



**FEDERAL UNIVERSITY OF TECHNOLOGY
MINNA**



**GEOLOGY: THE SUBJECT OF
THE FUTURE IN NIGERIA**

By

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Inaugural Lecture Series 1

F.U.T. MINNA PRESS

GEOLOGY: THE SUBJECT OF THE FUTURE IN NIGERIA

by

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**Inaugural Lecture delivered at the Federal University of
Technology, Minna, on February 24, 2000**

Inaugural Lecture Series No. 1

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA PRESS
MINNA, NIGERIA
2000

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Printed by UNIC Industrial Press, Minna

Vice-Chancellor, other Principal Officers of the university, Deans of Schools, Professors and other colleagues, distinguished ladies and gentlemen, I am highly honoured to have to give the very first Inaugural Lecture in this University. For various reasons, it has not been possible to start off this important academic tradition in the University. And I have always been the Chairman of the committee charged with the responsibility of organizing University Seminars, Public Lectures and Inaugural Lectures. It is with a sense of responsibility and humility that I offered to give the first lecture in the hope that it will help break the ice and other people can follow.

Inaugural Lecture is an established tradition in Universities in many parts of the world. It is an occasion when an academic, who has attained the position of Professor is formally introduced to the academic community and the enlightened public at large. He/she is inducted or "inaugurated" into office so to speak. The new Professor is expected to give a public lecture on any topic of his choice. The lecture is usually either on his/her personal research work or his broad subject area (or academic discipline) to show his work's (or his subject's) contribution, and/or relevance, to the University, the local society, the nation or even to humanity at large. He may also proffer solutions to some problems that he identifies. From the point of view of being "inaugurated", this lecture is some 12 years late for me.

Ever since I registered for geology as a student, by accident, in 1964, my colleagues, friends, and relations have been asking various questions about the subject. The questions, which have persisted up to now, show how ignorant many highly educated Nigerians, including other scientists, with whom I should be collaborating, really are about geology (and about the earth). However, I should quickly add here that such ignorance is not peculiar to Nigerian scientists and professionals; it is fairly common in other parts of the world. Cooray (1987) in his Presidential Address to the Association of Geoscientists for International Development (AGID) wrote:

"We geoscientists often complain that planners, engineers and others who we think should know better are generally ignorant of the importance of our discipline in development projects. They do not, we moan, consult us and they should... Most laymen are ignorant of the geosciences, and it is we who should go out of our way to explain the importance-and relevance-of the geosciences to the laymen, the planner and the administrator".

One of the aims of my lecture is to attempt to answer some of the questions I have been asked over these past 35 years.

Geology is the science of the earth. It concerns the whole earth and all that is in it, the processes that take place within and on the earth, its origin and history and the history of life on earth. Since other professors in other

disciplines will be concerned with only aspects of the earth, or materials and organisms contained in or on the earth, I believe it is appropriate for us to start off our Inaugural lecture series by a geologist who would give an overview of the earth, the environment of man.

It is also my intention to educate people on the subject of Geology and to show how the natural 'geological' processes that take place on earth have influenced man's cultural, religious, intellectual and social development. Human civilization, at any point in his history, has depended on man's ability to use particular earth or geological materials (rocks and minerals) i.e. civilization has always depended on minerals AND man's ingenuity (TECHNOLOGY) to get and use the rocks and minerals. The present space and information/communication technology age would not have been possible without minerals. Computers, cell phone, satellites etc. are constructed or made largely of minerals. In particular, I will show that geology is a practical subject which has helped, and will continue to help, in solving practical human problems and in providing the most basic human needs such as food, drinking water and sanitation, shelter, health and safety from natural and man-made hazards and, of course, employment (Table 1).

Finally, as an African geologist working in a University of Technology, at the dawn of a new millennium, to sensitize people to the fact that our world is divided into the *Developed* countries on the one hand and the *Developing-(Less Developed- or Underdeveloped)* countries on the other hand. The difference between these two groups lies primarily in the relative ability (*technology or know-how*) to get the minerals available in the earth and use them to make useful things. It must also be said that some countries e.g. Korea and Brazil are making this simple two-fold classification redundant. Black Africans have, so far, been non-participatory observers in the evolving global village and are, in the main, consumers of goods and services provided by other people. We have no choice but to make efforts to join the rest of the world in the new century. We can only do this by acquiring the necessary TECHNOLOGY and the skill to get and use the minerals around us and learn to engineer the earth (build dams, tunnels, canals etc.) as may be needed. The universities of technology have a big role to play in this bid for technology acquisition. The acquisition of technology will lead to demand for raw materials (minerals and other materials) for the industries.

Although I will mention metallic ores such as gold, tin, silver, iron etc. most of which we are usually interested-in only in terms of export and foreign exchange earning, my primary interest is in such lowly materials as clays, sands, limestone and ordinary stones. These lowly minerals, which cannot be exported, have wide usage in many industries and are in fact more relevant to

Table 1 Basic Human Needs and Geology

Food	Application of mineral fertilizers for soil improvement and improved crop yield; groundwater for irrigation and livestock
Safe Drinking Water	Hydrogeologists and geophysicists locate groundwater for domestic use in areas where there is no surface water.
Shelter	Apart from plant products used in building (planks for roofing, furniture and doors), virtually all other parts of a house are made of minerals or rocks—stones, clays, sand, cement and metals (iron, copper, aluminum etc.)
Energy	Coal and Petroleum products – (kerosene, petrol, diesel) for cooking, lighting, heating etc.
Health	Clean drinking water from boreholes protects us from water-borne diseases such as typhoid, guinea worm, dysentery, cholera etc. Geologists also monitor groundwater against pollution by toxic metallic elements, which may come from diverse places.
Clothing	Synthetic material such as nylon, teryleen, rayon etc. are obtained from coal and petroleum.
Protection from hazards	Geologists help monitor and predict natural phenomena such as earthquakes, floods, volcanic eruption etc. so as to lessen the possible effects on man. They also help provide data and advice on engineering projects so as to avoid failure e.g. dams, slopes and environmental pollution.
Education	Education about the earth will go a long way in freeing people from ignorance and disease. The more we know about the earth the more we can use its resources and protect it.
Employment	Mining industry has a multiplier effect on the society in form of various service-industries and manufacturing industries-leading to employment opportunities. As the demand for minerals and water increases, there will be need for more geologists, mining engineers, metallurgists and other professionals; technologists, technicians, artisans and various others.

development than all the gold and silver of this world. *Whether gold or sand, you require geologists to locate it.*

A consequence of mining and other engineering activities, industrialization and urbanization is environmental problems. Environmental issues will take a central stage in these parts of the world in the coming years. Geologists and other environmental scientists will be required to help solve some of the problems.

The key words of this lecture are **geology, development, technology, education and the environment.**

THE EARTH AND MANKIND

"You and I are from the earth. We carry its substances in our bones, in our flesh, and in our blood. We are the culmination of ceaseless centuries of biologic trial and error and thousands of years of cultural development and learning. We cannot erase our kinship with the earth, because our origin contains all that we may become. Our future is in understanding our planet, over which we have more and more uncertain domination."
(Barnes 1980)

There are as many mythologies about the origin of the earth and the origin of man as there are cultures and religions. The important thing is that man found himself on earth. It is believed that he was just like any other animal, gathering fruits and living a nomadic life. However, he was different from other animals both physically and mentally and he possessed the power of reasoning and language. He soon discovered fire and learnt to use the most abundant earth materials around him-stones- as a weapon for hunting and as a tool. He later found that some stones took on edge and made better weapons and tools than others. Geology can be said to have started when the early man chose those stones that were good and useful and discarded those that were not useful. He progressed from using 'found' stones to actively look for (or prospect) and mine particular stones such as flint stones, obsidian and, to some extent, quartz and quartzite all of which can take on sharp edges.

As man developed and settled in communities, agriculture replaced hunting as the main source of food. Stone continued to be the main tools. Archeologists have discovered stone ax heads and other tools as well as flint mines dating back to 20,000 BC in many parts of the world. In addition to stones for hunting, early man also mined several pigments such as oxides of iron and manganese, which he used for body decoration, and for painting cave walls.

It is most probable that commerce started with the exchange of these special stones and pigments between communities that had, for food from those *who did not have or who did not know-how to get (mine) them or how*

to shape them into tools and weapons. The Archeologists believe that copper was the first metal to be used by man. Native (natural) copper was probably discovered by accident when the Stone Age man had his foot cut in a streambed by the sharp edge of the metal. Copper is a soft metal but early man found that it became hardened when hammered. He thereafter started to look for the metal like a modern day geologist. Somehow either through experimentation or by accident, he was able to smelt copper and tin from their ores to obtain bronze about 3000 BC. This was the Bronze Age.

Other metals followed and by the time of the Christian era, 2000 years ago, the "seven metals of antiquity" namely: copper, tin, gold, silver, lead, iron and mercury were known. Of these metals, gold took a special position. Davies (1971) observed that gold's rarity and beauty and long lasting characteristics were soon appreciated by most societies. It was used primarily for personal body adornment and was sought to please the women-folk. It was later used as currency and for holding wealth. The hope to find gold led to many voyages and, later, colonization. The study of alchemy, which is believed to be the foundation of modern chemistry, was primarily aimed at transforming base metals into gold.

Iron made it possible for man to work other earth materials such as stones and clays for building his shelter and fortifications and for erecting monuments like the Egyptian Pyramids, and temples for the gods. The metal also made it possible for man to till the ground for agriculture better and to work timber for building boats, which enabled him to explore regions far from his immediate environment. (The Yorubas appreciated iron so much that they worship it as a god - *Ogun*).

It is conceivable that war started between communities over rights to minerals and that the transition from one age to another was marked by the emergence of the group that first started to use, or that developed the technology to use, a particular metal or earth material. For example the bronze swords of the Greek armies at the Battle of Marathon were said to have torn through Persian leather armour and led to the rise of Greek civilization and the collapse of the Persian Empire and civilization.

It was soon discovered that minerals are exhaustible. Once mined, they are gone forever and new deposits must be found either within one's own territory or elsewhere. This apparently led to more wars and slavery, destruction of one empire and its civilization and the emergence of new empires.

According to Davies (1971),

"The Romans set the pattern. Minerals were equated to power. So the conqueror first plundered the accumulated metal and jewel stocks of the vanquished, completing this with the exaction of annual tribute. When this proved insufficient, the Romans operated the mines themselves using the

