for silkworms. It is also used as a source of tannin. It is a member of the order *Trichocladales*, in the class *Trichocladales*.

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TRICHOCLADIA

Trichoclada is a genus of the family *Trichocladiaceae*, in the order *Trichocladales*, of the class *Trichocladales*. It is a small genus, with only a few species. The most common species is *Trichoclada* (L.) Kuntze (7). It is a small, green, leafy plant, with a woody stem. It is found in wet, shaded areas, such as swamps and bogs. It is a common plant in the tropics and subtropics. It is used as a food plant for silkworms. It is also used as a source of tannin. It is a member of the order *Trichocladales*, in the class *Trichocladales*.

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Occurrence. Colfax County: Raton region (?). Luna County: near Fort Cummings; in Deming region.

TITANITE. Sphene.

Physical characteristics. Monoclinic. Twins rather common, both contact-twins and cruciform penetration-twins. Crystals very varies in habit; often wedge-shaped and flattened; also prismatic. Sometimes massive, compact; rarely lamellar. Two rather distinct cleavages. Parting often easy, due to twinning-lamellae. H.- 5-5.5. Sp.G.- 3.4-3.56. Luster adamantine to resinous. Color brown, gray, yellow, green, rose-red, and black. Streak white. Transparent to opaque.

Chemical composition. CaTiSiO_5 , or $\text{CaO.TiO}_2.\text{SiO}_2$.

Varieties. 1. Leucoxene. See ilmenite, p.223.

Occurrence. Grant County: Burro Mountains, Central, and Fierro-Hanover districts. Luna County: Deming region. Sierra County: (not specified). Socorro County: Magdalena district. Valencia County: near Grant.

TORBERNITE. Copper Uranite.

Physical characteristics. Orthorhombic, pseudo-tetragonal.

WESTERN: Colfax County, Nolan region (V), Lake County;
near Fort Commanche in DeWitt region.

WESTERN: Oklahoma.

WESTERN: Oklahoma, DeWitt region, Nolan region, Lake County;
near Fort Commanche in DeWitt region. Plants very rare in
habit; often wedge-shaped and 1/2-
found; also primitive. Sometimes massive, mostly
massive. Two other distinct cleavages. Parting often
easy, due to thinning-lamination. R. 2-2.5. Sp. 2-3-
2.5. Luster abundant to resinous. Color brown, gray,
yellow, green, rose-red, and black. Streak white. Fracture
conchoidal to splintery.

WESTERN: Oklahoma, DeWitt region, Nolan region, Lake County;
near Fort Commanche in DeWitt region.

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2.5. Luster abundant to resinous. Color brown, gray,
yellow, green, rose-red, and black. Streak white. Fracture
conchoidal to splintery.

WESTERN: Oklahoma.

WESTERN: Oklahoma, DeWitt region, Nolan region, Lake County;
near Fort Commanche in DeWitt region.

Crystals usually square tables, thin or thick; less often pyramidal. Also foliated, micaceous. Cleavage: basal, perfect, micaceous; another cleavage at right angles, distinct. Laminae brittle. H.- 2-2.5. Sp.G.- 3.2. Luster of perfect cleavage surface pearly, other faces subadamantine. Color emerald- and grass-green, and sometimes leek-, apple-, and siskin-green. Streak paler than color. Transparent to subtranslucent.

Chemical composition. A hydrous phosphate of uranium and copper, $\text{Cu}(\text{UO}_2)_2\text{P}_2\text{O}_8 \cdot 12\text{H}_2\text{O}$. Arsenic may replace part of the phosphorus.

Occurrence. Grant County: White Signal district; Camp Kithil (?). Socorro County: San Lorenzo district (?).

TOURMALINE. Turmalin.

Physical characteristics. Hexagonal-rhombohedral. Crystals usually prismatic, often slender to acicular; rarely flattened, with prism nearly wanting. Prismatic faces strongly striated vertically, and the crystals often much rounded to barrel-shaped. The cross-section of the prisms three-sided, six-sided, or nine-sided. Crystals commonly hemimorphic. Sometimes isolated, but more commonly in parallel or radiating groups. Sometimes massive compact; also columnar, coarse or fine, parallel or divergent. No

Cystine usually occurs in pairs, with or without, less often
 separately, also isolated, microscopic. Cystine is
 formed, microscopic; another cleavage of right angles, dis-
 tinct, laminae brittle. 2-3-5. 2-3-5. 2-3-5. 2-3-5.
 of period cleavage surface, other faces subparallel-
 like. Color white and greenish and sometimes faint-
 ly pink, and bluish-green. Green color from color. Trans-
 parent to translucent.

Chemical composition. A hydrate phosphate of uranium and
 copper, $20(UD_2)_2 \cdot 2H_2O$. Uranium may replace part of
 the phosphorus.

Localities. Grant County, White Sulphur Springs, Grant
 County, Idaho. Grant County, Idaho. Grant County, Idaho.

URANINITE.

Uranium uranyl phosphate. Hexagonal-rhombohedral. Cystine
 usually rhombohedral, often slender to subulnar; rarely flat-
 tened, with prism rarely wanting. Cleavage less strongly
 revealed vertically, and the crystals often much rounded to
 prisms. The prism-cleavage of the prism faces
 is distinct, or almost so. Cystine usually has
 prisms, sometimes isolated, and more commonly in pairs
 or radiating groups. Good cleavage surfaces; also
 common, coarse or fine, parallel or divergent. In

distinct cleavage. Fracture subconchoidal to uneven. Brittle and often rather friable. H.-- 7-7.5. Sp.G.-- 2.98-3.20. Luster vitreous to resinous. Color black, brownish black, bluish black, most common; blue, green, red, and sometimes of rich shades; rarely white or colorless; sometimes shows variations in colors in the same crystal. Streak uncolored. Transparent to opaque. Becomes electric by friction.

Chemical composition. A complex silicate of boron and aluminum, with also magnesium, iron, or the alkali metals prominent. A general formula may be written as $H_9Al_3(B.OH)_2Si_4O_{19}$, in which H may be replaced by the alkalies and also magnesium, ferrous iron, or calcium. Fluorine is commonly present in small amounts.

Occurrence. Hidalgo County: Lordsburg district. Lincoln County: White Oaks district. Rio Arriba County: Bromide, Hopewell, and Rinconada districts. San Miguel County: Rociada and Willow Creek districts. Santa Fe County: Cerrillos and Santa Fe districts. Sierra County: (not specified). Taos County: Picuris district. Valencia County: Zuni Mountains district.

distinct cleavage. Fracture conchoidal to subconchoidal. Brittle and often rather friable. No. 10. 1.5-2.5 cm. Luster vitreous to resinous. Color black, iridescent black, bluish black, most common; gray, green, red, etc. sometimes of rich colors; rarely white or colorless. Light shades iridescent in color in the dark. Transparency translucent to opaque. Streak colorless. Fracture conchoidal. No. 11. 1.5-2.5 cm.

General description. A complex silicate of iron and aluminum, with also magnesium, iron, or the alkali metals present. A general formula may be written as $(\text{FeAl}_2(\text{OH})_2\text{Si}_2\text{O}_7)_n$, in which H may be replaced by OH, alkalies and also magnesium, ferrum iron, or calcium. Quartz is commonly present in small amounts.

Distribution. Michigan County, Louisiana district, Lincoln County, White Sulphur Springs. The entire Mississippi, Tennessee, and Minnesota districts. In Illinois, Kentucky, and Illinois Creek districts. In Canada and Alaska in districts. In the United States (see also) Kentucky, Tennessee, Louisiana districts, and elsewhere.

TREMOLITE. Grammatite, nephrite in part. A variety of Amphibole.

Physical characteristics. Monoclinic. Contact-twins common. In distinct crystals, either long bladed or more rarely short or stout. In aggregates long and thin columnar, or fibrous; also compact granular massive. Cleavage: two directions, perfect, at angles of 55° and 125° approx. Fracture subconchoidal, uneven. Brittle. H.-- 5-6. Sp.G.-- 2.9-3.2. Luster vitreous to pearly on cleavage faces; fibrous varieties often silky. Color white to dark gray, sometimes transparent and colorless. Streak uncolored. Transparent to translucent.

Chemical composition. $\text{Ca}_2\text{Mg}_5(\text{OH})_2(\text{Si}_4\text{O}_{11})_2$. Ferrous iron may replace the magnesium, tremolite thus grading into actinolite.

Occurrence. Colfax County: Elizabethtown district. Grant County: Fierro-Hanover district. Otero County: Orogrande district. Santa Fe County: New Placers district. Sierra County: (not specified). Socorro County: Magdalena district.

TRIDYMITE.

Physical characteristics. Hexagonal or pseudo-hexagonal. Crystals usually minute, thin tabular parallel to the base;

often in twins; also in fan-shaped groups. No distinct cleavage; basal parting sometimes observed. Fracture conchoidal. Brittle. H.- 7. Sp.G.- 2.28-2.33. Luster vitreous; on the base pearly. Colorless to white. Transparent.

Chemical composition. Pure silica, SiO_2 , like quartz. Formed at temperatures above 800°C .

Occurrence. Sandoval County: Jemez region (near Mount Pelado).

TRONA. Urao.

Physical characteristics. Monoclinic. In tabular or elongated forms, often fibrous or columnar massive. Cleavage: one direction, perfect. Fracture uneven to subconchoidal. H.- 2.5-3. Sp.G.- 2.11-2.14. Luster vitreous, glistening. Color gray or yellowish white. Translucent. Taste alkaline. Little altered by exposure.

Chemical composition. $\text{Na}_2\text{CO}_3 \cdot \text{HNaCO}_3 \cdot 2\text{H}_2\text{O}$, or $3\text{Na}_2\text{O} \cdot 4\text{CO}_3 \cdot 5\text{H}_2\text{O}$.

Occurrence. McKinley County: Ojo de Tao, in Valle de San Miguel, four miles north of Cerro de Alesna.

often in pairs; also in two-angled groups. In the
 (average) basal parting sometimes observed. From the
 crystal. $\text{MgO} \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$. Luster
 vitreous; on the base partly. Colorless to white. Trans-

General description. Two sizes, 50μ , the
 found at temperatures above 500°C .

Occurrence. Barro Colorado Island (near
 La Selva).

YAGG, Green.

Physical characteristics. Monoclinic. In habit of
 elongated forms, often fibrous or columnar crystals. Luster
 vitreous, partly. From the
 crystal. $\text{MgO} \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$. Luster vitreous.
 Color gray or yellowish white. Trans-

General description. $2\text{MgO} \cdot 3\text{SiO}_2 \cdot 2\text{H}_2\text{O}$ or
 $2\text{MgO} \cdot 4\text{SiO}_2 \cdot 2\text{H}_2\text{O}$.

Occurrence. Barro Colorado Island (near
 La Selva, low hills north of Camp de
 la Selva).

TSCHERMIGITE. Ammonia Alum.

Physical characteristics. Isometric. Habit octahedral. Also fibrous. H.- 2. Sp.G.- 1.64. Luster vitreous. Colorless or white. Transparent to translucent.

Chemical composition. Hydrous sulphate of aluminum and ammonium, $(\text{NH}_4)\text{Al}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$.

Occurrence. Quay County: Tucumcari region.

TURQUOIS. Turquoise.

Physical characteristics. Triclinic. Crystals minute and in angle near those of chalcosiderite with which it may be isomorphous. Crystals known only from Lynch Station, Virginia. Despite the abundance of turquoise in New Mexico, no crystals have ever been reported. Usually massive; amorphous cryptocrystalline. Reniform, stalactitic, or incrusting. In thin seams and disseminated grains. Also in rolled masses. Cleavage in two directions in crystals; none in massive material. Fracture small conchoidal. Rather brittle. H.- 5-6. Sp.G.- 2.6-2.83. Luster somewhat waxy, feeble. Color sky-blue, bluish green to apple-green, and greenish gray. Streak white or greenish. Feebly subtranslucent to opaque.

Chemical composition. A hydrous phosphate of aluminum and

HYPERICUM - American species

Hypericum perforatum L. - St. John's Wort.
Also known as Hypericum.
Colorless or white. Translucent to translucent.

Hypericum - St. John's Wort.
Colorless or white. Translucent to translucent.

Hypericum - St. John's Wort.
Colorless or white. Translucent to translucent.

HYPERICUM - European species

Hypericum perforatum L. - St. John's Wort.
Colorless or white. Translucent to translucent.
In some cases of hypericum with white or
yellowish flowers. Hypericum known only from
Spain. Despite the abundance of hypericum in
Spain, no hypericum have ever been reported.

Hypericum - St. John's Wort.
Colorless or white. Translucent to translucent.
In some cases of hypericum with white or
yellowish flowers. Hypericum known only from
Spain. Despite the abundance of hypericum in
Spain, no hypericum have ever been reported.

Hypericum - St. John's Wort.
Colorless or white. Translucent to translucent.

copper, $\text{CuO} \cdot 3\text{Al}_2\text{O}_3 \cdot 2\text{P}_2\text{O}_5 \cdot 9\text{H}_2\text{O}$, or perhaps
 $\text{H}_5(\text{CuOH})(\text{Al}(\text{OH})_2)_6(\text{PO}_4)_4$.

Varieties. 1. Odontolite. Bone-turquoise. Fossil bone or tooth, colored by a phosphate of iron. Not a true variety, but often mistaken for turquoise.

Occurrence. Grant County: Burro Mountains and White Signal districts. Hidalgo County: Hachita district. Lincoln County: Nogal district. Otero County: Orogrande district. Santa Fe County: Cerrillos district.

Var. Odontolite. Sandoval County: Nacimiento Mountains district.

URANINITE. Cleveite. Bröggerite. Nivenite.
Pitchblende.

Physical characteristics. Isometric. In octahedrons; less often in cubes. Crystals rare. Usually massive and botryoidal; also in grains; structure sometimes columnar, or curved lamellar. Fracture conchoidal to uneven. Brittle. H.— 5.5. Sp.G.— 9.0–9.7 of crystals; of massive altered forms from 6.4 up. Luster submetallic, to greasy or pitch-like, and dull. Color grayish, greenish, brownish, velvet-black. Streak brownish black, grayish, olive-green, a little shining. Opaque.

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Chemical composition. A uranate of uranyl, lead, usually thorium (or zirconium), often the metals of the lanthanum and yttrium groups; also containing the gases nitrogen, helium, and argon, in varying amounts up to 2.6%. Calcium and water (essential ?) are present in small quantities; iron also, but only as an impurity. Radium was first discovered in this mineral, and it has been shown that it and the helium present are products of the breaking down of the uranium. The relation between the bases varies considerably, and no definite formula can be given.

Occurrence. Rio Arriba County: Fetaca district.

URANOPHANE. Uranotil.

Physical characteristics. Orthorhombic. In minute acicular prisms, in radiated or stellate aggregations. Also massive with fine fibrous structure. H.- 2-3. Sp.G.- 3.81-3.90. Luster vitreous, of tabular faces pearly. Color honey-yellow, lemon- or straw-yellow.

Chemical composition. A hydrous silicate of uranium and calcium, $\text{CaO} \cdot 2\text{UO}_3 \cdot 2\text{SiO}_2 \cdot 7\text{H}_2\text{O}$.

Occurrence. Rio Arriba County: Fetaca district. Socorro County: San Lorenzo district (?).

Chemical composition. A mixture of nearly equal parts of
 borax (or boric acid) with the oxide of the base
 and other groups, also containing the gas nitrogen,
 helium, and argon, in varying amounts up to 5-10%. Calcium
 and water (essential) are present in small quantities.
 Iron also, but only in an impurity. Sodium and other dis-
 solved in this mineral, and it has been shown that it
 the latter present are products of the breaking down of
 the borax. The relation between the base varies con-
 siderably, and no definite formula can be given.
 Occurrence.—The Kribia County, Iceland District.

WATERGATE - Borax II.

Physical characteristics. Isometric. In minute grains
 for borax, in radiated or striated aggregations. Also
 massive with fine fibrous structure. H. 2-3. Sp. G. 2.4-
 2.5-2.6. Luster vitreous, of tabular form glossy.
 Color honey-yellow, brown or gray-yellow.
Chemical composition. A mixture of nearly equal parts of
 borax, and the oxide of the base, and
 Occurrence.—The Kribia County, Iceland District. Borax
 County, San Antonio District (V).

UTAHITE.

Physical characteristics. Hexagonal-rhombohedral. In aggregates of fine scales, microscopically tabular crystals with rhombohedral faces. Luster silky. Color orange-yellow.

Chemical composition. $3\text{Fe}_2\text{O}_3 \cdot 2\text{SO}_3 \cdot 7\text{H}_2\text{O}$. Perhaps identical with jarosite.

Occurrence. Dona Ana County: Organ district. Grant County: Georgetown district.

VANADINITE.

Physical characteristics. Hexagonal-pyramidal. Crystals prismatic, with smooth faces and sharp edges; sometimes cavernous, the crystals hollow prisms; also in rounded forms and in parallel groupings like pyromorphite. In implanted globules or incrustations. Fracture uneven, or flat conchoidal. Brittle. H.-- 2.75-3. Sp.G.-- 6.66-7.10. Luster of surface of fracture resinous. Color deep ruby-red, light brownish yellow, straw-yellow, reddish brown. Streak white or yellowish. Subtranslucent to opaque.

Chemical composition. $(\text{PbCl})\text{Pb}_4(\text{VO}_4)_3$, or $3\text{Pb}_3\text{V}_2\text{O}_8 \cdot \text{PbCl}_2$. Phosphorus or arsenic may occur, replacing vanadium.

YABUKI

Physical characteristics. Perennial herbaceous plant with a woody base. Leaves alternate, ovate, with serrated margins. Flowers small, white, in terminal panicles. Fruits are small, round, and yellowish.

General description. The plant is a small, bushy shrub with a woody base. It is found in the mountains of Yabuki, Japan. The leaves are alternate, ovate, and have serrated margins. The flowers are small and white, and the fruits are small and yellowish.

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Varieties. 1. Endlichite. A variety in which arsenic partly replaces vanadium. The ratio V;As = 1:1 nearly.

Occurrence. Dona Ana County: Gold Camp and Organ districts. Grant County: Central, Georgetown, and Lone Mountain districts. Hidalgo County: Steins Pass district (?). Santa Fe County: Cerrillos district. Sierra County: Caballos Mountains, Hillsboro, Lake Valley, and Macho districts. Socorro County: Magdalena (?), North Magdalena, and Socorro Peak (?) districts.

Var. Endlichite. Grant County: Central district. Sierra County: Hillsboro and Lake Valley districts. Socorro County: San Andres Mountains district (Grandview Canyon) (?).

VESUVIANITE. Idocrase.

Physical characteristics. Tetragonal. Often in crystals, prismatic or pyramidal. Also massive; columnar, straight and divergent, or irregular; granular massive; cryptocrystalline. No distinct cleavage. Fracture subconchoidal to uneven. Brittle. H.- 6.5. Sp.G.- 3.35-3.45. Luster vitreous; often inclining to resinous. Color brown to green, and the latter frequently bright and clear; occasionally sulphur-yellow, and also pale blue. Streak white. Subtransparent to faintly subtranslucent.

Chemical composition. A basic calcium-aluminum silicate of

Yucca. A variety in which some of the leaves are partly replaced by stems. The leaves are 2-3 in. long.

There are several other species in this district, some of which are found in the mountains. One of these is Yucca (var. glauca). It is found in the mountains of the north and west.

Another species is Yucca (var. glauca). It is found in the mountains of the north and west.

Var. glauca. Great County, Nevada district. It is found in the mountains of the north and west.

Yucca. It is found in the mountains of the north and west. It is found in the mountains of the north and west.

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Yucca. A basin between the mountains of the north and west.

uncertain formula, perhaps $\text{Ca}_6(\text{Al}(\text{OH},\text{F}))\text{Al}_2(\text{SiO}_4)_5$. Ferric iron may replace part of the aluminum and magnesium the calcium. Titanium and boron may be present.

Occurrence. Dona Ana County: Organ district. Grant County: Pinos Altos district (near Bear Mountain). Santa Fe County: New Placers district.

WERNERITE. Common Scapolite.

Physical characteristics. Tetragonal-pyramidal. Crystals prismatic, usually coarse, with uneven faces, and often large. Also massive, granular, or with a faint fibrous appearance; sometimes columnar. Cleavage: prismatic, both first and second order, rather distinct, but interrupted. Fracture subconchoidal. Brittle. H.— 5-6. Sp.G.— 2.66-2.73. Luster vitreous to pearly externally, inclining to resinous; cleavage and cross-fracture surfaces vitreous. Color white to gray, bluish, greenish, and reddish, usually light. Streak uncolored. Transparent to faintly subtranslucent.

Chemical composition. Intermediate between meionite, $\text{CaCO}_3 \cdot 3\text{CaAl}_2\text{Si}_2\text{O}_8$, and marialite, $\text{NaCl} \cdot 3\text{NaAlSi}_3\text{O}_8$, and corresponding to a molecular combination of these in ratios between $\text{Me}_{30}\text{Ma}_{20}$ and $\text{Me}_{40}\text{Ma}_{60}$.

amorphous form, $Ca_2(AlO_4)_2(OH)_2 \cdot 2H_2O$.
 from any regular part of the structure and is
 calcium. Titanium and boron may be present.
 Occurrence: In the County of Orange district, near
 these also district (near Santa Ana).
 See Placer district.

MINERALOGY. Common localities.

Trivalent chlorite. Tetragonal-prismatic. Crystals
 rhombohedral, usually coarse, with sharp faces, and often
 large. Also massive granular, or with a fibrous
 appearance; sometimes columnar. Cleavage: prismatic, both
 first and second order, rather distinct, but interrupted.
 Fracture subconchoidal. Lustre, N. S. P. 10-15.
 E. 1/2. Color bluish to gray externally, reddish
 internally; cleavage and cross-fracture surfaces
 color white to gray, lustrous, granular and pearly, greenish
 light. Streak whitish. Transparency to light translucent.
 Hardness.

Mineral composition. Interstitial spaces occupied
 by Ca^{2+} , Al^{3+} , and Fe^{3+} .
 corresponding to a molecular composition of these in various
 between $Ca_2(AlO_4)_2(OH)_2 \cdot 2H_2O$ and $Ca_2(AlO_4)_2(OH)_2$.

Occurrence. Colfax County: Baldy and Elizabethtown districts. Grant County: Fierro-Hanover district.

WHEELERITE. A hydrocarbon compound, exclusive to New Mexico.

Physical characteristics. A resin, yellowish in color, found in the Cretaceous beds in the northern part of the State, filling the fissures of the lignite, or interstratified in thin layers in it.

Chemical composition. Formula probably $(C_5H_6O)_n$, where $n = 5$ or 6 probably.

Occurrence. McKinley County: Gallup-Zuni Coal Basin (near Fort Wingate). Sandoval County: Rio Puerco coal region.

WILLEMITE.

Physical characteristics. Hexagonal, tri-rhombohedral. In hexagonal prisms, long and slender, or short and stout. Also massive and in disseminated grains; fibrous. Cleavage: basal, also prismatic, easy in some specimens. Fracture conchoidal to uneven. Brittle. H.- 5.5. Sp.G.- 3.89-4.18. Luster vitreo-resinous, rather weak. Color white or greenish yellow, when purest; apple-green, flesh-red, grayish white, yellowish brown; often dark brown when

BRONCHITIS. Colfax County, Idaho and Elmore County, Idaho. Great Basin; Sierra-Bonneville division.

BRONCHITIS. A hydrocarbon compound, crystalline in the liquid.

Physical characteristics. A resin, yellowish in color, found in the Bronchitis beds in the northern part of the State. It has the appearance of the liquid, or rather crystallized in thin layers in it.

Chemical composition. Formula probably $C_{10}H_{16}$, where $n = 5$ or 6 probably.

Localities. Lemhi County, Idaho; Elmore County, Idaho (near Wolf Springs). Elmore County, Idaho; Elmore coal region.

BRONCHITIS

Physical characteristics. Resinous, 10-15% translucent. In irregular pieces, hard and brittle, or hard and sticky. Also massive and in disseminated pieces. Color, light brown, also translucent, but in some specimens. It is composed of many crystals, $C_{10}H_{16}$, $C_{12}H_{20}$, $C_{14}H_{24}$, but in other specimens, rather weak. Color, white or translucent yellow, when purest; yellow-green, light yellow when mixed with yellowish brown; often dark brown when

impure. Streak uncolored. Transparent to opaque. Some varieties fluoresce strongly in ultra-violet rays.

Chemical composition. Zinc orthosilicate, Zn_2SiO_4 , or $2ZnO.SiO_2$. Manganese often replaces a considerable part of the zinc, and iron is also present in small amount.

Varieties. 1. Troostite. The variety in which zinc is partly replaced by manganese.

Occurrence. Grant County: Central district. Luna County: Tres Hermanas district. Socorro County: Magdalena and Socorro Peak districts.

Var. Troostite. Socorro County: Magdalena district.

WITHERITE.

Physical characteristics. Orthorhombic. Crystals always repeated twins, simulating hexagonal pyramids. Also massive, columnar or granular. Cleavage: one direction, distinct. Fracture uneven. Brittle. H.- 3-3.75. Sp.G.- 4.27-4.35. Luster vitreous, inclining to resinous on fracture surfaces. Color white, yellowish, grayish. Streak white. Subtransparent to translucent.

Chemical composition. Barium carbonate, $BaCO_3$.

Occurrence. Socorro County: San Andres Mountains region;

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Oscura Mountains region.

WOLFRAMITE.

Physical characteristics. Monoclinic. Crystals commonly tabular; also prismatic. Prism faces vertically striated. Often bladed, lamellar, coarse divergent columnar, granular. Cleavage: one direction, very perfect. Fracture uneven. Brittle. H.— 5-5.5. Sp.G.— 7-7.5. Luster sub-metallic. Color dark grayish or brownish black. Streak nearly black. Opaque. Sometimes weakly magnetic.

Chemical composition. Tungstate of iron and manganese, $(\text{Fe}, \text{Mn})\text{WO}_4$. Forms a series from ferberite, FeWO_4 , to hübnerite, MnWO_4 . It has been suggested that ferberite should include that portion of the series up to 20% MnWO_4 , hübnerite the portion up to 20% FeWO_4 , and wolframite the remainder.

Occurrence. Hidalgo County: Hachita district. Lincoln County: White Oaks district. Luna County: Victorio district. Rio Arriba County: Rinconada district. Santa Fe County: New Placers district. Socorro County: San Andres Mountains district (?). Taos County: Picuris district (Picuris and near Penasco).

Var. Ferberite. Colfax County: Elizabethtown district.

MEMORANDUM

Historical characteristics. Inhabitants. Original community
located; also prominent. This town vertically oriented
Other dated, limited, acute divergent settlement, near-
line. Character one direction, very private. Features
unusual. Middle. E. 2-3-3. 2-3-3. 2-3-3. 2-3-3. 2-3-3
details. Color dark grayish or brownish black. 2-3-3
nearly black. 2-3-3. 2-3-3. 2-3-3. 2-3-3. 2-3-3.

General description. 2-3-3. 2-3-3. 2-3-3. 2-3-3. 2-3-3.
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2-3-3. 2-3-3. 2-3-3. 2-3-3. 2-3-3. 2-3-3. 2-3-3.

San Miguel County: El Porvenir district.

Var. Hübnerite. Hidalgo County: Hachita district.
 Lincoln County: Nogal and White Oaks districts. Luna
 County: Victorio district.

WOLLASTONITE. Tabular Spar.

Physical characteristics. Monoclinic. Crystals commonly tabular; also short prismatic. Usually cleavable massive to fibrous, fibers parallel or reticulated; also compact. Cleavage: perfect, parallel to usual tabular face; less perfect, parallel to another face; a third less perfect cleavage at an angle between the first two. Fracture uneven. Brittle. H.- 4.5-5. Sp.G.- 2.8-2.9. Luster vitreous, on cleavage surfaces pearly. Color white, inclining to gray, yellow, red, or brown. Streak white. Subtransparent to translucent.

Chemical composition. Calcium metasilicate, CaSiO_3 , or $\text{CaO} \cdot \text{SiO}_2$.

Occurrence. Dona Ana County: Organ district. Grant County: Fierro-Hanover district. Hidalgo County: San Simon district. Luna County: Tres Hermanas district. Santa Fe County: New Placers district.

San Diego County, El Estero de San Diego.

Ver. Microgaster. Hidalgo County, Hidalgo District.
Lincoln County, Texas and White Lake District, Michigan.
County, Victoria District.

MOLLUSCIVORUS. Tanager sp.

Microgaster microgaster. Hidalgo County, Hidalgo District.
Tanager also about Hidalgo. Hidalgo County, Hidalgo District.
to Lincoln, Texas partial to Victoria District, also Hidalgo.
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Hidalgo to Hidalgo.

Chemical composition. Hidalgo District, Hidalgo.

Hidalgo. Hidalgo. Hidalgo. Hidalgo. Hidalgo. Hidalgo.
Hidalgo District, Hidalgo. Hidalgo. Hidalgo. Hidalgo.
Hidalgo. Hidalgo. Hidalgo. Hidalgo. Hidalgo. Hidalgo.
County, Hidalgo District.

WULFENITE.

Physical characteristics. Tetragonal-pyramidal; hemimorphic. Crystals commonly square tabular, sometimes very thin; less frequently octahedral; also prismatic. Also granular massive, coarse or fine, firmly cohesive. Cleavage: octahedral, very smooth. Two other less distinct cleavages. Fracture subconchoidal. Brittle. H.— 2.75-3. Sp.G.— 6.7-7.0. Luster resinous or adamantine. Color wax- to orange-yellow, siskin- and olive-green, yellowish gray, grayish white to nearly colorless, brown; also orange and bright red. Streak white. Subtransparent to subtranslucent.

Chemical composition. Lead molybdate, $PbMoO_4$. Calcium sometimes replaces the lead.

Occurrence. Dona Ana County: Organ district. Grant County: Central district. Hidalgo County: Lordsburg district. Luna County: Victorio district. Otero County: Orogrande district. Santa Fe County: Cerrillos district. Sierra County: Caballos Mountains, Hillsboro, Lake Valley, and Macho districts. Socorro County: Socorro Peak district.

XANTHOCONITE.

Physical characteristics. Monoclinic. In tabular pseudo-orthorhombic crystals; also massive, reniform. Cleavage

WILMINGTON

Tricalcium phosphate. Tetrahedral-pyramidal; translucent. Crystals commonly square tabular, sometimes very thin; also irregularly octahedral; also prismatic. Also granular and spherulitic. Color of lime. Luster cubical. Cleavage octahedral. Very brittle. The other less distinct cleavages. Fracture conchoidal. Wislizenus, *Ann. Chem. Phys.* 3p. 33-34, 1817. Luster resinous or adamantine. Color was in some specimens bluish and olive-green, yellowish gray, grayish white to nearly colorless, brown, also orange and white. Fracture white. Subtransparent to translucent.

Tricalcium silicate. Lead oxyhydrate. Yellow. Luster resinous, replaces the lead.

Geology. Found in the following districts: Great Valley, Central district. Also found in the following districts: Great Valley; Victoria district. Also found in the following districts: Victoria district. Also found in the following districts: Victoria district. Also found in the following districts: Victoria district. Also found in the following districts: Victoria district.

WILMINGTON

Tricalcium phosphate. Resinous. In some specimens orthorhombic crystals; also massive, granular. Cleavage

basal. Brittle. H.— 2-3. Sp.G.— 5.5. Luster adamantine. Color orange-yellow to dull red or clove-brown. Streak yellow. Transparent to translucent.

Chemical composition. $3Ag_2S.As_2S_3$.

Occurrence. Santa Fe County: Cerrillos district.

ZARATITE. Emerald Nickel.

Physical characteristics. Amorphous. In mammillary incrustations; also massive compact. Brittle. H.— 3-3.25. Sp.G.— 2.57-2.69. Luster vitreous. Color emerald-green. Streak paler. Transparent to translucent.

Chemical composition. A hydrated basic nickel carbonate, of somewhat uncertain formula, $NiCO_3.2Ni(OH)_2.4H_2O$.

Occurrence. San Miguel County: (not specified).

ZEPHAROVICHITE. (?)

Physical characteristics. Cryptocrystalline fibrous. Fracture conchoidal. H.— 5.5. Sp.G.— 2.37. Color yellowish or grayish white. Translucent.

Chemical composition. Of doubtful specific value, perhaps impure wavellite. Formula $AlPO_4.3H_2O$.

Chemical synthesis. A hybrid beta-keto ester
of several aromatic ketones. *Journal of Organic Chemistry*, 1957, 22, 1000-1002.

Chemical synthesis. *Journal of Organic Chemistry*, 1957, 22, 1000-1002.

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of several aromatic ketones. *Journal of Organic Chemistry*, 1957, 22, 1000-1002.

Occurrence. Taos County: Harding Mine district (?).

ZINCITE. Red Oxide of Zinc.

Physical characteristics. Hexagonal-hemimorphic. Natural crystals rare. Usually foliated massive, or in coarse particles and grains; also with granular structure. Cleavage: basal, perfect; prismatic, sometimes distinct. Fracture subconchoidal. Brittle. H.— 4–4.5. Sp.G.— 5.43–5.7. Luster subadamantine. Color deep red, also orange-yellow. Color thought to be due to the presence of manganese oxide. Streak orange-yellow. Translucent to subtranslucent.

Chemical composition. Zinc oxide, ZnO. Manganese protoxide is commonly present in small amounts.

Occurrence. Luna County: Tres Hermanas district. Socorro County: Magdalena district (?).

ZINKOSITE. Almagrerite.

Physical characteristics. Probably orthorhombic. In tabular crystals isomorphous with those of anglesite and barite. Sp.G.— 4.331.

Chemical composition. Anhydrous zinc sulphate, ZnSO₄.

Phytolacca. Lane County, Oregon, near Astoria (1912).

LEUCIS. See Celastrus.

Phytolacca. Lane County, Oregon, near Astoria (1912).
Phytolacca var. *hirsuta*. Usually collected near Astoria.
 petioles and veins also with glandular punctures. (1912)
 near Astoria, Oregon. (1912).
 Lane County, Oregon. (1912).
 Color deep red, also orange-red.
 Color thought to be due to the presence of mucous acid.
 Green orange-yellow. Translucent to translucent.

Phytolacca. Lane County, Oregon, near Astoria (1912).
 is commonly present in small amounts.

Phytolacca. Lane County, Oregon, near Astoria (1912).
 Lane County, Oregon, near Astoria (1912).

LEUCIS. *Asplenium*.

Phytolacca. Lane County, Oregon, near Astoria (1912).
 Phytolacca is common with some of the ferns and
 1912-1913.

Phytolacca. Lane County, Oregon, near Astoria (1912).

Occurrence. Socorro County: Magdalena district.

ZIRCON.

Physical characteristics. Tetragonal. Twins sometimes occur. Commonly in square prisms, sometimes pyramidal. Also in irregular forms and grains. No distinct cleavage. Fracture conchoidal. Brittle. H.— 7.5. Sp.G.— 4.2–4.86; 4.68–4.70 most common. Luster adamantine. Colorless, pale yellowish, grayish, yellowish green, brownish yellow, reddish brown. Streak uncolored. Transparent to subtranslucent and opaque.

Chemical composition. $ZrSiO_4$, or $ZrO_2 \cdot SiO_2$. A little ferric oxide is usually present.

Occurrence. Grant County: Fierro–Hanover, Pinos Altos, and Santa Rita districts. Hidalgo County: Lordsburg district. Luna County: Deming region. Otero County: Orogrande district. Sandoval County: Jemez region. Sierra County: (not specified).

ZOISITE.

Physical characteristics. Orthorhombic. Crystals prismatic, deeply striated vertically, and seldom distinctly

GENERIC

Phragmites australis (L.) Trin. ex Steud.
Common in aquatic habitats, especially in swamps and in freshwater lakes and ponds. Also in brackish water. In the United States it is native to the Atlantic coast from New York to Florida. In the West it is native to the Pacific coast from California to Alaska. It is also native to the Mediterranean region and to the British Isles.

Phragmites communis Trin. ex Steud.
Native to the Mediterranean region and to the British Isles. It is also native to the West Indies and to the East Indies. In the United States it is native to the Atlantic coast from New York to Florida. In the West it is native to the Pacific coast from California to Alaska. It is also native to the Mediterranean region and to the British Isles.

GENERIC

Phragmites australis (L.) Trin. ex Steud.
Native to the Mediterranean region and to the British Isles. It is also native to the West Indies and to the East Indies. In the United States it is native to the Atlantic coast from New York to Florida. In the West it is native to the Pacific coast from California to Alaska. It is also native to the Mediterranean region and to the British Isles.

terminated. Also massive, columnar to compact. Cleavage: one direction, very perfect. Fracture uneven to subconchoidal. Brittle. H.— 6–6.5. Sp.G.— 3.25–3.37. Luster vitreous, on the cleavage face pearly. Color grayish white, gray, yellowish brown, greenish gray, apple-green; also peach-blossom-red to rose-red. Streak uncolored. Transparent to subtranslucent.

Chemical composition. $\text{HCa}_2\text{Al}_3\text{Si}_3\text{O}_{13}$; or $4\text{CaO} \cdot 3\text{Al}_2\text{O}_3 \cdot 6\text{SiO}_2 \cdot \text{H}_2\text{O}$. The alumina is sometimes replaced by iron, and the mineral grades in composition toward epidote.

Varieties. 1. Saussurite. The compact, massive variety which has arisen from the alteration of feldspar.

2. Thulite. Fragile. Color various shades of rose-red.

Occurrence. Colfax County: Baldy and Elizabethtown districts. Dona Ana County: Organ district. Grant County: Fierro-Hanover district. Luna County: Cocks Peak district. San Miguel County: Willow Creek district. Santa Fe County: New Placers district.

Var. Saussurite. San Miguel County: Willow Creek district.

Var. Thulite. Taos County: Glenwoody district.

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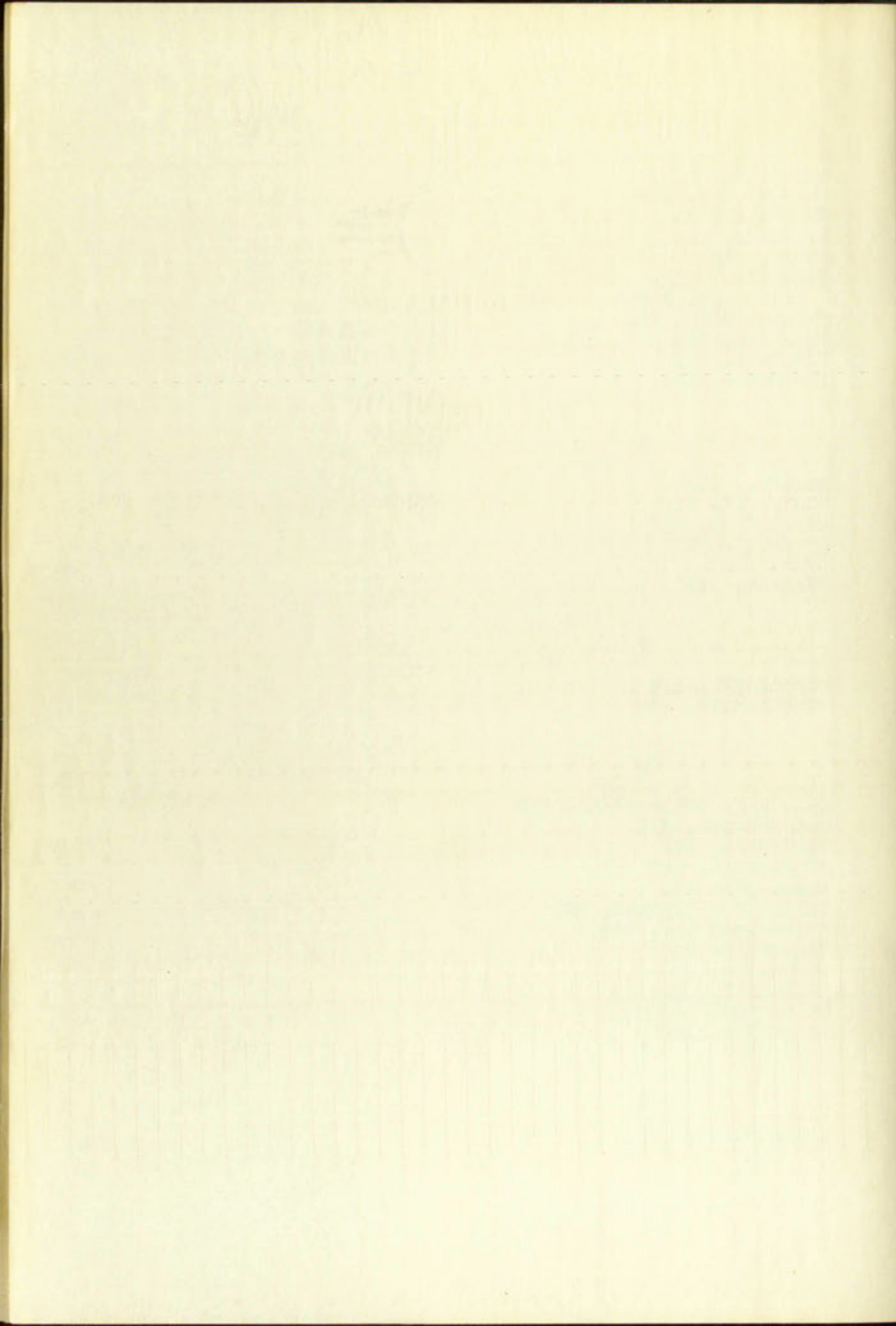
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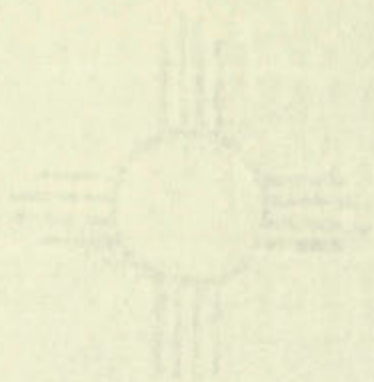
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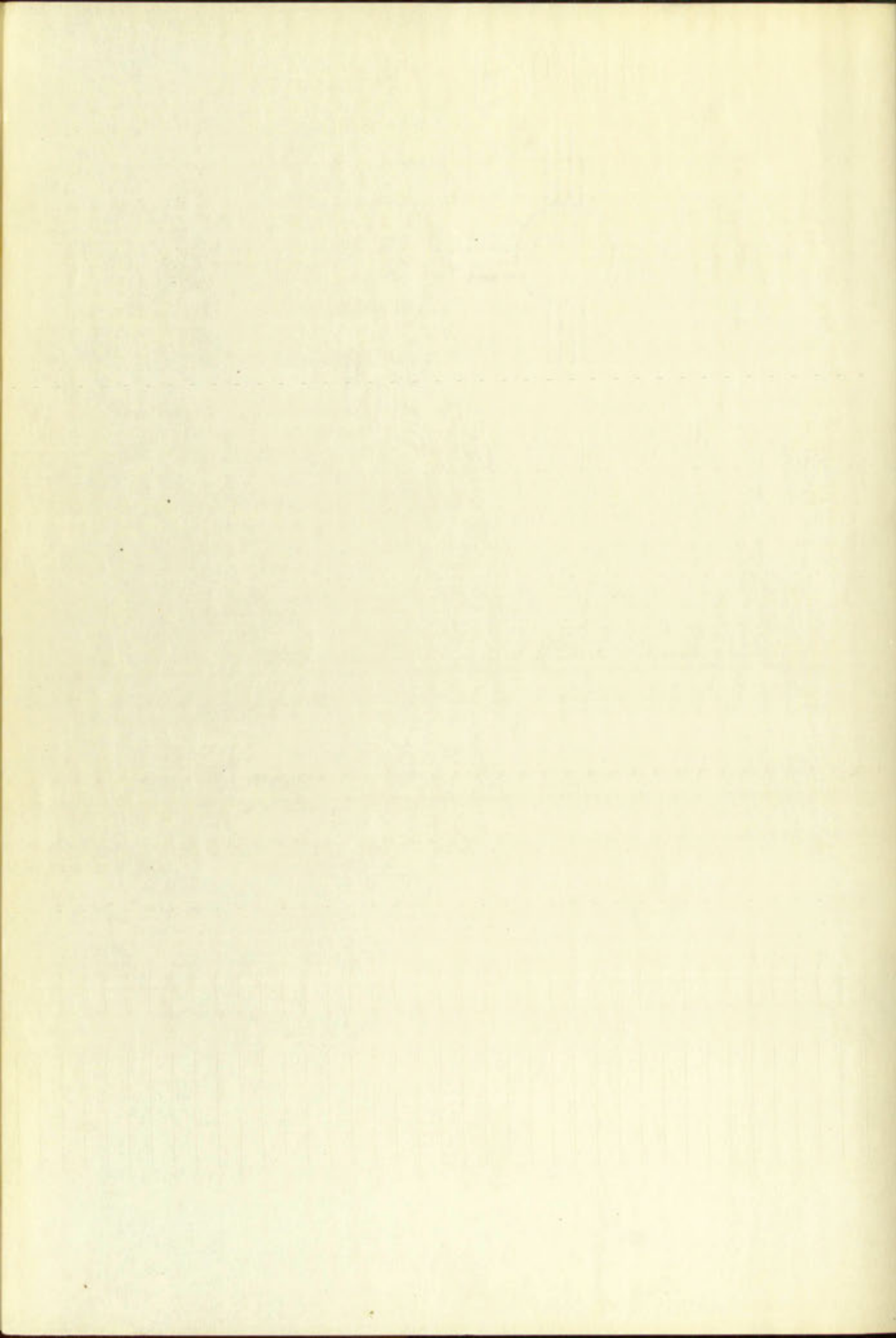
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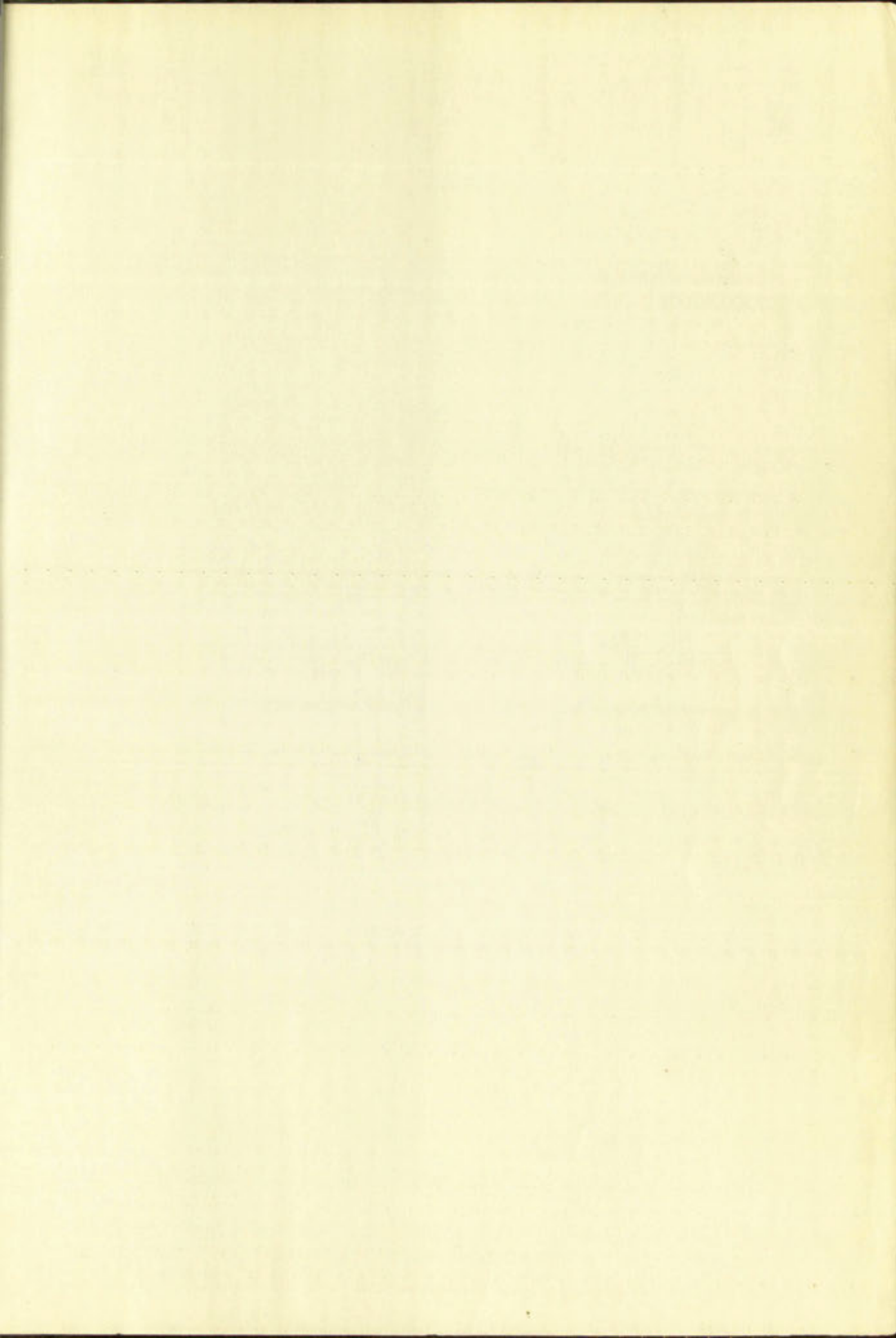
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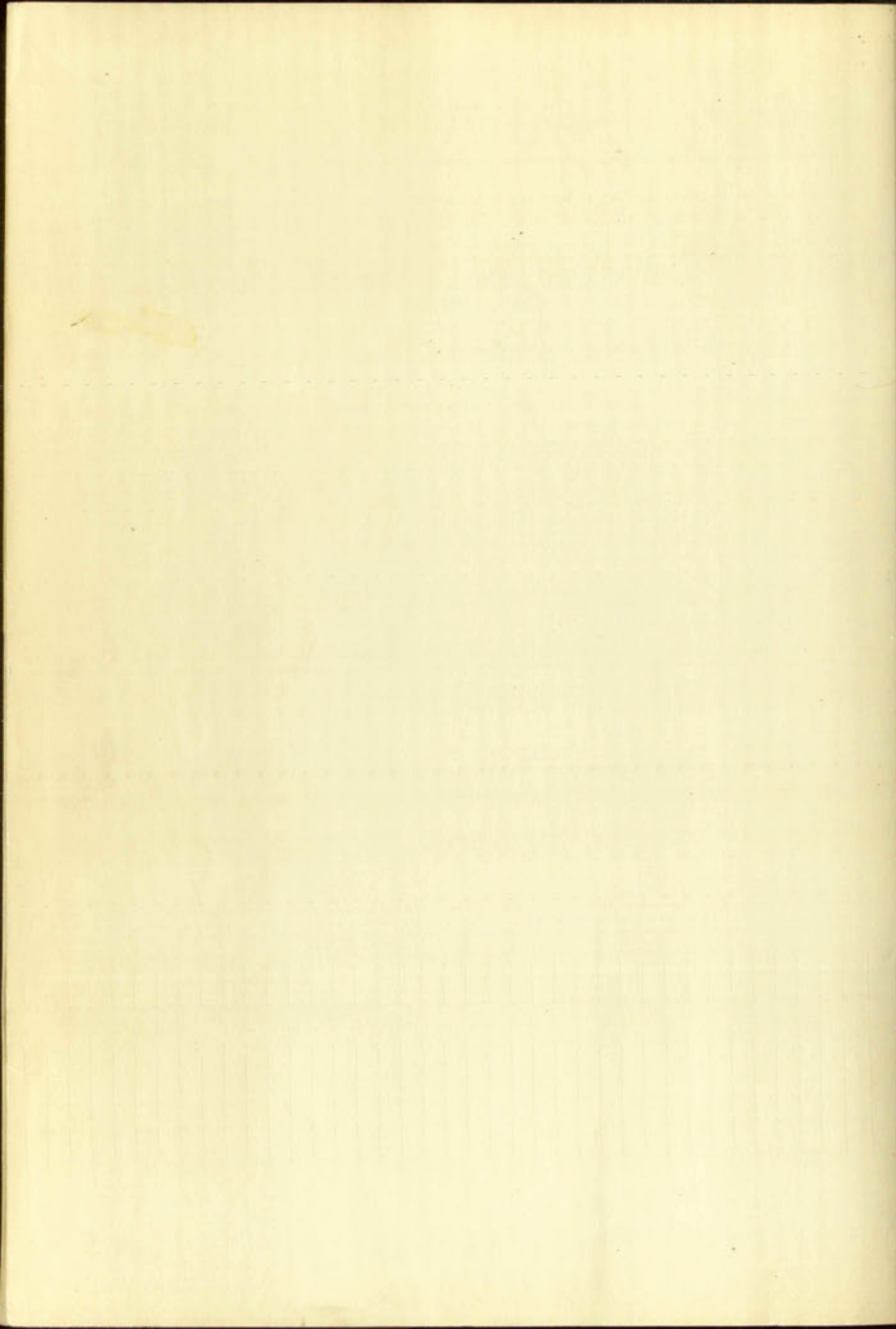
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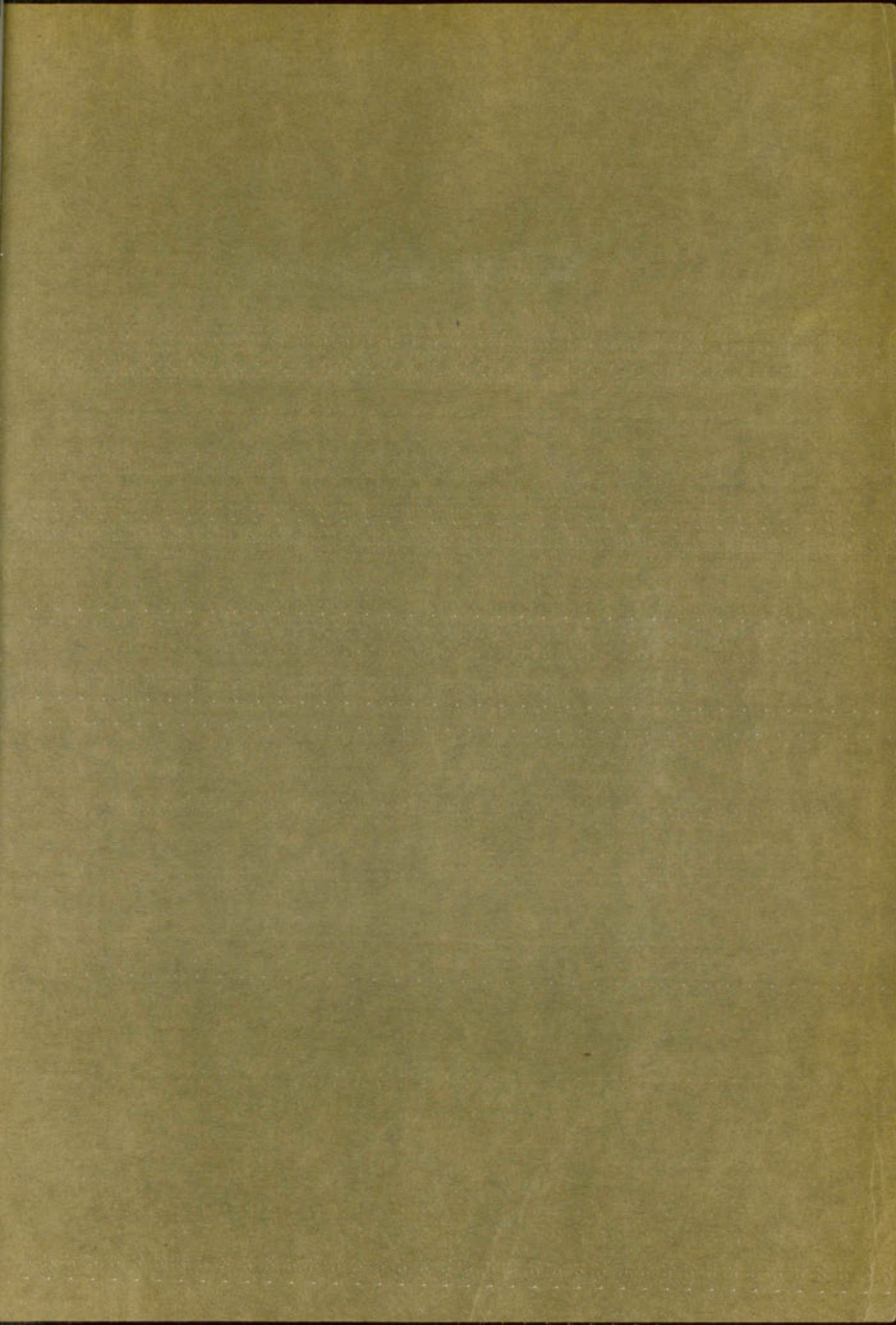


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