



**FEDERAL UNIVERSITY OF TECHNOLOGY
MINNA**

**THE FASCINATING ELEMENTS IN SOILS:
ARE YOU SEEING WHAT I AM SEEING?**

By

YAHAYA AHMED, IYAKA

*B.Sc. (Sokoto), M.Sc. (Ibadan), PhD (Abuja), MCSN
Professor of Chemistry*

INAUGURAL LECTURE SERIES 66

19TH JULY, 2018



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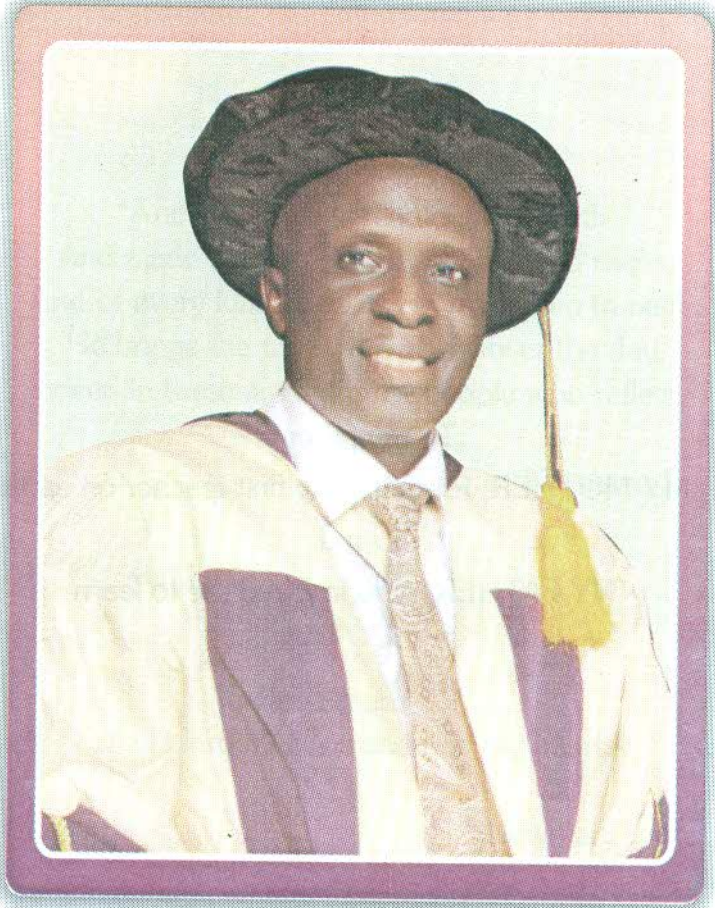
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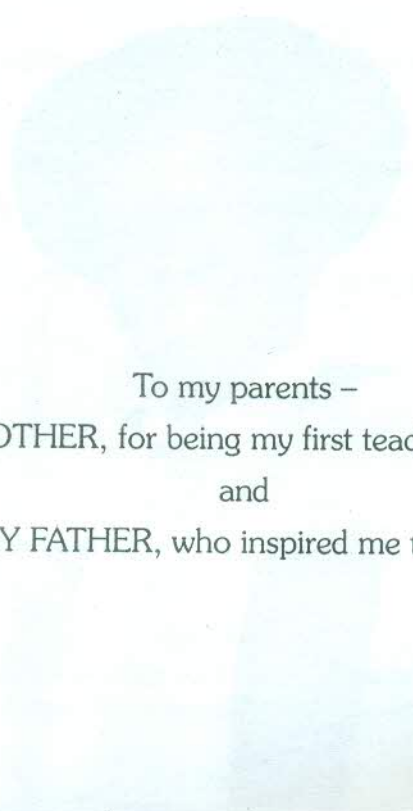
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Yahaya Ahmed, IYAKA

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To my parents –
MY MOTHER, for being my first teacher on earth
and
MY FATHER, who inspired me to learn

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EPIGRAM

“And He (God) spread out the earth,
And made therein firm mountains and rivers,
And of every kind of fruits He made two in pairs,
He brings the night as a cover over the day,
Indeed in these are signs for people who reflect.”

Quran 13: Verse 3

“Living nature
shall plan my ways and rule my heart.”

(Newman)

THE FASCINATING ELEMENTS IN SOILS: ARE YOU SEEING WHAT I AM SEEING?

PROLOGUE

My beginning

I was born in a learning environment; I started by learning and completing the recitation of the holy Quran at the tender age of seven. My late father was an Alim and a merchant who believed strongly that “only men of knowledge can be leaders of mercy to their people” and he wanted that for his child. I never experienced the pastime and frivolities of little children; my childhood was rather engaged in learning. In exchange to learning my father gave me exceptional privilege a child could enjoy and loved me very tremendously to the envy of my siblings and step mothers. Perhaps, because I was also his first surviving male child; verily my father was my **best friend**.

The Unseen Hands of Destiny in the choice of my Career

As a child I was endowed with an unusual intellect; always in the first position throughout my primary school days and a college scholar at the prestigious Federal Government College, Ilorin. After my secondary education, I was admitted into the School of Basic Studies, Zaria with my **Mock** result. However, when the GCE (O level) result was released my **Chemistry** was not included; by implication I was not to continue with my subjects' combination of Biology, Chemistry and Physics. Nevertheless, when the team of the staff registering us saw my result, they argued that a candidate with such distinctions in his result, coupled with the standard of my Secondary School, they were confident that my Chemistry result would be released and I would pass. Yes, that

was how **the unseen hand of destiny intervened**; I offered chemistry at "A" level **without** "O" level Chemistry result (of course with all Glory to Allah my Chemistry result was later released with a distinction grade).

Moreover, I came by vicissitude, an accident of time which is said to be the greatest misfortune of life; I had three years of unsuccessful academic life which again only my late father understood best. To the glory of God those three years were the best formative years of my life and existence.

Alhamdulillah (All praise is due to Allah)!

My Choice of Chemistry

Yes, I wrote to a very close uncle and friend:

*"You may probably not like the course of my choice, but I am at an end; at a point where I have to choose **the best** before me, though I am not alone in this and that is my only consolation".*

These were my words, when I ventured into Chemistry as a career and a profession. Consequently, to the Glory of the Lord (my Creator) I graduated as the best graduating student in **Pure Chemistry** in my set.

For the Sake of my Friend: Usman Nda – Umar

In our undergraduate days, we had teachers that gave their commitment and time; the best was Prof. L. G. Hassan – my Organic Chemistry teacher and my project supervisor. Hence, the only option before me at the Postgraduate level was Organic Chemistry. However, my good friend and faithful comrade Usman turned me away, to study Analytical Chemistry. Today, by the Mercy of Allah, I am a Professor of Chemistry with specialization in Analytical Chemistry; the **best place** I ought to be. Alhamdulillah!

INTRODUCTION

1.1 Inaugural lecture

Mr. Vice-Chancellor Sir, in these days that the best academic practice is to interact and take the ownership of learning, coupled with information surge I really marvel whether this assembly is really necessary. My only hope is that this professorial inaugural lecture at the end of it, may perhaps accord me an exceptional privilege and a feeling of immense humility for the following reasons:

- ✓ inaugural lectures are a part of an important research and a valued tradition in the University system;
- ✓ it will provide an opportunity for me to appreciate the loved ones, my mentors and colleagues, whose support over a lifetime, has led me to this remarkable day;
- ✓ perhaps my lecture may be plausible enough to inspire a young concessive mind to see the beauty of chemistry as a “worthy profession”;
- ✓ it will provide me a moment to tell the world (concisely) what I have learnt and done as an academician; in the words of Bammera Pothanna:

“What I have heard or learnt (or seen)
From many a scholar,
A pious hope it has been,
To render it crystal clear”
Unsornii ya Allah (So help me God)!

1.2 The title of my inaugural lecture

*"I find purer philosophy in a Poem than
In a conclusion of Geometry, a **Chemical analysis**, or
In a Physical law"*

(Wilfred Owen)

At the prime University of Ibadan, the erudite Prof. O. Osibanjo planted the seed for my quest for the **fascinating Elements in Soils** and the eminent Prof. S. E. Kakulu at my PhD level increased my concern for them, while they both nurtured my inspiration and deep love for **Analytical Chemistry**.

As to my question, I derived my inspiration from the words of Bill Nye who stated thus:

*"Everyone you will ever meet,
knows something you don't."*

Hence, the theme of my Inaugural Lecture:

*"The Fascinating Elements in Soils:
Are you seeing what I am seeing?"*

Subhanaka wa bi ahmdik (Glorified be you [Allah] and unto you be the praise)!

Mr. Vice - Chancellor Sir and distinguished audience in my lecture I will talk about:

- ✓ Chemistry
- ✓ Analytical Chemistry

- ✓ The Chemical Elements
- ✓ The Heavy Metals
- ✓ Soils
- ✓ My Contributions
- ✓ Conclusion and Recommendations
- ✓ Acknowledgements.

CHEMISTRY

"What in the world isn't chemistry?"

(Anonymous)

Chemistry is an experimental science that deals with the **study of matter**, including its composition, structure, physical properties, and reactivity. The practice of chemistry is not limited to chemistry books or laboratories: **It happens** whenever someone is involved in changes in matter or in conditions that may lead to such changes.

Attempts to understand the behaviour of matter extend back to more than 2500 years. The Greek postulate claimed that matter consists of four elements; air, earth, fire, and water.

2.1 The Age of Alchemy

It was not until about 320 BCE, at the time of Alexander the Great, that the alchemists made serious studies of **chemical changes**. Alchemy encompassed Greek and Egyptian as well as Arabian and Chinese concepts of **matter and energy**. The early alchemists were not scientists, and they also did not use scientific procedures, but they were philosophical and theological about their trial-and-error procedures (Figure 1). They were **unable to decipher the nature of chemical reactions**, but they did **make some discoveries that advanced knowledge**.

Most early alchemists are **unknown**, considering that they were very **secretive** about their methods and left little in the way of written history. Their goals were mystical, economic, secret, unpublished, and unshared. The alchemists' main search was for



Figure 1: An alchemist's workshop circa 1580 [Although alchemy made some useful contributions to how to manipulate matter, it was not scientific by modern standards (credit: Chemical Heritage Foundation)]

the “philosopher's stone” that could unlock the secrets of transmutation — that is, the secrets of how to transform base metals and chemicals into different, more useful and valuable products, such as gold and silver. This also led to the futile search over many centuries for the *elixir vitae* that would be both the universal “cure” for all illnesses and the way to achieve “immortality”.

For over 2,000 years, alchemy was the only “chemistry” studied. Alchemy was the predecessor of modern chemistry and contributed to the slow growth of what we know about the Earth's chemical elements. For example, the alchemists' interest

