Table 1. The Earth Sciences.

PHYSICAL GEOLOGY:	
Earth Materials and Their Origin:	
Mineralogy	Description, identification and occurrence of minerals.
Petrology	Study of rocks.
Igneous	Description, origin, and occurrence of rock melts and rocks that form from them.
Sedimentary	Study of the processes of sedimentation, sediments and sedimentary rocks.
Metamorphic	Study of the causes, processes and products of metamorphism.
Geochemistry	Study of the chemistry of rocks.
Landforms and Processes:	
Geomorphology	Study of the form of the land and processes that shape it.
Volcanology	Study of processes and products of volcanic activity.
Hydrology	Study of running water, including underground water.
Glaciology	Study of glacial forms, causes of glaciations.
Configuration of the Earth's Crust:	
Structural Geology	Mechanics of rock deformation, geometry of rock bodies, causes of structure.
Tectonics	Origin of the large-scale features of the crust.
Applied Geology:	
Petroleum Geology	Exploration for and development of oil and gas.
Hydrogeology	Exploration for and development of underground water resources.
Engineering Geology	Application of geology to engineering works, e.g. dams, building foundations
Coal Geology	Exploration for and development of coal deposits.
Economic Geology	Exploration for and development of ore (metal) deposits and economically Important rocks and mineral deposits.
Geophysics:	Study of the physics of the Earth.
Geodesy	Study of the shape and dimensions of the Earth.
Geomagnetism	Study of the shape and dimensions of the Earth.
Seismology	Study of the earthquakes.
Marine Geology:	Study of the rock under the sea.
HISTORIAL GEOLOGY:	
Paleontology	Study of ancient life forms.
Stratigraphy	Study of the stratified rocks and the record of the history they contain.

SUGGESTIONS FOR FURTHER READING

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MINISTRY OF LANDS AND MINERAL RESOURCES

GEOLOGY

MINERAL RESOURCES DEPARTMENT

WHAT IS GEOLOGY?

Derived from Greek words geo (meaning Earth) and logos (meaning knowledge), geology is the science which deals with the origin, composition, structure and history of the Earth and its inhabitants as recorded in the rocks, and the natural forces which operate to change it.

Geologists are scientists who study the Earth and by piecing together the history of rock formation and mineral deposits, provide clues to the Earth, but they deal especially with *mineral, rocks, fossils and ores*: how they are formed, what changes they undergo, and the geological history they have to tell. Rocks may appear to be inert and unchanging but each rock carriers within it a record of how it was formed and what changes it has undergone.

When studying the Earth, geologists ask questions such as: How old is the Earth? How was it formed? Of what is it made? To answer these questions, geologists study the evidence of events that occurred *millions of years ago*. They then must relate their findings to the results of similar events that are happening today. Geologists assume that agents of change, wind, rain, waves, rivers and volcanoes, affected the surface of the Earth in the past just as they do today. This is why geology is often referred to as the *science of a changing Earth*.

Those who imagine that geology is primarily concerned with the description and classification of rocks will be surprised to learn about the highly specialized nature of geology and the diversity of interests within it. In studying the Earth, geologists rely heavily on other basic sciences such as chemistry, physics, biology, zoology, botany and astronomy.

Geology has two divisions as outlined in Table 1-physical geology, and historical geology. ***Physical geology*** deals with the earth's composition, it's structure, the movements between different parts of the Earth's crust, and the processes (such as volcanism and erosion) by which the Earth's surface changes. ***Historical geology*** looks at the present nature of the earth, its evolution through time, and the evolution of plants and animals on Earth. It is thus possible to reconstruct relations of ancient land and seas, and organisms that inhabited them.

The goals of geology are direct towards understanding natural earth processes and the landscapes which result from them, as well as unraveling the evolution of Earth and the planets through their long history and comprehending the vastness of geologic time.

APPLICATIONS OF GEOLOGY

The most important applications of the science of geology to the aims and needs of our society are in the development of natural earth resources, and ecological and environmental protection.

Earth's resources have been exploited by human since before the rise of early civilization. Geologists study the composition of rocks and minerals forming the Earth's crust and attempt o locate the ***natural resources*** which modern civilization depends on, i.e. mineral deposits, fossil, fuels and groundwater. This is the main economic application of geology. Geologists play a key role in the exploration for and development of economic deposits of rocks, mineral and fuels. Various methods including chemical and geophysical means are used in exploration for these resources.

Another important application of geology is in assessing the effects that the human civilization and the physical environment have on each other, that is, ***environmental protection***. The need to understand our environment is very clear and geology is having an increasing role in land-use planning; environmental monitoring, e.g. assessing the damage and pollution caused by mining activities or to groundwater ; engineering investigations to assess and select sites for dams, roads, bridges, buildings; and conservation of soil, water, energy, and other resources.

Today people are beginning to appreciate their dependence on a finite world that geological processes helped to form and efforts are being made to conserve the land or to use it more effectively. Exploitation of mineral and other natural resources quickly removes the end products of geological processes that required millions of years to form. Exploitation of these resources (e.g. mining) cannot be stopped, but it can be made more efficient so that minimum damage is sustained by the environment.

It is also essential that we learn more about the Earth and the operation of natural systems in order to evaluate the hazards that exists naturally and those that are caused by human activities. This knowledge can help us to reduce economic and human losses caused by these natural disasters over which we have little or no control, such as landslides, floods, volcanic eruptions and earthquakes. We can also reduce the cost and increase efficiency in managing those natural processes over which we do have control.

An understanding of geology can lead to a deeper awareness of one's physical environment and the beauty of nature. It can lead to an understanding of the sometimes violent, awesome and damaging geological events such as earthquakes and volcanic activity.

GEOLOGY AND OUR HISTORY

The Earth's crust is a rich storehouse o valuable minerals and fossil fuels which have been of great importance to humans since the dawn of human history.

In the early ***Stone Age,*** people began to make *tools* out of *flint* and *obsidian* (volcanic glass). About 10 000 years ago they discovered how to make *copper* implements (the Copper Age).

About 5000 years later, they found out how to make *bronze* from copper and tin (the ***Bronze Age***). The invention of bronze, an alloy harder than copper, marked the end of the Stone Age.

Even more important was the discovery, about 3300 years ago, of how to work iron, a tough metal more common than copper and tin. The ***Iron Age*** marked the start of modern times. Since then, we have gone through the ***Steel Age*** and are now in the ***Atomic Age***. At each step, earth materials assumed progressively greater importance.

EARTH RESOURCES

Today earth resources play a role in our lives second only in importance to agriculture, and of course, plants too use minerals from the soil. We use the various materials of the Earth in thousands of ways. Mining and quarrying furnish the raw materials for many industries. Minerals are an important source of elements which are used in every facet of our lives. For example, ***metallic minerals*** produce aluminum for cans and cooking pots, copper for electrical cables, lead and zinc for batteries, tungsten for electric light bulbs, numerous metals for cars and alloys of iron and many other metals for steel.

Fossil fuels (petroleum, natural gas, coal, oil shale and gas) are our main source of energy. Non fossil fuels such as uranium are used in nuclear fission reactors to generate electrical power.

In addition, various ***non-metallic*** or ***Industrial*** rocks and minerals are used in the form of sand and gravel, crushed rock, brick, tile, plaster, insulation, glass, chinaware, fertilizers, structural materials, abrasives, lubricants, fillers and chemicals. Building stones such as sandstone, limestone, marble, granite and slate are also of considerable importance.

People have always been fascinated by the beauty of minerals, and they have been used in ***jewellery*** since the Stone Age. Valuable metals used in jewellery include gold, silver and platinum. Gold is the most important because it is easy to work and does not tarnish like silver. Gold mining at ***Vatukoula*** is a major industry in Fiji. Valuable minerals (gemstones) include diamonds, rubies, sapphires and emeralds. These four minerals are hard (and hence long-wearing), transparent, and sparkle magnificently when cut and quartz, topaz, turquoise, zircon, agate, chalcedony, jadeite and opal; those are known as semi-precious gemstones. Organic substances used in jewellery include amber, coral, ivory, jet (a kind of coal) and pearls; none of these are minerals.

The list of earth resources that we use is almost endless and the demand for them rises steadily as the world's population and standard of living increases.