

MODULE 2 CONTRIBUTIONS OF EARLY HUMAN CIVILISATION TO THE DEVELOPMENT OF MODERN SCIENCE

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UNIT 1 SCIENCE IN THE ANCIENT CITIES OF EGYPT AND MESOPOTAMIA

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1.0 INTRODUCTION

Ancient Egypt and Mesopotamia were among the ancient civilisations that contributed to the development of modern science. Their civilisation was due to the availability of the River Nile in Egypt and River Tigris and Euphrates in Mesopotamia. These rivers encouraged the inhabitants to settle near the rivers and practice agriculture. In this unit, you will learn about the achievements of these two cities.

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- describe the ancient Egyptian civilization;
- itemise the achievements of Egyptian civilisation and relate it to the development of science and technology;
- describe Mesopotamia civilization; and

- make a list of the achievements of Mesopotamian civilisation and relate it to the development of modern science.

HOW TO STUDY THIS UNIT

- Read through this unit with care.
- Study the unit step by step as the points are well arranged.

NOTE: ALL ANSWERS TO ACTIVITIES AND ASSIGNMENT ARE AT THE END OF THIS BOOK. THIS APPLIES TO EVERY OTHER UNIT IN THIS BOOK.

3.0 WORD STUDY

- **Nomad** - a member of a people who moves seasonally from place to place to search for food and water or pasture for their livestock.
- **Astronomy** - the scientific study of the universe, especially of the motions, positions, sizes, compositions, and behaviour of astronomical objects.
- **Ziggurats** - an ancient Mesopotamian pyramid-shaped tower with a square base, rising in stories of ever-decreasing size with a terrace at each story and a temple at the very top.
- **Mesopotamia** - ancient region located between the Tigris and the Euphrates rivers in modern Iraq and Syria.

4.0 MAIN CONTENT

4.1 Description of Ancient Mesopotamia

Ancient Egypt was one of the longest lived civilised countries of the ancient world. The ancient city of Egypt was isolated and bounded by other natural factors which combined to give rise to a great civilisation in the region. Nomadic people may have been attracted to Egypt because of the hospitable climate and environment. Other factors that made ancient Egypt to be successful include the following:

- Egypt had a relatively cloudless sky where the sun shone almost constantly thus consistently providing heat and light.
- The Nile River served as a water highway for the people and a constant source of life thus giving water and sustenance to all plants and animals.

The natural barriers provided good protection and security from invaders. For instance, the Egyptian desert is to the West, the seas to the North-East and the River Nile's rapids and valleys to the South. The natural barriers made ancient Egypt to be conservative and independent.

4.2 Contributions of Ancient Egypt to Development of Modern Science

Ancient Egypt built magnificent building using timbers and stones; this made their houses to be very strong. They were also experts in some cutting, sculpture and painting. They built great stone tombs in form of pyramid. A good example of such pyramid is the Great pyramid of Giza and that of Khufu.

Their style of building, sculpture and painting laid the foundation for modern architectural design of building, sculptures and paintings. Other contributions of ancient Egypt to development of modern science are discussed below.

Astronomy

The ancient Egyptians were very good in astronomy. They devised a way of knowing the direction of the four cardinal points of the universe. These are the North, West, East and South. Their calendar had 29 and 30 days with a total of 365 days in a year. They measure the hours of the day using the sun dials or the cardinal points. Calendar and measurement of time that are used today were ideas from the astronomy of ancient Egypt.

Mathematics

They were good in counting, addition, subtraction, multiplication and division thus, laying the foundation for modern “BODMAS” that is, bracket, of, division, multiplication, addition and subtraction.

Medicine

In terms of medicine, the Egyptians believe in life after death hence they embalm and preserve human body through the practice of mummification. During the process of mummification, the brain will be removed and thoroughly washed in herbs and wine. The body cavities will then be filled with perfume and sweet smelling resins (an excretory product of plant). The ancient Egyptian practice of mummification made them to be conversant with the human body and surgical operation process.

Agriculture

They were good in irrigation and animal rearing. Ancient Egyptians practiced irrigation at all times including gardening. The abundance of the Nile and the Egyptians’ careful management of the dykes and irrigation system guaranteed a flourishing agricultural society.

Finally, as one of the world’s earliest major and long lived civilised countries, ancient Egypt left a legacy of important innovations, discoveries and contributions that have led to the foundation of modern science and that have affected humankind over the millennia.

4.3 Achievements of Ancient Mesopotamian Civilisation

Agriculture

In terms of agriculture, the river valley and plains of Mesopotamia is favourable for agriculture especially fishing and irrigation. This encouraged people to settle in the ancient city and develop on their own. They built canals and practiced extensive irrigation.

Writing

The growing administrative needs stimulated the invention of a form of writing known as “Cuneiform” which is a mode of writing utilising wedge shaped strokes inscribed mainly on clays, stones, metal wax and other hard materials. There were about 200 signs with each representing a number of words having similar sounds.

Medicine

Their early medicine manifested itself in a combined form of magic and science. They believe that all ailments were caused by the gods and so they consulted their gods before they administer any drug. They also use herbs gotten from roots leaves and fruits of plants for treatment of diseases. However, there were no major surgical operations as there were no specialists.

Classification of Animals

Because of the presence of the two rivers, there were many animals and plants. This made them to classify the existing animals into fish, serpent, birds and four- legged animals. Also, hundreds of different animals and about 250 varieties of plants were found and classified.

Map Making

They were the first to introduce the idea of map making.

Building

- They used sundry bricks hardened by fire in building their houses.
- They build their temples known as ziggurats using sundry bricks.
- They were involved in trading by barter.
- They developed first class system of weight and measurements.
- In the field of mathematics, they adapted 12 instead of 10 as their counting unit.
- They also practice fractions, values of square and cubes.

5.0 ACTIVITY

- i. Discuss the major natural factors that contributed to the civilisation of ancient Egypt.
- ii. What was Egyptian perception about life after death?
- iii. What are the factors that made Mesopotamia to be successful in agriculture?

6.0 SUMMARY

In this unit, you have learnt about how ancient Egypt and Mesopotamia have developed and how their civilisation has led to the development of modern science and technology. In the next unit, you will learn about the achievement of ancient Greek and Rome.

7.0 ASSIGNMENT

- i. Explain the factors that led to the development of ancient Egypt.
- ii. Relate the achievement of ancient Mesopotamian civilisation to the development of modern science and technology.

8.0 REFERENCES/FURTHER READINGS

Barker, G., & Clark, C. (1998). *Explanation: An Introduction to the Philosophy of Science* Mountain View. California: Mayfield.

Hoover, K.R. (1984). *The Elements of Social Scientific Thinking*. New York: St. Martins.

UNIT 2 SCIENCE IN ANCIENT GREEK AND ROME

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- 1.0 Introduction
- 2.0 Objectives
- 3.0 Word Study
- 4.0 Main Content
 - 4.1 Description of Ancient Greek Civilisation
 - 4.2 Contribution of Ancient Greek Civilisation to the Development of Modern Science
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- 5.0 Activity
- 6.0 Summary
- 7.0 Assignment
- 8.0 References/Further Readings

1.0 INTRODUCTION

In the previous unit, we studied the development of two ancient cities- Egypt and Mesopotamia. We were also able to discuss the contribution of each of the cities to the development of modern science and technology. In this unit, we shall discuss the development of ancient Greek and Rome. We shall also discuss their various achievements and how these achievements have served as a foundation to the development of modern science and technology.

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- describe development of ancient Greek and Rome;
- state and explain the contributions and achievements of each of these ancient cities; and
- relate the achievements of each of the cities to the development of modern science and technology.

HOW TO STUDY THIS UNIT

- Read through this unit with care.
- Study the unit step by step as the points are well arranged.

NOTE: ALL ANSWERS TO ACTIVITIES AND ASSIGNMENT ARE AT THE END OF THIS BOOK. THIS APPLIES TO EVERY OTHER UNIT IN THIS BOOK.

3.0 WORD STUDY

- **Development** - the process of changing and becoming larger, stronger, or more impressive, successful, or advanced, or of causing somebody or something to change in this way.
- **Civilisation** - a society that has a high level of culture and social organization.

4.0 MAIN CONTENT

4.1 Description of Ancient Greek Civilization

The beginning of western science has traditionally been located among the philosophers of Greek on the coast and Island of the Eastern Mediterranean as far back as in the 6th and 5th centuries BC. The early Greek philosophers were cosmologists who made a guess freely about the ultimate constituent of the universe. Among the ancient Greek philosophers were Thales, Empedocles, Pythagoras, Aristotle, Plato and Socrates. One peculiar characteristic of these ancient philosophers is that they were more speculative than being empirical. This means that they give common sense explanations about events in the universe rather than using scientific equipment in their explanation. Let us discuss few of their speculative views of the universe.

Thales

He was regarded as one of the seven wise men of Greece. According to him, the original principle of all things is water. He is also said to have introduced geometry in Greece. He also became famous for his knowledge of astronomy.

Empedocles

According to Empedocles, all things in the universe are composed of four primal elements. These are: earth, air, fire and water. He also asserted that there are two active opposing forces which act on these forces combining and separating them into infinitely varied forms. These according to him are “love” and “hate.” The four elements are bound together by the principle of love while hate separates the elements.

Pythagoras

He was a Greek philosopher and a mathematician. He founded a movement with religious, political and philosophical aims known as *Pythagoreanism*. Pythagoras wanted to discover the master key to universal harmony both natural and social, and the personality of numbers which he construed as an ordered array of dots. Pythagoras was not only an influential thinker, but also a complete personality whose doctrines addressed the spiritual as well as the scientific.

Parmenides

He maintained that the universe is an indivisible, unchanging spherical entity and that all reference to change or diversity is erroneous. According to him, all that exists has no beginning and has no end and is not subject to change over time.

Plato

He was a great metaphysician, mathematician, astrophysicist and political theorists. He loved mathematics and saw in it the key to a rational method of scientific inquiry. He argues that geometry prepares the mind for the discovery of real ideas which can be perceived only through imagination. For Plato, genuine scientific knowledge is possible through the intellectual apprehension of the ideal entities in the world of forms.

Aristotle

He was a student of Plato and one of the world's first and greatest scholars. He created a biological science and taxonomy similar to those in use today. Aristotle also made important contributions to logic, physics and political theory.

Other prominent Greek philosophers include Alexander the great, Euclid, Archimedes, Apollonius and Hipparctus among others.

4.2 Contributions of Ancient Greek Civilisation to the Development of Modern Science

The following are some of the achievement of the ancient Greek civilization.

Mathematics

The Greeks taught the world about mathematics. Euclid was a famous mathematician who invented a complete system of geometry which is still studied in schools all over the world today. The same thing applies to Pythagoras theorems.

Philosophy

The Greek philosophy taught us to be inquisitive about our environment. It taught us to ask why things happen and how things should be done.

Science

The Greek began many of the branches of science that we study today. Aristotle wrote books on biology, zoology, physiology and botany. Archimedes was the greatest physicist of the ancient world while Theophrastus is regarded as the "father of botany."

Medicine

Hippocrates is regarded as the father of medicine. Modern medical doctors still honour his ideas today as it is expressed in the "Hippocratic Oath." The Greeks were

the first to debunk the belief that sicknesses were caused by supernatural causes, rather, that sickness were caused by diseases.

The Greek Language

The Greek language has had great influence on other European languages used in science and other disciplines today. For instance, words like philosophy, biology, geography, zoology, etc. were all derived from Greek language.

In fact, the contribution of Greek to modern civilization and particularly in science and technology cannot be over emphasised.

4.3 Contributions of Ancient Roman Civilisation to Modern Science

The Roman civilisation is a sophisticated and apparently modern in its personalities and politics. It is very solid in jurisprudence and law. It is also progressive in the technologies of warfare and public hygiene but failed to produce many noticeable scientists like the Greeks. This is because the Romans considered science as fit only for casual speculations on one hand, and practical techniques on the other hand.

The Romans discussed scientific matters seriously only in connection with philosophies that were basically ethical. They believed in the pursuit of happiness. This is enshrined in their philosophical belief known as Epicureanism. One of the possible explanations responsible for failure of science scholars in Rome could be slave trade which led to stifling and shifting of Romans for industrial innovation in Europe. It has also been speculated that, perhaps, the social structure of Rome which did not allow for the necessary social mobility necessary for scientific progress might be responsible for their low achievement in science.

The remains of vast building projects including roads and bridges, temples and theatres as well as entire towns in the North African desert still mark Rome's former domination. Their Latin language is used today in many words in science and technology today.

Finally, the Roman Empire became the channel through which the cultures and religions of many people were combined and transmitted via medieval and renaissance Europe to the modern world.

5.0 ACTIVITY

- i. Mention any three Greek philosophers and discuss their major contributions to the development of science.
- ii. What are the two major areas or fields that the Romans were well-known for?

6.0 SUMMARY

In this unit, you have learnt about the development and contributions of both ancient Greek and Roman civilisations. However, it should be noted that despite the giant strides achieved in the field of science by the Greeks, they had no precise instrument for testing their theories; they only base all their works on speculations.

In the next unit, you will learn about the achievements of ancient China, Maya and Indus River Valley civilisations.

7.0 ASSIGNMENT

- i. State and explain the major contributions of Greek civilisation to the development of modern science and technology.
- ii. Describe the major achievements of ancient Roman civilization.

8.0 REFERENCES/FURTHER READING

Butterfield, H. (1975). *The Origins of Modern Science*. New York: Free Press.

Toulmin, Stephen (1983). *The philosophy of Science*. London: Hutchinson University Press.

UNIT 3 SCIENCE & CIVILISATIONS IN ANCIENT CITIES OF CHINA, MAYA AND INDUS RIVER VALLEY

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Work Study
- 4.0 Main Content
 - 4.1 Description of Ancient China and Its Contributions to Modern Science and Technology
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 - 4.3 Contributions of Indus River Valley to the Development of Modern Science and Technology
- 5.0 Activity
- 6.0 Summary
- 7.0 Assignment
- 8.0 References/Further Reading

1.0 INTRODUCTION

In the last unit, we discussed the ancient cities of Greek and Rome. We also talked about their achievements and how these achievements have laid the foundation for modern science and technology. In this unit, we shall move further to discuss other ancient cities. These are China, Maya and Indus river valley. We will also discuss how their civilisation has contributed to the development of modern science and technology.

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- describe ancient cities of China, Maya and Indus River Valley; and
- state and explain the contributions of each of the ancient cities to the development of modern science and technology.

HOW TO STUDY THIS UNIT

- Read through this unit with care.
- Study the unit step by step as the points are well arranged.

NOTE: ALL ANSWERS TO ACTIVITIES AND ASSIGNMENT ARE AT THE END OF THIS BOOK. THIS APPLIES TO EVERY OTHER UNIT IN THIS BOOK.

3.0 WORD STUDY

- **Acupuncture** - the treatment of disorders by inserting needles in to the skin at point where the flow of energy is thought to be blocked meridians.
- **Craft** - a profession or activity involving the skillful making of decorative or practical objects by hand.

4.0 MAIN CONTENT

4.1 Description of Ancient China and Its Contributions to Modern Science and Technology

China traced its origins, as a discrete political and cultural unit, to ancient times. Like the Egyptians, the Chinese also developed as an independent civilised community in the far East. This is because they were isolated from the rest of the world.

Way of Writing

It was easy to disseminate information about their brand of science through their way of writing. They wrote on pieces of bone or tortoise shell and later changed to bronzed vessels.

Chinese Science

Chinese science does not have underlying theory guiding their planetary motion, mathematics or alchemy. Rather, most of what they did was in their bid to solve practical problems confronting them.

Mathematics

They use small rods to count their numbers. For instance, one rod stands for one, and two rods stand for two and it continue like that. The counting was done on counting boards and can be used for addition, subtraction, multiplication and division. They also devised a way of counting large numbers.

Astronomy

They kept tract of the solar system by observing the heavens and the planet. They devised a calendar which had $365 \frac{1}{4}$ days. They also kept records of significant astronomical events such as the eclipses, comets and earth quakes.

Pure Sciences

In pure science, the Chinese were more practical than theoretical. For instance in physics, they devised methods of practical measurements such as metric system, weights and balances. They studied optics, shadows and discovered that light traveled in straight lines. They also invented magnetic compass. In Chemistry, they discovered several chemicals which they thought could make them immortal. They use a chemical that today looks like mercuric sulphide on the body of the dead

person which made the body so elastic as if it was buried recently. They also devised special chemical apparatus in form of stoves, furnaces, vessels etc.

In Biology, the Chinese kept all sorts of animals and insects in their homes. They bred crickets for sports, kept bees for medicinal purposes, dogs for security and some insects for protection of crops. They also studied plants to know their different species and their environment in which they flourished best.

Medicine

Chinese medicine was very popular through the practice of acupuncture. Acupuncture is a process by which the natural responses of the body system were stimulated to the circulatory system, nerves, veins and arteries. They diagnosis patients by checking his heart rate breathe and colour of the tongue. These methods are in use by modern medical doctors today.

4.2 Ancient Maya and Its Contribution to Modern Science and Technology

Ancient Maya is today located in Middle America and in the Western mountains of South America. The people known as the Maya lived in the region that is now Eastern and Southern Mexico, Guatemala- Salvador and Western Honduras.

Architecture

Their power in architecture could be seen from the way they build. They built massive store, pyramid, temples and sculpture. They used cemented rubble bricks and thick plasters in their building.

Astronomy

The Mayan conception of the universe was primitive and superstitious. They believed that the universe contains four directions and 13 layers. The Earth was seen as the back of a giant lizard or crocodile lying in vast pond within water lilies and fish. They had a calendar which had 365 days consisting of 18 months of 21 days each.

Mathematics

The Mayan counted their numbers in the units of 20 with each number going by a special name. For instance, number 41 was calculated as two scores; one and 51 as two scores and 11. There was no formal mathematics.

Writing

The Maya developed a complex system of hieroglyphic writing to read any astronomical observations and calendar calculations and also historical information. Scribes are carved on stone, altars, wooden lintels, roofs, beams and in books made of bark paper.

4.3 Contributions of Indus River Valley to the Development of Modern Science and Technology

This is one of the largest ancient civilisations similar to ancient Egypt and Mesopotamia. The remains of settlement belonging to this culture are found throughout the Indus river valley in Pakistan and Western India. The civilisation was covered by a single Bronze Age Culture.

Craft Specialisation

They were very good in pottery-ceramic toys, beads, metal ornaments and stamp seals.

Indus valley used to be very fertile and rich in agriculture but later complex ecological change occurred in the Indus valley area forcing abandonment of many settlements and altering the basic characteristics of the settlement.

Harappa was a city in the Indus civilisation that was very popular and it still remains a living town today.

Material culture and the skeleton from the Harappa cemetery and other sites testify to a continual intermingling of communities from both the West and the East.

The major achievement of the Indus river valley civilisation was in brick making and the industries of pottery and metal production which helped to develop their culture. They were also good in town planning and the establishment of uniform standards of weights and measures.

5.0 ACTIVITY

- i. Discuss briefly the Chinese way of counting numbers.
- ii. Describe the nature of architecture in ancient Maya civilisation.

6.0 SUMMARY

In this unit, you have learnt about a brief historical background of three ancient cities. These are China, Maya and Indus valley. You have also seen how these civilisations have aided the development of science and technology in modern time. In the next unit, you will learn about Islamic civilisation and how it has aided the development of modern science and technology.

7.0 ASSIGNMENT

- i. Describe briefly the major features of ancient China, Maya and Indus river valley civilisation.
- ii. How did the civilisation of ancient China, Maya and Indus river valley aided the development of modern science and technology?

8.0 REFERENCES /FURTHER READING

Butterfield, H. (1975). *The origins of Modern Science*. New York: Free Press.

Bakker, C., & Clark, L. (1988). *Explanation: An Introduction to the Philosophy of Science*. California: May field.

UNIT 4 ISLAMIC CIVILISATION AND SCIENCE

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- 1.0 Introduction
- 2.0 Objectives
- 3.0 Work Study
- 4.0 Main Content
 - 4.1 Background to Islamic Civilisation
 - 4.2 Contributions of Islamic Civilisation to the Development of Modern Science
- 5.0 Activity
- 6.0 Summary
- 7.0 Assignment
- 8.0 References/Further Reading

1.0 INTRODUCTION

In the last unit, we learnt about how three ancient cities (that is, China, Maya and Indus river valley) civilisations developed. We also learnt about how the civilisations of these cities have aided the growth and development of modern science and technology. In this unit, we shall look at Islamic civilisation and how it has aided the development of modern science and technology.

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- state the contributions of Islamic civilisation to the development of modern science and technology; and
- make a list of the major Islamic scientists and what they are credited for.

HOW TO STUDY THIS UNIT

- Read through this unit with care.
- Study the unit step by step as the points are well arranged.

NOTE: ALL ANSWERS TO ACTIVITIES AND ASSIGNMENT ARE AT THE END OF THIS BOOK. THIS APPLIES TO EVERY OTHER UNIT IN THIS BOOK.

3.0 WORD STUDY

- **Algorithm** - problem solving procedure.
- **Ophthalmology** - medical study and treatment of eyes.

4.0 MAIN CONTENT

4.1 Background to Islamic Civilisation

Literature has shown that Islamic culture is very relevant to European science. Besides, Islamic religion is also related to Judaism and Christianity. There was also active cultural intermingling between Arabic speaking countries and Latin. Drawing from the traditions of Greek science through Christian scholars at Syria, the early Arab leaders at Bagdad in the 9th century had the bulk of the Greek science translated into Arabic. Their scholars also advanced further especially in mathematics, astronomy, optics chemistry, biology and medicine. Let us now look at some of the contributions of Islamic scholars to the development of Science and Technology.

4 Contributions of Islamic Civilisation to the Development of Modern Science

Mathematics

Arab mathematician, Muhameed Al- Khwarizmi introduced Hindu – Arabic numerals to Europe. Hindu- Arabic numerals include “zero” which was not known in Europe at that time. Al-kwarizmi also wrote on Algebra, a name derived from Arabic word “Al-Jabr”. He was also the person that introduced Algorithm which forms the backbone for our modern day computing.

Astronomy

The Arab scholars, through their effective observational skills, gave names to many of the brightest stars. Some of these names include – Aldebaran, Altair and Denab. All these names are used today by modern astronomies.

Chemistry

Arab scientist developed methods of manufacturing metallic alloys and method of testing the quality and purity of metals. Arab chemists left their marks in some names used in chemistry today. Such names include Alkali and Alchemy which are both Arabic in origin.

Physics

The Arab scholars were also vast in physics. One of the famous Egyptian physicists, Alhasan, published a book that dealt with the principles of lenses, mirrors and other devices used in optics.

Medicine

Translations from Greek were instrumental to the development of Arabic system of medicine throughout the Arab speaking world. They introduce numerous chemical treating substances for treatment of the sick. They were also good in the fields of ophthalmology and public hygiene.

Prominent among the Arabian physicians were Al- Razi who was the first to identify small pox and measles, Avenzoar, who was the first to describe the parasite that causes the disease scabies. Malmonides wrote books on diet and hygiene, Al-Quarashi wrote commenting on the writing of Hippocrates on diet and diseases.

5.0 ACTIVITY

Discuss the role of Muhammed Al-Khwarizmi in the history of Islamic civilisation.

6.0 SUMMARY

From the previous units, you have learnt about the contributions of ancient cities including Islamic civilisation to the development of modern science and technology. That some Islamic scholars have contributed to the development of modern science and technology. This is reflected in mathematics, astronomy, chemistry, physics and medicine. In the next unit, we shall discuss science in the Dark and Middle Ages.

7.0 ASSIGNMENT

- i. Discuss the contributions of Islamic scholars to Mathematics, Astronomy and Medicine.
- ii. With the aid of specific examples, what are the contributions of Islamic scholars to the development of modern science and technology?

8.0 REFERENCES/FURTHER READING

Butterfield, H. (1975). *The Origin of Modern Science*. New York: Free Press.

Bakker, G., & Clark, L. (1988). *Explanations: An Introduction to the Philosophy of Science*. California: Mayfield.

UNIT 5 SCIENCE IN THE MIDDLE AGES

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- 2.0 Objectives
- 3.0 Work Study
- 4.0 Main Content
 - 4.1 Review of Science in the Dark Ages
 - 4.2 Science in the Middle Ages
 - 4.3 Why Science was Background in the Middle Ages
- 5.0 Activity
- 6.0 Summary
- 7.0 Assignment
- 8.0 References/Further Reading

1.0 INTRODUCTION

In the previous unit, you saw how Islamic civilisation has contributed to the development of modern science and technology. In this unit, we will look into science in the Middle Ages and the factors responsible for the backwardness of science and technology in the Middle Ages.

2.0 OBJECTIVES

By the end of the unit, you should be able to:

- briefly discuss science in the Dark Ages;
- mention and discuss the main features of science in the Middle Ages; and
- explain reasons why science was backward in the Middle Ages.

HOW TO STUDY THIS UNIT

- Read through this unit with care.
- Study the unit step by step as the points are well arranged.

NOTE: ALL ANSWERS TO ACTIVITIES AND ASSIGNMENT ARE AT THE END OF THIS BOOK. THIS APPLIES TO EVERY OTHER UNIT IN THIS BOOK.

3.0 WORD STUDY

- **Nomad** - a person belonging to a group of Fulanis who move seasonally from place to place in search for food and water.
- **Dark ages** - the period of European history between the fall of the Roman Empire in AD 476 and about AD 1000, for which there are few historical record and during which life was comparatively uncivilized.

- **Middle ages** - period between antiquity and Renaissance.

4.0 MAIN CONTENT

4.1 Review of Science in the Dark Ages

The past half millennium in Europe up to the year 1000AD is often referred to as the Dark Ages by the historians of science. The major events that happened are:

- Literary culture in the Rome –dominated Western Europe were almost declining.
- In contrast to the above, the Eastern Empire under the reign of Constantinople hosted a civilised society, though they did not produce much new scientists.
- There were no many scientists even in Europe but philosophers that only speculates.
- It was a period of ignorance because no meaningful learning was achieved during this period.

4.2 Science in the Middle Ages

In the early part of the 11th century AD most learned men knew and understood a bit of ancient science but later, a little progress was noticeable.

The 12th century witnessed the beginning of rebirth in science. That was when treaties and books were written on natural philosophy. The books also sensitised the public on the need to embrace science.

The 13th century witnessed the great age of scholastic learning and the founding of great monasteries and universities. At this period in question, learning was centred on the monasteries and not on universities. Religion tends to obstruct the road to scientific progress.

In the mid-13th century, Europe witnessed traumatic economic and social disasters in form of general financial collapse. This incidence further made science to be inactive and little interest was placed on experimentation. Natural philosophy and particular facts were studied mainly in connection with problem relating to religion and philosophical speculations. Historians of science have described the Middle Age as a period peculiar with dogmatism superstition and magic.

Throughout the Middle Ages, formal attempts to understand the physical world were developed especially in the arts and medical faculties of the medieval universities. Most of the speculations made by the Greek philosophers were revisited. The works of Greek philosopher like Aristotle, who had the most immediate impact, began to dominate western philosophical thought. There was little or no practical study or

experimentation within the medieval university; the Bible and Roman law were the only two popular courses.

The tendency to avoid practical subjects was reinforced by Aristotle's teachings on how natural philosophy should be conducted and the correct way of determining the truth of things. He rejected the use of mathematics in natural philosophy. This was because he believed that mathematics being entirely abstract, could not contribute to the explanation of natural world. Although, geometry and arithmetic were taught in the university system, they were always regarded as inferior to natural philosophy.

4.3 Factors Responsible for the Backwardness of Science in the Middle Ages

The following were some of the factors responsible for slow progress of science in the medieval period.

1. Medieval mathematics was confined to simple computations; mathematics was not regarded as a compliment of science. This period failed to recognise that mathematics can be used to tackle advance problems in science and astronomy.
2. Absence of scientific incentives.
3. Great emphasis on theology and faith that is, Bible and Roman law.
4. Technical methods were treated as secret and with mysteries hence, there was no spirit of open mindedness. Knowledge acquired in industrial practice was not disseminated to others.

During the late Middle Ages, there was a positive change in the intellectual climate. It was discovered that theology and religion could no longer solve man's problem. Secondly, there were divisions among churches. Disagreements appeared at the very centre of medieval learning, philosophical controversies seemed to shake the very foundations of dogma, there was intellectual curiosity, willingness to reopen questions which appeared closed before and to seek answers from every source capable of giving them and this was the beginning of rebirth in science which the historians of science called "Renaissance."

5.0 ACTIVITY

- i. Discuss the major contribution of 13th century to the development of modern science.
- ii. What was the major positive change in intellectual climate that occurred in the late Middle Ages?

6.0 SUMMARY

You have learnt from this unit the main features of science in the Middle Ages. You have also learnt the reasons for the backwardness of science in the Middle Ages and how development in the mid and late 13th centuries prepared for the rebirth of

science which is called the Renaissance. In the next module, we shall discuss in detail Renaissance and its impact on modern science and technology.

7.0 ASSIGNMENT

- i. Briefly describe the nature of science in the Dark Ages.
- ii. Enumerate and explain the major factors that led to backwardness of science in the Middle ages.

8.0 REFERENCES/FURTHER READING

Butterfield, H. (1975). *The Origin of Modern Science*. New York: Free Press.

Hoover, K.R. (1984). *The Elements of Social Scientific Thinking*. New York: St. Martin Press.