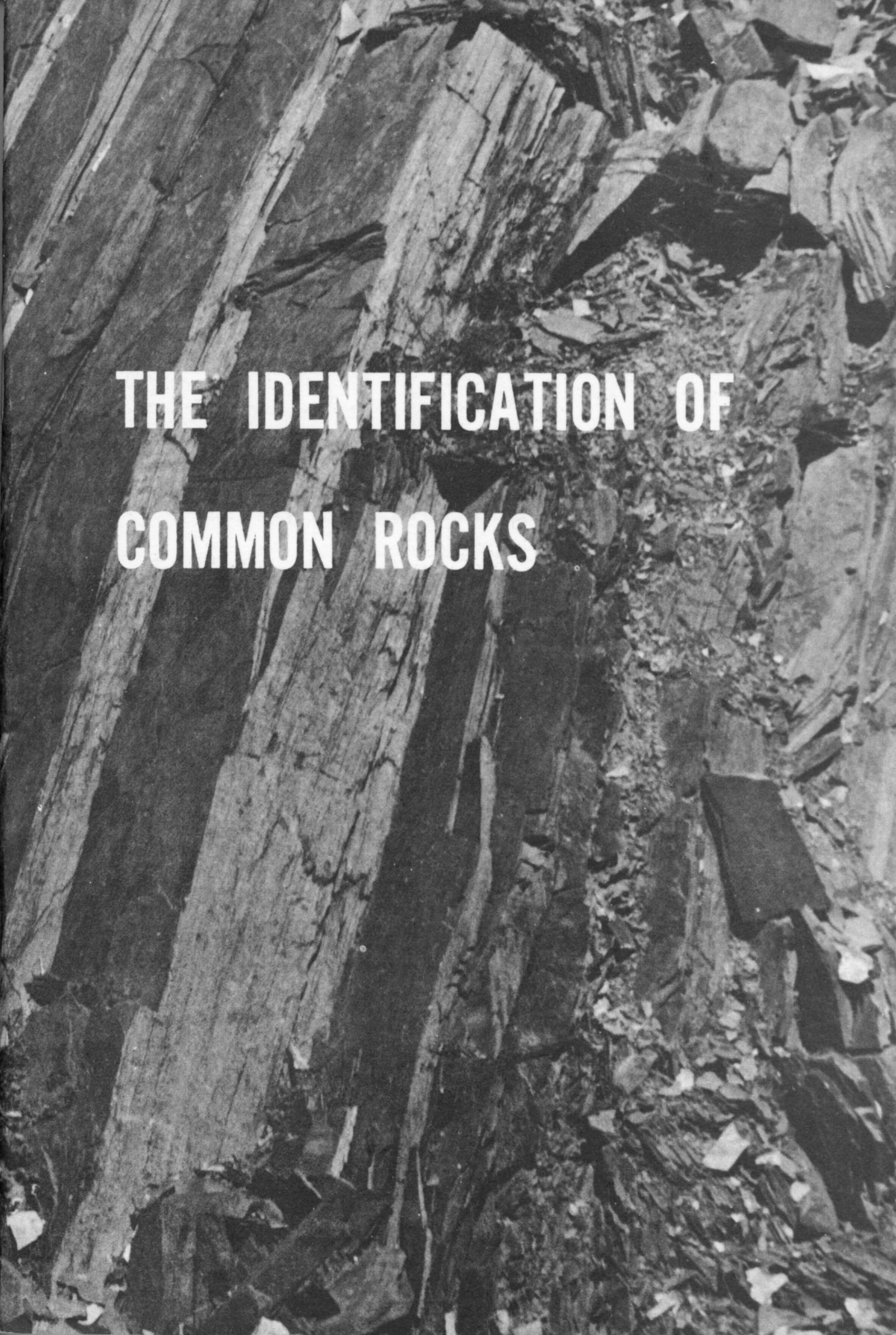
THE IDENTIFICATION OF COMMON ROCKS



Province of British Columbia
Ministry of Energy, Transport and Communications

The Identification of Common Rocks

by

OFFICERS OF THE DEPARTMENT

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The Identification of Common Rocks

INTRODUCTION

Rock is the most abundant material of the earth's surface, yet very few people can recognize accurately the common varieties of rock. This is because some rocks cannot be told without close scrutiny and not many people have the need or desire to do so. It is also because a single variety of rock may vary widely in appearance and may grade imperceptibly into other varieties, and consequently rock determination is in some instances too difficult for those who are not specially trained. Most text-books, being written for geologists who are of course specialists, are too involved for those who are only casually interested. This booklet tries to make identification of the most common rocks both interesting and easy for the ordinary person.

The Department of Mines and Petroleum Resources receives many inquiries regarding rock identification. Some want a name for a stone that has taken their fancy, some are " rock hounds " and mineral collectors, some are prospectors, some are engineers who are uncertain of their nomenclature, and others are just people who are generally interested in nature. To all of these, text-books are unsatisfactory, requiring more study than is desired, and even most handbooks and determinative tables fail in general to satisfy any but the most serious. Most people must start from scratch, for although they probably have been taught some rock names in school they have not been taught the principles of rock identification sufficiently well to apply them in later years. The following treatment assumes little prior knowledge on the part of the reader, and is addressed only to those who wish to know the names of some of the common rocks about them.

This booklet is addressed to British Columbia readers and deals with British Columbia rocks, but that does not mean that the rocks in this Province are unique or that the principles of rock identification are not universal. The counterpart of any rock found in British Columbia may be found in many other parts of the world. What is characteristic of British Columbia is not a particular assemblage of rocks but rather the complexity of its geology and the variety of its rocks, as to both character and age.

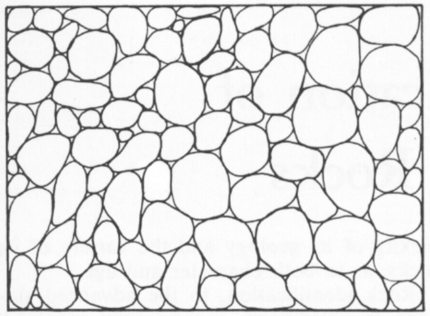
Rock identification, to the advanced student or petrologist, can be very involved, but it is the intention here to present only the simple essentials that may be understood by anyone with the simplest equipment. Given a hammer with which to break off pieces of rock or to reduce them in size, all that is needed is a pocket knife, a hand lens or reading glass of six to ten power magnification, and a dropper bottle of dilute hydrochloric (muriatic) acid; five parts of concentrated acid in 100 parts of water.

Before starting to identify rocks it is advisable to know something of what rocks are, how they are formed, and the principles of classification.

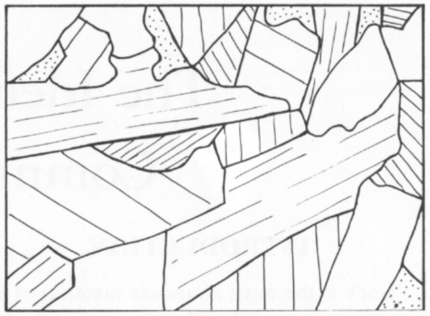
What Are Rocks?

With few exceptions, rocks are aggregates of mineral grains, sometimes of a single mineral but more often of several minerals. They possess coherence under ordinary conditions. Thus sand is not a rock because it has no coherence, and mud is not a rock because it disintegrates if immersed in water. The mineral grains may be held together by a cementing material, as are the sand grains in sandstone, or they may be firmly held together by crystalline bonds, as in quartzite or granite. One special case is a conglomerate, which is made up of pebbles which themselves are mineral aggregates; another special case is obsidian, a volcanic glass that cooled from the molten condition too rapidly for crystals to form.

Most minerals are solid crystalline substances. They are described on the basis of chemical composition and physical properties. The study of minerals is termed mineralogy and much time can be devoted to it. About 2,000 mineral species are recognized to-day, but fortunately for us the common rocks contain relatively few minerals which are comparatively easy to identify. The chemical composition is not determinable by the ordinary person, and so the physical characteristics are the ones we must use for identification of mineral species. Chief among the physical characteristics are the



Grains cemented.
As in sandstone.



Grains interlocked.
As in granite.

crystal form, the hardness, the colour and lustre of the mineral, and the colour of the powdered mineral (or streak).

In some rocks the individual grains of the minerals are recognizable. In the coarser rocks the nature of the grains and their relationship to one another can be seen. In the finer rocks, in which the mineral grains are not recognizable, and the rock has a dull or stony appearance, the hardness and colour are more important as a means of identification.

Some varieties of rock grade into one another. Thus there is every gradation from a shale to a sandy shale to a shaly sandstone to a sandstone. Similarly there is every gradation between, say, a granite and a gabbro. In the science of petrology, precise definitions are made and rocks are firmly classified in the laboratory as a result of careful microscopic examination, but the reader of this booklet can be only approximate. He can only apply what are called field terms, those that are based on identification in the field only. Geologists in the course of their work employ field terms until such time as laboratory study is desirable.

Basis of Rock Classification

Rocks, like all natural or artificial substances, may be grouped according to various characteristics. The fundamental grouping is on the basis of origin, according to the geological conditions under which they were formed. Rocks are thus igneous, sedimentary, or metamorphic, depending on whether they crystallized from molten material (magma), formed as the result of the accumulation of discrete sedimentary particles, or are the products of change (alteration or metamorphism) of pre-existing rocks. Every rock has characteristics that are the result of the process of formation, and so determine in which of the three basic divisions the rock belongs. Each division has subdivisions or classes based upon various physical or chemical properties. It is the purpose of this booklet to deal only with the principal classes of rock. Geology — that is the occurrence and distribution of rocks in nature—is not considered.

Identification of rocks depends upon manner of occurrence, uniformity, grain size, character of grains, hardness, manner of breaking, colour or hue, and behaviour with weak acid. Determinations should be made only on clean, freshly broken material. Rock at the surface may be dirty, covered with lichen, coated with some mineral substance, decomposed by weathering, or in some way may have its true nature obscured. A fresh surface can usually be obtained with a few strokes of a prospector's pick. Identification of beach pebbles that are smoothed and rounded is not considered, because this booklet deals specifically with fresh surfaces. Many pebbles are relatively easy to identify without breaking, but many are extremely difficult, and breaking usually destroys their interest or charm. As a rule a pebble catches the eye and is picked up because it is an object which shows some special effect of colour or pattern, due often to layering, veining, or alteration. Such pebbles are not good examples of common rock types.

IGNEOUS ROCKS

Igneous rocks form from molten matter that is called magma. As magma cools the chemical elements within it combine to form minerals. These minerals tend to solidify in flat-faced three-dimensional crystal shapes, and under ideal conditions each mineral forms a complete crystal such as is seen in displays and illustrations. Usually, however, so many crystals form at the same time in a magma that each interferes with the growth of its neighbour and in the end there is a solid mass of partly formed interlocked crystals, some of which may show no crystal faces at all.

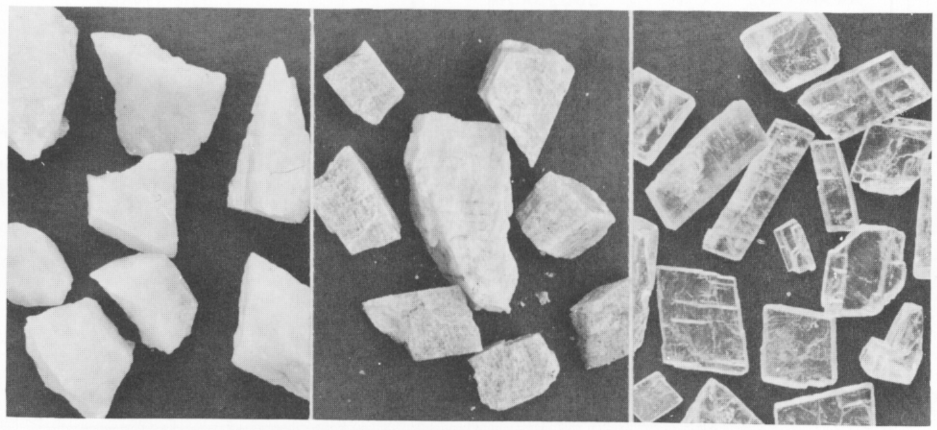
If magma solidifies deep within the earth, it cools so slowly that the crystals have time to grow to a good size and the resulting rock is medium or coarse grained. This kind of rock is called intrusive or plutonic. On the other hand, if the molten magma pours out on the surface of the earth, it cools quickly and the crystals do not have much time to grow, and so the rock thus formed is fine grained. Such rocks are called extrusive or volcanic rocks. Occasionally the magma cools so fast that no crystals can form and it hardens as a natural glass. This is called obsidian or volcanic glass. At times magma may start to cool deep in the earth and some crystals form — then the mass may move nearer or onto the surface and the rest of the molten magma solidifies so fast that no more crystals or only very small ones can form. The resulting rock consists of large crystals scattered through a fine-grained groundmass and is called porphyry. On certain rare occasions, and under special conditions, part of a magma may produce extremely large crystals which form bodies named pegmatites.

The variety of igneous rocks is large and many schemes have been suggested for their classification. While these schemes are similar in a general way, they vary in detail. This is mainly because igneous rocks grade from one type into another and the problem is to agree where to put the dividing points. Most classifications are based on the kinds and amounts of minerals present in the rock.

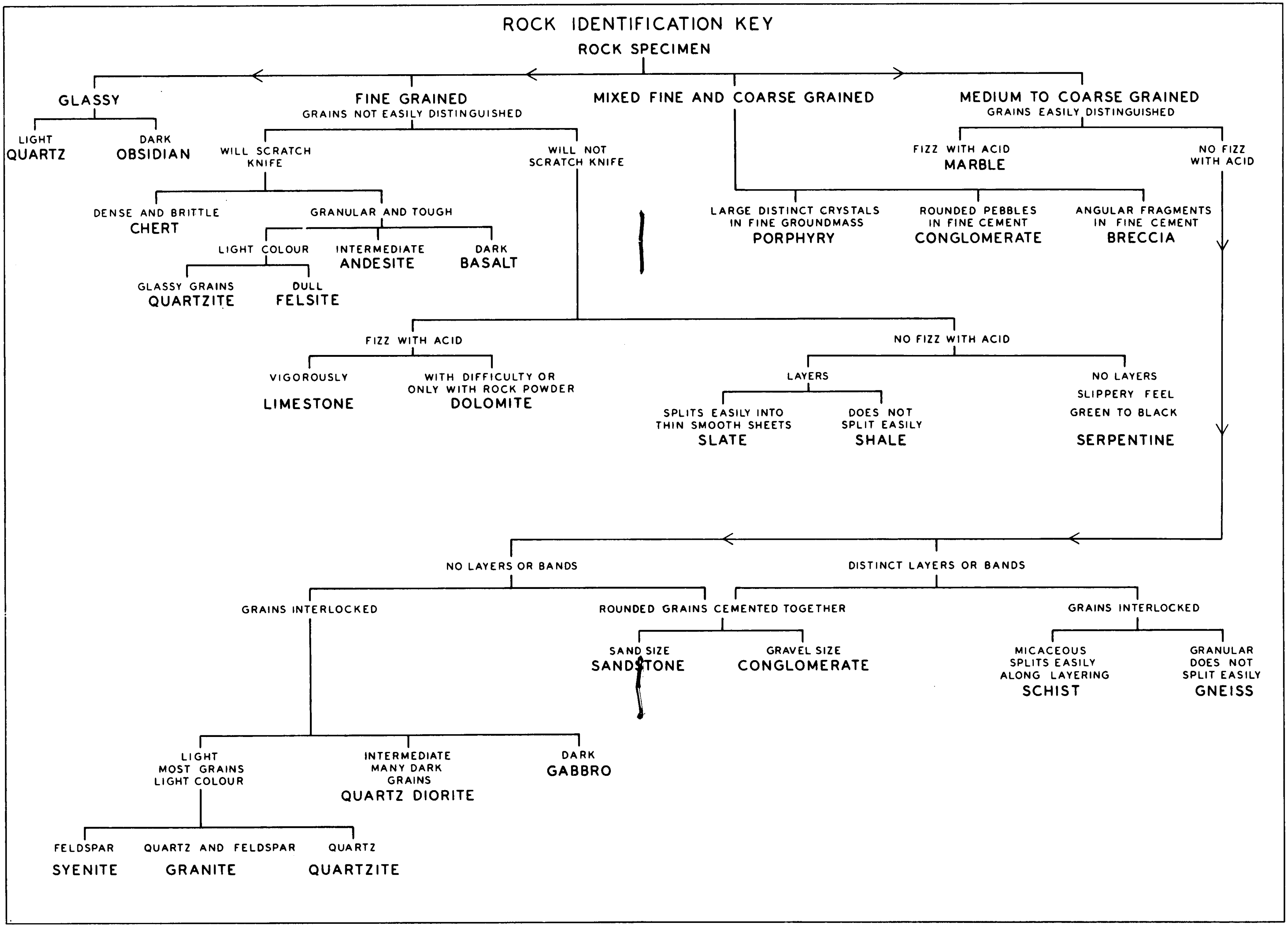
ROCK IDENTIFICATION KEY

The following key is designed to identify rocks from freshly broken clean surfaces. Much can be learned from rock surfaces that have long been exposed to the weather, but for the present purpose weathered surfaces are not considered.

To use the rock identification key, it is essential to begin at the top of the table. Do not try to begin part way down. Examine the rock closely with the naked eye and first decide which of the four descriptions fits it best—that is, is the rock glassy, fine grained (granular appearance but individual grains not distinguished), mixed fine and coarse grained, or medium to coarse grained (individual grains readily distinguished)? Having decided the grain size, next follow down the arrows below the class into which you have placed your rock. From here on use a hand lens for examination. At each point where there is a division, check all possible choices and decide which choice most closely fits your specimen, then continue on down from there until you reach a rock name. Once you have decided on a name, check the description of that rock in the text of the booklet to see if the detailed description suits your specimen. If the text description does not fit your rock, go back to the table and check for alternative choices at places where you may have been unsure of your observations.



Quartz. *Feldspar.* *Calcite.*


ROCK IDENTIFICATION KEY
ROCK SPECIMEN
GLASSY
LIGHT
QUARTZ
DARK
OBSIDIAN
FINE GRAINED
GRAINS NOT EASILY DISTINGUISHED
WILL SCRATCH KNIFE
DENSE AND BRITTLE
CHERT
GRANULAR AND TOUGH
LIGHT COLOUR
GLASSY GRAINS
QUARTZITE
DULL
FELSITE
INTERMEDIATE
ANDESITE
DARK
BASALT
WILL NOT SCRATCH KNIFE
FIZZ WITH ACID
VIGOROUSLY
LIMESTONE
WITH DIFFICULTY OR ONLY WITH ROCK POWDER
DOLOMITE
NO FIZZ WITH ACID
LAYERS
SPLITS EASILY INTO THIN SMOOTH SHEETS
SLATE
DOES NOT SPLIT EASILY
SHALE
NO LAYERS
SLIPPERY FEEL
GREEN TO BLACK
SERPENTINE
MIXED FINE AND COARSE GRAINED
LARGE DISTINCT CRYSTALS IN FINE GROUNDMASS
PORPHYRY
ROUNDED PEBBLES IN FINE CEMENT
CONGLOMERATE
ANGULAR FRAGMENTS IN FINE CEMENT
BRECCIA
MEDIUM TO COARSE GRAINED
GRAINS EASILY DISTINGUISHED
FIZZ WITH ACID
MARBLE
NO FIZZ WITH ACID
NO LAYERS OR BANDS
GRAINS INTERLOCKED
LIGHT
MOST GRAINS LIGHT COLOUR
FELDSPAR
SYENITE
QUARTZ AND FELDSPAR
GRANITE
QUARTZ
QUARTZITE
INTERMEDIATE
MANY DARK GRAINS
QUARTZ DIORITE
DARK
GABBRO
ROUNDED GRAINS CEMENTED TOGETHER
SAND SIZE
SANDSTONE
GRAVEL SIZE
CONGLOMERATE
DISTINCT LAYERS OR BANDS
GRAINS INTERLOCKED
MICACEOUS
SPLITS EASILY ALONG LAYERING
SCHIST
GRANULAR
DOES NOT SPLIT EASILY
GNEISS

The Common Minerals in Igneous Rocks

The common rock-forming minerals are quartz, feldspar, mica, pyroxene, and amphibole. Quartz and feldspar are generally light coloured, mica may be dark or light, and the others are generally dark coloured.

Quartz. — This mineral is so hard that it will easily scratch a knife blade. In igneous rocks, quartz is usually transparent or translucent and grey to smoky in colour with a definite glassy appearance. In large masses it is more likely to be opaque and milky white but still glassy. In the rock, quartz grains are irregular in shape because crystal faces are rare and quartz does not break or cleave along flat planes to form cleavage faces.

Although quartz is a mineral, it is included in the accompanying table for rock identification because it is so common and is found in large masses.

Feldspar. — Two groups, orthoclase and plagioclase, make up a family of minerals known as the feldspars. For the purposes of this booklet all will be considered as a single mineral. Feldspar is almost as hard as quartz but can be scratched by it. In the rock the grains are dull to opaque, with the general appearance of porcelain. The colour may vary from red through pink to white and grey to green. Feldspar usually forms well-developed crystals and it also breaks or cleaves along flat cleavage faces. Consequently, grains of this mineral normally have some straight edges and display flat rectangular faces on broken rock surfaces. Often two faces meeting at right angles are visible.

DIFFERENCES BETWEEN QUARTZ AND FELDSPAR IN IGNEOUS ROCKS

Quartz	*Feldspar*
glassy	dull
transparent	opaque
grey	white, grey, red, pink, green
irregular shape	rectangular shape
irregular broken surface	flat broken surface

Mica.—Like feldspar, mica is the name of a group of very similar minerals. All are recognized by the fact that they peel off into extremely thin flat and smooth sheets or flakes because they have perfect cleavage in one direction. The smooth flat faces are shiny in the rocks. The black mica, biotite, is most common in igneous rocks, but the white mica, muscovite, is sometimes found and is common in metamorphic rocks.

Pyroxene.—Pyroxene is also the name of a family of minerals of which the commonest is augite. Augite is dark green to black and forms stubby thick crystals that have a square or rectangular cross-section.

Amphibole.—This, too, is a group name for several minerals of which hornblende is the most common. Like augite, it is dark green to black but it forms needle-like or long slender crystals that have diamond-shaped cross-sections. Often it is difficult to distinguish pyroxene from amphibole in a hand specimen of rock.

The colour of a rock depends mainly on the relative proportions of the light and dark minerals. If most of the mineral grains are quartz and feldspar, the rock will have an over-all light appearance. If most of the mineral grains are dark minerals, the rock will have an over-all dark appearance. A rock in which the dark and light minerals are in nearly equal proportions is classed as intermediate in colour.

Granite. Light.

Quartz diorite. Intermediate.

Gabbro. Dark.

Intrusive or Plutonic Rocks

The intrusive rocks are homogeneous, medium- to coarse-grained granular rocks that grade in colour from light to dark. For the accompanying chart any rock in which the individual grains are large enough to be distinguished readily by the naked eye is considered to be medium to coarse grained. The light-coloured intrusive rocks are often lumped together as "granitic" rocks and the dark ones as "gabbroic" rocks. Technical classifications are usually based on the proportions of light and dark minerals, the presence or absence of quartz, and the types and relative proportions of feldspars in the rock under examination. These details can only be determined by microscopic study, and for that reason only a broad general field classification can be used for hand specimens.

Granite.—Is usually a light-coloured pink or grey medium- to coarse-grained rock. It consists of interlocked grains of feldspar and quartz with small amounts of dark minerals, generally biotite and (or) hornblende. Sometimes the feldspar is red and the rock will look darker than normal. True granite is not common in British Columbia.

Syenite.—Looks the same as granite except that very little or no quartz can be seen in it. Interlocked crystals of feldspar with minor scattered grains of mica or hornblende make up the rock. Syenite is rare in British Columbia.

Gabbro.—Is a dark medium- to coarse-grained granular rock. One-half or more of the grains are dark minerals, usually pyroxene, and the rest are dark plagioclase feldspar. Gabbro is not found in many British Columbia localities.

Quartz Diorite.—Is the middle member of an almost continuous series of rock types that grades from granite through granodiorite, quartz diorite, and diorite to gabbro. The gradation involves decrease in quartz content, increase in dark mineral content, and replacement of orthoclase feldspar by plagioclase feldspar. The change in mineral content results in a gradual darkening of colour from the light granite to the dark gabbro. Because of the difficulty of accurately naming a hand specimen of one of the intermediate rocks, only the one name, quartz diorite, is included in the accompanying determinative table. For this purpose any medium- to dark-grey granular rock of medium to coarse grain size which contains feldspar and abundant dark minerals plus some recognizable quartz is classed as a quartz diorite. This rock is abundant in British Columbia.

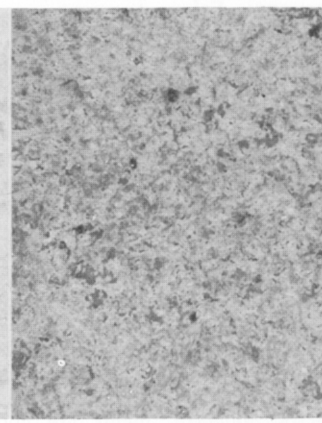
Granodiorite. — Is intermediate between granite and quartz diorite and may be difficult to distinguish from either. In granodiorite the feldspar consists of nearly equal amounts of orthoclase and plagioclase, whereas in granite orthoclase is more abundant and in quartz diorite plagioclase is more abundant. Granodiorite is common in British Columbia but is not quite as abundant as quartz diorite.

Diorite.—Is intermediate between quartz diorite and gabbro and may be difficult to distinguish from either. It has a "salt and pepper" appearance and contains no quartz. Diorite is not common in British Columbia.

Extrusive or Volcanic Rocks

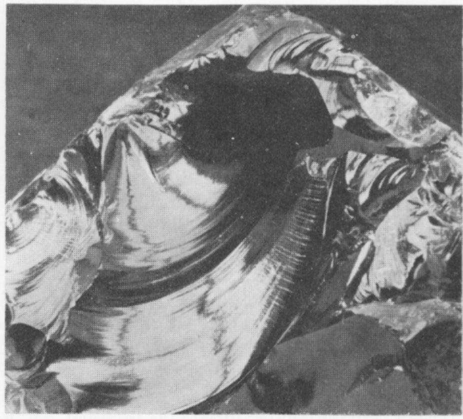
The extrusive igneous rocks are usually called lavas or volcanic rocks. They are composed of grains that are generally too

Felsite. Light.

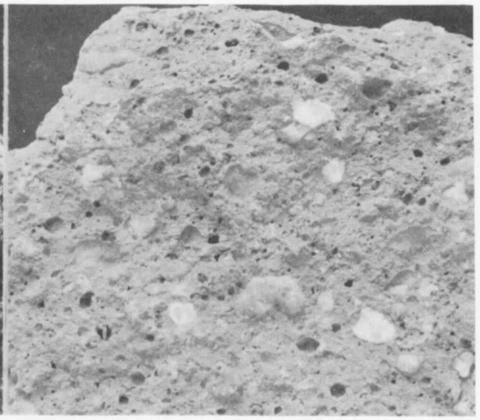


Andesite. Intermediate.

Basalt. Dark.



Obsidian with conchoidal fracture.



Amygdaloidal lava.

small to be seen by the naked eye but which are, nevertheless, large enough to give the rock a granular appearance. Porphyritic varieties in which scattered large crystals occur in a fine groundmass are common. Extrusive rocks form a gradational series with the same mineral composition as the series of the intrusive group, but they are finer grained. Because the mineral composition normally is indeterminable, in hand specimens, only three names, felsite, andesite, and basalt, respectively light, intermediate, and dark in colour, are used in the accompanying table. These rocks are tough to crack with a hammer and break to a rough fracture surface.

Felsite.—Is a general name used for fine-grained light-coloured igneous rocks. Of the many rock types grouped under this name, rhyolite, the volcanic equivalent of granite, is perhaps the most common. Felsite exposures sometimes show a series of more or less parallel bands of slightly different colours called flow bands. These bands can be mistaken for the bedding seen in sedimentary rocks or the foliation planes found in metamorphic rocks. However, as a rule flow bands are wavy and swirly rather than nearly straight like the others. Felsites are not common in British Columbia.

Basalt.—Is a dark fine-grained tough rock. It is often porphyritic, vesicular, or amygdaloidal. When some lavas cool, the gases escaping from the magma leave small rounded holes in the rock—these holes are called vesicles and the rock is said to be vesicular. If, as is frequently the case, the vesicles later become filled with mineral matter, especially agate, the filled vesicles are then called amygdules and the lava is said to be amygdaloidal. Basalt is the volcanic equivalent of gabbro. It is a common rock in British Columbia.

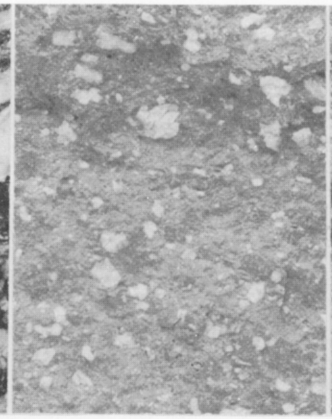
Andesite.—Is the fine-grained or volcanic rock nearly equivalent to diorite. For the accompanying table all the fine-grained rocks of intermediate colour are termed andesite. Andesite is more common than felsite but rarer than basalt in British Columbia.

Obsidian.—Is a glassy rock. It is usually dark and so can be distinguished from quartz, which is normally white in large masses. It has a conchoidal fracture (*see* illustration).

SEDIMENTARY ROCKS

Any rock exposed on the surface of the earth is acted on by rain, air, temperature, plants, and animals. These agencies all tend to break up the rock mechanically. In addition, water removes parts of the rocks by dissolving them. Most of the fragments and the dissolved material eventually are washed into a river and carried downstream. When the river empties into a sea or lake, the bits of rock are dropped and the dissolved material precipitates out. These materials settle down on the floor of the body of water to form layers of sediments. The coarser bits of rock, now rounded from rolling and bumping, are called gravel; the finer particles are called sand; and the very finest grains are called mud or clay. The precipitated material forms a very fine-grained mud or ooze. Due to the pressure caused by the weight of overlying layers and the deposition of cementing materials from water, the sediments are compacted and the grains cemented together to form sedimentary rocks. Sedimentary rocks characteristically show a

Breccia.



Porphyry.

Conglomerate.

series of parallel lines, each of which indicates where a layer or bed was deposited on top of the layer below. Often plants and animals or their remains drop into and become buried in the sediments—these become fossils.

Conglomerate.—Looks like concrete. It consists of gravel that has become cemented together to form a rock. Sometimes there is not much cementing matter visible, and at other times there is considerable cement mixed with sand in between the pebbles. In the latter case conglomerate can be distinguished from porphyry because the large grains are rounded pebbles, whereas in a porphyry the large grains are minerals showing crystal shapes. Many conglomerate beds are so thick that the bedding planes cannot be seen in a single outcrop.

Breccia (pronounced bretchia). — Is a term used to describe a rock that consists of sharply angular fragments of rock held together by a fine-grained cement. Breccias are formed in many different ways, and although few are actually sedimentary they are included here for convenience. The word means broken, and the angular and broken nature of the fragments as contrasted to rounded pebbles distinguishes a breccia from a conglomerate.

Sandstone.—Consists of grains of sand cemented together. Sandstone grades down through fine grain sizes to mudstone and shale and upward through coarse sizes to conglomerate. As with conglomerate, beds are sometimes too thick to be recognized in specimens or small outcrops. On occasions the cement of a sandstone may consist of calcite, in which case when tested with acid effervescence would result.

Shale.—Looks just like hard mud or clay, and so it should because it is the rock formed from them. Shales are usually grey to black or brown, but can be almost any colour. They are easily scratched with a knife. Bedding is usually quite plain in shale exposures, and sometimes the beds are very thin. Shale has a characteristic earthy odour when breathed upon. If struck with a hammer, the rock breaks into chunks and does not split into thin flat sheets. Some shales contain a considerable amount of calcium carbonate and may effervesce or fizz if tested with a drop of dilute hydrochloric acid.

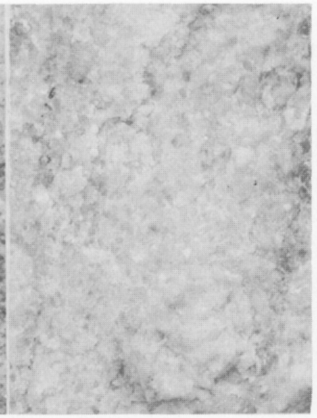
Limestone.—Is easily recognized because it will fizz vigorously when a drop of dilute hydrochloric acid is put on it. Limestones are composed of the mineral calcite, which is calcium carbonate. Ordinary limestone is a fine-grained white to grey or even black rock that can easily be scratched with a knife. It commonly forms from matter precipitated out of solution. Fossil shells are common in limestone and sometimes are so numerous that they make up practically all of the rock. Bedding lines can be seen sometimes, but at other times the beds are so thick that the lines are too far apart to show in an exposure.

Calcite is a very common mineral that frequently forms tiny veinlets and stringers through and coatings on all kinds of rock. Since any calcite will fizz with acid, when testing for limestone it is necessary to put the acid on a fresh and clean surface of the rock to be tested and to look closely to see that the rock is fizzing all over and not just along cracks or in isolated spots.

Dolomite.—Usually looks exactly like limestone, but normally it will not fizz if a drop of cold dilute hydrochloric acid is put on it. If dolomite is ground to a powder and then tested, or if hot or concentrated

Slate.

Sandstone.



Marble.

acid is used, there should be good effervescence. Dolomite often weathers to a brown or reddish colour on the surface, whereas limestone turns light grey or white. Also, dolomite tends to weather to a rough and finely angular surface, whereas limestone weathers smooth.

Chert.—Is a very hard dense rock that can be any colour, but in British Columbia is most commonly dark. It can be distinguished from quartz by its appearance, which is waxy or horny and smooth rather than glassy. It is brittle, and when struck with a hammer breaks with a shell-like conchoidal fracture or shatters into slivers. Chert consists of extremely fine-grained silica, the same chemical composition as quartz. It may be found as layers or ribbons separated by thin films of shale and as thin irregular bands and lenses in some limestones.

METAMORPHIC ROCKS

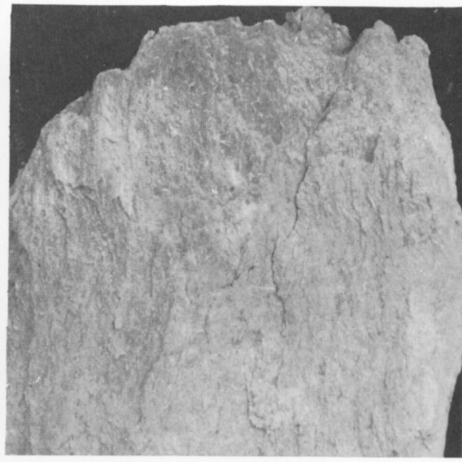
When any rock is changed from its original nature by the action of heat, pressure, or chemical action, it is said to be metamorphosed and is called a metamorphic rock. The changes that take place at the surface of the earth due to the action of the weather are called weathering and are not considered to be metamorphic. During metamorphism one or more of three main changes may take place. Sometimes the original minerals present simply recrystallize to form a coarser-grained rock—the change from limestone into marble is perhaps the best example of this. At other times entirely new minerals may form in the rock—the formation of garnet in schist is a good example of such a change. The third main type of change is the development of foliation—this is a structure that allows the rock to split into leaves, flakes, or sheets, and is caused by the growth of thin platy minerals, especially micas, with other minerals in parallel layers. Metamorphic rocks may form from igneous, sedimentary, or other metamorphic rocks.

Marble.—Is limestone that has recrystallized due to metamorphism. It consists of a medium- to coarse-grained mass of interlocked crystals of calcite. A magnesium-bearing limestone or dolomite will change into a magnesian or dolomitic marble. Ordinary marble will fizz with dilute acid, as will limestone. Dolomitic marble will only fizz if it is powdered or put in hot or concentrated acid. Marble is easily scratched with a knife.

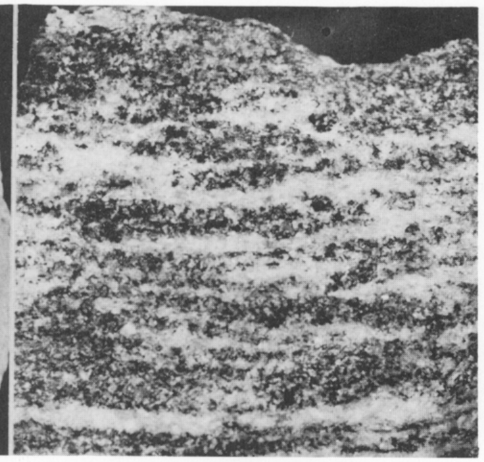
Quartzite. — Is metamorphosed quartz sandstone. Quartz cement binds the original sand grains together so tightly that the resulting rock is extremely hard and tough. When the rock is broken, it breaks through cement and grains alike and not around the grains as in sandstone. The broken faces have a glassy appearance. Quartzite can be mistaken for vein quartz or chert if the grains are not distinctly visible. Pure quartzite is rare, and most varieties contain some mica; there is every gradation between quartzite and mica schist.

Slate.—Is a very fine-grained brittle rock that splits easily into thin smooth-faced layers or sheets. The mineral grains are too small to be seen without a microscope. Most commonly slates are dark grey or green to black, but they can be red or brown. They are metamorphosed shales. The term argillite is used for rocks in between shales and slates. Argillite is harder than shale but will not split or " cleave " into sheets as slate does.

Gneiss (pronounced nice).—Is a medium- to coarse-grained banded rock. Characteristically it has well-developed colour banding due to the concentration of light and dark minerals in alternate layers or streaks. Gneiss splits better along the layers than across them, but the splitting is not easy and the split faces are not very smooth.



Schist.



Gneiss.

Schist.—Is a foliated rock intermediate between slate and gneiss. It splits along the foliation more easily than gneiss but not as easily as slate and tends to form flakes or lens-shaped slabs rather than thin sheets. Mica and mica-like minerals are abundant and easily recognized in schist, and the faces of split pieces of the rock glisten with the flat cleavage faces of these minerals.

Serpentine.—Is an oily looking green to black fine-grained rock that can be scratched easily with a knife. In many places it is highly sheared and breaks into scaly fragments with smooth shiny faces and a slippery feel. At thin edges the fragments tend to be translucent. Serpentine is actually a mineral name, and more correctly a rock composed of serpentine should be called a serpentinite. Soapstone is a rock composed of the mineral talc and can be mistaken for serpentine. Soapstone, however, is usually light green to grey in colour and soft enough to be scratched with the fingernail.

ELEMENTARY BOOKS DEALING WITH ROCKS

The following list of books may prove useful to those who wish to pursue the subject of rock identification further. (Prices as at April 1, 1970.)

	Price
1. Elementary Geology Applied to Prospecting, J. F. Walker, British Columbia Department of Mines.	$1.00
2. Rocks and Minerals, Zim, Shaffer, and Perlman, A Golden Nature Guide, Simon and Schuster, New York.	1.35
3. A Field Guide to Rocks and Minerals, F. H. Pough, Houghton Mifflin Co., Boston.	5.95
4. The Rock Book, C. L. and M. A. Fenton, Doubleday & Co., Inc., New York.	11.50
5. Rocks and Rock Minerals, Pirsson and Knopf, John Wiley and Sons, Inc., New York.	8.95