THE NIGERIAN ACADEMY OF SCIENCE

WHY I BECAME A SCIENTIST

Why I Became a Scientist

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The Nigerian Academy of Science
8A, Ransome Kuti Road
University of Lagos, Nigeria.
PMB 1004, University of Lagos Post Office, Akoka, Yaba,
Lagos, Nigeria.

Tel: (+234) 8089622442

Email: admin@nas.org.ng

Website: www.nas.org.ng

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About the Nigerian Academy of Science

The Nigerian Academy of Science (NAS) is the foremost independent scientific body in Nigeria which was established in 1977 (but incorporated in 1986). NAS is uniquely positioned to bring scientific knowledge to bear on the policies/strategic direction of the country, and is also dedicated to the development and advancement of science, technology, and innovation (STI) in Nigeria. The aims and objectives of the Academy are to promote the growth, acquisition, and dissemination of scientific knowledge, and to facilitate its use in solving problems of national Interest. The Academy strives to do this by:

- Providing advice on special problems of scientific or technological nature presented to it by the government and its agencies, as well as private organizations;
- Bringing to the attention of the government and its agencies problems of national interest that science and technology can help solve;
- Establishing and maintaining the highest standards of scientific endeavours and achievements in Nigeria, through the publication of journals, organization of conferences, seminars, workshops, and symposia, recognition of outstanding contributions to science in Nigeria, and the development of a working relationship with other national and international scientific bodies and academies.

NAS is a national not-for-profit organization with a total membership comprising 248 Fellows elected through a highly competitive process, who have distinguished themselves in their fields both locally and internationally. Some of its members have served as Vice-Chancellors of universities, Directors-General of government parastatals, and Ministers in federal ministries. The Academy, given its clout, also has the ability to attract other experts from around the country and internationally when needed. NAS is Nigeria's national representative on such bodies as the International Science Council (ISC) – the umbrella body for all science associations and unions – and the Inter-Academy Partnership for Policy (IAP) – the umbrella body for all national science academies globally. The Academy is also a member of the Network of African Science Academies (NASAC).

Some recent accomplishments of NAS include:

1. The development of a training manual on getting research into policy and practice,
2. The organization of an international conference on climate change in Lagos,
3. Implementation of a project on linking agriculture and nutrition,
4. The organization of a national consensus building workshop on the prevention of maternal and child mortality in Nigeria,

5. Convening a roundtable meeting to discuss the issues related to the Ebola Virus Disease epidemic that recently affected the country and the West African region,
6. Conveying a media roundtable meeting to discuss issues of depression and suicide prevention,
7. Implementation of an intervention program to address the social and reproductive health issues of the youth in Ekiti and Nasarawa States of Nigeria,
8. The hosting of all African academies and other scientists at an international conference on STI education and manpower development in Africa,
9. The organization of a summit to discuss the role of women in science and sustainable development in Nigeria, and
10. The organization of a workshop to discuss the evolution of big data and artificial intelligence (AI), and the impact on education and training.

Foreword

Nations develop through their exploitation of the frontiers of STI. The importance of science and technology in a given society cannot be overstated. Also, it should be highlighted that what accounts for such national development is not buildings and equipment alone, but more importantly, it is human capital development. To be able to do exploits in STI, there is a crucial need for good scientists. Nigeria has her share of scientists who have aided the development of this country and of its brand internationally. To continue along the path of development, it is necessary that there is a consistent production of scientists who are skilled enough to lead the country's STI initiatives. It is on this background that the NAS instituted this book project on *Why I became a scientist* to document the stories of distinguished Nigerian scientists (home and abroad). The project aims to inspire new generations of Nigerian scientists, by sharing with them how ordinary Nigerians were inspired to pursue scientific careers and ended up making an impact in the world!

While the book project aims to document stories of Nigerian scientists (Fellows and non-Fellows of NAS), this first volume is focused on the Fellows of the NAS. The Academy is the foremost independent scientific body in Nigeria into which only 10 Nigerian scientists can be elected annually through a very competitive merit-based process. These are Nigerians who have distinguished themselves in various fields of science, including engineering and medicine.

In conclusion, I present to you Volume One of *Why I became a scientist,* which is recommended reading for all, including policymakers and students. This book has the propensity to inspire thoughts of greatness. Enjoy!

Dr. M. Oladoyin Odubanjo
Executive Secretary,
NAS

Richard A. Adegbola FAS

Professor of Microbiology/Bacteriology

My field of science is Microbiology, with a focus on bacterial infections in the tropics, vaccine trials, and immunization.

I attended Fatima College, Ikire, Osun State, and obtained my West African School Certificate (Division One), after which I gained admission to the School of Medical Laboratory Sciences, Lagos University Teaching Hospital. I attained the Fellowship of the Institute of Medical Laboratory Sciences (FIMLS), with specialization in bacteriology and parasitology. I did post graduate studies at the University of Dundee, Scotland, and obtained my MSc and PhD degrees in microbiology. Also, I attended the Nordic School of Public Health, Goteborg, Sweden, for the European Course in Tropical Epidemiology.

While growing up, my initial interest was to become a lawyer like the son of my father's friend, whose gown and wig I so much admired. This changed when I got to class 3 in college and started studying biology. I was intrigued and fascinated by the human body, brain, blood, heart, limbs, and how all work together to keep the body going. "I will praise You, for I am fearfully and wonderfully made" (Psalm 139:14). Henceforth, I knew I was going to be a scientist and there was no turning back!

I had several motivations for becoming a scientist, which, initially, was simply to satisfy my curiosity about the human body. My motivation later progressed to a real passion for the prevention of pneumonia in children. Networking and opportunity for global travels have been additional motivations. I have visited more than 50 countries across six continents in my quest for science.

I have had a unique work experience in science cutting across diagnostics, research, and academia, as well as philanthropy and industry. From starting as a medical laboratory technologist in the diagnostic microbiology laboratory at the Lagos University Teaching Hospital, I joined Lagos State University, as a senior lecturer, teaching and researching on bacterial agents of diarrhoea. I moved on to the UK Medical Research Council Unit in The Gambia working on bacterial infections in children and vaccine trials for many years. I later worked on pneumonia clinical studies at the Bill & Melinda Gates Foundation in Seattle and was Global Director for Scientific Affairs & Public Health at GlaxoSmithKline Vaccines, Belgium, using my decades of knowledge from research and from the front line, to make a substantive impact in saving lives through contributions to increased global vaccine access. My work has led to several awards and recognitions including Visiting Honorary Professor,

University of Leicester, Hon FRCP (London), as well as the publication of 5 book chapters and 235 articles in peer-reviewed scientific journals.

My initial research interests focused on characterization of fimbrial adhesins of enterobacteria, using a novel method of immuno-electron-microscopy. Antigenic characteristics of the type 1 and type 3 fimbriae were fully described and new fimbrial types were discovered. My focus shifted to bacterial infections in the tropics when I joined the MRC Unit in The Gambia. My first studies were on the bacterial causes of pneumonia in young children in Africa, a topic about which little was known at that time. This work identified *Streptococcus pneumoniae* and *Haemophilus influenzae* type b (Hib) as the primary causes of severe pneumonia in young children in The Gambia. Based on these findings, the MRC Unit embarked on a series of trials of Hib and pneumococcal conjugate vaccines. Our studies demonstrated, for the first time, the potential of these vaccines to save the lives of young African children and were key to decisions taken by the World Health Organization to recommend routine implementation of these two vaccines in Africa. Hib disease has virtually disappeared from countries in which Hib conjugate vaccines have been introduced, including The Gambia, Kenya, Mali, Malawi, and more recently, Nigeria, saving many lives and avoiding lasting disability. Pneumococcal conjugate vaccines, being introduced into the routine immunization programmes of many countries are saving even more lives.

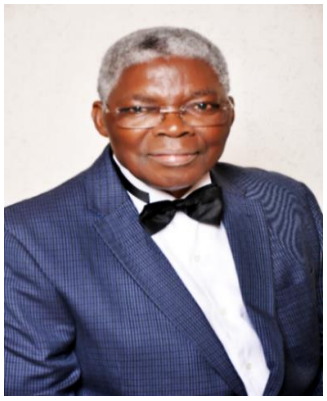
My election as a Fellow of the NAS in 2016 was a proud moment for me as a Nigerian scientist as it represents recognition of my work by colleagues in my country.

The most challenging moment as a scientist was early in my career. I returned to Nigeria after my PhD studies in the UK and discovered there was little access for me to do top-level laboratory-based studies. To overcome this challenge, I decided to combine laboratory-based expertise with bed-side and population-based studies, the outcome of which has turned out to be a long-term rewarding career in scientific research.

My advice for young and prospective Nigerian scientists is to be focused and persistent in addressing scientific questions. Give careful thoughts to a career path and choose a mentor. Set clear goals and objectives with SMART criteria that are, specific, measurable, achievable, realistic, and time-based. Finally, be determined to work with honesty and integrity.

Sylvester O. Adegoke FAS

Professor of Geology/Earth Sciences



My field of science is Geology / Earth Sciences. I attended the following educational institutions; University College, Ibadan, Nigeria (B.Sc. Zoology), University of California, Berkeley, USA (PhD Paleontology).

My earliest memory of being interested in science was in high school and university; I had greater interest and better recollection and understanding of Science. I had limited patience when I read lengthy humanities and related books.

My motivation for becoming a scientist was that science offered me unlimited opportunity to discover and explore new fields. Thus, at 1st degree, I majored in zoology (UI) and at PhD (UC Berkeley), I majored in palaeontology (with geology and zoology ancillaries). I also had four scientific papers and one monograph accepted for publication in learned journals. The following year was spent as Postdoctoral Research Fellow at the California Institute of Technology, Pasadena where I further improved my skill and published an additional four papers.

The areas of science that I have worked on during my career are; Geoscientific and related sciences, biological and environmental researches, oil and gas exploration.

My career highlights and contributions to the field of science are that I have about 150 scientific publications and over 300 technical reports in varied fields of science, technology, and environmental research.

My proudest moments as a Nigerian scientist were attaining the rank of Professor at the end of my fourth year in the university (OAU) and at the relatively young age of 34 years, and being a recipient in 1987 of the Nigerian National Order of Merit (NNOM) Award, Nigeria's highest prize for research and development. I was also the first recipient in the natural science section.

The most challenging moment in my career was the appointment of the last candidate as Vice Chancellor of the university when I was first, with the vote of all members of the Selection Committee and the Chairman of Council. I overcame it by putting the matter behind me, and working consistently as if nothing unusual had happened.

My advice for young and prospective Nigerian scientists is to be inquisitive, aim high, and follow the dictates of your heart and mind. Believe that you will always succeed if you put in your best.

Isaac A. Adeyemi FAS

Professor of Food and Science Technology

It's the journey of life. Starting from where? primary or secondary school? Is it fate, providence, or luck at work? How I wish, I could give straightforward answers without mincing words or beating about the bush. Anyway, I found myself today a Professor of Food Science and Technology with specialization in cereal science and technology.

It all began during my primary school days, growing up in the village, and being close to nature and admiring the gifts of nature and life, not only from the biblical perspective, but also from a scientific point of view. What constitutes life? How do plants grow, and how do animals behave? What differentiates man from the other animals? What makes man unique on this planet earth? More questions and inquisitions drove me into the realm of science, and made me to shut my mind completely against the social sciences and humanities.

The above was further enhanced right from my first year in secondary school, Baptist High School, Iwo, Osun State. We had experienced teachers in our first two years who handled the teaching of general science usually complemented then with some basic practicals and illustrations. Trained, experienced, and committed teachers, these would go any length to accommodate and stimulate the unwilling minds. That was my exposure in the first two years. Another enhancer was my distaste for geography and history by the time I was in form four. As much as I loved history and was doing very well, I could not stand reading and memorizing years and events, plus the confusion of being exposed to European history and West African history all at the same time. On another hand, geography was my worst subject, as I was not (and I am still not) particularly good at drawing. By the time I got to form five, the only arts subject I was left with was English Literature, apart from English language and Yoruba that were compulsory. This paved the way for my options at the higher school certificate level: chemistry, physics, zoology, and general paper.

The University of Ibadan, offered me admission to study a course in agriculture, with specialization in agricultural biochemistry and nutrition. Right from the onset, my principle was dictated by the biblical injunction: "Whatever your hands find to do, do it with your might" (Ecclesiastes 9:10). Therefore, from the onset I had made up my mind to achieve the best academically, and to take after some of our renowned professors and lecturers; the likes of Emeritus Professor V. A. Oyenuga FAS (Late), a mentor of mentors. After graduating with a second-class upper division, I decided to deviate from pure agriculture to a

relatively new course in Nigeria then, food science and technology. In order to have a broad-based knowledge, I had to take a one-year postgraduate diploma (PGD) programme in the Food Science and Applied Nutrition Unit (now Department of Human Nutrition), University of Ibadan, Ibadan. After the successful completion of the programme, which gave me a clearer picture of food science and nutrition, my interest in the subject matter had become unwavering. As luck will have it, my Project Supervisor at PGD Level, Professor Edward Banigo, who had his Ph.D. in cereal chemistry and processing, introduced me into the world of cereals and recommended me to his supervisor at the University of Leeds, Leeds, England for my Ph.D.

My admission to the University of Leeds under the supervision of Dr. H.G. Muller, one of the then leading global authorities in cereal science and technology, especially, dough rheology, gave me the opportunity of learning at the feet of the 'master', just like Professor Banigo. The three and half years were not only a full exposure to cereal technology, but also to the entire field of food science and technology. At that time, Procter Department of Food and Leather Science was one of the leading departments in the field of food science and technology in the United Kingdom. As a postgraduate student in the department, one had the opportunity of exposure to the best available facilities which make teaching and learning highly interesting and educative not only in the narrow field of cereal science and technology but in the broader field of food science. There is no doubt; working with a 'giant' in the field had a rubbing effect in terms of focus, discipline, global exposure and confidence. That was my status by the time I returned to Nigeria after the completion of my Ph.D.

The next port of call was the University of Ife (now Obafemi Awolowo University), Ile-Ife, Osun State. I found myself inheriting a fully equipped cereal laboratory funded by the Dutch Government with similar facilities as I had in Leeds. This stimulated me further into research in the area of cereal chemistry and processing. While my Ph.D. work was focused on the baking quality of wheat, I had to further explore other cereals like maize, sorghum and millet, in addition to other cereal-like grains like amaranth seeds.

My teaching schedules piled on me by my then Head of Department, Professor Patrick Ngoddy, which included non-cereal courses such as nutrition, food chemistry and analysis, food rheology, basic food science etc. enabled me to have a better grasp of the subject matter and widened my research interest to include the following: food product development, food chemistry and analysis, and nutrition. I rose from the initial position of Lecturer II in 1978 when I joined OAU to that of Reader (Associate Professor) in 1990. I was eventually appointed Professor of food science and technology in 1990 at the establishment of Oyo State University of Technology (OSUTECH), now called Ladoke Akintola University of Technology (LAUTECH), Ogbomoso, Oyo State.

My academic satisfaction lies more in the lives that have been imparted through teaching and research. I have had the opportunity of successfully supervising several undergraduate students up till my retirement last year, as well as many M.Sc. Students and 13 Ph.D. graduates. Professionally, I rose to become the National President of the Nigerian Institute of Food Science and Technology, (NIFST), from 2008 to 2010 having served in various capacities within the body. Administratively, within the university system I held various positions ranging from Head of Department to Dean, to Deputy Vice-Chancellor, and to crown it all, for ten years (2006 to 2016), as Vice-Chancellor, Bells University of Technology, Ota. Currently, the exposure as Chairman, Governing Council, The Polytechnic, Ibadan since January 2018 has enabled me to gain insight into the running and challenges of another tertiary institution that has contributed immensely into the manpower requirements of Nigeria. These positions have enabled me to mentor some of my junior colleagues and to positively influence lives. My election in 2012 as a Fellow of the NAS is an icing on top of the cake.

On a final note, there is nothing that pays in life other than to be focused, hardworking, willingness to be mentored and to mentor others, and most importantly, to be God fearing from whom one should draw inspiration on a regular basis. I welcome you into my world of science, especially food science and technology, which forms one of the cardinal fields for human survival and civilization.

Olanike K. Adeyemo FAS

Professor of Aquatic Epidemiology and Toxicology

I was born into the family of Late Chief Moshood Akanni Salami of Iseyin and Mrs Modupeola Victoria Salami of Igbajo on 17th July 1970.

I started my primary education at LEA Primary School, Kigo Road, Kaduna (1975-1978), and later attended CAC Primary School, Sango, Ibadan, from 1979 to 1981. My secondary school education was at Anwar-Ul-Islam Grammar School (formerly Ahmadiyya Grammar School), Eleyele, Ibadan where I completed the West African secondary school leaving examination in 1986. I had a brief stint of advanced level studies at St. Annes School, Molete, before I entered the University of Ibadan during the 1987/88 session to study veterinary medicine. I passionately chose veterinary public health for my master and PhD degrees. Therefore, I can describe my journey into the sciences in one sentence: *"Science happened to me, but passion for my disciplinary specialization stoked my love for science and has kept the love burning"*. Science happened because, in my generation, students were randomly assigned to the arts, social sciences, or sciences, based on academic performance without the benefit of a choice. My investigative passion was triggered off when I was trying to arrive at what to focus on for my PhD research project. Then, the concept of "*One World, One Health, One Medicine*" was still in its infancy, but I was intrigued by the potential and possibilities inherent in the research strategy.

My research is therefore premised on "One Health", which promotes health through interdisciplinary study and action, across all animal species, humans, and the environment. This unique perspective and approach produced research outputs which addressed aquatic epidemiology/pollution and emerging diseases with the potential for significant transboundary and/or socioeconomic impacts at the animal-human ecosystem interface; thus, providing a strong evidence base to support policy decisions on global public health at international, regional, and national levels. For example, my study on the effect of oil and commonly used dispersants (Corexit 9500 and 9527), singly and in combination, on *Menidia beryllina* embryos using tissue differentiation, hatching success, expression of transcripts of genes associated with sexual differentiation, growth, and the stress response as indices detailed the often overlooked potentiation effect of dispersants, which are deployed during oil pollution events, on aquatic fauna. More recently, I have been extending my research thrust to further foster interdisciplinary collaboration at the ecosystem-animal-human interface to address the threat of neglected tropical diseases (Buruli Ulcer) and emerging zoonotic diseases (Monkey Pox).

The major challenge I have faced as a Nigerian scientist is limited national research funding, which also translates to lack of access to cutting-edge equipment and infrastructure. Additionally, as a female academic living in Nigeria, where culturally and socially, the values, beliefs, attitudes, and behaviour still have a strong patriarchal leaning, it is challenging for a woman to perform optimally because of the gender-assigned roles being juggled with career pursuits. The most challenging moment for me as a scientist was when I had to leave my 6 weeks old daughter, whom I had through a caesarean section, to participate in a 6-week training fellowship. I couldn't have done it without the very strong backing of a fantastic husband, and the support I received from my mum and mum-in-law, who both stepped up to fill the vacuum.

My proudest moments as a scientist are receiving peer recognition and acknowledgement of my contribution to knowledge in my field; with the most recent being election, in 2019, into The World Academy of Sciences (TWAS), for the advancement of science in developing countries, as one of the 12 people and 2 females ever so elected to date in Nigeria.

Paltry research funding limits the ability of a Nigerian scientist to actually focus on deploying strength and capability towards conducting research with global relevance but local application, which is what is required for a developing country like Nigeria. As the saying goes, "*he, who pays the piper, dictates the tune*". International funding is awarded based on a broader agenda, which might not necessarily have local application and/or be a research within national development priority. The purpose of research is to generate knowledge that can improve development outcomes; as such, a national research council is required to drive Nigerian research for national development.

My advice to young and prospective Nigerian scientists is to never compromise on excellence. Excellence is a universal standard, which is not limited and/or defined by geographic boundaries. Other ingredients are self-motivation, and the determination to excel in spite of any limitations, without excuses. It is also important to purposefully set and work towards short- and long-term goals, staying focused, being resilient with the end always in sight. Seeking positive role models (male and female) at different career stages, and through changing needs, as well as making myself available to mentor junior colleagues has been quite beneficial to my overall growth and career progression.

Mojisola C. Adeyeye FAS

Professor of Pharmaceutics and Manufacturing Science Engineering

Why did I become a scientist? The answer is all encompassing and it defines who I am. I couldn't crystallize all until I read certain dispositions or character traits stated in a reference: Mindful by Design. Defining Habits of Mind.

These dispositions include the following:
Persisting (Managing impulsivity), Listening with understanding and empathy (Thinking flexibly), Thinking about your thinking, emotions, and biases (Striving for accuracy), Questioning with critical curiosity; problem posing (Applying past knowledge to new situations), Thinking and communicating with clarity and precision (Attentively gathering data through all senses), Creating, imagining, and innovating (Responding with wonderment and awe), Taking responsible risks (Finding humor), Thinking interdependently (Remaining open to continuous learning).

By nature, I am very curious and persistent to see the end of a process or a storyline. My interest in science was developed in secondary school, at Yejide Girls Grammar School, in Ibadan. We were the first set to take physics and chemistry separately, with biology, instead of general science. I became curious when we did titrations and a yellow colored solution became blue as a result of reaction between two or more chemicals. I wanted to know why**.** That is part of the innate trait that became part of the reason for becoming a scientist.

Another aspect of my make-up is a perfectionist tendency. This has worked many times but can also be a weakness that I still work on. I like things to work and if they don't work, to find out why, and to do everything possible to make it work. This positive outcome-driven character has added to my becoming a scientist.

I also love nature and I am filled with awe to see the result of things coming out as they are supposed to. This may be linked to my youth. I grew up helping my father, along with my siblings, on the farm. During the yam harvest season, the tubers of yam were kept in the barn, after harvesting, for preservation for food, sale, and replanting. To replant, the tubers of yam were cut into "ebu" or small portions that were then planted. I responded with awe when I saw the yam shoot coming out of the ground, and growing, until harvested. That excitement, of seeing something beautiful, from ordinary "ebu" became part of why I became a scientist.

In high school, I liked chemistry just for the curiosity and anticipation of what could happen when two chemicals were mixed together. The process of selecting component A, at the right quantity, and having it added to component B and or C was a thrill, and that is the creativity part of me. I apply the same attribute in the kitchen to make meals. If I see a recipe somewhere, I cherish it with delight, and would like to experiment to see if the food would come out well. This is similar to finished drug products.

As a pharmaceutical scientist, in particular, pharmaceuticist and drug product evaluator, a lot of early planning and research have to be done in pharmaceutical development and manufacturing in order to ensure positive outcomes. This is called pre-formulation, which is a combination of chemistry, analytical chemistry, biology, engineering, and pharmaceutics. I don't like to waste time, or energy, naturally. It turns out that I spend more time reading than expected in the planning phase; I wouldn't be satisfied if I have doubt about the process.

Taking risks is also an attribute that comes naturally; this trait, sometimes, comes with a price of failure. I have exercised this character many times in my professional life, and a few times, I have failed. However, in general, as a scientist, it has worked very well and the gains have outweighed the losses. This has contributed to my becoming a scientist and staying so.

Another trait that I believe has helped me in becoming a scientist is independent thinking. I like to figure things out myself. If somebody hovers over me in the laboratory, for example, I get confused because of the distraction. I also do things with the expectation of possible mistakes; this makes me to be well guarded to avoid such mistakes. This falls under risk management. If mistakes are made, I try to analyze them, sometimes painfully, and though disappointed, to know how and why the mistakes occurred. What can be done to correct such, and how to avoid them in the future, becomes my concern and another priority attention. This is the "lessons learned" outcome that works for me daily.

I love new information. Whenever I am doing a literature review, or gathering information for a task or research project, I am like a fish in the ocean; I keep looking for more and could spend long hours in the library, and now on the computer, trying to find as much information as possible. This trait is embedded in the dispositions above.

Finally, I strongly believe that God gives insight into new discoveries and expands the mind to comprehend and synthesize them. My interest in science and these character traits that added to my becoming a scientist are talents given by God for a purpose. The purpose is to benefit mankind and give glory to God. Using the talents is part of living to ensure that I don't live purposelessly.

Folorunsho I. Adu FAS

Professor of Animal Nutrition

My field of science is Animal Science and I attended the University of Ibadan from 1968 to 1972 for my undergraduate studies and from 1972 to 1975 for my postgraduate studies.

I grew up in an environment where the only professions I knew were farming, teaching, and the priesthood. My late father, being a very successful and rich farmer, wanted me (his third son in a family of 18 children) to take after him as a farmer. So, after my primary school education in 1956, my father took me to the farm where I spent about 14 months before providence opened the door to secondary school. While on the farm, I was intrigued by how putting two or three grains of maize into the soil produced several cobs with many more grains. In other words, I knew the product but not the process. The 'how' occupied my mind and I was eager for an answer. Unfortunately, the secondary school I attended did not offer science subjects. The nearest it offered was rural science. So, the question 'how' kept quietly agitating my mind until again providence brought me to the University of Ibadan, where I had to struggle with chemistry in particular (having passed Biology at GCE level years after leaving secondary school) to retain my admission to the preliminary class of 1968. Within my 1st year in the university, I knew the answer to my question was in biology and chemistry and since I loved farming, I opted to study agriculture.

I was motivated to become a scientist first by the neat appearance of my lecturers in their sparklingly white laboratory coats. Secondly, the 'simple' life of the scientists (lecturers)-from home-lecture-club-lecture-laboratory-home) just fascinated me. Thirdly, my late mentor, Papa Oyenuga had all it takes to inspire and motivate students to take after him.

I have worked extensively in the area of animal science with specialization in ruminant animal nutrition. I have contributed to the knowledge and development of sheep and goat (small ruminants) in the following areas;

I. Characterizations of indigenous sheep and goat breeds using macro and meta approaches as well as formulated strategies to improve the performance of the breeds.
II. Rumen ecology and feed utilization to enhance the efficiency of utilization of non- conventional foodstuffs through enhanced rumen fermentation.

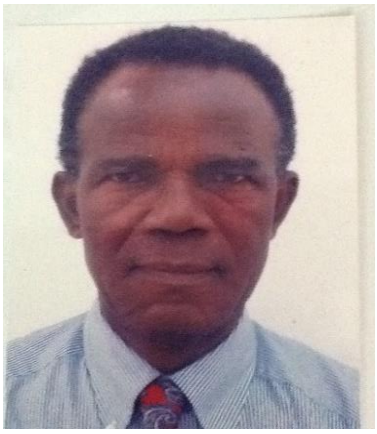
III. The use of blood metabolites (non- esterified fatty acids, glucose and ketones) to monitor and regulate the nutritional status of pregnant ewes (female sheep).

My proudest moment was when I was elected into the NAS, and the most challenging moment of my career was during a religious crisis in Zaria. We have had several of them but the one of March 1987 stood out as the rioters/hoodlums moved from quarters to quarters killing or torturing people. Of course, I ran into the bush for days with my family. Meanwhile I had an on-going animal feeding experiment that I thought would give me a breakthrough. I had to go at midnight, at risk to my life, to feed the animals while I missed several blood-sampling periods. As should be expected, I did not get the best from the research. This hurt me seriously and I guess with the scar still in my heart today. Worse still was my inability to repeat the study as I transferred shortly thereafter from Ahmadu Bello University (ABU), Zaria. The research was repeated by one of my postgraduate students' years after, and the findings from the study announced him.

My advice for young and prospective Nigerian scientists is: believe in yourself, have passion for what you believe and do, continue learning for currency in knowledge and skill development and be proficient in Information Communications Technology (ICT).

Adeyinka Afolayan FAS

Professor of Enzymology and Protein Science



My field of scientific research for many decades was Biochemistry. I became a biochemist by an accident of fate. After leaving Christ's School, Ado Ekiti in 1958, my main interest was to sit for the entrance examination to the University College, Ibadan (UCI), now University of Ibadan to study medicine. For during my five-year sojourn at Christ's School, we had highly committed teachers in biology, mathematics, and chemistry who inspired us to study these subjects. We had only two graduate teachers in science at that time; one was in botany and the other was in chemistry. However, we had many Cambridge School Certificate holders who were bright and smart. They were also our mentors. Many of them passed the entrance examination to either the UCI or the Nigerian College of Arts and Sciences (which later became University of Ife) to study medicine or any of the basic sciences such as physics (which we were never taught at school at that time), chemistry, zoology, or botany. For me, the only choice on my table at that time in 1959 was to study medicine. And, I passed the entrance examination to study medicine at UCI clearly. Only ten of us in the whole country were admitted into the course in that year. It was a big win for me, a reward for hard work, diligence, and strong competition.

After almost two years of pursuing a medical education in the university, I had to change my course because I had no scholarship or any financial support to continue studying medicine. I then changed course to study chemistry and zoology, which became extremely helpful in my future career. While studying chemistry, a few of my lecturers in organic chemistry really inspired me to take an interest in physical organic chemistry, particularly mechanistic principles. In particular, Prof A. U. Ogan FAS encouraged me to consider biochemistry as a future career. He gave me access to many instructive publications on biochemistry, which were produced by the Biochemical Society in the UK. From then on, I made up my mind to make a career in biochemistry. I earned my B.Sc. degree from the University of London in 1964.

After graduation, I became a science teacher in a secondary school. But I was not satisfied with being a secondary school teacher for life. I therefore decided to pursue graduate studies in biochemistry and I was admitted to study biochemistry at the Department of Biochemistry, of the University of Ibadan. However, my stay there was short lived for a variety of reasons. I had to withdraw from the programme. Almost immediately, I learnt about a similar

graduate biochemistry programme being run in the Department of Chemical Pathology. I moved there to register for a Ph.D. degree in Enzymology and Protein Chemistry. The research facilities available there were comparable to what were available in the best department of biochemistry or molecular biology in the USA. During my stay there, I had the opportunity to participate in advanced courses in molecular biology, which was conducted by the staff of Hadazar - Hebrew University in Israel. In addition, I also attended a highly competitive NATO sponsored workshop on molecular biology of phages in Naples, Italy. My Ph.D. work was on the kinetic studies of genetic variants of glucose 6- phosphate dehydrogenase from red blood cells and two new genetic variants were discovered.

Immediately after my graduate studies in 1969, I went to the Department of Microbiology and Molecular Biology, Washington University at St Louis, MO, USA for my postdoctoral training in molecular biology, specifically on ribosome metabolism and regulation of ribonucleic acid (RNA) synthesis. It was indeed an exciting moment in my life, participating in modern molecular biology research in the Department where deoxyribonucleic acid (DNA) polymerase was once discovered. I also had the opportunity in meeting many distinguished scholars, including Nobel laureates, working actively in many aspects of molecular biology and who came in to give seminars. This was the peak of my academic training. I returned home in 1970 to take up an appointment as one of the pioneer staff assigned with the responsibility of starting a B.Sc. degree programme in the science of biochemistry at the University of Ife, Ile-Ife (now Obafemi Awolowo University, Ile-Ife).

As an Ibadan man, the university at Ile-Ife, established three years after I became an undergraduate at Ibadan, was like a playing ground. But the Ile-Ife sojourn not only turned out to be my home for nearly four decades, the great institution became my identity. My research laboratory was involved in vigorous research work on structure, regulation, and mechanism of action of enzymes. I retired from the university in 2006.

Perhaps one of the exciting moments of my life in my younger days was when two of the publications out of my Ph.D. thesis, which were published in 'Biochemistry' (USA) in 1971, were used as workshop teaching materials on enzyme regulation, at a NATO sponsored international workshop, which I attended in Madrid, Spain in 1972.

My advice to young and prospective students is to cultivate a profound sense of enquiry, work hard, and be competitive. The beauty in experimental science can only be discovered when you are part of the team that is involved in the extension of frontiers of knowledge.

John O. Agbenin FAS

Professor of Soil Environmental Chemistry

My field of science is Agriculture (soil-environmental chemistry) and I attended the following educational institution; St. John Bosco's College, Ubiaja, Southeast Local Government Area, Edo State, Ahmadu Bello University, Zaria (BSc, MSc), University of Saskatchewan, Saskatoon, Canada (PhD).

There was never a moment in my life when I planned to be a scientist. Coming from a long generation of farmers in a rural community in Edo State, my foremost ambition was to be the first in the family, and among my peers to attend a university and acquire a degree. There was no thought of any course of study. However, in secondary school, my initial interest was in history. Even though I was performing well in the sciences, I consistently came first in history. Unfortunately, my history teacher stopped me from attending the class since it was clashing with my other science subjects. My interest in agriculture was aroused at the final year in my secondary school after a brief excursion to the newly established cattle ranch and dairy farm, at Ubiaja, by the then Bendel State Government.

Becoming a soil scientist, specializing in soil-environmental chemistry, was again not in my interest, in agricultural science. My direct entry admission to Ahmadu Bello University, Zaria, was to study agricultural economics. On enrolment in the first year, there were no courses in agriculture taught to us. Our courses were mathematics, physical chemistry, inorganic and organic chemistry, biochemistry, microbiology, invertebrate and vertebrate biology, botany, plant anatomy and physiology, helminthology, and entomology. I was thoroughly puzzled whether my admission was really to study agricultural economics. To complicate matters, those of us who did not take physics at the advanced level were to offer supplementary physics, consisting of two lecture hours and 3 hours of practical per week, for one full session at the Department of Physics. To shorten a long story, I vied into soil science, instead of agricultural economics, in my option year because it was more challenging for me. The processes occurring in soils that produce a healthy crop and clean water require the knowledge of chemistry, physics, biochemistry, and microbiology to comprehend. In order not to waste all the chemistry, mathematics, physics, biochemistry and microbiology taught to me in the first year, for which I worked so hard to earn good grades, I vied into soil science with special interest in the chemistry of the soil environment at the higher degree programme.

My research interest has been the application of chemical reaction models to processes regulating the availability of phosphorus to crops in weathered tropical soils; the chemistry of trace and potentially toxic metals in soils and their subsequent transfers into the food chain in urban and peri-urban agriculture. My research efforts produced several publications in high impact factor journals in soil and environmental sciences, which are the most cited internationally of any soil scientist in Nigeria. My career as a scientist saw me hold the Alexander von Humboldt Fellowship at the University of Giessen, Germany (1998 – 1999); University of Bonn, Germany (2006 and 2015); The World Academy of Sciences (TWAS) Fellowship at the Institute of Agronomy, Campinas, Sao Paulo, Brazil (1997 – 1998, 2004); and an International Fellowship at the Rothamsted Research, Harpenden, England (2004), among others.

The major highlight and the proudest moment of my career as a scientist was the election as a Fellow of the NAS, along with another soil scientist in 2014; being the first two soil scientists ever elected as Fellows of this prestigious academy since its inception in 1977. The election prompted a personal congratulatory letter to me by the Chancellor of the University of Saskatchewan, Canada, where I completed my PhD several years ago, stating, "Election into the fellowship of the national academy of science is no mean feat for any scientist". I cherish his congratulatory letter because how the university got the information about my election still baffles me. However, the letter further states that the university follows the progress of its alumni everywhere in the world.

The most challenging moment in the life of any scientist, especially in Nigeria, is the dearth of research facilities, in terms of equipped laboratories and funds for research. In Nigeria, a grant of three to five million naira might be viewed as substantial. Yet, this amount of money is not enough to purchase analytical grade reagents for a high-quality MSc research and thesis in my field of soil-environmental chemistry.

For young and upcoming scientists, one way out of this problem is to seek grants and collaboration with scientists outside Nigeria, provided they are convinced of your worth and value from your published papers. Donor agencies only put out money to reinforce excellence with a view to getting the value for their money. Young scientists must avoid the temptation of doing haphazard work and rush to publish in predatory journals that will eventually destroy your career. I am, however, aware that Nigerian universities count numbers and not the quality of publication for promotion; hence, the temptation to follow this path. Indeed, many individuals with these dubious publications are vice-chancellors, and are usually uncomfortable with the real scholars on their campuses. Let this not deter you from pursuing academic excellence in your field of science because a body like the Nigerian Academy of Science only recognizes and rewards excellence.

Martin A. Aghaji FAS

Distinguished Professor of Cardiothoracic and Vascular Surgery

I am the past President of the Nigeria Cardiac Society. I graduated from the University of Nigeria Medical School with 5 distinctions in my professional examinations during my medical education. Not only was I the overall best graduating medical student in my class, I was awarded several prizes for the best graduating student in Medicine, Surgery, Obstetrics and Gynaecology, Community Medicine, as well as over 14 academic prizes. I proceeded to King's College London, where I distinguished myself by acquiring fellowships of the Royal Colleges of Surgeons of England, Glasgow, and Edinburgh. I obtained a Master of Science degree in Nuclear Medicine from the University of London. I specialized in adult and paediatric heart surgery, thoracic surgery, liver surgery, kidney transplantation, and nuclear medicine. I studied the complex methods and worked on simplifying them such that they could be adapted in a country like Nigeria. I was the first to successfully replace the mitral valve with a mechanical heart valve (December 17th1986), first to replace the aortic valve with a mechanical heart valve (March 1987), modernizing the art of colon transplants for oesophageal replacement, carried out the first mitral valve replacement in Nigeria (1991), first total correction of tetralogy of fallot (Blue Baby Syndrome) in Nigeria (1992), first double heart valve replacements in Nigeria, to mention but a few achievements.

Why I became a scientist

It is established that life is like a drama, played out by actors and actresses. My story is divided into acts and scenes**.**

***Act 1, Scene 1*:** starts by referencing the recent declaration by the 'Tibetan Lama Council', who declared that Michael Jackson was reborn as a duck, and is now residing in a farm in Lhasa Tibet. A recent video by the famous owner showed that he was happy and has not forgotten his famous signature dance moves. This is not a judgement on the life of Michael, but the first lesson the community taught us: belief in reincarnation and time (how brief our lives on this earth would be). One really has a very short time on earth and needs to make the best of it.

Act 1, Scene 2: describes the man who prepared me for the challenges of scientific life: my dad, moderated by an "understanding" mum. Dad was a famous educationist and teacher. He would insist on staying with us for our lessons from 3pm to 7pm daily, Mondays to Sundays. Here was my conflict: how about time for my football? Football was the most important love of my life, after the air we breathe; and clearly more important than food. Why won't

this guy just go out to drink with his friends in the evenings, like other dads did? Mum helped me develop a strategy to make time out for my dear football: I started my lessons, alone, earlier at 1.30pm after a quick lunch and convinced my dad that I was done by 5pm. Then I would hit the field with our friends who had been playing since 3 pm.

***Act 1, Scene 3*:** describes dad as a perfectionist who expected excellence in any thing he did. I had a double promotion in primary school, from Year 2 to Year 4. In the new class, we had final Christmas exams. I came top of the class with 94% in mathematics. I thought this was great and ran home with the result, anxious to show my people. Dad looked at it and repeatedly asked, 'Where is the remaining 6%?' It was just not an ordinary enquiry; he was very serious, with eyes popping out like a pilot who is looking for a way to navigate the plane that suddenly hit a deadly cloud and turbulence! He kept asking for the famous 6% in the following days, until Mum, obviously irritated, interjected and said, "next time, you should bring back the famous 6% first, so that he will have something more substantial to look for!!" That is, score 6% in Maths and let him then look for 94%!

Act 1, Scene 4: describes my Irish school missionary teacher who taught mathematics, Fr O'Dounaghue. OD had two types of zeros: the ordinary zero (which meant that one had 0%), and a special zero called OD's zero - a zero decorated with a mouth, ears, eyes, and nose, and which sometimes had the mouth deviated to one side. This 'zero' means that 30 marks would be deducted from your other scores in other subjects. OD's specialty was teaching us time management, and the futility of procrastination. He coined out the famous slang: no more to-morrow, aim at to-now. He asserted, "Once you conquer procrastination, one will experience quadrupled achievement. Do not wait for tomorrow—do it now"

Act 1, Scene 5: describes how nature's second course, sleep, the poorly understood sleep, affects our lives. Sleep is an evolutionary process that has a tremendous effect on our lives. Man needs to sleep about 33 to 36% of his time on earth to be healthy. This means that a man who turns 80 must have slept for 30 years of those 80, and there are major problems if one sleeps more or less. A man who lived till he is 80 years old has 50 years awake time, to make a difference.

Act 2, Scene 1: describes the typical town setting in Eastern Nigeria and the yearly town award system. The recipients are crowned as 'DI s'-the 'champions', titled men. The areas of human endeavours were: 1) warrior 2) warrior 3) warrior. The rest were commerce, education, and yam farming. "Di Ji"-hunting; "Di Nta"-wrestling; "Di Mgba"-wine tapping- "Di Ochi"; and best herbal/traditional medicine man -Di Ogwu. Only a few traditional doctors were able to differentiate between the groin swelling, called hernia, and hydrocoele, and a collection of water around the testis. Once the traditional doctor drains the water by making the incision, the person is cured. Unlike hernia, where the

swelling contains bowel/intestine. Any incision there will expose the intestine to serious infection and death. In the local language, any groin swelling is called an "Ibi", whether it is a hernia or hydrocoele. Traditional doctors were classified into two. Ibi-treating doctors-are supposed to be more gifted, experienced, and charged more money. Non-Ibi treating doctors were the general ones - and included the traditional bone setters. The Ibi-treating doctors always got the yearly award just because they were able to differentiate a hernia from a hydrocoele. Those with hydrocoeles were treated while those with hernias died. I made up my mind as a kid that I would research and successfully treat all these cases in the future.

Act 2, Scene 2: describes our debut with the king of fruits, the mango. Dad had taught us that mangos (a fruit like no other) are seasonal and come out from February to April yearly. It was my favourite fruit and I couldn't wait for February to come. Suddenly, there was a bout of severe diarrhoea in the community, and everyone attributed it to eating mango. The community dispensary officers confirmed that the dysentery was caused by eating mangos, as several school children died of the diarrhoea. The community responded by outlawing eating mangos in the community. My dilemma was: 'How would I go through life without enjoying my favourite fruit?' After the first year of mango abstinence, I made up my mind to find the truth about the mango deaths. Information was not as robust as we have today. I had a 16-year-old pen pal living in New York with whom I communicated by mail, which took at least 21 days to arrive. Our top priority was the mango issue, and he told me that mango cannot cause death, and our people probably did not wash the mangos before eating. I led a team of school children and asked for a simple procedure—let us wash our hands and mangos (with soap and clean water) before eating. Not a single person came down with diarrhoea. Community leaders reversed the ban on mango. This marked the beginning of my being the champion of "evidence-based medicine". This began my life as a scientist. The locals started eating mango, with the provision that they washed the mango and their hands.

Act 2, Scene 3*:* describes my other happiest day as a scientist. This was on December 17, 1986, just as I returned from the USA. Rheumatic heart diseases, with leaking heart valves, were very common and caused many heart failures. The leaking heart valves had to be replaced by open-heart surgery. I set up a research team and we set up a system for monitoring the blood thinners. On 17th Dec 1986, we did the first artificial metallic mitral valve replacement in Nigeria at University of Nigeria Teaching Hospital (UNTH). All the team members were Nigerians.

Act 2, Scene 4*:* describes the day I faced the greatest challenge of my scientific life. The same day I carried out the above surgery. My research and surgical team had gone through the drills for the proposed open-heart surgery. We set up a checklist/guidelines/protocols for the surgery. The planning was intense! We thought it was water-tight, but I was conscious of the fact that, as mere humans,

depending on our strengths only would be folly. We prayed before the surgery; that God would take control and direct our hands and strategy. Exactly 67 minutes into the surgery, we had connected the patient's blood and circulation to the pump machine. I had cooled the patient from 37 degrees core temperature to 29 degrees (this was the saving grace). I had stopped the heart, opened it, and excised the leaking valve. I was just sizing the valve to know which artificial MV to sew in and NEPA struck. There was total darkness! All our machines stopped and blood filled the patient's chest. Screams came from the doctors, "Put on the gen! Put on the generator!!" I managed to keep my cool and direct events. "No screams!" I ordered. "Crank the machine!" I could feel my own heart beating fast, as if it was going to jump out of my chest. Using the hand cranker, we were able to prevent the blood from spilling to the floor. The 9 minutes it took for the generator to come on seemed like 90 years. The NEPA people had promised us uninterrupted power for 2 days, for the operation. We quickly completed the surgery with no adverse effect on the patient, as we were down at 29 degrees core temperature. For subsequent surgeries, we operated with the generator, and kept NEPA on standby. This patient is alive today. He lives in Kaduna and has two children after the MV replacement.

Conclusions - I thank God for his amazing gifts to me- too many to mention. My mentees must recognize that they must put in more vigor in anything they do. Remember **VEPP (**vigor, enthusiasm, passion, and perfection) —in carrying out any assignment you are given. My quest for science was driven by my love for football and mango. My life would have been meaningless without these two things. My mentees must identify the "football and mango" in their lives and leapfrog with these. My mentees must aspire to something greater, set targets and work towards them. Finally, my mentees must recognize that it is never too late to start! My people have a saying "Today is still morning".

Peter A. Akah FAS

Professor of Pharmacology

My field of science is Pharmaceutical/Medical Science (Pharmacology). I attended Bishop Shanahan College, Orlu, Imo State, Federal School of Science (FSS), Victoria Island, Lagos, and University of Ibadan, Ibadan.

My interest in science started in class four at Bishop Shanahan College, Orlu, in 1973. Twenty "hot boys" in my class went into competition on who would be the first to solve all the problems in 'Nelkon' (textbook called 'Principles of Physics'), and 'Shanon and Smith' (General Mathematics). I came first in physics and second in mathematics. Of course, I had 'A1' in both physics and mathematics in the West African Examination Council (WAEC) Examination. With grade one in the WAEC examination in 1974, and with 'A1' in all the science subjects, I was motivated to apply for admission into the Federal School of Science in far away Lagos for the 'A' level programme. My interest in science was nurtured in FSS.

For over three decades, I have been working on drug development from natural products (medicinal plants). My major career highlight/contribution was my research on *Vernonia amygdalina* (bitter leaf). I was the first to report on the anti-diabetic efficacy of bitter leaf which opened the flood gate of research on the plant. Today, the active compound has been identified, purified, and formulated into medicine. The publication has been cited 180 times.

My proudest moment, as a Nigerian scientist, was when Niprisan (Nicosan) was registered as a treatment for sickle cell disease. I was a member of the team, in the National Institute for Pharmaceutical Research and Development (NIPRD) that produced that drug, from the crude to the finished products. I was also elated when I received an American patent on a phytomedicine for the treatment of ulcer.

The most challenging moment in my career was the first two years as an independent research scientist. There was lack of basic materials and equipment to work with. At a point, I contemplated quitting research for a job in industry. I was able to overcome these challenges through the advice and encouragement of my supervisor, and most importantly the advice to be patient and focused, as well as to look for external grants.

To be a scientist in Nigeria can be interesting, the challenges notwithstanding. My advice to young and prospective Nigerian scientists is for them to engage on problem solving researches with the aim of tackling perceived problems. They should, as much as possible, avoid researches that require sophisticated

equipment which may not be available. This may create frustration. There is need to keep abreast with new trends by visiting laboratories outside the country's shores when the opportunity comes. Collaboration is very important in scientific research.

Samuel O. Akande FAS

Professor of Geology

My field of science is Earth and Environmental Science. I attended the following educational institutions; University of Ibadan, Ibadan, Nigeria, University of Western Ontario, London, Canada, Dalhousie University, Halifax, Canada.

My interest in science emerged from the perception of natural resources in my immediate and remote environments while in the secondary school. This led to my inquisitiveness to study ecology of plants and animals, the nature of rocks, water bodies, and soil types around me as a young folk. The selection of science subjects for in-depth studies of these resources in the context of the earth evolution motivated my interest to explore the fields of bioscience, chemical science and geosciences. I was fascinated by the growth of flowering plants and how they thrive and are sustained in the soil media from which they extract nutrients. The fact that soils are products of weathering of the varieties of rock types led to my personal curiosity to know what rocks are made up of, the origin of rocks, and their evolution. I recall the large rock exposures occurring as flat lying outcrops and the spectacular inselbergs close to my home. This motivated me to study geology and environmental science.

At the bachelor's level, my exposure to field mapping and map preparation coupled with petrographic studies increased my awareness of the several constituents of rocks and the occurrence of valuable metals and minerals. I was, therefore, privileged to know which of the constituents are economic and which are not. The motivations to do a master's degree in geosciences in the field of economic geology led to a successfully completed thesis on a gold mineralization project in Canada. By this time, I knew I should be missing out without a PhD in my desired field of economic geology. The drive to do a PhD was accomplished by attending the graduate school in the Earth Science Department of Dalhousie University, where I successfully carried out a PhD thesis on the depositional environments, fluid inclusions, and isotopic characterization of a carbonate-hosted lead-zinc-barite deposit in the Fundy basin. The study threw new light on the stratigraphic evolution of this basin and the timing of mineralization and hydrocarbon accumulation. On my return to Nigeria, the experience gained during my PhD thesis investigations was applied to the paleo environments of petroleum source rocks, paleothermics, and basin evolution histories of sediments of the Nigerian Benue Trough. This led to significant contributions and provision of new knowledge on the origin of the Nigerian lead-zinc-fluorite –barite mineralization and new insights into models with predictive capabilities to exploration of this class of deposit. My

contributions in the study areas extended to the Anambra and Dahomey basins where new knowledge into the hydrocarbon source rock potentials, and oil and gas potentials of these basins were put forward.

As a recipient of more than 15 awards and research grants (local and international), my proudest moments as a Nigerian scientist was the day I received the American Association of Petroleum Geologists (AAPG) Distinguished Educator Award for decades of my mentorship and motivational leadership of young geoscientists in the integration of structural geology, stratigraphy, sedimentary petrology, and geochemistry for evaluating hydrocarbons and ore metal potentials of rifted basins. This was awarded to me at the Annual Convention of the Association in Denver, Colorado, USA on 31, May, 2015.

I give credit to my teachers at all levels of my scientific adventures that also motivated my thoughts into using known scientific tools to explore the unknown. Most geosciences research initiated with field data gathering and map preparation are followed up by experimental work. The experimental aspects, which are great aids in the acquisition of new knowledge, frequently pose challenges because of the lack of adequate equipment or insufficient funding. Significant support from scientific funding agencies has in no small way contributed to the success of scientists, even at the level of the nobel laurels. Several funding agencies, for example the Rockefeller Foundation, Alexander von Humboldt Foundation, German Research Foundation, the United States National Science Foundation, Canadian National Science and Educational Research Council etc., have motivated and encouraged the personal fulfilment of several scientists, including myself, to accomplish scientific goals.

The originality of any scientific contribution depends on the commitment and interest to achieve the desired goal. Where limitations for analytical work are encountered, Nigerian students are encouraged to reach out to collaborative research agencies, renowned institutes, universities, and funding agencies who can partner on the major components of the analytical aspects of the research. Such collaborations have contributed significantly to making great scientists.

Abayomi O. Akanji FAS

Professor of Endocrinology and Matabolic Medicine

For Nigerians born between the end of the second world war and the early 1960s – aka baby boomers or digital immigrants – most of whom are now aged between 55-65years, it was a choice essentially made for them. If one was really good in primary school (and those government controlled Awolowo schools were quite decent then), one subsequently got admitted to another government or mission secondary school (also quite good then). Those public institutions had dedicated and satisfied teachers then and their facilities for science teaching were adequate. With the right aptitude, one was almost automatically channeled into science. Those who went into the arts then, had talents in languages and literature, and/or wanted to be lawyers or accountants.

The belief, rightly or wrongly, was that the really good students gravitated to science. Admittedly, that belief, in today's contemporary society, is grossly politically incorrect and on hindsight, most likely untrue.

The choice was therefore made for me, at least at the secondary school level in Oyo. Moving on to higher school in Lagos was through a nationwide highly competitive process. On getting in, the choice was between really liking biology or really liking mathematics. These options were presented as being mutually exclusive – you could not do the two together. If one liked biology and did well in it, the next destination was medical school. On the other hand, if one was really good in Math, the destination was an engineering school. This was the mindset of most high school administrators in Nigeria, at least in the late 1960s and early 1970s. In-between would be considered careers in academics (through the PhD route) or administration.

My biology teachers in high school (King's College, Lagos) encouraged and facilitated my interest at the advanced level in biology. There, the labs were well equipped and the teachers well trained and sufficiently motivated – probably as good as those in some universities. My model teacher then literally breathed ecology and we had such a wonderful time exploring the lagoon marine ecosystems around the beaches and mangrove swamps in Ikoyi and behind the University of Lagos (Unilag). Biology was presented as being alive, and the environment as being crucial to human sustenance. The teachers were not dogmatic, they encouraged open debates, introduced us early to such journals as *Scientific American*, and also encouraged students' intuitiveness and innovation without feeling threatened. The science labs were always open at any time for those who wanted more. I became love-struck with biology and the

living environment. Hence the inevitable leap into, and progress into medical school, then at Ibadan, the first and unarguably the best, in Nigeria. Even till today, the environment and its social and demographic implications, constitute a major part of my passion.

Much more difficult for me was the decision between a scientific academic career and professional practice. In that respect, I had help from two great mentors who, at crucial decision points in my career progression, encouraged me into taking postgraduate scientific research degrees in Nigeria and the UK. These had to be sandwiched into professional certification programs – a hell of a lot of work and sleepless nights not to mention angst from some of my other professional supervisors who could not understand why I had decided to take such an unusual career path! My wife and young family were a great support during those long, teething and difficult days, nights and years. Their sacrifice and love, have hopefully, proven well worth it.

My subsequent professional and academic specialization choices of internal medicine, clinical biochemistry and endocrinology were fortuitous. It could not have been anything else. One cannot excel in any of them without a solid basic science grounding, which I had, with an Oxford DPhil degree in metabolic medicine – a fact that likely accelerated my subsequent career progression through four continents – Africa, Europe, the Middle East, and North America. I am a hybrid – an advantage that affords me a ring-side position in the major discoveries on different sides of the medical career divide.

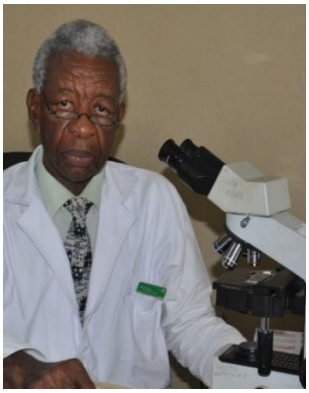
My most important contributions to research in my field relate to nutrition and intermediary metabolism, diabetes care and control, and molecular aspects of susceptibility to cardiovascular disease. My most important current passion however is medical education – using modern pedagogies to train and mentor the next generation of medical practitioners.

In all these, my God has been faithful. He started it all – and sprinkled liberal doses of a supportive family, good luck, hard work, altruistic mentorship, safe international travels, and perhaps some innate intelligence.

A message for my students, the digital natives or millennials or Gen Z, in contemporary lingo. You can do it. Let only the sky be your limit. The internet opens wide vistas of opportunity and knowledge. Do not allow yourself and your ambition to be caged by frequent university closures, empty libraries and laboratories or professors who are not up to date. You can take charge of your learning – the opportunities are out there, waiting to be explored. Do not be afraid to think outside the box.

Edward 'B. Attah FAS

Professor of Human Pathology



Coming in the second generation of school education in my family and region, I studied science by default. Secondary school found me placed amongst the bright students to train in the classics, at first. However, when the teachers of Greek left, the school had no choice but to place the bright students along with the others in science. An easy time with general science, as a subject, that the school offered, created an uphill task in grappling with 'A' level science. Subsequently, at the end of which, a career in medicine seemed to me the best option. Although I had not had the privilege of experiencing or observing doctors at work, medicine, to me, seemed to be the most suited to my temperament. There was only one medical school in the country and it was new, my class being the fourth to graduate.

The teachers, nearly all of them foreigners, strove to uncover knowledge of practically every disease that afflicted the patients. So much was unknown, and the answers lodged with the patients and the environment. The method for uncovering the secrets resided in systematized observation, applying suitable instruments of investigation. To my benefit, some of the teachers introduced me to such investigation through asking me to assist them in their work.

I reached for the microscope, training it on tissues and organs. Applying it to the cardiovascular organs, the prostate gland, and fibrous connective tissue yielded results early in my career. These included new entities such as histiocytoid infiltrates of the large blood vessels of infants, the phyllodes tumour, and some other atypical connective tissue tumours and granulomatous inflammations of the prostate. (These are respectively large, unusual inflammatory cells invading the large blood vessels of infants, and in the prostate gland a peculiar type of fibrous growth previously seen in the female breast, and inflammation resembling that in tuberculosis.) Working out the process of development of some peculiar tumorous inflammatory masses of the male urinary system followed. Turning to heart disease, the microscope uncovered severe injury of internal organs by blood pressure in individuals whose blood pressure had not reached up to the levels regarded at that time as defining hypertension. We suggested a downward review of blood pressure levels considered harmful. Mercifully, blood pressure levels used in the definition of hypertension or recommended as healthy have now been reviewed downward as we suggested back in the nineteen seventies. My cardiovascular studies also helped to elucidate the importance of the contribution of anaemia to

early heart failure, and sometimes massive enlargement of the heart seen in African hypertensive patients.

A careful application of the microscope to tissues many years on uncovered granuloma type inflammation in the liver in hepatitis C virus infection, obviating concerns and investigations for tuberculosis or fungi. It continues to reveal pathology in some overlooked or not well understood tropical diseases.

Peace C. Babalola FAS

Professor of Pharmacy/Pharmacokinetics

My field of science is Pharmacy/Pharmaceutical Science. I attended the following educational institutions; Obafemi Awolowo University (O.A.U), Ile-Ife (B. Pharm, MSc and PhD), University of British Columbia (Postdoctoral Fellowship), Kilimanjaro School of Pharmacy, Tanzania, Purdue University, USA (PGD), Advanced Industrial Pharmacy.

My earliest memory of being interested in science dates back to age 7, while in primary school. My mother, a headmistress then, made it compulsory for each of her children to know Mathematics because she was of the opinion that a child who knows Mathematics, would excel in any subject. By the time I reached primary 5, it was compulsory for me to complete one exercise book with Mathematics daily and I actually excelled.

I was motivated by my mother who gave me a solid background in Mathematics at the primary level. Mathematics, being a core subject for science-based programmes, influenced my being in a science class in secondary school and, eventually, I found myself studying Pharmacy in the university. I loved Mathematics so much that I developed the habit of solving difficult questions in mathematics and other science subjects such as Physics and Chemistry. I recall scoring 100% in my physics examination in my first year in the university.

I finally graduated as one of the top 3 candidates in my class and, therefore, the university retained me along with other best graduates as an intern/graduate assistant. Therefore, I was further motivated to continue a career in academics from then on.

By nature, I am very inquisitive, and I ask a lot of questions. I am always interested in knowing the source of any issue around me. I was nicknamed "Inqui" by classmates.

I have always been attracted to mathematics-related subjects, and therefore, naturally specialized in pharmacokinetics, a discipline that determines rates of drug movements and levels in the body.

My research has therefore focused on pharmacokinetics, pharmacodynamics, and pharmacogenetics pharmaceutical analysis/drug quality assurance as tools to study drug disposition (antimalarials, anti-infectives and others) in Nigerians, as a guide to optimizing therapy in black people. I am the first female Professor of Pharmacokinetics in Nigeria.

I have developed novel methods for drug analysis in humans, which in turn have been used to evaluate their pharmacokinetics in Nigerians. I have been able to combine pharmacokinetic with pharmacodynamic principles in order to improve dosage regimen. The outcome of my research made me discover wide ethnic/racial/genetic variations in drug disposition, leading to my interest in pharmacogenetics in Africans.

Much of current therapy for malaria and other tropical diseases have been based on information from studies outside Africa. My research has tackled some important issues with regard to the pattern of response in black people.

Highlights of my contributions to science include:

I. I developed a widely accepted method (plus WHO) for analyzing quinine in humans, which enabled full elucidation of its pharmacokinetics and optimal dosage in Africans in the 1980s and 1990s when quinine was back in use as an antimalarial.
II. On drug-drug interaction, I have observed marked reduction in bioavailability (30-90%) and bacterial activity (5–7-fold decrease) of Beta-Lactam antibiotics by antimalarials, after oral administration, a source of possible treatment failure and drug resistance, and calling for change in dose regimen.
III. My team and I reported the first pharmacogenetic data in Nigerians (sickle cell disease (SCD) and non-SCD) using proguanil as probe for CYP2C19. We observed lower prevalence of mutant 2C19 *2 in SCD (0.9%) compared to non-SCD (4.8%), a finding that favours SCD patients.
IV. We also reported one of the largest studies on pharmacogenetics and hypersensitivity of sulphonamides in HIV-negative and HIV-positive volunteers. We discovered rare slow acetylator haplotypes of NAT2 in Nigerians - pointing out the importance of genetics in personalized medicine.
V. In 2011, I led a multinational/interdisciplinary team that won a MacArthur Foundation grant (approx. $1 million) to set up the Centre for Drug Discovery, Development, and Production (CDDDP), University of Ibadan, (termed first of its kind in West Africa), for capacity building CDDDP is one of the 11 designated centres of excellence in Africa by NEPAD/AMRH. CDDDP developed a number of medicinal/herbal products.

My proudest moment was when I received the news of election as a Fellow of NAS (FAS) in January 2011, making me the first female Pharmacist in Nigeria, and the 9th female Nigerian to be so elected. The fellowship of NAS is the foremost fellowship for any scientist in Nigeria.

My worst challenges came during my postgraduate studies (MSc & PhD) at Ife. My plan was to get a scholarship to study outside the country, but all attempts I

made failed. Both programmes took unusually long (4 years for MSc and 7 years for PhD), due to strikes, poor resources and bureaucracy. For example, I submitted my PhD thesis in 1994, defended it in 1995, senate approved the degree in 1997 i.e. three years after completion. All my dreams to obtain a PhD at age 25 and Professor at 35 were shattered. Though I was discouraged, I picked up courage after my PhD, and after joining UI, I had two mentors who assisted me a greatly in my teaching (Professor Olaniyi) and research (Professor A. G. Falusi FAS).

The study of science is challenging but it is rewarding, innovative, and productive. I advise that young prospective scientists should assess the role of science in assuring a good quality of life. They should develop a desire to bring innovations that are implementable and life-transforming. They should be interested in the basics of science at primary and secondary levels. They should have mentors that can mould them.

Joseph A. Balogun FAS

Professor of Health Sciences/Physiotherapy

I am a Physiotherapist born in Idofin, East Yagba, Kogi State. Neither of my parents could read nor write, but they surrounded me with lots of love and encouragement, hoping that one day I would shine a bright light on the family tree. They enrolled me in school at the age of five, and I completed the primary education at ECWA/SIM School in Makutu (1966), secondary school (ordinary level) at St. Kizito's College in Itedo (1972), and high school (advanced level) at Offa Grammar School (1974).

As a child, I grew up with the aspiration of working in the hospital to heal people. However, I had a morbid fear of corpses, of the sight of blood, and was petrified of venipuncture needles. I am one of those kids who cringe in fear and cry hysterically when receiving immunization shots. Given my personality and sensitive disposition, I quickly ruled out a career in medicine, but settled on physiotherapy because of its non-invasive treatment approach. After high school, I received a federal government scholarship to attend the University of Ibadan to study physiotherapy.

My undergraduate educational experiences were unsettling as our department lacked both the physical and human resources needed. The highest academic degree of the only full-time lecturer in the department was a bachelor's degree. The clinical environment during the second and third years of the program was not intellectually stimulating. The curriculum had no content in the liberal arts, and the social sciences. The physiotherapy courses lacked the scientific rigor that permeated the first year of the programme. Although these preceding factors undoubtedly contributed to the low morale among my classmates, they solidified my desire to obtain a Ph.D. degree and pursue an academic career, determined to add to the scientific knowledge base of physiotherapy.

I began my career as a physiotherapist in 1977, during the national youth service year, at Mubi General Hospital, where I established the first Physiotherapy Department in the defunct Gongola State. As the first Kwara indigene to train as a physiotherapist, I joined the State Civil Service in 1979 as Physiotherapist II and was deployed to the General Hospital in Ilorin. I left the country in 1980 for my postgraduate education at the University of Pittsburgh; where I took the most challenging science electives in addition to the core courses; venturing into other disciplines to compensate for the deficiencies in my undergraduate curriculum. I earned a Master’s degree in Orthopedic and Sports Physical Therapy (1981), Certificate in Research Methodology, and a

Ph.D. in the Physiology of Exercise in Cardiac Rehabilitation (1985). I am the first Nigerian physiotherapist to obtain postgraduate degrees in both clinical specialties.

The highlights of my professional career include faculty and administrative positions at Russell Sage College, Obafemi Awolowo University (OAU), Texas Woman's University, the State University of New York in Brooklyn (SUNY-B), and Chicago State University (CSU). I was appointed Consultant Physiotherapist and Vice-Dean in the Faculty of Health Sciences at OAU (1986–1991), Chairman of the Physical Therapy Program, and Associate Dean for Student Academic Affairs at SUNY-HSCB (1993–1999), Dean and Distinguished University Professor in the College of Health Sciences at CSU, and Emeritus Professor of Physiotherapy, University of Medical Sciences, Ondo.

I have contributed to knowledge in physiotherapy, cardiovascular epidemiology, ergonomics, and Human Immunodeficiency Virus (HIV) behavioral research. To date, I have authored two books, five book chapters, and five monographs/technical compendia. Also, I published 137 full manuscripts and 59 abstracts/conference proceedings in peer-refereed journals. The scientific impact of my scholarship on Google Scholar indicated an H-index of 26 and 2,478 citations. On the Research Gate platform, my H-index and RG score are 20 and 33.4, respectively, and ranked in the 93rd percentile when compared to my peer scientists globally.

There are several rewarding highpoints of my career. I am a Fellow of the Royal Society for Public Health, Fellow of NAS, Fellow of the Nigeria Society of Physiotherapy, and Fellow of the American College of Sports Medicine. I am the first physiotherapist to be inducted as a Fellow of the NAS. In 2003, I was awarded the Warren Perry Distinguished Author's award by the Journal of Allied Health. My proudest moment was the day that I defended my Ph.D. dissertation. The reality of the occasion suddenly descended on me with mixed emotions. On the one hand, I was full of joy knowing that I have achieved my ambition, but was also sad that my mother was not alive to witness this significant milestone of my career.

My advice for burgeoning and prospective scientists is that they should follow their dreams by believing that nothing is impossible, if they put their heart into the mission and do the hard work. Find a mentor and aggressively pursue every academic opportunity available. These tenets will serve them well. The disadvantaged background and insurmountable challenges in my early life are living proof of the rewards of hard work, tenacity, and a positive thinking mindset.

Suleiman E. Bogoro FAS

Professor of Animal Science/Agriculture

My field of science is Animal Science (Biochemistry and Ruminant Animal Nutrition). I attended the following educational institutions; Mwari Transferred Primary School – First School Leaving Certificate (1971), Boys' Secondary School (BSS) Gindiri, Plateau State- WASC (1976), University of Maiduguri (B.Sc. Agriculture) – 1981, Ahmadu Bello University, Zaria – M. Sc. Animal Science (Nutritional Toxicology) – 1988, Abubakar Tafawa Balewa University, Bauchi – Ph. D. Animal Science (Biochemistry and Rumen Physiology), with composite research and benchwork at the Rowett Research Institute Aberdeen, and Veterinary School, University of Cambridge (1997).

My earliest memory of being interested in science: Most of my missionary teachers from mainly the University of Cambridge at the BSS Gindiri were science teachers, many of them with first class or second-class upper honours degrees in physics, mathematics, chemistry or biological sciences. Through the Boys' Brigade and Botanical Club, they taught us the botanical names of most of the common plants and trees in and around the school compound. It was common to hear students make jokes by saying that a girl was as beautiful as Mangifera Indica (mango).

My motivations for becoming a scientist: First of all, my alma mater was and has remained a science school mainly, and so most of us fancied science as we had hoped to be "world junior scientists" like some of our teachers were so referred to. For me, our Principal at the time, Derek Joy, was my ultimate inspiration. He was an agricultural scientist, turned missionary. He was incredibly versatile, as he was known to have been a royal pilot in the British Air Force before he took to teaching. He popularized agricultural science and innovated a subject called "AgroBios". In teaching agricultural science, we realized that it is not just science, but a remarkable discipline that requires the mastery of all the basic sciences, as well as the sciences of the environment, geography, statistics, and agrotechnology. As evidence, Mr. Joy while passing by a class where a physics, chemistry or maths teacher had not reported early to teach, will go into the class and ask the students where they stopped in the last class, and, impressively continue with them to the end of the hour. In short, the versatility of my late agric science teacher and principal made me decide from 'Form 2' that I must read agriculture or nothing else.

As a lecturer and researcher, I have taught and supervised both undergraduate and graduate students in animal science, anatomy and animal physiology, biotechnology, toxicology, and food science and technology.

My main contributions to the field of science include the innovation of a Rumen Nutritional Fermentation Model, a modification of a rumen cannulation surgical technique, and a modification and improvement in the CRUPROCESS anaerobic fermentation of crop residues for ruminant animal feeding.

My proudest moment as a scientist was when I successfully deployed the modified rumen cannulation surgical technique used for Scottish Black face rams to apply same on our indigenous Balami rams, and in the process, guided my veterinary medical surgeons in the successful cannulation of both rams and bulls, many of which have been used for postgraduate physiological studies by both animal scientists and veterinary doctors.

My most challenging moment was when I had to design an animal research housing facility for my Ph. D. research, because I was the first in my Department to start a Doctoral work in my specialization in the Department. It took courage and determination, but after I successfully designed, supervised and used the building for my doctoral studies, it has remained the main ruminant nutrition and metabolic facility that has been used by uncountable postgraduate students, over 25 years after I started it.

My advice for young and prospective Nigerian scientists is to believe in yourself, and through focus and grim determination, you can do the unthinkable for a nation that badly needs scientists and innovators to be competitive in the 21st century.

Ekanem I. Braide FAS

Professor of Parasitology/Epidemiology

I reluctantly studied Science but I am glad I did!

I was initially interested in the arts. When I turned sixteen my dad gave me a copy of the Complete Works of Shakespeare as a gift. On the first page he wrote, "our minds, like the soil, will yield results, the measure of which will be in proportion to our effort to cultivate them". Obviously, he had noticed that I loved to read and write. Sadly, I lost that book during the civil war.

Just before the civil war my dad drafted us, his children awaiting admission into the university, to teach in our Community Secondary School (which he had mobilized the community to build). Within that period, I wrote a book, and two one-act plays. I directed the acting of one of the plays, The Kings Daughter, by the students in a competition during the National Festival of Arts. The play won first place! I have a collection of poems, and I am a member of the Calabar chapter of the Association of Nigerian Authors (ANA).

Why then did I choose to be a scientist? My dad insisted that I study science since 'I was already an artist'. I could not understand why he wanted more scientists in the family of almost all scientists! With a frown in my heart, I enrolled to study Zoology at the University of Nigeria, Nsukka, but the sound of heavy bombardment, signal of the beginning of the civil war, sent everyone packing from the university. After we were 'liberated', I ended up as one of the South Eastern State refugees in the then University of Ife. I stuck to Zoology, graduated in 1971, and enrolled in Cornell University, Ithaca for a Master's Degree in parasitology. After three years teaching in the University of Nigeria Nsukka, I returned to Cornell in 1976 for a PhD in parasitology. I also hold a Certificate in Epidemiological Methods from Southampton University (British Council Course). I served at the Nigerian Institute for Trypanosomiasis Research, Kaduna (1978 - 1979). Thereafter, I joined the University of Calabar and became a Professor in 1991.

I was involved in the eradication of guinea worm in Nigeria and in the control/elimination of onchocerciasis in Africa. I have served as a member of the World Health Organization (WHO)/African Programme for Onchocerciasis Control (APOC) Technical Consultative Committee (TCC) from 2001 to 2006 and chaired the Committee from 2003 to 2006. I was a member of Mectizan Expert Committee (2003-2006). I served as a member of the National Steering Committee, Nigerian Neglected Tropical Diseases (NTD) Programme (2007-2008), and I am the current Chairman, Technical Advisory Committee, Cross

River State NTD Programme. I was a member of the Board of Trustees of Sightsavers for eight years and chaired the Technical Advisory Group (TAG) of Sightsavers Department for International Development (DFID) funded NTD UNITED project till 2018. I am; Chairman, Board of Trustees, Society for Family Health (SFH); Chairman, the Board of Trustees, The Leprosy Mission (TLM) Nigeria; cofounder and Chairman of Youthcare; member of Board of trustees of AMEN Foundation; member of Board of Trustees of Margaret Ekpo Foundation; Fellow/Co-founder, Nigerian Society of Parasitology; Fellow, Salzburg Seminar Session 319; Fellow (and now Vice President) NAS. I have received many awards, including, Cross River State 2000 Millennium Award, and Jimmy/Roslynn Carter Award for outstanding dedication and achievement in the eradication of guinea worm in Nigeria. In July 2010, I was honoured by the President of Nigeria with the award of Officer of the Order of the Federal Republic (OFR). I served as Vice-Chancellor, Cross Rivers University of Technology (CRUTECH) Calabar, Nigeria (2004- 2009), and as Pioneer Vice-Chancellor, Federal University, Lafia, Nigeria (2011-2016). I am currently the Pro Chancellor of Arthur Jarvis University, Akpabuyo, Nigeria.

All through, I enjoyed being a scientist. There is this problem-solving attitude in scientists, which makes life very exciting. Parasitology and epidemiology placed me in another realm. As indicated in my inaugural lecture, parasitologists are very special people with special skills. The tag, Jack-of-all-trades and master of some, fits with our multi-sectoral approach in unravelling the mysteries around parasites. *Plasmodium*, the causative agent of malaria, is capable of developing resistance to many antimalarial drugs and presents clinical manifestations similar to typhoid. *Onchocerca* of cattle is so site specific that it has up to four site-specific strains in different locations in the same cow. Yellow fever virus is symptomless in monkeys, but can easily kill man. One parasite attacks plant but goes unnoticed because of its beautiful colour!

Epidemiology is not less interesting. To tackle an epidemic, one prepares as though one is going to war. Working around the determinants to end an epidemic requires the strategizing skills of a detective! The joy of being part of the team that eradicated guinea worm from Nigeria is unimaginable! Young scientists, the sky is your limit!

Boniface C. Egboka FAS

Professor of Hydrogeology

The field of Science in which I have been fully involved over the years is "Water Resources of the total environment with special interest and emphasis on environmental hydrogeology". I study, teach, learn, research, and consult on issues of water resources in the atmosphere, above and below ground surface, water for use and disuse, for offence and defense; in exploration, exploitation, planning, design and management of groundwater resources; environmental pollution and contamination; floods, soil and gully erosion and landslides. I attended the following educational institutions; St. Matthew's Primary School, Umuchu, Aguata L. G. A., Anambra State, St. Peter's Secondary School, Achina, Aguata L. G. A., Anambra State, Government Secondary School, Afikpo (High School), Ebonyi State, University of Nigeria, Nsukka, Enugu State; and University of Waterloo, Waterloo, Ontario, Canada.

As far back as during my early primary school years in the late fifties, one was imbued with an inquisitive/inquiring mind. One often ruminated over the wonders and mysticism of events of science and its ramifications. One wondered over what I observed and seriously-thought about things happening around me; what one saw, heard, touched, felt, smelled, experienced etc.; the air, foods produced/eaten, waters stored/managed, floods/erosion, hills/valleys, plants and animals, herbal medicines, totems/belief systems etc. Reasoning and thinking in my adolescence age over the wonders of science in these matters tended to put one into mixed conflicts with the teachings/belief systems in religion and culture. An army of scientists was badly-needed in Nigeria for solving myriads of environmental problems of humanity. One fervently-dreamt of becoming one of such scientists. One accompanied my father to the farm; also followed him to work-sites and watched where they opened up roads/drainages to check floods and erosion in communities at Aguata L. G. A. These observations and thoughts dovetailed into one's secondary school life in the early sixties. In 1964, we went on Geographical field-work/explorations to the Agulu-Nanka gully erosion and landslides sites and also to the world-famous Ogbunike cave. These observational home/field experiences and their socioeconomic implications energized me into more serious thinking and eventual decision to study Science and specialize in Environmental Sciences with particular reference to Environmental Hydrogeology.

The serious enquiries that arose in my mind from what I saw, heard, felt, and experienced around me; and the dire urge to find answers and solutions to these arising problems, motivated me to pursue becoming an environmental scientist.

I have worked in various areas of environmental science, issues and sometimes, in collaboration with professionals in the fields of social and education sciences. I am primarily an environmental hydrogeologist, who also uses elements of applied sciences, engineering and technology to solve hydrogeological problems of the environment. Hydrogeology deals with various aspects of the hydrologic cycle and problems of water resources. Elements of geology, geophysics, geochemistry, biology, civil/chemical engineering etc., may also be useful in tackling water problems.

My career highlights and contributions to the field of Science are as follows: I have been working on issues of geology and hydrogeology with particular reference to environmental hydrogeology, hydrogeochemistry, and hydrogeotechnics from 1974 till now (2019). I have been teaching and guiding students since I was employed in a university, beginning as a Graduate Assistant/Researcher at the University of Nigeria, Nsukka (1975), and University of Waterloo, Ontario, Canada (1976), and, later, as a Lecturer/Professor at Nnamdi Azikiwe University, Awka (1982). I introduced postgraduate programmes for masters and doctoral degrees at the University of Nigeria and Nnamdi Azikiwe University in hydrogeology/water resources for students with earth sciences and engineering degrees. One successfully-supervised many undergraduate and postgraduate candidates. As a Vice-Chancellor, I encouraged development and improvements in teaching, learning, and research in the pure/applied sciences, engineering, agriculture and technology. The Faculty of Natural Sciences at UNIZIK was split into two - Faculties of Physical Sciences and Bio Sciences to create convenient teaching and research spaces, easier study opportunities for students as well as to attract more funding. Research institutes for science fields were also created. With a team of researchers, I contributed scientific inputs for possible solutions to problems of water supply, scarcity, and management, as well as environmental pollution and contamination, floods, soil and gully erosion and landslides, oil and gas pollution of the Niger Delta etc.

I have had some proud moments: On graduation as a geologist at the University of Nigeria, Nsukka in 1974; At the award of a doctor of philosophy degree by the University of Waterloo, Canada in 1980; At my appointment as a Professor in 1987; With recognitions and wide scale uses of my publications by researchers, professionals and environmental planners and managers for studies, teaching and research. Lastly, I was proud during my induction as a Fellow of the Nigerian Academy of Science (FAS) in 2011.

Although, I have enjoyed the professional honour and glory of being a Nigerian environmental scientist, I have also been faced with challenging moments over some issues from time to time. Many of such challenging moments were mainly over lack of financial support and funding problems. Being from a humble family, during my first-degree studies at the University of Nigeria, Nsukka, I had a serious financial handicap. The French oil company, now ELF (then

called SARAP), came to my rescue with an award of a very comfortable scholarship that enabled me to fund my tuition, accommodation and field-work fees. While one was being sponsored at Canada from Nigeria, the Scholarship money was not coming as at when due. The University of Waterloo, Canada, where one was a Graduate Student, again, came to my rescue and gave me work as a Graduate Assistant and also a Bursary Award, enabling me to overcome my huge financial malaise as one was there with my family. In terms of funding for research in Nigeria, availability of funds has not been easily-forthcoming as required. As a result, one has to take recourse to personal and friendly financial sources for support to fund oneself and research assistants most of the time.

My advice for young and prospective Nigerian scientists is as follows: Nigerian universities should be more serious about introducing some entrepreneurship courses blended with courses in the applied sciences in order to produce self-employable graduates. The federal and state governments should increase funding of primary and secondary schools and tertiary institutions, in order to improve the strength and quality of teaching personnel, infrastructure and instruction materials for teaching of the Sciences. Opportunities should be created for the award of scholarships or giving of grants-in-aid to brilliant students studying the sciences. The Ministry of Science and Technology should be better funded and encouraged to promote scientific events/issues. The NAS should make further Inquiries to enable her develop some effective programmes to promote these various issues for the upgrade of the sciences in Nigeria.

Adeyinka G. Falusi FAS

Professor of Haematology

I am a retired Professor of Haematology, a Fellow of the NAS, a National Productivity Order of Merit Award recipient, a L'Oreal/United Nations Educational, Scientific, and Cultural Organization (UNESCO) Laureate Outstanding Woman of Science (Africa) with a science career spanning four decades and a legacy as a role model for budding scientists.

My education started at St. Paul's Anglican Primary School, Efon Alaaye, Ekiti State, then to Queen's School, Ede, for the WASC (1959-63), HSC (1964-65), and to the University of Ibadan (1966-69) for a BSc. Hons. in Chemistry (1969), M.Phil. Haematology (1981) and a PhD Haematology (1986). My thesis titled "*Alpha thalassemia in Nigeria*" was adjudged the best thesis for the year-1986 at the University of Ibadan.

My earliest memory of an interest in science was inspired by an older 'Queens School girl' (Grace O. Olaniyan now Professor Taylor FAS). Her diligence and brilliance at reading those huge science books during her holidays in Efon Alaaye, coupled with the fortune of my being the only successful candidate from Efon Alaaye for admission to Queens School in 1959 helped me to dream of becoming a scientist like her.

My motivation for becoming a scientist started with a good foundation in science at Queens School and was further nurtured at the chemistry department, University of Ibadan (UI), in my undergraduate days. The three-year exposure at the Langmuir Laboratory, Cornell University, Ithaca, New York, USA (1970-1973), inspired my part-time registration for MPhil and PhD in Haematology at UI. I had a robust and rewarding scientific experience as a visiting scientist to several advanced research laboratories such as the Hammersmith Hospital, London in 1983; NDM, Oxford University, UK (1984); University of Malta (1991); Sloan Kettering Cancer Centre, New-York, USA (1994-1995) and Institute of Tropical Medicine, Humboldt University, Berlin, Germany (1997). These exposures honed my scientific career.

I have had a very productive and rewarding career in my field of science through the encouragement of my mentors, Professors Luzzatto and Esan (FAS). My scientific findings are cited in ResearchGate, PubMed, and Academia Edu. My focus has been on the genetics of non-communicable diseases of haemoglobinopathies, breast cancer, asthma, and malaria with a sound imprint in the ethics of research in Nigeria and Africa. I have published over 95 peer review articles, books, and book chapters and attended over 100

conferences, nationally and internationally, with abstracts published. Over the years, I have used my experience, leadership attributes, motivation, and ability for development to implement successful and formidable genetics research in non-communicable diseases. My pioneering landmark contributions include the genetic basis of megaloblastic anemia (1974), the genetic basis of alpha thalassemia in Nigerians and haplotype studies in sickle cell disease (1986-94). My contribution was pivotal in the documentation of BRCA1 and BRCA2, triple negative gene identification in breast cancer, and for the establishment of a functional Immunohistochemistry laboratory serving several tertiary health institutions in Nigeria (1998-2019). I have been the principal investigator (PI), Co-PI on several university, National Institutes of Health (NIH) and other agency grants; successfully leading teams; recruiting investigators and trainees; as well as facilitating community participation in translational research. I served as Director of a University of Ibadan research institute – Institute for Advanced Medical Research and Training (IAMRAT), and Chair of the University's ethics committee from (2001-2005, 2009-2010). I have been a leading voice and champion of ethics of research in Nigeria and Africa (2002-2017), and successfully organized and published the first University of Ibadan Institutional Ethics Guidelines (2005), and the first Ethics Policy (2010) for publication, which are now modelled for other Nigerian institutions.

My proudest moment as a Nigerian scientist was standing on stage in Paris at the L'Oreal headquarters on the 28th of Feb. 2001, in the full glare of over a 2,500 International audience and the world press (including NTA, Ibadan) in recognition of my acceptance of the L'Oreal/UNESCO Laureate Outstanding Woman of Science (Africa) Award. It was indeed an unforgettable moment!!!

My most challenging moment was after the theft of my thesis draft and three-year data from my car while carrying out experiments late in the laboratory, (usual for scientists), on Friday, 14th September 1979. I overcame the depressing event through family support in prayers, hard work and belief in myself. I collected samples over again, which led to an MPhil. degree. Later, a rare opportunity presented, and I was offered three separate grants to do my experiments for a PhD in top laboratories of Hammersmith Hospital and Oxford University in the UK (1983-84) using the latest molecular biology techniques. This resulted in novel findings of alpha thalassemia in Nigerians!!

As a role model, my advice to young and prospective Nigerian scientists is that science is exciting and rewarding, but they should not expect a pre-packaged journey. They should be prayerful, focused, and hardworking, (not intimidated or discouraged by the long hours in the laboratories or the slow gratification), but, rather, they should tap into their inner strength and surround themselves with people who believe in their dreams.

Olatunde E. Farombi FAS

Professor of Biochemistry/Toxicology

My earliest memory dates back to 1983 after being exposed to information on the cloverleaf structure of transfer-RNA and protein assembly in the cytoplasm. I became interested in pursuing biochemistry as a career.

My motivation to become a scientist is premised on a number of factors. First, I had the privilege of being taught biochemistry as part of biology during my A level days at the Polytechnic in Ibadan. The teaching capability of Dr. Jide Olowookere was extraordinary and inspiring, then at the Polytechnic Ibadan. He came to class with little or no notes to teach the students. On gaining admission to study biochemistry at the University of Ibadan, I was really motivated by the exemplary commitment of some lecturers, to research, in chemistry and biochemistry departments. I recall walking in the night around laboratories in those departments and seeing scientists, with white laboratory coats, working, even during weekends. As a young student, I always asked why they worked that way. In addition, I experienced monthly academic staff seminar series of the biochemistry department, at Ibadan, where academic staff presented their research findings, followed by rigorous discussions of the research papers with comments from other lecturers. This rich academic culture motivated me and I made up my mind to pursue science as a career despite very juicy jobs I was offered in industries after graduation.

My research areas over the past 25 years have been on molecular toxicology, cellular oxidative stress mechanisms, reproductive and environmental toxicology, antioxidant redox biochemistry, nutraceuticals as prophylactic agents, and nutrigenomics, as well as natural product biotechnology. I have been involved in translational research on the elucidation of the biochemical and molecular mechanisms of chemoprevention of phytochemicals addressing neurodegenerative diseases, viral infection, and cancer of certain organs.

I hold a PhD degree from the University of Ibadan and, subsequently, had postdoctoral training at the School of Biological Sciences, University of Liverpool, UK, the Danish Institute of Food Safety and Nutrition, Copenhagen, Denmark, and the Institute of Environmental and Occupational Medicine, University of Aarhus**,** Denmark. I am a recipient of several international fellowships and grants, I have been a visiting professor to 10 world-class laboratories and institutions.

Over the years, using state-of-the-art equipment, I have (with others) systemically, scientifically, and uniquely developed several phytochemicals from Nigerian indigenous plant substances. For instance, we have in the last 20 years developed an original patented compound from *Garcinia kola* (Bitter kola; Orogbo in Yoruba, Namingin goro in Hausa, and Aku ilu in Igbo), known as Kolaviron, as a novel chemotherapeutic agent relevant in liver and brain disorders, as well as viral infections. We demonstrated, for the first time at the molecular level, the role of Kolaviron in oxidative stress and inflammation-associated liver disorders. In addition, we reported, for the first time, the antiapoptotic effect of Kolaviron in PC12 cells, a rat pheochromocytoma, and human neuroblastoma SH-SY5Y cells exposed to endocrine disruptor-Atrazine with Parkinson-like symptoms. Recently, in both rat and *Drosophila melanogaster* models, we reported, for the first time, that Kolaviron extended longevity and protects against experimental parkinson disease. These studies uniquely qualify Kolaviron, and or *Garcinia kola*, as an agent that can prolong life span and confer protection against neurodegenerative diseases like Parkinson's and Alzheimer's. In addition, we showed the uniquely anti-viral property of Kolaviron and that it could be explored, clinically, as anti-influenza (flu) and immune-modulatory agent.

I have helped, in my little way, to build capacity for Nigeria in the area of biochemistry, toxicology, and translational science as I have supervised 220 MSc students, 25 PhD theses, and mentored 10 postdoctoral fellows in these areas of science. One of the PhD theses was adjudged the best in the disciplines of basic medical sciences within the Nigeria university system during the 2009 assessment by the National Universities Commission (NUC). Recently, another thesis was adjudged as the best in the University of Ibadan in 2018. Six of my former postgraduate students are full professors in various Nigerian universities. I have edited a book titled "Nutritional Antioxidants in Cancer and Degenerative Diseases" with contributors from Nigeria, Cameroon, USA, Mauritius, South Africa, Japan, and Denmark. I have published 230 scientific articles in well-rated international journals, 18 chapters in international books, and given over 100 invited lectures in countries spanning 4 continents of the world.

My proudest moment as a Nigerian scientist was the day one of the students I supervised, received an award for producing the best PhD thesis in the basic medical sciences in Nigeria.

The most challenging time in my scientific career was when I had no access to facilities and basic infrastructure to carry out modern science in the early 1990s. I had to struggle to survive locally by making use of what was available till I got a placement abroad to fulfill my ambition of doing good science. I leveraged on the series of exposure outside the country, came back to set up my laboratory, and built a formidable research career in Nigeria through effective international networking.

My advice to young and prospective scientists is first, to have a clear vision of what they intend to become as scientists. It is important for them to be very patient as the road to greatness in science could be very rough. It is important to look out for very good mentors in their areas of research, role models on whose shoulders they can lean in order to climb the scientific ladder. I will advise them not to be local champions, but earnestly covet outside postdoctoral training and exposure.

Oyewusi Ibidapo-Obe FAS

Distinguished Professor of Stochastic Control and Information Systems Engineering

"In the beginning; God created the heavens and the earth" – the planets and stars, the marvels of the sea, the rugged beauty of the mountains, the wonders of the animal world and MAN. Gen. 1-1.

The universe, made up of millions of galaxies of incredible size, with each galaxy rushing away from all others, faster and faster – farther they get – faster they go! What a marvelous creation? What an incredible growth rate? When will it blow up? Incredible! All these creations are in a stable state.

That scenario of stability within a chaotic space excites me – hence my interest in Applied Mathematics /Engineering Science, especially dynamical systems in a stochastic environment. My interest in science started from an exploratory lecture, in 1962 or so, on galaxies, the Milky Way, etc. at our secondary school.

In the quest to understand our environment better, two years before Viking landed on Mars, some scientists (in 1974) calculated that as many as 50 million civilizations may exist somewhere in space, and that some of these civilizations may have found methods to improve our lives and control the time of death. This is interesting. We want to know more about space and conquer it so that we can improve our lives and control the time of death! We believe and have faith that we can do it! Yes, we did, as space has been conquered and time is still work-in-progress.

I attended llesa Grammar School (1962-1966); Igbobi College (1967-1968); University of Lagos (1968-1971), and the University of Waterloo (1972-1976) where my desire for scientific enquiry was expanded. Even at the Government Demonstration School, Ilesa, with a prominent Nature Study Corner, my curiosity about living things expanded.

We naturally wish to know how tomorrow will be so that we may influence it our way. Man's initial desire is to "live forever" – the quest for everlasting life on earth has led to great discoveries in Biology, Chemistry, and Physics, with Mathematics. The non-feasibility of this initial desire to "live forever" resulted in a strategic objective refocus, which is "to determine and control the time of death".

Even at the early stage of my life, I felt that science rules the world and that there is a need to inculcate science in order to live abundantly well.

The earth is a continuum, consisting of matter. The interactions of the matter generate energy. This basic principle is a convenient platform for the modelling

of human activities. Perturbations appear in time and space – probability theory deals with the study of perturbations in space whilst differential equations look at changes per unit time. All real-life systems are doubly random, i.e. stochastic, because they exhibit variabilities in time and space.

Science makes living worth our while. Engineering technology searches for ways and means of ensuring that life is more abundant! The methodology for knitting all these variables together is very intricate – this is the realm of engineering systems analysis and, specifically, modelling! The language of nature is mathematics; of change, is differential equation and probability. The use of mathematical models to support decision making continues to make great impact on the public and private sector policies; it is the power of modelling that allows us to 'play GOD'.

I have worked intensively to understand nature through modeling and simulation in engineering, biomedical, space, and other human systems.

Time is a physical quantity that ensures change. Unlike length and mass, it is difficult to define. Suffice it to say that time measures the sun's movement. The history of time is intricately related to the origin of the universe, from the "Big Bang" through "Black Holes" to the system that generates sunlight (the source of life), gravity, and atoms.

One of the most fruitful sources of mathematical intuition is the physical space. It provides a pictorial framework for visualization and conveniently introduces key ideas of continuity and smoothness. Indeed, the notion of real number originates from measurement of spatial separation and of time intervals, both of which are related. Space and time are combined together to give a 4-dimensional picture of the world and a relationship between time and space

Quantum mechanics introduced elements of unpredictability or randomness into science. At first, there was strong opposition to this concept – the most remarkable of which was from Einstein, who contended that "God does not play dice"!

I have published extensively in several topical journals and written some books on Systems Engineering, especially identification and control. As an academic; I have made some significant contributions to programmes in research, especially Stochastic Systems, since 1976.

However, we know that invariableness and randomness underlie nearly all modern science and technology. Although I do agree that GOD does not play dice, I wish I know what He plays (if He plays at all!!!).

I was very proud to be a scientist in 2009 when I, as the President of NAS (2009-2013) met with President Umaru Yar'Adua GCFR, and secured a grant of US$5 million for the Academy. The most challenging moment in my career was when NAS could not get the 6th National Assembly to pass the NAS Bill in

spite of all our efforts and know-how. We went back to the drawing board to re-strategize.

Herein lies my sustaining interest in the study of stochastic systems; but I would rather be contented with knowing why and how my machines (rather than humans) play dice!

Science is exciting and totally inclusive of other professions because of the basic tenets of reproducible facts as well as the discipline of rigour. My advice is that youths should focus on scientific careers and the benefits are surely assured.

Alechenu J. Idoko FAS

Professor of Medicine

I graduated from Ahmadu Bello University medical school in Zaria with an MBBS degree in 1976. I later trained in internal medicine and infectious diseases through a residency program at the Ahmadu Bello University Teaching Hospital, and the Royal Victoria Infirmary in Newcastle upon Tyne in the United Kingdom. I was a commonwealth research fellow in Immunology at the London School of Tropical Medicine and Hygiene (1986), and Senior Fogarty Fellow at the Institute of Human Virology of the University of Maryland, Baltimore USA (2002) where I worked with Professor Robert Redfield current Director of Centers for Disease Control and Prevention (CDC). I was the President of the Nigerian Human Immunodeficiency Virus (HIV)/Acquired Immunodeficiency Syndrome (AIDS) Research Network.

My journey to science began with utter fascination and admiration with seeing medical doctors treat and heal sick people when I was as young as 10 years. From then, I dreamed that one day I will be a doctor curing people of all sorts of ailments and saving lives. The urge was so strong that even in secondary school, when my mathematics teacher wanted me to do engineering at university, I told him that I was already cut out to be a medical doctor.

In my early clinical years as a medical student, my interests in research commenced gathering momentum when my two mentors (Professor Brian Greenwood and Dr. Hilton Whitle)-both physicians/immunologists invited me to work with them in the immunology laboratory. My early research escapade commenced with minor studies with light/heavy chains and immunoglobins in various tropical diseases. I was called upon in my first clinical year to solve one clinical riddle. Young Hausa women were developing heart failure around the time of delivery of babies, and it was thought that it was “Kanwa” (local salt) which they took in excess was the cause, and that it was the potassium in the Kanwa that led to cardiac toxicity. Working for three months in the clinical chemistry laboratory, with spectrophotometry, I discovered that Kanwa contained sodium and not potassium. This proved that sodium and the consequent fluid overload from the salt containing Kanwa was responsible for the puerperal heart failure, confirming that the treatment with diuretics to wash away the sodium from overloading the circulation was the right course of therapy.

My research interests include studies of the prevention, treatment, and care of HIV/AIDS, and co-infections including tuberculosis (TB) and hepatitis B and C. I have been involved in a number of research projects including clinical trials

of antiretroviral drugs, pre-exposure prophylaxis, elimination of mother to child transmission of HIV, HIV/TB co-infections, HBV/HCV and HIV co-infections, and as well as operational research in HIV service delivery in resource- limited settings.

My career highlights started in the 90s with clinical work and research studies in HIV and related diseases. I was involved in all the five clinical trials that introduced antiretroviral drugs for HIV/AIDS in Nigeria, and led four of them as principal investigator. Our program in Jos led the research on the model for providing services for HIV/AIDS with the development of the hub and spoke model, which is a referral model vertically and horizontally from the tertiary centre in Jos University Teaching Hospital (JUTH) through general hospitals and primary health centres (PHCs) to the communities. This was subsequently adopted at the national level under my leadership as Director General of the National Agency for the Control of AIDS (NACA). This contributed to the significant decline of the HIV prevalence from 5.8% in 2001 to 1.4% in 2016. Other contributions include strengthening the research infrastructure (material and human) at the University of Jos and NACA.

My two proudest moments include the outcome of the hub and spoke model for addressing HIV/AIDS in JUTH and nationally, and, recently, when the result of the National HIV/AIDS Indicator and Impact Survey (NAIIS) confirmed the significant drop in HIV in Nigeria.

The most challenging moment of my career was in the year 2000 when I had more than 2000 HIV-positive individuals who were waiting for antiretroviral drugs but which were not available in the country. In 2002, President Olusegun Obasanjo approved the procurement of drugs for HIV-positive Nigerians and subsequently (2003), President George W Bush established the US government supported Presidents Emergency Program for AIDS Relief (PEPFAR) program, which remains the largest financial contributor to the AIDS program in Nigeria.

What is my advice for upcoming young scientists? They should develop their vision as to what, where, and who they want to be in science and pursue the goals. Training in strong institutions is key and any opportunity to crossbreed with scientists outside the country will enhance their career given the weak research infrastructure available in Nigeria at the present. That will enhance collaboration, research networking, and strong menteeship.

Jacob K. Kwaga FAS

Professor of Veterinary Sciences

I am a veterinarian by training, but while undergoing training, my interests were mainly in infectious diseases especially bacteriology and veterinary public health encompassing zoonoses, food hygiene, and epidemiology. I graduated with a Doctor of Veterinary Medicine (DVM) degree from Ahmadu Bello University, Zaria and was later awarded an M.Sc. based on research on salmonellae in cattle and meat. I was awarded a Canadian commonwealth scholarship to pursue a Ph.D. at the University of Saskatchewan, Saskatoon. Upon successful completion of the program, I was privileged to have been offered a two-year post-doctoral fellowship at the world-famous Vaccine and Infectious Disease Organization (VIDO) of the University.

My earliest recollection of an interest in science was in biology, chemistry, and physics classes where we could set up experiments, observe or read the results and interpret the same. In particular biology practical on dissection was intriguing and was a harbinger for the desire to dig more, thereby thrusting my inquisitiveness into science and discovery.

The motivations for becoming a scientist were driven by the desire for discovery into the vast sphere of science and to expand the frontiers of knowledge for the benefit of mankind. My motivation was also inspired by the depth of knowledge and confidence exhibited by science teachers and the dream of being like them one day.

My career spans close to 40 years, having joined the services of ABU in 1980. My research conducted, either for the award of higher degrees, post-doctoral fellowship, and on-going collaborative and team research, or research topics for students have been in the area of infectious diseases including bacterial, mycotic, viral, and parasitic infections. My research endeavours were largely conducted in Nigeria, but a substantial component in Canada during PhD studentship and post-doctoral fellowship.

The scope and directions of my research efforts have been mainly in the areas of zoonoses, food safety, antimicrobial resistance (AMR), virulence genes of infectious diseases and molecular epidemiology of the causative agents. These efforts were geared towards generating data that is useful for prevention and control of infectious diseases at the animal-human interface, for continued surveillance of zoonotic and food borne pathogens and their changing antimicrobial resistance patterns. Specifically, we established the diversity of *Salmonella* serotypes rather than preponderance of a few serovars. Various

zoonotic bacterial agents that are pathogenic for humans were detected in food animals, foods of animal origin and the environment. My group and I were pioneers in the occurrence of *Yersinia enterocolitica* in animals and food in Nigeria. Furthermore, my research on *Y. enterocolitica* in Saskatchewan, using a combination of bacteriological, virulence phonotypes and molecular techniques established pigs as reservoirs of human pathogenic strains in the province.

From my studies with other collaborators, the changing patterns of AMR among zoonotic bacterial organisms were found to parallel the published findings in human isolates, further pointing to the roles of animals and the environment as reservoirs of resistance genes capable of being spread to humans.

My research on vaccinology, led to the construction of genetically engineered auxotroph of *E. coli* that was effective as an oral vaccine against colibacillosis in poultry. This proof of principle suggests its applicability as a pathway for vaccine development against bacterial infections.

The moments of pride were when my manuscripts were accepted for publication in high impact international journals. Another moment was when early in my career, I was accepted for a post-doctoral position, based on my capacity upon presentation of a synopsis of my doctoral thesis. The cap of my career pride was being elected as a Fellow of the Nigerian Academy of Science even though prior to that I was already a fellow of my professional college. I was also greatly elated, when I published a book on introductory molecular genetics.

It was not always a bed of roses. One challenge that I have faced was putting into practice when back in Nigeria the molecular genetics tools I mastered in the course of my doctoral and post-doctoral studies in Canada. What I did to overcome this was to put a team together to appeal to the University to establish a facility to actualize that dream by providing sound scientific arguments. Glory to God, this led to the establishment of Center for Biotechnology Research and Training, where I had the privilege of being the pioneer Coordinator.

In order to maximize competence in a chosen field it is expedient to gain expertise in relevant aspects of computer software and ICT. Prospective scientists must discipline themselves by diligent and continuous study of the extant and most current literature in their fields and decide on goals early in their career. This has to be backed up by thorough training in the practical aspects of their chosen research field and they should remain current with new developments continuously. Finally, they should aim to seek collaboration with top leaders in their fields of research. Success in science is challenging but interesting and rewarding and on it rests the future of nations and humanity.

Edward D. Mshelia FAS

Professor of Theoretical Nuclear Physics

My field of science is theoretical nuclear physics with specialization in nuclear models, especially the collective model, and nuclear structure.

After completing my primary education, I attended the famous Gindiri Secondary School in Plateau State, then the Federal Emergency Science School, Lagos for the London General Certificate of Education at advanced level studies in pure mathematics, applied mathematics and physics. Thereafter, I was awarded the German Academic Exchange Service (DAAD) scholarship to further my education in the then West Germany. For my first degree I studied mathematics and physics at the Technical University (now University of Technology), Darmstadt. From there I went to Frankfurt and attended the Johann Wolfgang Goethe University where I earned an MSc degree in theoretical physics, and three years later, bagged the PhD in theoretical nuclear physics from the same university.

My earliest memory of being interested in Mathematics, a science subject, can be credited to my father, who was so particularly gifted in the subject, that as a primary school teacher under the Church of the Brethren Mission (now E.Y.N) in the North-East of Nigeria during the colonial era, was allocated mathematics as his only teaching subject, and was responsible for teaching most if not all the primary school classes and in which I greatly benefited. My second earliest memory of showing interest in science can be, to my surprise, credited to my English Language teacher in the secondary school at Gindiri. Following the demise of the 20th century- genius of theoretical physics, Albert Einstein, in 1955, several popular articles on special relativity theory, one of his creations, were released to the public, in his honour. Even though I had no idea of the subject at that time, I was presented a copy of one of such books written for "pedestrians" by my English teacher, a British lady national who, I believe, was aware of the fact that (in my class), I excelled well above everybody else in the subjects of mathematics, physics and chemistry. This singular act even motivated me the more to become a scientist, even if I do not become another Albert Einstein.

As mentioned earlier, I am a theoretical physicist. Now then, what is the difference between a theoretical physicist, and an experimental physicist in general? Physicists aspire to investigate and study the physical properties of matter, their interactions, and relationships, whether at the classical scale (normally visible to the naked eye), at the quantum level (atomic and nuclear scale, not normally visible to the naked eye), or cosmic scale (large-scale

phenomena such as planets, stars, galaxies). Specifically, a theoretical physicist is saddled with the responsibility of conceiving and developing models, using mathematical tools, in order to explain observable physical phenomena. An experimental physicist, on the other hand, is concerned with performing tests and experiments to verify models and theories. Thus, theoretical and experimental physicists, normally, work hand-in-hand in order to verify or disprove each other's claims, which may then lead to further modifications on either side, and eventually lead to new laws of physics.

My first contribution to science resulted from my doctoral research in which for the first time, the splitting of the photo-nuclear giant resonance in light and medium-heavy nuclei observed experimentally, was explained based on my model. The nuclear model developed consisted of coupling the 1particle-- 1hole (1p-1h) giant dipole resonance states to collective nuclear quadrupole surface vibrations of atomic nuclei, thereby taking into account the continuum property of the dipole states in the framework of the eigen-channel theory of nuclear reactions. The result of the work was published immediately in the prestigious Physical Review Letters in the United States.

My later work and contributions to science is in the field of modelling heavy-ion reactions. In the early 1960s, nuclear scientists were interested in the creation of trans-uranium elements beyond the naturally occurring Uranium-238. Theoretical calculations in 1966 predicted the existence of an island of stable elements beyond the doubly magic Lead-208 having the doubly magic isotope with 114 protons and 184 neutrons located at the centre of this island. This idea gave birth to super-heavy elements (SHEs) and undiminished efforts to create them artificially in the laboratories of heavy-ion research centres. The existence of SHE would trigger far-reaching consequences in science and technology because their synthesis would not only lead to research in the chemistry of new materials, but also lead to new nuclear fuels and other spin-offs such as their use as surgical scalpels in health-care delivery, (they being more effective than x-rays), as well as use in smoke detectors, etc. My colleague and I developed a useful model for the description of the energy that is lost or dissipated from the kinetic energy of relative motion of the two bombarding nuclei into intrinsic excitations. We considered the energy dissipation as a result of the coupling of relative motion of the two ions into intrinsic degrees of freedom. The formulation was purely microscopic, that is, based on quantum mechanics. The work led to the solution of coupled integro-differential equations for functions that determine the probability for finding the intrinsic energy within some energy interval. This model, including subsequently modified ones, proved to be useful for our understanding of the physics of energy dissipation in heavy-ion fusion.

My proud moments as a Nigerian scientist come with the recognitions accorded me by the frequent citations of my work as evidenced on ResearchGate and requests for off-prints of publications. My proudest moment, however, is the

recognition accorded me as a scientist by electing me a Fellow of NAS, the apex science society in Nigeria.

My advice to young and prospective Nigerian scientists is to excel in your discipline, both at the national and international levels. Your choice of the area of expertise should not be based on monetary considerations, but be based wholly on interest. If monetary rewards should form the basis for advancement in science, then there would not be the likes of great scientists such as Albert Einstein and a host of many other nobel laureates that have shaped the destiny of science including many of its revolutionary applications in human endeavours such as the discovery of electricity, of means of communication by telephone, radio, television, and the internet, to name just a few.

Salihu Mustafa FAS

Professor of Civil/Water Resource Engineering

My interest in science started when an American Peace Corps teacher visited our secondary school and demonstrated a fast-rotating device which, I now believe, was a gyroscope. He demonstrated the three motions of the earth - around the sun's orbit, spinning around its own axis, and the axis tilting back and forth. The gyroscope has, over the years become a useful instrument for measuring the orientation and angular displacement of an object in space, with wide applications in navigation and, currently, in electronic devices such as an iphone.

Also, my interest was awakened in chemistry - how strange gases and chemicals could be produced in the laboratory. One time, our chemistry teacher notified us that we were going to produce "*laughing gas"* (nitrous oxide) in the laboratory. Before the experiment commenced, some of us busted into uncontrolled laughing, claiming that we had already experienced the effect of the gas. This, and other similar events, made science lessons interesting.

Indeed, physics, to me, was a drab, but my perception of the subject changed suddenly when we were taught how to calculate the angle of inclination, speed, distance, and height traversed by a missile travelling in space. There was an ongoing Vietnam War at that time with both sides in the conflict deploying surface to air missiles. The missiles were guided by fixed and variable frequencies, to hit their targets with pin point accuracy. To me, it was an interesting game, imagining myself standing behind one of those missiles aiming at an enemy target and intercepting an incoming missile before it could land on us. This spurred my interest in physics.

For mathematics, it got my curiosity right from secondary school because, we had very good mathematics teachers who were dedicated to teaching and they made the efforts to make us like the subject. We had a mathematics teacher, a Briton, who if he could not solve a problem during the class, would take it home, and bring the solution to us in our dormitories.

Admittedly, I had fun-seeking tendencies right from primary school and I found similar characters in my HSC class at Federal Government Sokoto. Our class was made up of brilliant students, drawn from across the country, but we were noisy, and, often, unruly. In one of such moments, the attention of the Principal was drawn to our class. He came, and without mincing words, told us that he was disappointed with our behavior because, some of us would, someday, become pilots and aircraft engineers, and our unruly behaviors would not stand in mid-air. He advised us to take our studies seriously or he would send all of us

back to our homes. That was the moment the thought of being an engineer came into in my mind until I applied to study engineering at Ahmadu Bello University, Zaria, after passing my Cambridge advanced level subjects.

My research work on non-linear groundwater flow in porous media which led to improved design of drain-spacing in irrigation fields, and was published in the prestigious ASCE Journal brought great fulfillment to me. Also, there was the assignment to draft an irrigation policy for Nigeria, thereafter adopted by the Federal Ministry of Water Resources.

My greatest challenge was as a Vice-Chancellor at the Federal University of Technology, Yola (FUTY), during which I found most of my colleagues in academics had been attuned to expecting too much from the government. Despite my effort, most of them were not willing to exploit the tremendous resources at their disposal- their brain power - to overcome the challenges facing them. However, I am glad that recognition came five years after my tenure when the university decided to name two lecture theatres after me in appreciation of my past services to the university**.**

To young upcoming scientists, my advice is that they should know that there is no limit to discoveries in science. There are many unknowns yet to be discovered. Also, for one to make appreciable impact in science, he must develop an analytical mind and be versed in mathematics for, it is the language of science.

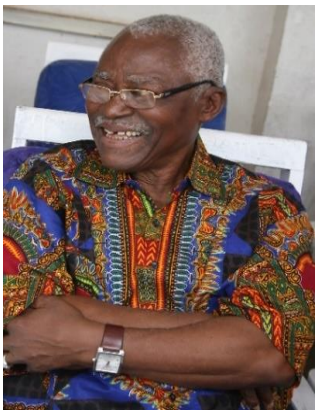
I received B.Eng. in civil engineering from Ahmadu Bello University, Zaria, MSc in Water Resources Technology from the University of Birmingham, and PhD in civil engineering, from the University of Strathclyde, United Kingdom.

I served as Special Adviser in the Federal Ministry of Water Resources, and Director of Research and Postgraduate Development at the NUC, before my appointment as Vice-Chancellor, Federal University of Technology, Yola. I served on various boards and committees including Vision 20-2020, Nigeria Merit Award, Advisory Committee to Nigerian Building and Road Research Institute (NBBRI) and Nigeria Hydrological Services Agency (NIHSA). I served as consultant to many government agencies including the Nigeria Atomic Energy Commission (NAEC). Currently, I am assisting in the establishment of new engineering programs at the Kebbi State University of Science and Technology and Usman Danfodiyo University. I am the Chairman, Ministerial Policy Advisory Committee on Water Resources, Federal Ministry of Water Resources.

I am a Fellow of many professional bodies including, the Nigerian Society of Engineers (NSE), Nigerian Academy of Engineering (NAE), Nigerian Association of Hydrological Sciences (NAHS), and the NAS. I was a President of the Nigerian Association of Hydrological Sciences. I am married with four grown-up children.

Mark Nwagwu FAS

Professor of Zoology



I am a human being, with a strong desire to participate in the essential elements that make up life. And science is just one aspect of life. Yes, by nature, all my being dances to science.

I attended Christ the King School, Aba, Eastern Nigeria, for my primary education, 1942-49, and St. Patrick's College, Calabar for my secondary and post-secondary education. It was at this stage of my life, at age 17 in 1954, that I discovered I should follow my interest in the sciences, specifically in the biological sciences. I studied Zoology at University College, Ibadan initially with the support of my village, Obetiti, Nguru, and later on a Government scholarship. After graduation in 1961, I was strongly motivated to pursue a career in genetics by the nuclear explosions in the Sahara at the time with the attendant deleterious genetic defects. Although I did not venture directly into genetics, a fellowship offered by UNESCO in developmental biology at the Wenner Gren Institute, University of Stockholm, provided much needed insight into errors in development that could be caused by a variety of agents (including nuclear radiation). My Ph.D. provided evidence for the first time, for the messenger RNA hypothesis in eukaryotic systems by showing that some metabolic enzymes of the frog, *Xenopus laevis* were inhibited by chloramphenicol, an inhibitor of protein synthesis, and we suggested that the level of the effect was at primary messenger RNA. After my Ph.D. in 1965, I proceeded to the Biological Sciences Group, University of Connecticut, as a post-doctoral research fellow with the sponsorship of Professor Heinz Herrmann. It was here that Stuart Heywood and I successfully isolated myosin messenger RNA, and for the first time demonstrated the presence and activity of messenger RNA in the synthesis of a monomeric, single protein molecule, myosin in developing chick muscle – a landmark achievement.

My research continued at Brock University where I was appointed Assistant Professor, Department of Biological Sciences in 1969 until my resignation in 1976. I worked on transfer RNA and regulation of protein synthesis and showed that the four different species of serine tRNA were discriminately utilized in myosin synthesis in developing chick muscle and specifically regulated myosin synthesis – another landmark achievement.

In 1976 I returned to Nigeria, to the University of Ibadan having been appointed Reader, Cell and Molecular Biology in the Department of Zoology. This was a time of great travail and upheaval: nothing was available for molecular biology, neither equipment, nor supplies, nor books. In 1979, Nobel Laureate Christian

de Duve brought me to the International Institute of Cellular Pathology to work on trypanosome cellular biology on a WHO fellowship. This saw the emergence of a novel research effort to bring the methods and results of cell and molecular biology to unravelling the problems of tropical parasitic diseases. Thus, the unique Cellular Parasitology programme was born, and came to full life in the Department of Zoology with solid and long-term support by the Research Strengthening Group of WHO. We developed a ground-breaking M.Sc. degree programme in Cellular Parasitology which, at its inception, was not available anywhere else in tropical Africa. For the first time in the university, students were exposed to cutting-edge parasitological research with the tools of cell and molecular biology. African students from, notably, Kenya and Cameroon, enrolled for the M.Sc. degree in Cellular Parasitology. Continuing on its initial successes, the first students of the programme went on to pursue a career in Cellular Parasitology by registering for the Ph.D. degree on the trypanosome with theses on the purification, characterization and immunobiology of *Trypanosomabrucei*; purification and characterization of a cysteine proteinase released extracellularly by *T. brucei*; organization of the glycolytic enzymes of *T. brucei*; compartmentalization of glycolytic enzymes on the glycosome of *Trypanosoma brucei*. Later by 1996, our research interests included malaria research with support from the WHO programme, Multilateral Initiative on Malaria, which provided post-doctoral training for some of our teaching staff now employed in the department. The Cellular Parasitology Programme has been running since 1981, and has successfully produced over a hundred M.Sc. degrees and ten Ph.D. doctoral theses. The Cellular Parasitology Programme stands as my sterling contribution to sophisticated biological research in cell and molecular biology and capacity building in a Nigerian University.

Any young person who wishes to pursue a career in science should as early as possible take keen interest in the objects of science, from plants and animals to physical and chemical phenomena such as light, sound, rainfall and water, fire, gas, and air. They must live out their dreams and bring them to real accomplishments through observation, reading, and studying, unrelentingly. And they must pay close attention to any avenues that would help them fulfil their dreams.

Timothy I. Odiaka FAS

Professor of Organometallic Chemistry

My field of science is organometallic chemistry. I attended the following educational institution; Urhobo College, Effurun, Near Warri, Delta State, St. Anthony's College, Ubulu-Uku, Delta State, Rumney College, Cardiff, Wales, U.K, University College, Cardiff, Wales, U.K, University of Cambridge, England, U.K, University of Ottawa, Ottawa, Canada, and University of Witten – Herdecke, Germany.

My earliest memory of being interested in science dates back to my secondary school days at Urhobo College, Effurun, near Warri, in Delta State. We had in our laboratory common chemicals such as tetraoxosulphate (VI) acid (H_2SO_4), phenol, benzene, hydrofluoric acid (HF), chlorine gas, and carbon IV oxide gas (CO_2) to name but a few.

The following are some of the observations that aroused my interest in Chemistry during my teenage years at Urhobo College:

I. I was made to understand that all chemicals are useful but dangerous if not properly handled. For example, addition of some millilitres of water to a small volume of tetraoxosulphate VI acid, (H_2SO_4) resulted in an explosion whereas the reverse addition had no effect whatsoever.
II. Also, pouring of hydrofluoric acid (HF), into a glass beaker resulted in the slow dissolution of the beaker whereas it was unreactive in a plastic bottle.
III. When the two colorless aqueous solutions of $Pb(NO_3)_2$ and KI are mixed, the resulting solution is yellow due to the formation of PbI_2.
IV. The various beautiful colors observed at the end point of our titration experiments also aroused my keen interest in chemistry.

I was so much in love with the chemistry experiments that I found myself collecting discarded glasswares at the back of the laboratory for my own personal use during the holidays. My mother actually caught me one day stealing her table salt for my practical work, and thought I had gone mentally deranged when she saw me mixing her salt with sand in a beaker!! She wept as she watched me adding water to the mixture, filtering the solution through a clean white cloth into a clean beaker and recovering her salt by gentle heating of the filtrate. Her smile at the end of my experiment was an encouragement to my determined effort to become a scientist.

My motivations for becoming a scientist include my appreciation of the impact to humanity by the work of scientists such as Alfred Nobel, a chemist who

discovered explosives and the contributions of Louis Pasteur to medicine. As a scientist, one could also contribute to the wellbeing of humanity.

My research interest has been in organometallic chemistry, including synthesis, reactivity, and reaction mechanisms, as well as the application of organometallics to medicine and industry.

My career highlights/contributions include:

I. Discovery of the first organometallic complex[1] showing nucleophilic addition at the organic fragment and at the coordinated metal atom. This has enormous applications in industrial processes.
II. Synthesis of the first pyridine -, aniline and Aryltrimethyl- silanes and stannanes – substituted 1, 3-diene Organometallics. This has enormous applications in drug synthesis.
III. Established the "Odiaka's Ordered Transition State" Mechanism to explain, beyond doubt, the predominance of negative entropies of activation in the dissociative processes of organometallic systems.
IV. Modified the structures of natural products extracted from Nigerian trees using organometallic techniques. This has enormous implications in drug discovery. For example, a related paper attracted 675 views and 181 citations within 3 months of its publication, making it the most cited research work all over the World between 1st June 2016 and 30th August, 2016.
V. Discovered isokinetic behaviour and reported the existence of π-complex intermediates.
VI. Established the dependence of reaction rates on nucleophile basicity, as well as steric and electronic influencesin organometallic systems.
VII. Discovered novel triosmium metal clusters in which the metal cluster surface catalysed the organic substrate attached to it. This is of immense industrial interest.
VIII. Single-handedly introduced organometallic chemistry into the undergraduate (CHE 327, CHE 429) and postgraduate (CHE 732, CHE 734) curricula in the Department of Chemistry, University of Ibadan, in 1981. Today, over 90% of the 150 Universities in Nigeria now teach organometallic chemistry at undergraduate and postgraduate levels and a large number of my former students are now professors in Nigeria and overseas.
IX. Publication of two standard University textbooks, 'Modern Organometallic Chemistry' (2004, 2015), and 'University Inorganic Chemistry" A third book is titled "A Modern Approach to Undergraduate Practical Inorganic Chemistry".

My proudest moment as a Nigerian scientist was when I gave the first inaugural lecture in organometallic chemistry in Nigeria and, to the best of my knowledge, in Africa, South of the Sahara. The lecture was given in Trenchard

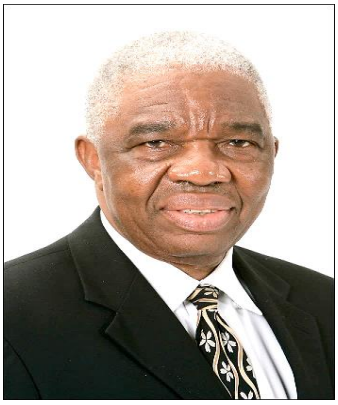
Hall, University of Ibadan on Thursday, 9th August, 2012, titled "Organometallics: The Indispensable Link in Modern Chemistry"

The most challenging moment in my career was when my paper titled "Addition of anilines to the (Fe $(CO)_3$ (1-5- η -C_7H_9)]BF4 complex, and the 'Ordered Transition State' Mechanism" appeared in J. Chem. Soc; Dalton Trans; 561-565. The scientific community was initially hostile to this new discovery bearing the name of the Author and demanded for more work on the system. I overcame it by applying for an Alexander von Humboldt research Fellowship which was successful. My work in Germany with Professor Rudi van-Eldik was the first application of pressure to organometallic systems and our excellent results confirmed the "Odiaka's Ordered Transition State" mechanism and silenced our critics. Today, the mechanism has been accepted all over the world.

My advice to young and prospective Nigerian scientists is to be assiduous in the execution of their academic responsibilities, and have confidence in themselves that their dreams will surely come to pass someday. Closeness to Almighty God is also strongly advised as we can do nothing without Him.

Gabriel B. Ogunmola FAS

Professor of Chemistry



I am the Chancellor, Lead City University, and Past President of the NAS (2003 – 2006), Professor of Chemistry, University of Ibadan (1980 – 2005), and a recipient of the Olu Allison Chair of Applied Chemistry in 1990 at the Laboratory of Biophysical Chemistry. I was Head of the Department of Chemistry (1991 – 1993), and Dean, Faculty of Science (1986-1988), at the University of Ibadan. I have served as the first Chairman of the International Council for Science (ICSU) Regional Committee for Africa. Also, Co-founder and Chairman, Institute of Genetic Chemistry and Laboratory Medicine, Ibadan in 2005.

It all started with my mother's moonlight stories.
The moon light story, told of the man on the moon described as carrying an axe to protect the world against dangers, so that children can walk without fear as the man in the moon covers and protects. The repeated mother's moonlight story, edged in my head on moonlight days, as the storyteller-mum, stroked the head of the child, me, while I gaped to view, from afar, the man in the moon. The image of the man in the moon looked real in my early imagination as the distance to the moon shrunk in my view of the images from mum's moonlight tale.
I remembered that I wanted to know how far the man on the moon was from me and whether by flying my kite I could get a message across to the moon. I was just curious, and the idea was just 'delicious' and suiting. At primary school, St. Paul School, Sagamu, I learnt with curiosity, counted very well, and knew the multiplication tables.

I entered the high school, Remo Secondary School, Sagamu. I had an impressive teacher, He was a physics teacher, Mr. Ogunnaike, He made a great impression on me as he stood up in class to begin our first lesson in physics on 'menstruation' – units of length, yards, feet, inches, metres, centimetre measurement.

Our physics teacher showed our class the meter rule and the 'venier caliper', for measuring to the second place of a decimal using the venier scale; nine division divided into ten divisions. The sliding up and down of the venier scale to obtain the measurement of different objects to the second place of a decimal was exciting. I had a good feel of the instrument and its construction detail was explained to us. The teacher explained how useful the instrument was, as engineers used it to make accurate measurements. It was the only one in this school. 'I hope one day many of you would be great physicists that would

advance the course of physics and science, make instruments like venier calipers and more'. 'You all must know that man is aspiring to go to the moon and I would take the best student along with me to the moon.', said Mr. Ogunnaike, the physics teacher in 1954, well before man landed on the moon in 1969 (which I watched live from Philadelphia on July 2, 1969).

You can imagine the value of this motivational statement to a child who had gazed at the moon, with full concentration, in the moon light story told by his 'first teacher', my mum. I went home and, in restless challenge, planned to respond to the teacher's promise, stemming from the only venier calipers in the school. I was motivated to construct my own venier calipers with cardboard, using the local adhesive starch. I took the venier calipers to the school physics teacher to claim the prize of the journey to the moon. The physics teacher, in exhilaration from the precision of the cardboard venier calipers, rushed to the school principal to announce what he had discovered. A school assembly was called and so was announced the story of the day - 'Venier calipers made with cardboard'- and of the same precision as the steel one imported into the school. The physics teacher had to redeem his pledge, which he was not expecting to do so soon.

Before, and in lieu of, the journey to the moon, as from that day, I was to be exempted from all manual labour in the school. I would spend all the time assigned for grass-cutting in school working in the physics laboratory. I was privileged as ordered by the physics teacher; I had a wonderful experience working in the laboratory. That was the beginning of my motivation for a career as a scientist. Every one of our students must be so treated and so motivated. When we do not, we rub the world of great promise that is irreplaceable. We must catch the student's attention both in the classroom and outside the classroom.

I went through the Federal Emergency Science School, Lagos, and, subsequently, entered the University of Ibadan and studied chemistry for no other reason than that it has more experimental activities than physics (at least, so I thought). Chemistry continues to play a central role in the natural sciences and its many applications in our everyday life, and in meeting human needs - in food, medication, in clothing, in energy, materials and communications.

After graduation with a degree in chemistry, I started postgraduate research work in the laboratory of Professors Dennis Irvine and John Bettlestone. Professor Dennis Irvine, on my first day in the laboratory, handed to me a pint of his own blood to start my studies on human haemoglobins. It was his blood, as precious gift to start a research carrier; I needed no extra lesson on how to care. I realized that, to be part of the group of scientists who are exploring the world, the way molecules function in relationship to their structure is important and could be explained, if I understand why the molecules of the hemoglobin of the elephant are different from that of the rat and the human, in order to meet

their biological needs. These are explainable by chemistry and evolution. Scientists are explorers too.

Today there are many unknowns in the matter of life and many mysteries to explain. What is it that distinguishes between living and non-living matters as to define life in molecular terms? I have worked with others to bring science to shed light on the 'Abiku' mythology and, also, bring relief from fear about the sickle cell disease and the needed contribution to the progress of therapy in order to enhance the quality and meaning in the matter of life.

Science has offered me a most exciting life, working collaboratively with others across different disciplines, and across nations in order to bring science to the service of my country, and mankind. My field of activity in science is chemistry. I would like to say a few words about the excitement in chemistry and what is making it so attractive to me. Chemistry is a central science with great creative power over the structure, and transformation of matter, inanimate, and animates, in the living world: thus, increasing our understanding and control of diseases.

It has also become very much interdisciplinary in such fields as biochemistry, genetic chemistry, biophysical chemistry, and biotechnology. It has opened wide, the doors of creative imagination at the interface of chemistry with biology, and physics.

The future of mankind now lies in how we use the discipline of chemistry to solve the challenges of the future of mankind, in an intelligent universe which we must face with enthusiasm, determination, and a deep sense of responsibility, in the pathway of knowledge to the control of destinies of our nation and mankind.

Sunny E. Ohia FAS

Professor of pharmacology

My field of science is Pharmacology and I attended the following educational institutions namely; University of Ibadan, Nigeria - B.Sc. (Pharmacology), University of Ibadan, Nigeria - M.Sc. (Pharmacology and Therapeutics), The University of Glasgow, United Kingdom - Ph.D. (Pharmacology), Memorial University of Newfoundland, Canada - Postdoctoral Training (Neuroscience), University of Louisville Kentucky Lions Eye Center, USA - Postdoctoral Training (Ophthalmology and Visual Sciences).

My earliest memory of being interested in science was in third year in secondary school when general science was separated into the disciplines of physics, chemistry, and biology. I was especially fascinated by biology as we dissected small animals, and watched the germination of seeds into plants in the laboratory. I never ceased to wonder how the different parts of animals and plants worked with each other to make life possible. My curiosity increased the more I studied higher level biology combined with chemistry and physics at the advanced level and subsequently to my tenure as a first-year student at the University of Ibadan.

My motivation to become a scientist was borne basically from my innate curiosity about life and interest in solving problems in general. The breakdown of our bodies due to diseases, and the changes that chemicals (i.e., drugs) made to the prevention or cure of the different disorders became my focus in the quest for new knowledge.

My love for biology and chemistry lead to my choice of becoming a pharmacologist, a scientist interested mainly in understanding how chemicals interacted with biological systems to cure or prevent diseases.

Over the past 30 years, I have been interested in several areas of pharmacology as they pertain to the prevention and treatment of eye diseases. Specifically, I have studied the role of oxygen-derived free radicals in the pathophysiology of eye diseases such as glaucoma and diabetic retinopathy. I have also collaborated with a team of chemists and biochemists to study the pharmacological actions of novel compounds that can lower intraocular pressure and the potential therapeutic action of an extract of the dried fruit rind of South Asian trees of the genus, *Garcinia Cambogia (hydroxycitric acid)* on appetite control. Both studies led to the issuance of both the United States and world patents for our invention. My collaborators and I have also studied the pharmacological role of hydrogen sulfide in the eye as it pertains to diseases

such as glaucoma and retinal degeneration, a contribution that led to the issuance of a United States patent for our finding that hydrogen sulfide-releasing compounds can lower intraocular pressure in animals.

My proudest moment as a scientist from Nigeria was my election as a Fellow of the NAS, and my subsequent selection as a Diaspora Fellow of the Academy to present a public lecture on "Antibiotics Resistance" in Lagos in 2018.

My most challenging moment as a scientist occurred during my tenure as a master's degree student at the University of Ibadan where I had to deal with a shortage of a special gas mixture (carbon dioxide/oxygen) in Nigeria needed to study the effect of drugs on blood vessels. I eventually overcame this problem by switching to another project, but this experience left an indelible mark on my career and led to my subsequent move to the United Kingdom to complete the Ph.D. degree.

My advice to young and prospective scientists at home is that they should develop an interest/passion in an area of science as early as possible and to stay focused on it. To be successful in a science career does not depend on ethnic origin or geographic location in the world. Individual scientists are capable of thinking of unique ways to solve problems in science. As a scientist from Nigeria living in the United States, I found that an important pathway to success is being able to develop unique ideas with a potential impact on the treatment of diseases that afflict mankind. The ability to persist in providing additional evidence to support one's hypothesis is a key to convincing the skeptics that you are on the right path to solving the problem on hand. I am aware that there could be a lack of adequate infrastructure for scientific studies at home, but that should not serve as a deterrent for young colleagues in the pursuit of new knowledge. It is, therefore, important for our young scientists to improvise and use their talents to solve scientific problems that are unique to Nigeria. Indeed, there are myriads of problems waiting to be solved by indigenous scientists at home, in the biomedical or other scientific disciplines.

Nduka Okafor FAS

Emeritus Professor of Microbiology

I am an Emeritus Professor of Industrial Food Microbiology at the Godfrey Okoye University, the Catholic University of the Enugu Catholic Diocese.

I attended Government College, Ibadan (GCI), at a time when Nigeria was still a British colony, i.e. before Nigeria attained its independence in 1960.

At that time there was only one university in Nigeria, the University College Ibadan (UCI). Attending UCI was routine for students of GCI. Students simply moved the several miles from the Apata area of the large city of Ibadan, to the Mokola area where UCI is located. The Cambridge school certificate examination was conducted about December, after which students waited to do the entrance examination to UCI before leaving school.

Thinking back about it now, it must have been a school policy that GCI students in my time, almost all in their entity, studied science-related courses. Since UCI did not have an engineering department at the time, very few students studied engineering.

Students studied medicine, agriculture, and the basic sciences of botany, zoology, and chemistry. Those who wanted to study engineering went to the Nigerian College of Arts and Science when that was founded.

What GCI students studied at UCI was based on the trend of the time. It was usually medicine as attested to by the fact that, for many years, the leaders in the medical field in the south west were GCI old boys. During my time a change occurred and the British government began to emphasize agriculture. This was how many GCI students in my set, including me, went to study agriculture. Deep down I was not very happy but I soon left it when I was admitted to University of Cambridge, England, to study microbiology.

I have published numerous papers and books in industrial and food microbiology.

My proudest moment has been gaining admission to the Cambridge University. The Nigerian scene is very diverse today and I would not advise young Nigerians to, of a necessity, study the sciences. They should look round and choose a profession they like. My first child is a gynaecologist, the next son and the only daughter are lawyers. My last, and fourth child, is a male and an engineer. None of them have remained in the area of their first degree. They all went into other areas.

David U. Okali FAS

Emeritus Professor of Forest Biology, Environment and Conservation

The most significant influence that set me on the path to science came from my exposure to the whole plant physiologist, Eni Njoku, who became the first Nigerian Professor of Botany at UCI (University College, Ibadan) in the late 50s. Professor Njoku was my lecturer, and naturally influenced me in many ways, but, I single out listening to his lecture to the Philosophical Society of the university, on 'Some Problems of Plant Growth in the West African Environment' as being the tipping point in my path to science, and indeed, on my path to becoming a plant ecologist. I say this because, up to that point, opportunity, rather than choice, had propelled me towards science. Indeed, when I had had to choose, as was the practice in my school where, after the School Certificate Examination, the class was divided into arts and science streams, I had opted for the arts stream. I reverted to the science stream only because the only other student with me in the arts stream left to go and train as a priest, and I could not remain as a single student in the arts stream.

The impact of the lecture I listened to was greatly reinforced by my experience from a vacation job, done also for Professor Njoku. Along with colleagues, Festus Nwoke and Sam Okonkwo, both now of blessed memory, I spent a vacation, sectioning, staining, and mounting a large number of slides (arranged serially) of buds from twigs of common woody plants on the university campus, collected over several months, for Professor Njoku's study of the environmental trigger of flowering in those woody plants. Learning that the study of such stained serial sections was to identify the point when cell division in the branch buds changed from being vegetative to producing flower cells (differentiated by the staining), made an enduring impression on me of some of the key requirements for successful scientific enquiry - the need for clear logical reasoning, the need for tenacity in applying oneself patiently to a problem, the need for paying attention to details, and the need to be as comprehensive as possible in the search. The use of buds collected over many months was to match changes in cell division with seasonal environmental variables in the search for correlations.

Looking back from the time of my exposure to Professor Njoku's influence, I began to interpret some early childhood experiences as possible pointers to my inclination towards science. For example, up to this day, I have never forgotten my frustration and utter devastation, at kindergarten age, with my inability to leave a clean trace of my palm on sand. Each time I completed the tracing and

tried to take my palm away, my fingers smudged the tracing, and I would cry and try all over again repeatedly. Could this have been an expression of a trait for precision, which is the hallmark of science? Also, I remembered my fascination and joy, in school exercises, at seeing a bean, okra, or maize seed germinate and shoot out from the soil. Looking back, I began to appreciate what I was doing when at a stop-over job, while waiting for placement in a tertiary institution, I worked at a colonial outfit called Tropical Testing Establishment (TTE) in Port Harcourt. The assignment then was to amass data on termite holes made in the furniture of houses in the European quarters of the town, setting down details of date, house, furniture, and its parts where the holes were found. On the same job also, we collected data on teredo (wood boring worms) holes on wooden piles used for shoring the beach at the harbour in Port Harcourt. It was only after I had 'seen the light' with exposure to Professor Njoku's influence that, in retrospect, I began to understand these exercises as data collection in the study of the durability of materials (in these cases, wood) against destructive agents in the tropical environment.

My path to science recounted above shows that the tendency towards a scientific future may not always be recognized in early life, to form a strong part of a conscious, choice-driven pursuit of a career in science. Rather, as it happened to Apostle Paul of the scriptures, it may be later in life that one sees the light, and thereafter begins to make a conscious effort to truly become a scientist.

Francisca N. Okeke FAS

Professor of Geomagnetism/Ionospheric Physics

I am a Professor of Physics, since the year 2000, and my areas of research interest include: solid earth geophysics, atmospheric physics, and climate variability. I have the following qualifications; B.Sc. physics (second class honours, upper division), 1980, M.Ed., 1985, M.Sc. in solid earth geophysics 1989, Ph.D. in ionospheric geophysics 1995, and PGDE in 1983. All my degrees are from the University of Nigeria, Nsukka (UNN), while I did my post-doctoral work at the University of Tokyo, Japan 1999-2000.

My childhood curiosity is the key to my remarkable achievements and my passion for science. This began long before I became a Physicist. As a little girl, I was fascinated by the sky; why the sky appears white some times and blue at other times. Again, I wondered why airplanes could fly. In my secondary school career, I found my vocation when I learned that Physics could answer my questions. Immediately after completing my secondary school education, I got an appointment to teach physics to final year secondary school students. During this period, I took up challenges and solved so many problems that the graduate teacher could not attempt. For a particular problem, it was at the wee hours of a Sunday night that I got the break-through. My scream of joy woke my father who rushed to my room in anxiety and enquired why I screamed. I replied, "Papa, I have solved the disturbing Physics problem"; and he joyfully walked away admiring and praising me. When I solved the problem to my students, they were excited and hailed me. This marked the turning point of my career. That day I made a bold resolution to become a Physicist, a profession feared by many Nigerians.

My painstaking research resulted in significant and outstanding contributions in my area, which has been recognized worldwide. This led to my prestigious award as a Laureate of L'Oreal-UNESCO Award for Women in Science for Physical Sciences in 2013; this marked my proudest moment as a Nigerian scientist. I contributed immensely to the academic growth of the Department of Physics and Astronomy and the development of Physics in Nigeria. I published over 100 papers in international reputable journals, 20 minor articles, and 15 books. I have mentored dozens of scientists, with some currently serving as Heads of Departments and Deans of Faculty in various institutions.

My late father, a mathematician, was my great mentor and hero, he taught me mathematics at a young age and I was always ahead of my class. I then developed love for mathematics, that later metamorphosed into love for physics. My father planted and watered the seed of my academic excellence that I am

enjoying today. I secured admission into UNN and studied physics, in a class of 30 students with only two females. Then, physics was regarded as a male domain subject and not a female domain subject.

There are lots of challenges I faced being in a male dominated area. My journey was not without challenges, especially being a mixture of an academician and a dedicated family person. I was focused, determined, hardworking, patient, and persevering; therefore, I did not give up. Out of my hard work and perseverance I produced 20 PhD's and thirty-five MSc's while being the leader of a very active research group. Another challenge is combining family duties with academics. I surmounted all difficulties because of my perseverance; neither the family nor my academic work suffered, although, a lot of sacrifices went with the success.

My achievements include: A Laureate of L'Oreal-UNESCO 2013, for Women In Science for the Physical Sciences; Fellowship awards - Fellow, The World Academy of Science, FTWAS, Fellow, African Academy of Science, FAAS, Fellow, Nigerian Academy of Science, FAS, Fellow, Nigerian Institute of Physics, FNIP, Fellow, Japan Society for the Promotion of Science, FJSPS, Fellow, Astronomical Society of Nigeria, FASN; Merit awards - first female indigenous Professor in Science and Engineering in UNN, first female Professor in the Eastern part of Nigeria, First female Head of Department, Physics and Astronomy, 2003 to 2006, Dean, Faculty of Physical Sciences, 2008 to 2010; Director, Africa Climate Change Adaptation Initiative (ACCAI-UNN), 2016 to 2018; Director, Institute of Climate Change Studies, Energy, and Environment (ICCSEE-UNN), 2018 to present; CNN celebrated me in 2015 (on African Voices) for my numerous contributions to science; The Nigerian academia, in 2016 celebrated me as one of the 10 most influential Nigerian women in science; I won a Staff Award of UNN, as one of the top 10 most outstanding lecturers in research and publications in the UNN in 2016; and I won the VC's research leadership award in 2017.

I am a member of several learned societies; member, National Space Council of Nigeria; member, Governing Council of the African Network of Science and Technological Institutions (ANSTI). I have collaborated with many universities in the USA, Japan, Brazil, and UK etc.

Emerging scientists, especially women should not give up. There will be no room for laxity or laziness, they should be encouraged to take up challenges and never relent. They should look out for a mentor. With hard work and determination, they will get there.

Iruka N. Okeke FAS

Professor of Pharmaceutical Microbiology

I am a molecular bacteriologist studying the genetics of bacteria that cause infections. Most of my research is basic science, but it informs vaccine and drug development. Today it is performed in the University of Ibadan's pharmacy school, where I work in the Department of Pharmaceutical Microbiology.

As a secondary school student in Queens College, Lagos, my love for biology and chemistry steered me, almost inevitably towards a career in the sciences. However, I did not always intend to be a molecular bacteriologist and indeed did not find out about my area of specialization until after I had qualified as a pharmacist at Obafemi Awolowo University, Ile-Ife. Pharmacy school was a good fit for me because of my love for biology and chemistry, and my desire to promote human health. These too are the reasons why I perform molecular bacteriology research today.

The most fascinating part of my B. Pharm. degree program was my final year research project conducted alongside classmate Folashade Johnson (nee Ologunagba) under the supervision of Professor Adebayo Lamikanra. We studied antimicrobial resistance in bacterial isolates from toilets. As disgusting as this might sound to some, 'Shade and I were riveted by the features and capabilities of our bacterial strains and the possibilities for genetic change and gene acquisition that our data revealed. Stool is not pretty, but *Escherichia coli* undoubtedly is on a MacConkey or eosin methylene blue agar plate, or in a capsule stain. Every undergraduate science student should have the opportunity of research, if not for anything else, at least to see whether or not they love science.

Right after university, first as an intern and then during youth service, I practiced the pharmacy profession, filling prescriptions, compounding medications, and consulting with patients and providers. These were fulfilling tasks that came with a lot of responsibility but I worried that they might not continue to hold my attention over years or decades. With the intent of moving to pharmaceutical quality assurance, I entered a master's programme in the Faculty of Pharmacy, Obafemi Awolowo University, Ile-Ife, and once again fell in love with gram-negative bacteria. My ambitions drifted from practicing applied science – for this is what pharmacists do – to making new discoveries. I was captivated by discovery, including its challenges and requirement of intense life-long learning. After getting my Master's degree, I decided not to stay on at Ife to pursue research as a doctoral student.

During my PhD research I found that basic bacteriology was very good for answering 'What?' questions, but had its limits when one wanted to probe further and ask 'How?' and 'Why?' A bacterial genetics course offered by the late Professor Shonukan in microbiology department when I was a master's student made me realize that molecular genetics extends questioning for inquisitive biologists. Molecular biology also unites biology and chemistry making it possible for me, as aptly put by Nobel laureate Paul Nurse, to study "life as chemistry". I devoted nine months of my PhD to learning the rudiments of molecular biology in Professor James Kaper's laboratory at the University of Maryland and in the course of doing so, discovered that enteroaggregative *E. coli*, a type largely ignored by researchers working in African countries, was one of the most important causes of childhood diarrhoea in and around Ile-Ife. I returned to Ife to finish my thesis, recognized that I needed more training in molecular biology and therefore underwent post-doctoral training at Uppsala University, and again in Jim Kaper's lab. At this point, most of my friends and family were asking very pointedly when I was going to "finish school".

Perhaps one of the three most wonderful things about a scientific career is that one never really finishes school. New knowledge is published in my field every day and every few months, I make a contribution myself mostly on *E. coli*. Most bacteriologists focus on domesticated *E. coli* but I am drawn to natural isolates that live within the intestines of humans and other animals. A few strains of this bacterium make people sick but majority are harmless. Our work has contributed to understanding the *E. coli* that cause childhood diarrhoea and how they differ from harmless strains, with particular focus on West African isolates, which are understudied overall. We've identified and characterized proteins that help the bacteria hold on to the intestine, work that informs vaccine development. We have also found and sequenced mobile pieces of DNA conferring resistance to what were once the most cost-effective antibacterial drugs, precipitating an epidemic of antibiotic resistance, and providing valuable information to support antibiotic policies. Some of our studies have lasted over a decade. Sometimes it can be hard to get to the bottom of things and I typically insist on answers to my 'How?' and 'Why?' questions before I'll close a chapter on our research.

I may have been born a scientist, with my innate love of biology and chemistry, but I became the scientist I am through a string of happy accidents, and some struggles too. Physics never came naturally to me, nor did calculus or physical chemistry. Each time I thought I was 'finished' with those disciplines, they returned again as essential pieces of learning I needed to forge along my path of interest. I was also wrongly taught to ignore the humanities early in my career. In the university, I had to take the standard 'African History and Culture' course twice to pass it. I am glad that my undergraduate curriculum forced me to do it since the history and anthropology of health and science in Africa are central to my science studies research today. I am proud to be one of few scientists with a significant body of published work in the social science field of science and

technology studies, work that makes me sensitive to ethical and sociological issues pertinent to science. I encourage all aspiring scientists to press through the difficult encounters one meets during a sail across easy things. The most creative scientists may be highly specialized but they have a broad foundation, which makes them competent to approach their questions from multiple perspectives.

Another reason why I am grateful to have been forced to learn things that do not come to me naturally is that molecular biology is not as easy to every one of my students. Empathy, I hope, makes me a more effective teacher. Teaching is an incredibly important part of my science, and is one of the many things that I have voluntarily struggled to learn. Teaching forces me to read outside my specialty and to continually interact with new scientists, who inevitably challenge science in new ways. And so, to me, the second wonder of science is the privilege one has of passing it on, like the torch my high school motto committed us to handing down. The third wonder is that science itself is an explanation of wonder. The thrill of discovery never grows old and each problem solved opens up new questions. If that isn't a reason to be a scientist, what is?

Pius N. Okeke FAS

Professor of Astronomy and Space Science

My field of science is physics and space science. I attended Federal Emergency School of Science, Lagos and obtained my G.C.E 'O' Level and 'A' level (pure mathematics, applied mathematics and physics). I got a direct entry into the University of Lagos to study physics and completed my second year before I was messed up by the Nigerian Biafra war. I transferred to the University of Nigeria Nsukka (UNN), where I completed my first degree with second-class upper division in physics. Given my excellent performance I was recalled as Junior Fellow in the department of Physics and Astronomy UNN in 1972.

Here, I made history graduating as the first PhD holder of the University of Nigeria in the Department of Physics in December 1975 in the area of theoretical physics. Between 1979 - 1980, I did my post-doctoral program in the University of Cambridge U.K, where, I retrained as a space scientist with a wide range of field of interest: observational astronomy, high energy astrophysics, lower and upper atmospheric sciences. In addition, I developed interest in writing fundamental physics books both practical and theory that can easily be understood by students, with an aim to displace foreign physics textbooks.

My interest in science started as early in primary school. I was able to discover my talent very early and worked towards its development. In the primary school, I liked only mathematics and general science. In secondary school the same was the case, but unfortunately for me the school I was admitted into did not offer physics and chemistry in WAEC. It was a great set back but I did not give up. After the secondary school I decided to start all over again by enrolling for an intensive one-year program in the Federal School of Science Lagos, after which I got my G.C.E 'O' level distinctions in Physics, Mathematics, Chemistry, Biology, and English.

I continued with G.C.E 'A' level in pure mathematics, applied mathematics, and physics instead of any other combination because I love physics. In my choice of university subject, I preferred to read physics instead of engineering because I admired lecturers in the university and my aim was to obtain a Ph.D. and become a lecturer in physics. Therefore, as mentioned above, I got admission to read physics at the University of Lagos in 1965.

When I completed my post-doctoral program in the University of Cambridge, I was faced with three challenges, which I was determined to tackle and achieve:

I. To simplify and make the study of physics in Nigeria and West Africa more attractive and interesting.
II. To make Africa and Nigeria in particular, fully participate in the study, research and development of space science.
III. To collaborate with advanced countries in the world to carry out enormous manpower development for Nigeria and African space scientists.

My most challenging moment in my career was how to achieve the above three objectives.

My proudest moment as a scientist is that I was able to work extremely hard, despite all hindrances, (relying mainly on foreign aid), to achieve all my above three objectives.

Today I am proud to state that:

I. It seems that I am the most popular author of physics books for secondary and tertiary institutions in Nigeria. I have written several excellent books both theory and practicals;
II. Through my collaborations with the United Nations, UNESCO, USA, Japan, South Africa, Brazil, and China, I was able to produce 35 PhD's in space science;
III. I have trained over 100 scholars in various institutions overseas;
IV. I have published over 80 journal articles in top international journals;
V. I was a pioneer of the National Space Research and Development Agency (NASRDA), Abuja and member of its Technical Advisory Board, as well as the first Director of the Centre for Basic Space Science;
VI. As a lecturer I have touched many lives and students enjoyed my lectures;
VII. I have served as a Head of Department as well as Dean of Faculty. My merit awards are too many to list here;
VIII. I served as President of both the Nigerian and African astronomical societies, and physics writers;
IX. Currently I am Emeritus Professor of Physics UNN and Member Advisory Board of NASRDA.
X. I am the husband of a distinguished physicist Prof. (Mrs.) Francisca. N. Okeke – UNESCO L'Oreal Nobel Laureat of 2013 in physical science, and Fellow, TWAS.

My advice to young scientists: Everyone should realize that they have a talent, which no one else has, just like their fingerprint. The problem is that over 90 percent of us do not discover our talents. Once you are able to discover it and work extremely hard to develop it, you will surely distinguish yourself in the field. Notice that I discovered mine right from primary school.

Friday E. Okonofua FAS

Professor of Obstetrics and Gynaecology

I am a medical doctor and a specialist obstetrician and gynaecologist. I was born in Eko-Ojeme village in Ewu, Esan Central Local Government Area of Edo State. My father was a farmer (Odionwere Iyoha Okonofua), while my mother (Madam Abhaigbe Okonofua) was a successful trader. None of them was educated, but my father vowed right from the onset that "his son will obtain the education which himself did not receive". As such, while other families in the village were insisting that their children would farm with them, my father never allowed me to go to the farm but instead ensured that I went to school consistently. They enrolled me in primary school at the age of five, which I completed at the Eko-Ojeme Primary School in 1965. I completed my secondary school education at the Anglican Grammar School, Ujoelen, Ekpoma, in 1969, and was the only candidate, in my class, that passed the school leaving certificate WAEC examination in Grade 1. I subsequently took and passed the entrance examination into the High School Certificate program at Edo College, Benin City, and was enrolled in 1970. However, I did not complete the program as I was admitted into the University of Ife (now Obafemi Awolowo University, OAU) in the preliminary class in 1971.

My mother influenced me greatly in my choice of medicine as a career. I was born at the Zuma Memorial Hospital, Irrua, by the Sage himself, Dr. Christopher Okojie OFR, who was the foremost obstetrician and gynaecologist in the Midwest region at the time, and who later became a Minister of Health of Nigeria. My mother told me that she was so mesmerized by the skill with which Dr. Christopher Okojie (fondly called Gbelokoto by the Esan natives) delivered me that she vowed that she would make sure that I become a medical doctor when I grow up. One day, I came back from school to tell her that my friends said I could not be a medical doctor because I was too playful. She immediately told me to forget such thoughts, that she was convinced that if Dr. Christopher Okojie could become a medical doctor, I could also become a doctor. As she put it at the time: "Gbelekoto omoi unhumo eva," meaning "Gbelekoto does not have two heads."

However, as I attended primary and secondary schools, I observed that I was an all-rounder in both science and art subjects. I particularly liked the art subjects of Civics, History, Literature, and English, and quickly topped the class in those subjects, but also in the sciences. Thus, at the time, I began to prioritize the art disciplines as a possible future career. In particular, I read the articles of columnists like Sad Sam in the daily newspapers, and marveled at how they

wrote and were acknowledged throughout the country. Thus, at the time I completed secondary school, I was convinced that I would focus on the arts and become a journalist. However, again, pressure from my mother and my uncle, Chief Salu Okonofua, ensured that I enrolled in the science subjects in the higher school in Edo College, Benin City in Biology, Chemistry, and Physics rather than in the art subjects. That immediately changed the trajectory and ensured that I focus entirely on the sciences.

My confusion further grew when I took the concessional entrance examination for entry into the university. There was no Joint Admissions Matriculation Board (JAMB) at the time, and candidates were allowed to take the entrance examination into as many universities as they liked. I took the concessional entrance examination into the University of Benin, the University of Ibadan, the University of Ife, and the University of Lagos. I passed all at first attempt, and was admitted simultaneously into the four universities. Interestingly, while I was admitted to read medicine in Benin, Lagos, and Ibadan, I was accepted into pharmacy in Ife as I thought the university did not have medicine as a course that year. I chose Ife because of its beauty – it was the most beautiful and, arguably, is still the most beautiful campus in Nigeria. Later I discovered, after spending the first semester in Ife, that the University of Ibadan had given me a scholarship as the candidate with the best result in the concessional entrance examination to the university. So, I went to the University of Ibadan to meet with the Registrar, seeking transfer to enable me to benefit from the scholarship. The Registrar angrily drove me away from his office because he could not understand why I chose Ife rather than Ibadan at the beginning.

This was the first time my mother and uncle knew that I had been admitted to study pharmacy in Ife. Before then, I had hidden the information from them. My having to tell them that I had obtained a scholarship in Ibadan, and my trip to Ibadan, to try to rectify the situation made me open up. Indeed, it was my uncle who gave me a letter with which I was introduced to the Registrar in Ibadan. After the Ibadan trip failed, my uncle got the information that the University of Ife will be starting medicine the following year. Indeed, some of the students in the first set had been admitted the same year with us in Pharmacy. My uncle then gave me a letter to see the Admission Officer at the University of Ife, Mrs. Joyce Aluko (the wife of the late Professor S. A Aluko, the well-known Professor of Economics), who informed me that I could change to medicine the following year if I passed the examination in the preliminary class year very well. I passed the four subjects in the preliminary class with four As. I completed a course transfer form, and I received a letter of transfer from pharmacy to medicine while I was on a long semester holiday in 1972.

The Ife medical training program was unique. It was the first University in Nigeria to insist that medical training must include a preliminary BSc degree in the health sciences. This was to deepen the understanding and use of science by health science graduates. I obtained a BSc (Second Class Upper) in the Health

Sciences in 1975, and an MB ChB degree in 1978. I subsequently did my mandatory one-year rotating internship at the University of Benin Teaching Hospital, and my one-year national youth service (NYSC) in Ogun State. However, although I was given the Ogun State Best Corper Award, and offered an automatic job in the State, I declined the offer and preferred to undergo an immediate postgraduate training in obstetrics and gynaecology. I enrolled in the program at the Obafemi Awolowo University Teaching Hospital in 1981, and passed the examination of the West African Postgraduate College in 1984 and of the Nigerian Postgraduate Medical College in 1985, after attending a one-year internship program at the University of London Royal Free Hospital.

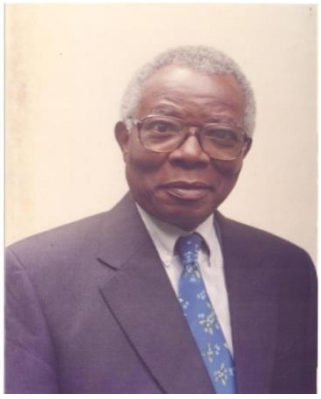
The rapidity with which I progressed after that testifies to the firm grounding I had in science due to my pursuing a BSc degree before medical school. I later obtained a PhD in public health from the prestigious Karolinska University in Stockholm, Sweden. I joined the Obafemi Awolowo University as Lecturer 1 in January 1986, became a Senior Lecturer in 1987, Associate Professor in 1989, and full Professor in 1992. Since then, I have done nothing else but science, research, and discovery.

The lessons for science in Nigeria that I learned from my experiences are two-fold. Firstly, the fact that there is virtually no counselling for young students in the country to enable them to take up future careers in the sciences. My foray into science was fortuitous – I had no advice from my teachers. Only the tenacity of my parents helped me through. Therefore, I strongly recommend that the counseling of students in the uptake of science and related disciplines need to be integrated into foundational education in the country.

Secondly, medicine, as a discipline, is an off-shoot of science. For graduates in the health sciences to make a success of their disciplines, they must be grounded in the principles of science, as has been shown when the OAU first insisted that its medical graduates must take a first degree in the sciences. The poor integration of science into medical disciplines is one of the most severe setbacks that medical education suffers today in Nigeria. This deficiency must be corrected if future medical graduates in the country will hope to make a significant mark in science, research, and innovation.

David T. Okpako FAS

Professor of Pharmacology



That I ended up a scientist happened by accident and *Eseoghene* (the grace of the almighty Creator). My parents and all around me were subsistence non-literate farmers. I started school, aged about 10 years old, in 1944. The owner/proprietor (Mr. Ifaka) of the school, Ifaka Providence School, was also the only teacher. He never mentioned science, not even the wetland fishes-*irhiorhi, igbehren, ephoro, owhre,* etc., that I knew a lot about as a young fisherman, though that was practical biology without the name! At Urhobo College, Effurun (UCE), we were taught rudiments of agriculture, how to plant corn 'three feet apart in two rows, staggered'. However, agric was not a subject in the Senior Cambridge School Certificate syllabus; chemistry, physics, and biology were. We had no physics teacher or laboratory. The sciences were not areas of scholarship in which our otherwise polyglot Principal, M.G. Ejaife (B.A. Durham), could stand in when there was no teacher; he did that in virtually every other subject!

Our science laboratory was one room in the corrugated roof mud-walled block. For chemistry and biology, there were some test tubes and Bunsen burners, but I cannot recall exactly what we did with them. The biology teacher, E. N. Igho (M.A. Cantab), who was also the Vice-Principal, was remarkable more for what he taught us outside, than for his class room lessons. As we walked about the wetland swamp (*ivwori*) on the other side of the Warri-Sapele Road, now a concrete jungle of hotels and shops, Igho would talk about what we saw - tadpoles, lizards, mosquito larvae, mudskippers, crabs, etc., and then about himself! He and Ejaife were the first Urhobo graduates, trained on Urhobo Progress Union scholarships, to come back to UCE to take charge. Igho would boast, "Your Principal is only a bachelor, but I am master from Cambridge" or words to that effect. Daniel Okumagba doubled as a tough games master and mathematics teacher: I recall his two trains of different lengths in parallel tracks, travelling at different speeds in the same or opposite directions: the question was how long it would take for one train to pass the other. None of us in the class of 1954 had set eyes on a train!

At the end of my career at UCE, which I enjoyed, I found that I had not been brilliant at anything! I graduated with a grade 2 school certificate -7 credits, one pass, and no distinction. My friend, Matthew Scott-Emuakpor, had grade 1 and a distinction in mathematics; he was the brilliant all-rounder who also held Grier Cup records in high, and triple jumps; we were classmates, but not in the same class! So, even at this stage, there was nothing I could identify with in the sciences.

In 1955, I got a job as a medical laboratory technician-in-training at the UCH, Adeoyo, Ibadan, the then Western Region headquarters. I liked laboratory work, and in 1956, entered the Nigerian College of Arts, Science, and Technology, on a federal scholarship, for 'A' levels in preparation for a diploma course in pharmacy.

It was here I had my first ever physics laboratory experience: the exercise was the Wheatstone bridge experiment. I had absolutely no clue what to do. I began to sweat from confusion. The physics master, a tough-looking wiry Englishman with piercing blue eyes and years of experience of teaching "A" level physics in different government colleges in Nigeria, noticed my predicament. He came over and asked what school I came from, and when I confessed that I had not done physics before, he looked as if he would throw me out; he did not. Instead, he said something like, "Do you think you can study physics for two years and pass it at "A" level?". As if to show the man that I could, I made the Nelkon textbook my constant companion. I got the required three "A" level passes, and two years later, a diploma in pharmacy. In 1960, a registered pharmacist had a good life on a salary of #408 pounds sterling per annum, but I had become greedy for more knowledge.

So, when a federal scholarship, to study for a pharmacy degree at the University of Bradford came, I grabbed it and flew there in 1961. It was there that my interest in science was ignited. David E. Clarke was a junior lecturer in pharmacology; he delivered his lectures on the autonomic nervous system and receptor theory with such enthusiasm that I fell in love with the subject. At this time, there was scintillating interest in neurotransmitter pharmacology, and Sir William Paton, an Oxford don, was causing excitement with his *rate* theory of drug receptor interaction.

What really cemented my passion for pharmacology was that I independently discovered early in my work, on guinea-pig anaphylaxis, for the PhD, that desensitization in the Schultz-Dale response is reversible. I experienced the scientist's elation at discovering something new; everyone thought it was until we found that, 40 years earlier, a little-known Polish scientist had published a similar observation in an obscure journal! But the excitement never left me. An MRC postdoc fellowship enabled me to devote all of 1968 in Professor H. O. Schild's lab at the University College London trying to unravel the mechanism of *in vitro* recovery of anaphylactic sensitivity. The issue remains unresolved, and that is science!

Oladunni G. Olaniyan-Taylor FAS

Emeritus Professor of Chemical Pathology

My earliest interest in science-related subjects started in the primary school where subjects such as arithmetic, geography, agriculture, sewing, and cooking were taught. It was usual to start the day with mental arithmetic tests. This was most stimulating and exciting, and I always looked forward to it because I would come first in the class with a score of a hundred percent. When I gained admission to Queen's School Ede in 1952, my interest in mathematics, general science, geography and English language pointed to my interest in science. Miss Grace Alele (now Prof. Alele-Williams) joined the staff of the school just a year before my final year at Queen's School. She introduced another subject called additional mathematics. Only six out of our class of 21 girls were elected for this course, and I was one of them.

After my final examinations which I passed with distinctions, I was admitted to the Nigerian College of Arts, Science, and Technology in Enugu for a preliminary science to a general course in education (GCE) advanced level in 1957. The knowledge of additional mathematics was most helpful. I studied physics, chemistry, and zoology with the intention of going to the University of London to study nutrition. It was obvious that I could not be given any government scholarship for any subject except I was ready to teach because there were very few female science teachers at that time. After a brilliant performance in the three subjects of physics, chemistry, and zoology at the advanced level examinations of the London GCE, I chose to study chemistry on being admitted to the University College, Ibadan (the present University of Ibadan). I got a Shell BP scholarship.

After graduation, I got a job in the Research Section of the Western Region Ministry of Agriculture, Moor Plantation, in 1962. In those days it was the usual practice to send new graduates for postgraduate training, but then I was expecting my first baby, and so I was told that I could not pass the medical examination required for an entry to a civil service job. So, I decided to apply for the post of an Assistant Research Fellow in the Department of Chemical Pathology at the University of Ibadan where I ended up as a Lipid Chemist. I was awarded a PhD in 1969, became a postgraduate fellow and was appointed a lecturer and rose through the ranks of a lecturer to become a Professor in 1984. Apart from lecturing medical students and postgraduate science students, I was involved in the research of lipid metabolism in hypertension, diabetes, kwashiorkor, in pregnancy, in women on oral contraceptives, as well in liver, renal, and other diseases. The effect of socio-economic status was the main

focus of these studies. A very outstanding study on the effect of socio-economic status and race on cord blood lipids was carried out among Nigerians and Trinidadians. This study showed no differences in the lipid levels of the cord blood of the two groups. Therefore, the differences in the lipid levels in the adult groups could only be due to diet and life style.

These research studies led to the most glorious moment in my life when I was elected a Fellow of NAS, and was also awarded the Helena Rubinstein–UNESCO (L'Oreal – UNESCO) prize as the first woman in Africa to earn this award. The award ceremony was most glorious. I stood in front of such a large audience, of about two thousand people, as my citation was read. It was also shown on CNN, BBC, and NTA for days. I was invited to chair the panel of jury for the selection of fellows for L'Oreal–UNESCO for sub-Sahara African Women.

I have worked in many lipid laboratories in USA, Zimbabwe, West Indies, and other countries during my study leave. I have also attended many conferences in Beijing, South Africa, Italy, and many other countries.

This L'Oreal–UNESCO award has been a motivating factor for me to encourage young female scientists to reach the highest levels in science. I have built an International House for Postgraduate Women in Science which consist of three two-bedroom flats and eighteen studio apartments, right in front of the University of Ibadan.

Funding education has always been a challenge for most students since the fifties. I was lucky to have gotten a Shell-BP scholarship on admission to the University College Ibadan. The study for my GCE "A" level was funded by my brother, Prof. Olaniyan, when he was in London for the early part of his PhD studies. He was my role model. Prof. Olaniyan became the President of NAS (1989 – 91).

After my retirement, I was appointed an Emeritus (Emerita) Professor in 2004, the first woman to be so honoured at the University of Ibadan.

Martins O. Olorunfemi FAS

Professor of Applied Geophysics

I attended Ifaki Grammar School, Ifaki Ekiti between 1967 and 1971, University of Ife (now Obafemi Awolowo University) Ile-Ife between 1972 and 1976, where I received a B.Sc. degree (first class honours) in applied geophysics; and the University of Birmingham, England, between 1978 and 1981 where I received an M.Sc. degree in applied geophysics, and a Ph.D. degree in geological sciences (applied geophysics) in 1979 and 1981 respectively. My field of work is applied geophysics – an applied science that utilizes basic principles of physics to study the composition, structure, and constituents of the earth.

I developed passion, in my formative years in the primary school, for aerodynamics and telecommunication engineering by engaging in kite flying and match box telecom – a practical demonstration of transmission of sound through solid (hair weaving tread). Being a son of a roadside mechanic, I grew up to develop an interest in auto mechanics and later got fascinated by the white overall of a medical doctor whose mission is to save lives. I carried this latter interest in medicine up to my middle class in the secondary school where I maintained a dissecting table and regularly dissected live toads and rats to study the alimentary canal and other internal organs. I wanted to be a surgeon. I abandoned this dream when senior colleagues in the secondary school, who we really looked up to for career guidance, informed us that medicine is an expensive course and not for poor students like us. However, in my fourth and fifth year in the secondary school, I was fortunate to be taught by a then freshly graduated physics teacher who became a role model and mentor. I had distinctions in all the science subjects and opted to study physics at the University of Ife even though I was also admitted to read mechanical engineering in a polytechnic. During the week of registration at the University, there was this advertisement of a new course (applied geophysics) at the Department of Geology whose graduates were needed in the exploration division of the then evolving oil industry. Twelve of us left physics department and got registered at the geology department as applied geophysics students. We became, in 1976, the first set of applied geophysics graduates in Nigeria and in the African sub region. I subsequently obtained postgraduate degrees (M.Sc. and Ph.D.) in the same field.

I practiced as an applied geophysicist in the then Ministry of Mines and Power, (Geological Survey Department) and Gulf (now Chevron/Texaco) Oil Company between 1977 and 1978, and as a teacher, researcher and consultant at the Department of Geology, Obafemi Awolowo University, Ile-Ife, between 1982

and now. I have been involved in data acquisition, data processing, modeling and interpretation phases of various geophysical surveys designed to address different needs of man relating to oil and gas, groundwater and mineral resource development, engineering site investigation and post-construction integrity assessment, as well as environmental impact assessment, archaeological prospection and precision agriculture.

As a teacher in the university, I have contributed immensely to human capacity building. I have successfully supervised and graduated 59 Masters students and 20 PhD students, 90% of whom are engaged in Nigerian universities and institutions abroad. In the course of my career, I have published 124 articles in national and international journals; 1 course manual; and 1 monograph.

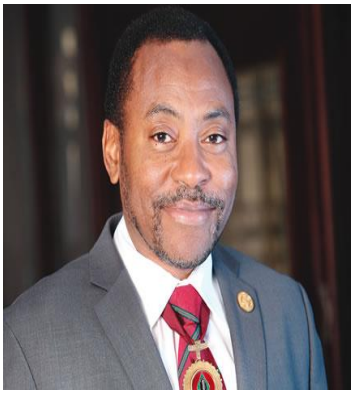
In recognition of my contributions to promoting the career of young mining engineers and geoscientists, I received the Nigerian Mining and Geosciences NMGS/VersaTech/P. O Nwasike Award for the Year 2012. I also received the Fellowship of the Nigerian Association of Hydrogeologists (FNAH) same year. I was listed in the 1989 edition of Profiles of African Scientists (Courtesy of African Academy of Science), and in the 2017 NUC Directory of Full Professors in the Nigerian Universities.

My proudest moment as a Nigerian scientist was the day, I was elected a Fellow of NAS. It was my moment of fulfilment as a scientist. The most challenging experience in my career as a scientist is the poor funding of academic research. Virtually all my researches were personally funded. Also, in this part of the world nobody (not the government, parastatals, private, or public establishments) seems to be interested in research findings, and these often times end up in the archives, gathering dust!

I became who I am by an accident of nature, not by design. My advice to young and prospective Nigerian scientists is to focus, work hard, take advantage of career guidance, follow your passion through, and believe there will be help on the way. We must leave this world better than we met it. Most problems of man are amenable to scientific solution and you can be part of the solution.

Akinyinka O. Omigbodun FAS

Professor of Obstetrics and Gynaecology



I am a medical doctor with specialist training in Obstetrics and Gynaecology and sub-specialization in Gynaecological Oncology, an area focused on understanding the causes, prevention, and treatment of cancers of the female reproductive tract. I commenced my education at All Saints' School, Osogbo, a public primary school, before proceeding to Loyola College Ibadan. I had my undergraduate medical training at the University of Ibadan. My specialist training was at the University College Hospital, Ibadan following which I was certified as an obstetrician and gynaecologist by both the West African College of Surgeons and the National Postgraduate Medical College of Nigeria. I had sub-specialist training in oncology and reproductive biology at the University Hospital of South Manchester, Withington, United Kingdom, and the University of Pennsylvania (Penn), Philadelphia, United States of America.

My earliest recollection of being interested in science was in the latter years of my primary education when my teacher, Mr. Ajidagba, encouraged me to buy a book titled *'Things Worth Knowing'*. I cannot remember who the compiler was, but the book was filled with trivia about science, geography, politics, and general knowledge. I was fascinated by the scientific information in the book, particularly information about the planets and the laws of physics. By the time I was in Loyola, general science became my favourite subject, and by the third year I enthusiastically embraced the study of physics, chemistry, and biology. I was also good in mathematics and what was called 'Additional Mathematics' then. So, I was a natural in the sciences. When the time came to choose what discipline to pursue in the university, it became a dilemma choosing whether to pursue mathematics or biology. Eventually, I found myself in medical school and the beginning of my journey into the biological sciences.

In medical school, I met another teacher in my second year, Dr. Akintola Odutola, who wanted student volunteers to work in his research laboratory. He was doing research into the nervous system, using rats as models. I was fascinated with the numerous experiments we carried out under his guidance. Making the histological slides and staining for the changes of interest in the tissues was particularly exciting. That fascination never stopped, because as a research scholar at Penn several years later, I always found a way to incorporate immunohistochemistry and cytology into the research projects I undertook there.

In the course of my specialist training, I was struck by the large number of women suffering and dying from cancers of the reproductive tract, particularly

cancer of the cervix and cancer of placental tissues following pregnancy. It was really tragic that cervical cancer, which was eminently preventable, was the leading cause of cancer deaths among our patients and this motivated me to want to do something to ameliorate the situation. I started with looking for ways of making diagnosis, clinical staging, and treatment adaptable to the constraints in our environment. I also studied how the more treatable precancerous stages of cervical cancer could be detected more readily in our country. Later on, in the USA, I used molecular techniques to study the mechanisms of placental invasion of the womb to provide a better understanding of how cancers of placental tissues occur. Thus, a lot of my earlier research was in gynaecological oncology in the hospital and the basic science laboratory. In the past twenty years, there has been a decided shift toward looking at the public health implications and applications of some of my findings and the observations of others.

Some of my findings that have found application in the prevention and treatment of female reproductive tract cancer include the use of urine cytology in the clinical staging of cervical cancer where cystoscopy was unavailable and the use of visual inspection of the stained cervix to screen for precancerous cervical lesions. My proudest moment as a scientist was when I was awarded the American Society of Reproductive Medicine Prize for Distinct Contribution to Science in Boston in 1996 for my research into the molecular mechanisms of trophoblastic invasion of the uterus. The most challenging period of my research career was the loss of the reagents and antibodies I brought from the USA to continue my molecular biology research in Ibadan due to prolonged power failure over a long weekend. It made me refocus my attention to public health research in the community, in addition to laboratory research.

My advice to young Nigerians contemplating a career in science is not to be discouraged by the infrastructural and funding constraints to research in our country, but to be determined to succeed no matter the odds. Nigeria has problems that can only be solved by focused research conducted by Nigerians in Nigeria. Aspiring scientists have to look for the resources to do the research that will lead to solutions to these problems.

Kalu M. Onuoha FAS

Professor of Pure and Applied Geophysics

My interest in science started right back at home as a little boy during my primary school days in my home town, Akanu Ohafia in Ohafia Local Government Area of Abia, State, Nigeria. The town is located on hills overlooking valleys and depressions, and I remember being very intrigued as a boy by the morphology of the hills and valleys. I often tried to trace the courses of the flowing streams and understand the nature of the exposed rocks and the general scenery. In the primary schools in those days, the nearest that we were taught about science was in a subject called 'Nature Study', which dealt with bits and pieces from agriculture, geography, and things about the immediate environment. In the higher classes at the primary school, geography was introduced, and I became very interested in this subject and at a time even wanted to be a geographer, i.e. a person studying about countries, continents, hills, valleys, oceans, about people and population distributions, and about phenomena such as earthquakes and volcanoes.

I was fortunate to attend one of the oldest and best secondary schools in Nigeria at the time – Hope Waddell Training Institution, Calabar. This school was established in 1896 by Christian missionaries from Scotland, and following the birth of Nigeria as a country, helped to produce some of the greatest Nigerian leaders of the past century, e.g. Dr. Nnamdi Azikiwe, Dr. Akanu Ibiam, Chief Adeniran Ogunsanya, Dr. Dennis Osadebe, just to name a few. In the secondary school curriculum at the time, in addition to Mathematics, General Science was taught in the lower classes, but by the third year, individual science subjects like Biology, Physics, and Chemistry were introduced. I was very interested in these subjects and performed so well in them that after obtaining the West African School Certificate in 1964 (with a Division I pass), it was very difficult for me to choose the three principal subjects that I was to enroll for in the two-year Higher School Certificate (HSC) programme. Some of my teachers encouraged me to study medicine; others suggested engineering, and so on. At the same time, I still maintained a strong interest in Geography and Mathematics and did not want to drop them.

It was easy for me to drop Biology and to forget the idea of becoming a medical doctor because I hated the sight of blood and could not fancy myself injecting or using a scalpel on people. I eventually completed my secondary school education in 1966 and obtained my Cambridge Overseas Higher School Certificate (as it was then called) with good grades in all my subjects (Physics, Pure and Applied Mathematics, and Geography). My school was specially

commended by the University of Cambridge for producing a candidate who obtained one of the highest grades in Geography in the 1966 HSC examination in the British Commonwealth.

Medicine and Engineering were becoming popular, but the leading scientists of the time in Nigeria were more of experts in single subjects, like Physics, Mathematics, Chemistry, Zoology, etc., and as is now well known, most of the founding Fellows of the NAS were actually experts in particular science subjects. Because of my personal interest in mathematics and physics, I no longer wanted to major in geography, but instead opted to study geophysics, which deals with the study of the earth using physics, chemistry, and mathematics as tools. I was fortunate after the Nigerian Civil War to obtain a Federal Government of Nigeria scholarship to study Geophysics at the Loràn̈d Eötvös University in Budapest, Hungary in 1971. Some of my academic records in that university, including a 5/5 perfect aggregate at the completion of my Masters' Degree in Applied Geophysics, earned me some good attention and brought opportunities for further academic pursuits when my Nigerian government sponsored training ended in 1977. My PhD degree was obtained in 1978 and was followed by a post-doctoral research grant from the government of West Germany at the time for some research studies at the Institute for Geophysics of the Technical University of Clausthal-Zellerfeld, Germany (1979-1980).

Geophysics as a course of study is very interesting and has different aspects. There are aspects that deal with the earth's interior, the origin and mode of occurrence of earthquakes and volcanoes, the magnetic field of the earth, the distribution of land masses, oceans, etc. However, the more practical aspects of geophysics use tools and techniques developed over time to uncover the make-up of the earth below, and to discover hidden mineral resources, oil and gas deposits, groundwater resources, etc. When people ask me what I teach in the university, I often used to answer by saying that I teach how to look for and discover things that are hidden under the ground, without necessarily having to dig or bore into the ground, but simply by using equipment and methods of investigation that are carried out on the surface or even from the air to look deep into the ground to great depths. I have been involved over the years in teaching and research, and have carried out different kinds of geophysical and geological investigations in search of mineral resources, groundwater, and petroleum deposits.

In my career I have been privileged to hold some special academic positions based on my adjudged contributions to science and to the profession, and these include three different Professorial Chairs. One of the earliest Professorial Chairs endowed in the Nigerian University system was by Exxon Mobil way back in 1991, then known as Mobil Producing Nigeria. I was in that year appointed as the pioneer "Mobil Professor" at Mobil's newly endowed Chair of Petroleum Geology at the University of Calabar, Calabar, Cross River State.

Several years later, I was also appointed and for ten years successfully served as the Occupant of the "Shell Chair of Geology" at the Department of Geology, University of Nigeria, Nsukka (January 2003 to December 2012). In the last five years of my service at the University of Nigeria, and up till my mandatory retirement from university service at the age of seventy years, I served as the Petroleum Technology Development Fund (PTDF) Professor of Petroleum Geology at the PTDF's Chair at the University of Nigeria, Nsukka. Three different Professorial Chairs at different times, in one university career. This is something that I cannot stop thanking God for making possible. I regard these appointments and the privilege and opportunity to be chosen by my peers to become a Fellow of the Nigerian Academy of Science, and even to be entrusted with the awesome task of leading the Academy as President, as major highlights in my academic and professional career.

Like everyone else, I have had challenges in my career. One of the earliest was in 1980 when as a young professional with a PhD degree and some post-doctoral research experience, I had a lot of job offers from the industry and academia both inside and outside Nigeria, and had to make a decision, after having spent close to a decade abroad. The attraction to remain abroad was high, but I eventually made a decision in September 1980 to return to Nigeria and contribute to the development of my country. When successive military regimes (especially between 1984 and 1999) made university careers in Nigeria unpalatable and hard through poor working and salary conditions, the country lost many professionals that left for greener pastures abroad. For me such opportunities also came, especially for relocation to the USA, but I again decided to stay back at home. However, in order to update myself and remain relevant in my profession, I elected during those hard times to go to the industry, and subsequently took a leave of absence from the university. The Shell Petroleum Development Company of Nigeria (SPDC) granted me an opportunity of serving as Technology Development Adviser at its Subsurface Services Department in Port Harcourt in 1996, a position that I took until I returned to the University of Nigeria in 2001.

Our younger generation has to learn how to adopt good and correct role models. A lot of young people today have taken up the wrong people as their role models, mostly the super-rich musicians and private jet owning elites. Many young people simply want to be billionaires before the age of thirty. Nobody that is sane would want to be poor, but we need scientists and I want to believe that many young Nigerians should find sufficient interest in science. Many fancy areas of science are coming up, e.g. Artificial Intelligence, neuroscience, nanotechnology, etc. It is very possible to become rich and famous as a scientist, and I would encourage the younger ones to develop their skills in science, which ultimately holds the key to the rapid economic development of our nation and the solution of problems in health, agriculture and food production, industrialization, etc.

Mike O. Onyekonwu FAS

Professor of Oil and Gas Engineering

I am a Professor of Petroleum and Gas Engineering. I started my career in 1979 as an Assistant Lecturer at the University of Port Harcourt. I attended schools in Aba, Enugu, and Oba (near Onitsha) for my primary and secondary school education. I went to the University of Ibadan for my first degree and subsequently attended Stanford University USA for my post-graduate (MSc and PhD) degrees.

I noticed that I had interest in science subjects while I was in the secondary school. This interest did not come as a result of counseling, but the ease with which I passed the science subjects. Actually, I put in more than ten times the effort to just get a "C" in the WAEC history examination than it took me to get an "A" in physics, chemistry, or mathematics. In science, the equations and theories speak volumes and also form the basis of great scientific discoveries. In addition, many of the scientific concepts stand the test of time. For example, the age-long concept of conservation of mass, energy, and momentum cannot be violated in any serious scientific consideration. Science is specific and predictable, unlike the arts. The example of this, in the arts, is the study of human behavior which changes with time and environment.

I was motivated to be a scientist because science is the bedrock of several inventions that transform the society. Therefore, I wanted to be part of the group that spearheads scientific discoveries. As a scientist, I have contributed to knowledge in Petroleum Engineering, and particularly in oil and gas reservoir engineering. This is about understanding how oil and gas flow in the reservoir and how to optimally recover the fluids. Incidentally, the reservoir engineering discipline is not just science, but has elements of the arts because of the inherent uncertainties we deal with in the reservoir. However, in managing the reservoirs, scientific principles are still upheld.

My major contributions in the Petroleum Engineering discipline include my studies on several reservoirs which helped many oil and gas companies manage and exploit their reservoirs efficiently. I have also worked on the use of nano-particles in enhancing oil recovery and inhibiting fines migration in the oil and gas fields. These are landmark researches that are cited in many journals. We also have a patent on this work. As a lecturer, I also consider passing on knowledge to my students as a significant contribution to society. My students are everywhere in the oil industry and academia and they are doing very well.

My proudest moment as a Nigerian scientist was when we undertook a field development study that was used in developing an oil field in Nigeria by one of

the international oil companies. Before this time, all studies were done overseas. Nigerians in the National Petroleum Investment Management Services (NAPIMS) were excited, as it dawned on them that Nigerians could also undertake studies. That became the beginning of domiciling of some reservoir studies in Nigeria. Today, we have the Nigerian Content Act. I was also delighted when we set up a mercury-free pressure-volume-temperature fluid laboratory that is comparable with any of such laboratories in the world. This laboratory is 100% managed by Nigerians, and it is the first of its kind in Africa.

I have enjoyed my career, but I also had challenges. My greatest challenge was when I was in graduate school and failed an examination which I was not supposed to fail. I was devastated because failing an examination was strange to me. This happened in the USA, where there were few shoulders to cry on. I learnt my lessons from the failure and pulled myself together to pass the examination by the grace of God.

In all these years, I have learnt some lessons that will be useful to our young ones and these lessons are summarized as follows:

I. It is important that one finds out what one is really good at and work hard to nurture the talent. It may not necessarily be science.
II. With hard work and the fear of God, one can get to any height. My parents were uneducated traders, but they loved education. Circumstances cannot therefore be a deterrent!
III. Failure cannot be the end of it, but a guide on how not to fail again. No one should then be scared of failure.
IV. One should look for a mentor to look up to so that one remains focused. Professor G. K. Falade FAS helped me in this aspect and I am grateful.

I am glad to contribute this little note to guide the young ones. I am certain that with the fear of God, hard work, and discipline they will rise to the challenge of modern times and contribute positively to the growth of our society.

Ikenna Onyido FAS

Professor of Mechanistic and Bioorganic Chemistry

My field of science is physical organic chemistry, which seeks to understand the behaviour of organic molecules, and their reaction mechanisms as descriptors of the potential energy surfaces traversed by reactants to become products. Its overall concern is the improvement of the theory of organic chemistry. For industrial purposes, mechanistic studies enable product- yield-optimization through the avoidance of reaction pathways, which yield unwanted products. Over time, physical organic chemistry tools have been extended to chemical biology, the interdisciplinary, interfacial landscape concerned with understanding the physico-chemical forces holding biomolecules together, which also influence their reactivity.

I had less than two years of secondary school education. While my mates went off to renowned secondary schools, my father, an educationist, insisted on my attending the new secondary school he founded, the New Salem Secondary School, Okija, now in Anambra State. My father ran into political trouble when he criticized the then Eastern Nigeria educational policy: his school was closed down by government. This harsh political retribution, with its collateral adversity, led my father to challenge me with self-tutoring to prepare for the London University GCE. I sat and passed the examination before the start of hostilities in the Nigeria-Biafra war.

With the war ending in 1970, I sat and passed the University of Ibadan (UI) concessional entrance examination into the preliminary science year to study chemistry. My first formal laboratory classes were in UI, due to my chequered secondary education, sketched above. I graduated with a B.Sc. degree in chemistry with first class honours in 1974. My plans to study for a Ph.D. abroad were thwarted by the sudden death of my father in 1975 during my National Youth Service Corps year. The first of eight children, I changed my plans, returned to UI as a Graduate Assistant and registered for Ph.D. study under Professors Jack Hirst and Titus Bamkole. I obtained my Ph.D. in 1979 in the thesis area of the mechanisms of nucleophilic aromatic substitution reactions. After a postdoctoral year with Professor Per Ahlberg in Uppsala University, Sweden where I studied kinetic isotope effects in elimination reactions, I returned to a lectureship position in UI in 1980. In 1989, I was appointed Professor of Chemistry at the new University of Agriculture, Makurdi, and was assigned responsibilities as Head of Chemistry and Dean of Science to organize teaching and research in the natural sciences in a mission-oriented university charged with promoting scientific agriculture.

Before I acquired books for self-tutoring for the London GCE, I picked up the old chemistry textbook my father used in secondary school in the early 1940s, Holmyard's Elementary Chemistry. Notwithstanding the book's age, I was fascinated by the chemical creativity, which it conveyed, whereby one substance could be transformed into a new substance under stated conditions. It was intriguing to me that electrons, not visible to human eye, could give effect to the changes we could touch, feel, taste or smell. Later, I owned a copy of Chemistry for School Certificate by Holderness and Lambert, which described chemical changes in graphic ways akin to virtual reality. It was this fascination with the creativity of chemistry that attracted me to the subject because it promised a voyage of discovery.

Our work has focused on different aspects of mechanistic chemistry: catalysis in nucleophilic aromatic substitution, metal ion-biomolecule interactions, σ-complexes as biochemical and biophysical probes, isotopic exchange in biologically important heterocycles, structure-reactivity correlations, nucleophilic reactions of phosphorus esters as models for biological phosphoryl transfers, and slow release pesticides for sustainable agriculture. We have contributed to an understanding of various phenomena which are germane to chemical reactivity: the mechanism of proton transfer processes between electronegative atoms in aprotic solvents; transition state structures in uncatalyzed phospho transfers involving oxyanions; the ambident nucleophilicity of phenoxides and anilines in their reactions with super-electrophiles; metal ion surrogates for protons in biomolecular isotopic exchange, etc. Our contributions to the theory of organic chemistry over the years have been substantial.

My proudest moments were during my induction as a Fellow NAS (2008) and of the African Academy of Sciences (2005). For someone like me with less than two years of secondary education to be admitted into the highest honorific science bodies in Nigeria and the continent is a satisfying career outcome. My most challenging time was during my pioneering experience in Makurdi, which entailed leaving the elaborate facilities and solid research culture in Ibadan for the uncertainty of pioneering, which demanded that I work to install both. I kept alive scientifically during the period by collaborating with first class centres of research.

To close, I advise young Nigerian scientists to emulate the mentors who inspire them, listen to their advice, abide by the tenets of good research culture, and work really hard. With these, they cannot miss the top.

Micah O. Osilike FAS

Professor of Mathematics

I am Micah Okwuchukwu Osilike, Professor of Mathematics at the University of Nigeria, Nsukka. I attended Ebenesi Primary School Nnobi, Idemili South Local Government Area (LGA), Anambra State; Boys High School Aguluzigbo, Anaocha LGA, Anambra State; University of Nigeria, Nsukka (UNN) for B.Sc., M.Sc. and Ph.D. degrees in Mathematics, as well as the Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy where I obtained the DICTP in Mathematics.

In my primary and secondary school days, I did not have any particular interest in mathematics, but I remember vividly that in spite of the irritation and underlying phobia associated with mathematics by many, I usually excelled in it with minimal effort. The only attraction and reference to mathematics then was the enigmatic name "Chike Obi". In my high school leaving examinations (WASCE), I sat for the following subjects: English, mathematics, physics, chemistry, biology, agricultural science, economics, history, and commerce. I was well motivated and inspired by my science teachers, but in choosing a career, they encouraged me to consider medicine, which I was not really interested in. I preferred pharmacy. Immediately I got my WASCE result, the principal of Nnobi High School, Nnobi (in Anambra State) employed me specifically to teach mathematics and physics as an auxiliary teacher at the school. He told me that I must secure admission into university and pursue a career after one year. That one-year experience strengthened my interest in mathematics and physics. I started contemplating doing a combined B.Sc. degree in mathematics/physics at UNN. By providence, I was offered admission into B.Sc. Mathematics in 1982 at UNN. I completed first and second years of study with ease but without being sure of where it was leading me to although I was already being influenced by the personalities of some of the lecturers in the department such as Professor J.C. Amazigo, FAS and Professor J.O.C. Ezeilo, FAS. In 1984 in my third year, Professor C.E. Chidume, FAS returned from the USA and taught me some courses, notably metric space topology and elementary differential equations II. It was metric space topology that endeared me to him and he became my mentor. His encouragement, motivation and inspiration convinced me beyond all reasonable doubts that I would make a career in mathematics. It was a turning point; I believed in myself and believed in the future. He supervised my M.Sc. and Ph.D. degrees, and he facilitated so many grants and oversea research visits for me.

My main research interest is in Fixed-Point Theory and Applications (FPTA), where I have made invaluable contributions. I have proved several novel theorems, lemmas and propositions, and constructed several incisive examples that are outstanding contributions to the area. I introduced and studied several important operators, I am a member of the Editorial Board of several journals, and I coordinate a formidable research group in FPTA at UNN. I am very visible in Google Scholar and ResearchGate. I have supervised several M.Sc. and Ph.D. candidates that have demonstrated outstanding qualities, and I have received the UNN Vice-Chancellor's Research Leadership Prize. I have served the Nigerian Mathematical Society as Assistant Secretary, Vice-President, Acting Editor-in-Chief, Editor-in-Chief, and President.

I enjoyed a great deal of mentoring, and now in my career I enjoy mentoring people. I feel very elated about the quality of candidates I have guided through graduate programmes and it appears my greatest joy is the progress of my mentees.

A career in mathematics has many persistent challenges in our country. The government's lack of sincere commitment to funding research in the basic sciences has consistently given rise to poor remuneration, and lack of adequate reward for cutting edge research in the basic sciences. Basic research facilities are lacking and researchers spend valuable time seeking for basic life amenities while insecurity is recently becoming a great threat. It is my association with International Centre for Theoretical Physics (ICTP) early in my career in 1992/93 that served as a great pivot for my career and opened up several opportunities.

Mathematics is universal and the evolving research is very dynamic. There is no Nigerian or African mathematics. There is no different mathematics for those whose government is not interested and willing to fund and support high level research in mathematics; those who are poorly remunerated; or those with epileptic power supply; certainly, no different mathematics for those who spend valuable time searching for basics amenities or those experiencing security challenges. To be relevant and happy, we must compete at the same level with our Western and Asian counterparts! Although there is joy in carrying out research that will tackle problems of our immediate surroundings, we must be careful not to localize our research. Young and prospective Nigerians who wish to make a career in high level research in mathematics must seek collaboration early enough and explore opportunities to expose themselves to good facilities. Good mentoring is essential.

Mayowa O. Owolabi FAS

Professor of Neurology

I obtained the MBBS degree from University of Ibadan (1997), MSc. Biomedical Education with distinction (University of Ibadan), and *Doctor medicinae* (Charité University of Medicine; Humboldt University, and Free University, Berlin, Germany, 2010). I also obtained a Certificate in Epidemiology & Global Health, University of Dundee, UK, 2010.

My fields of science include; Neurorehabilitation, stroke, cognitive neurology, genomic epidemiology, preventive neurology, holistic medicine, translational neuroscience, and cardiovascular diseases.

My earliest memory of interest in science began when I was in primary school. I got inspired through books and encyclopedia in my father's library. I perceived science as a means to unravel the mysteries of the environment and the universe. Science holds the key to understanding and deploying the laws of nature. Knowledge so discovered and deployed brings emancipation, solutions, and development. I read the biographies and admired the great scientists and nobel laureates whose discoveries have transformed the world and made the seemingly impossible possible.

To strive under and towards God, as well as to discover the laws of the universe. To have great knowledge, wisdom, and understanding, that truth can bring liberty and light can dispel darkness that robs the world of peace, progress, and prosperity. Specifically, to discover and use scientific knowledge to prevent and reduce the burden of neurological diseases, and contribute to improving the health of mankind in the journey towards immortality motivated me to becoming a scientist.

I developed the cardiovascular quadrangle, implementation cycle under the Control Unique to Cardiovascular diseases. In low and middle income countries (COUNCIL) initiative (PMID: 27840737); '*Cervical vertigo tetrad'*, the *Health-related quality of life in stroke patients' questionnaire* **(**HRQOLISP, 40-item and 26 item versions), a holistic multi-culturally-validated multidimensional measure in use in USA, Spain, Jamaica, Germany, Nigeria, and Ghana and available in numerous languages; the *seed of life model (SOLM)*, the *stroke recovery spiral*(PMID: 23509863); and *stroke levity scale* (PMID:18474078).

In neurorehabilitation, I pioneered the establishment of the first neurorehabilitation centre in sub-Saharan Africa (SSA) – Blossom Specialist Medical Centre. I am the pioneering Regional Vice President (SSA) of the

World Federation of Neurorehabilitation. I lead international studies (NIH funded grants -SIREN & SIBS Genomics) in community-based genomic epidemiology of stroke, and I am the pioneer chairman of the largest study of cardiovascular diseases in Africa (with >55,000 subjects).

I am Professor of Neurology and Pioneer Director, Center for Genomic and Precision Medicine, as well as Dean, Faculty of Clinical Sciences, College of Medicine, University of Ibadan. I have several awards and I am also a distinguished member of several professional bodies including the Fellowship of the Royal College of Physicians (RCP), the NAS, and the American Academy of Neurology (AAN). I developed a stroke phenotyping software (patent *Reg.#:NG/PT/NC/2016/2007*), and have over 215 highly-cited peer-reviewed publications. I lead the global fight against stroke as the Lead Co-Chair, WHO- *Lancet* Commission on stroke in developing countries. I am Co-Chair, Joint Publication Committee - Global Alliance for Chronic Diseases (GACD); Founder of COUNCIL initiative; member, Global Burden of Diseases group; and Director, World Hypertension League, Sub-Sahara Africa Regional Office (2019 – 2021).

In SIREN, the largest study of stroke in Africa (Nigeria and Ghana), which I lead, we have investigated over 8,000 subjects and identified 11 potentially modifiable factors in stroke, which include novel factors such as stress, regular meat intake, and protective factors such as green leafy vegetables among others. The most exciting is the consistent protective, and dose-dependent relationship of the consumption of green leafy vegetables with all types of stroke and severe stroke.

We also are the first to discover the association of Apoliporotein-1 gene to stroke, an observation which has been confirmed by another study.

Rejection of manuscripts and grant applications could be challenging. However, they are just stepping stones on the road to success. Constant improvement, coupled with persistence, is the key to progress.

My advice for young and prospective Nigerian scientists? Discover yourself: develop and harness your strengths. Be diligent and remain focused in the pursuit of your life's goals.

Babs M. Oyeneyin FAS

Professor of Petroleum and Mechanical Engineering

My field of science is Mechanical Engineering and Petroleum Engineering. I attended the following educational institutions; St Joseph's College, Ondo (1964-1968); Exit qualification: WASC Grade 1, Federal School of Science, Onikan Lagos (1969-1970), University of Benin, Benin-City Nigeria (1970-1975); B.Eng. (Hons) in mechanical engineering (2:1), University of Belgrade (1977-1979); M.Sc in petroleum engineering with distinction, Heriot-Watt University, Edinburgh, Scotland (1980-1983); MPhil & PhD in Petroleum Engineering.

My earliest memory of being interested in science was in St Joseph's College, a Catholic School with strong pedigree in the sciences, and by the careers of my senior siblings who were engineers and medical practitioners.

The area of science that I worked on is; integrated petroleum-engineering practice (field engineering practice and academic teaching and research).

My career highlights in the field of science are:

I. Head of Petroleum Engineering Department, University of Benin (1987 – 1990).
II. Professor of Petroleum Engineering, Robert Gordon University, Aberdeen UK (2004 to 2019).
III. Royal Society Enterprise Fellow, 2011.
IV. MD, Intelligent Flow Solutions/I-Flow Energy (2011 – Date).

My contributions to the field of science are:

A. Capacity Building for Oil & Gas Industry in Nigeria and Globally.
    - Shell Intensive Training Programme Facilitation (1997-2002).
    - FUPRE Energy Solutions Ltd – In partnership with Federal University of Petroleum Resources, Effurun.
B. Development of new unique products for oil/gas applications.
    - Virtual Reality Digital Well Engineering Software.
    - Intelligent Variable Slot Screen Systems for Oilwell applications.
    - New NMR Multiphase Flow Meter.

My proudest moments as a Nigerian Scientist are:

- Election in 2012 as the First Black President of the Mining Institute of Scotland (MIS).
- Election into the NAS in 2017.

The most challenging moments in my career were:

- Establishment of a specialist UK engineering spinout company (Intelligent Flow Solutions) in 2012 with target market focus on Africa. Difficult to raise start-up fund for the technology development company.
- Company has now been turned into an oil/gas service company for the purpose of revenue generation.

My advice for young and prospective Nigerian scientist is to strive to become a Technopreneur.

Abubakar S. Sambo FAS

Professor of Mechanical Engineering

My field of science is Mechanical Engineering. I attended Capital School Kaduna for my primary education; Government College, Kaduna for my secondary education; Ahmadu Bello University (ABU), Zaria for my first degree; and the University of Sussex in the United Kingdom for my doctorate degree programme.

I remember that in my last year in primary school in 1968, I became extremely curious about car engines and what causes cars to move. I also remember that in my third year in secondary school, in 1971, I became extremely interested in the use of lenses to concentrate sunlight and create a burning sensation. My motivation for becoming a scientist was to become a specialist on engines especially car engines, and also to acquire the competence on how best to harness direct solar radiation as well as indirect solar energy.

The areas of science I worked on included heat transfer and fluid flow in gas turbine rotor-stator cavities; research, development, and deployment of solar energy and other renewable energy systems, as well as planning and advocacy for adoption of sustainable energy systems and practices in addition to promoting mainstreaming energy plans into overall national development plans.

At the University of Sussex, I conducted research on gas turbine rotor-stator cavities aimed at improving the efficiency of the gas turbines, reducing thermal fatigue and extending the lives of the turbines. This involved the use of theoretical studies and experimental measurements of temperatures and velocities using Laser Doppler Anemometry. At Bayero University, Kano apart from teaching thermo-fluid mechanics courses of thermodynamics, heat transfer, fluid mechanics and engineering drawing, I conducted research on solar radiation studies, flat plate collectors, and thermo-syphon solar water heaters.

As the Vice-Chancellor of Abubakar Tafawa Balewa University, Bauchi (ATBU) (1995-2004), I established the Chemical and Petroleum Engineering Departments and strengthened the then existing engineering departments (Civil, Electrical and Mechanical) such that they were granted full accreditation by both the Council for the Regulation of Engineering in Nigeria (COREN), and the National Universities Commission (NUC). I also established the Faculty of Science Education and the Faculty of Management Technology, as well as the Postgraduate School. I also supervised 10 PhDs, in applied Mathematics, solar

radiation, solar water heaters, and industrial energy consumption, amongst others, all while serving as the VC at ATBU.

As the Director General of the Energy Commission of Nigeria (ECN) from 2005-2012, I spearheaded the production of the National Energy Master plan and ensured that substantial work was done on the development of the National Energy Databank and the National Energy Manpower Plan. New computer-based energy modelling tools were acquired for predicting the energy demand and supply profiles of the nation on economic scenario basis and covering the major economic sectors. Two new departments were created at the ECN head office and four new national energy research centres were established at the federal universities in Bauchi, Benin City, Ilorin and Lagos.

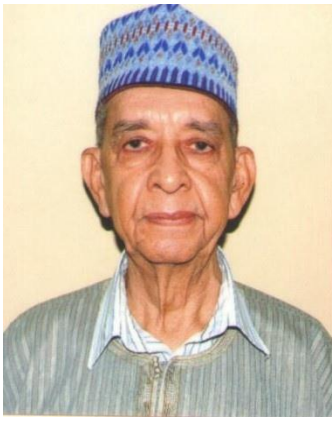
My very proud moments as a scientist were three: when I was appointed Professor of Energy Studies in October 1991, at the age of 36 years, when I was appointed Vice- Chancellor of Abubakar Tafawa Balewa University of Science and Technology, Bauchi in April 1995 at the age of 39 and also when I was elected a Fellow of the NAS in 2002 at the age of 47 years.

My most challenging moment was when I completed my doctoral degree programme at the University of Sussex in 1983, and a world-renowned expert was appointed as my external examiner. Many members of my laboratory, the Thermo-Fluid Mechanics Research Centre, informed me that the examiner was known for his extreme thoroughness and a sizeable proportion of the candidates he examines, fail and I should prepare to extend my stay at Sussex by another year. My strategy was to prepare very well for the viva by thoroughly revising all the experiments and theoretical predictions I did and the basic concepts I relied upon for the finite difference code I used to solve the fluid flow and heat transfer partial differential equations. In the end, the external examiner did not only find my work acceptable by recommending to the University of Sussex to award the D.Phil. degree to me, he also offered me an appointment to work in his laboratory as a post-doctoral fellow.

My advice to young and prospective Nigerian scientists is that they should be as innovative as possible because innovations are the needed outputs for all interesting scientific and technological research endeavours. Secondly and very important, is the need for the up and coming Nigerian scientists to be inquisitive, persistent, determined, and not to cut corners in their scientific pursuits.

Umaru Shehu FAS

Professor of Health Resources and Management



My western education began in 1941 when I was admitted into Borno Middle School. Mathematics was a subject I enjoyed very much and when I eventually got admitted into Kaduna College in 1944 the subjects of chemistry, physics, and biology added to my desire to study science.

1947 was to be my last year to pursue my interest in science. This was because there were no higher educational facilities for Northern Nigerians. However, that year the colonial government decided to establish a University College of London in Ibadan, Nigeria. Since I excelled in mathematics, I was invited to return to Kaduna to prepare for entrance examination into the new University College Ibadan, which opened in 1948. I passed.

Having completed my pre-clinical studies successfully in 1953, I was admitted into the medical school of the University of Liverpool for clinical training. I qualified as a medical doctor in 1956 and returned home to Nigeria.

In 1968, I felt strongly that the training of our doctors needed to be oriented towards community medicine. I joined a team of colleagues with similar vision to design a new curriculum for a new medical school at Ahmadu Bello University (ABU) Zaria. This brought me in contact with universities abroad as well as international organizations like the WHO, United Nations Children's Fund (UNICEF) etc.

At one time, I was elected the President of the Association of Medical Schools in Africa. I was invited by the WHO Headquarters in Geneva, after the Nigerian authorities had asked WHO to appoint a Nigerian to represent it in Nigeria. This was unprecedented. The government confirmed this when I returned home. Thus, my appointment as the National WHO Programme Coordinator/Representative in Nigeria in 1980. A unique and challenging appointment.

Five years later I received a call, from WHO Geneva asking me to be in Brazzaville, Congo to meet the Director-General and the Regional Director for Africa. At the meeting, the Director-General explained that Africa presented several problems for WHO and therefore, the organization has decided to create three Sub-regions to tackle them. I was then informed that WHO had decided to appoint me as the first Director of the Sub-Regional Health Development Office III to be located in Harare, Zimbabwe. I worked in that capacity until I retired from the WHO.

Albert Einstein and Bertrand Russell convened a conference of scientists of like minds in Pugwash, Canada in 1957. From then on there were annual meetings called "Pugwash Conference on Science and World Affairs". I was invited to join the conference in the early 1970.

The Pugwash Conference on Science and World Affairs was awarded the Nobel Peace Prize in 1995.

When the NAS was established in 1977, I became a Foundation Fellow and four years later I became its President. This was a very proud moment in my life and I have continued to support the NAS since then.

In the 1970s, I held several appointments with WHO as Consultant, Temporary Adviser, Facilitator etc. This was to give leadership in the development of human resources in medical science. Two examples are the development of the medical school in the Gambia and the progress of Malawi Medical School.

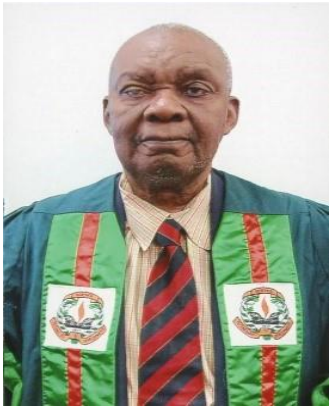
In the sixties, smallpox was a widespread disease, which affected millions all over the world. Nigeria was a victim and when WHO launched the smallpox eradication programme, Nigeria established a Smallpox Eradication Committee. I was the Chairman of the Smallpox Eradication Committee in the North. Smallpox was eradicated worldwide in 1970.

World attention on disease eradication then focused on poliomyelitis. I was the Chairman of National Programme on Immunization(NPI), which was established to promote the eradication of polio. I was designated Polio Eradication Ambassador by the President to give leadership to the programme. Just as I was handing over leadership of the NPI, a new dreadful disease AIDS was diagnosed early in the 1980s in USA. Nigeria established the National Agency for the Control of AIDS (NACA) to tackle the new deadly disease, and I was Chairman for some years. Even after that I continued to work against AIDS. Currently, I am the Chairman of the Board of the Institute of Human Virology Nigeria (IHVN), a foremost organization in the fight against AIDS.

In the process of pursuing my programme in medical science I have earned memberships and fellowships of several bodies at home and abroad. Some of these are F.F.C.H. [Nigeria] (Fellow of the Faculty of Community Health) 1976, F.F.C.M. [UK] (Fellow of the Faculty of Community Medicine) 1976, F.A.S (Fellow of the Nigerian Academy of Science) 1977, F.W.A.C.P (Fellow of the West African College of Physicians) 1977 and Distinguished Fellow of the Postgraduate Medical College (DFMC) 1994.

Alfred B. Soboyejo FAS

Professor of Aeronautical and Astronautical Engineering/Agricultural and Biological Engineering



My special field of science is theoretical and applied engineering sciences and applications.

I attended Igbobi College, Lagos Nigeria (1952 - 1956). I, later on, went to King's College Lagos (1957 - 1958) where I studied for the HSC of Cambridge University UK. I also studied civil engineering at the Nigerian College of Art, Science, and Technology, Zaria Nigeria (1959 - 1962). After that, I received the B.Sc. degree in Civil Engineering of University of London, UK in 1962. I studied at Stanford University, Stanford, California, USA, from 1962 to 1965 where I received the M.Sc. in 1963, CE in 1965, and Ph.D. in 1965. I carried out Post-Doctoral work in mechanical engineering at Massachusets Institute of Technology (MIT), USA; University of Pennsylvania in Philadelphia, USA; and Princeton University, Princeton, USA from 1966 to 1968. I have gained tremendous practical engineering experience in the US, Europe, and Africa.

My earliest memory of being interested in the sciences and their applications was from observing locomotive engines that can drive railway engines and also my observation of aircrafts that can travel in the air. I was also interested in the work of medical doctors when they inject medicines in treating patients. My motivation was based on the encouragement of my teachers, who saw my natural abilities in mathematics and sciences.

Since 1965, the focus of my scientific and technological research alongside some colleagues has been in the areas of Statistical methods in Engineering with relevant applications. The highlights of my contributions are as follows:

I. The research has provided better understanding of several problems of Nigeria and other countries, particularly the assessment of wind load on structures and infrastructures in order to reduce the damaging effects of wind.
II. The research has also provided new models in the design of air conditioning and ventilation systems in Nigeria for human comfort.
III. The research has provided guidelines on how to assess heavy rainfall events and the design of adequate drainage systems in Lagos or anywhere in Nigeria using appropriate statistical data of rainfall.
IV. Using advanced statistical concepts, my research (in collaboration with others) produced a biological and statistical model for bone strength in turkeys and broiler chickens in the United States. The research led to

increase production with less bone fractures and mortalities in turkeys and boiler chickens. This research has tremendous practical applications in biomedical engineering, and Orthopaedic medicine. This research has global applications in many countries including Nigeria. When I successfully published this work was my proudest moment as a Nigerian scientist.

V. Tremendous research work has been done over the years by me in the statistical modeling of the strength of concrete the most widely used material of construction in the world. My research work in this area has tremendous benefits in Nigeria and also globally.

VI. The application of statistical methods to rubber research in order to meet the increasing demand for rubber, particularly for tires in modern day transportation, including tires for aircrafts and other space vehicle structures. Nigeria can gain tremendously in this effort through increased foreign exchange earnings from latex of rubber trees.

VII. A new statistical model of petroleum wax formation in the Niger-Delta areas of Nigeria was developed. This is a novel result, which I have successfully carried out with others. The research has tremendous application in the evaluation of Nigerian petroleum resources.

VIII. Working with others, I carried out research on water supply treatment and filtration and had discovered novel and cheaper methods of water filtration devices. The new method is suitable for rural applications. The system has been successfully used and tested in rural parts of Ogun State, Nigeria and in some parts of India.

IX. Increased agricultural production of vegetables and fishes from wetlands which are not normally used in many countries with global applications.

The most challenging moment of my career was in the year 2002 when I was working with others at the National Aeronautics and Space Administration (NASA), John Glenn Research Center, Cleveland, Ohio. This was when I was working on research with others to find a solution to the problem of agriculture in space so that astronauts can grow and eat fresh fruits and vegetables in space under zero gravity in order to improve their bone strength and health. We worked very hard on this project and we were successful.

My advice to young scientists is to work hard and make use of all opportunities available to them. They should focus on their work. Young scientists should know that the sciences can be used for peaceful applications and at the same time can be used to destroy mankind. The development of atomic bombs and guided missiles are great examples of destructive applications of science. A great scientist should love God and use scientific knowledge and applications to bring happiness to mankind.

Olusoga Sofola FAS

Professor of Physiology

My field of science is Medicine, Physiology and my research area is Cardiovascular Physiology.

I attended the following educational Institutions; Igbobi College, Yaba, 1959 – 63 (O levels), St Gregory's College, Lagos, 1964 – 65 (A Levels), College of Medicine of the University of Lagos, 1966 – 72, BSc Physiology (1969), MSc (1972), MB.BS (1972), University of Leeds, Leeds, UK, PhD – 1975 – 78.

My earliest memories of being interested in science was in form 2/3 in Igbobi college when our then Physics Teacher, Mr. Guy Garguilo, introduced us to practical physics where we built electric motors (with copper wire and nails), developed and printed photographs from pin hole cameras, did electroplating, built calculators with coloured bulbs as binary figures, as well as building transistor radios etc. These activities ignited my interest in science.

Motivations for becoming a scientist – these include curiosity and interest in discovering things. Curiosity because at school, especially Igbobi College and 'St Gregs', we were exposed to hands-on experiments. As for interest, this was mainly during my intercalated BSc Physiology year in 1969. I was able to work with many equipment that we had in the College then, including Gas Analysers and a cold ultracentrifuge (which allowed me to separate cell components and measure metabolism), as well as exposure to the Electron Microscope at Professor Grillo's department at the University of Ibadan, where I was able to carry out histochemistry of ATP-ase activity in the Frog skin (as part of my investigation into active transport processes). This ability of discovering things really excited me.

The areas of science that I have worked on in my career were mainly in the cardio-respiratory system. My earlier work was on experimental tetanus toxicity and effects on the cardiovascular system. I also looked into the cardio-respiratory responses to chemoreceptor stimulation. After my PhD at Leeds University, I worked on cardiovascular reflexes and finally settled on the mechanisms of salt-induced hypertension in experimental animals and man, which culminated in our recent paper (Elias, Sofola, Jaja, 2019) on Epithelial Sodium Channel (ENaC) and its relationship to blood pressure.

Career highlights and contributions – The major highlights included the description and elucidation of the mechanisms of the cardiovascular responses in an experimental tetanus model. During my PhD work, along with my

supervisors (Roger Hainsworth and Faisal Karim) I demonstrated the cardiac ventricular responses to carotid and then aortic chemoreceptor stimulation. Then during my stay in Leeds Institute of Cardiovascular Research, as a British Heart Foundation Fellow, we were able to report the switch/ change in blood vessel / vascular endothelial function during salt loading in which we were the first to demonstrate that the vascular endothelium can use other molecular channels to respond during salt loading. The last one was our report of β-ENaC polymorphism in Nigerians and the response to salt loading.

Proudest moment as a Nigerian Scientist – There were moments such as being appointed an Emeritus Professor of the University of Lagos in 2015. Others also are the award of the Fellowship of the NAS, election as President of the African Association of Physiological Sciences (AAPS), and election as a Member of Council of the International Union of Physiological Sciences (IUPS). I was also a guest speaker at the IUPS congress in Birmingham, UK, in 2013, before an international scientific audience.

Most challenging moment in my career – I cannot think of any serious challenge. It is only recently that it has become difficult to get the current, and up to date, equipment and tools for research that saddens me, because it will stunt development of research especially among the young and upcoming researchers. I was lucky to have the BHF fellowship that expanded my research capabilities, as well as the Nigerian Tertiary Education Trust Fund (TETFund) award for our current research on ENaC.

Advice for young and prospective scientists – The advice is that they should not be despondent. The research terrain now is very choppy and they should put all their energy into their work. They must always be looking out for grants, starting with the small ones e.g university central research grants and then build up on their publication record in order to attract bigger grants. I also advise that they start researching by using techniques that they can easily master before looking for esoteric techniques. They must ensure that any results to be published must be credible and reproducible. They must be prepared for manuscript rejection and accept valid referee criticism in good faith. Once the storm is weathered and they become more established, then things will surely get better.

Olaitan Soyannwo FAS

Professor of Anaesthesia/Pain Management

My field of science is Anaesthesia and 'Pain'.

I attended the following educational institutions; African Bethel School, Ilisan Remo (Primary School), Mayflower School, Ikenne (Secondary School), Queens College, Yaba, Lagos (Higher School Certificate), University of Ibadan, College of Medicine/University College Hospital, Postgraduate clinical and research training at several centers including; Royal College of Surgeons, London, Royal Liverpool Hospital, Liverpool, Walton Centre for Neurology and Neurosurgery, Liverpool, End of life Observatory, Lancaster University, UK.

In school, I observed that lessons on science subjects (general science and later biology, physics and chemistry) were more interesting to me and easier to understand. I also got interested in how our local dispenser (regarded as the doctor in the village) used to dress our wounds. These must have been my earliest interest in science and medicine.

In Mayflower school, the proprietor/principal, Tai Solarin emphasized the importance of science subjects and encouraged students' interest. I also found science subjects (biology and chemistry especially) easier to understand. The dissection of cockroaches and toads picked from Yaba area of Lagos during higher school, at Queens College to identify various structures was followed by more chemistry practicals in the university. The knowledge gained from other applied science subjects (including physiology, biochemistry, histology, microbiology, immunology, pharmacology, and pathology) led to my understanding of how various components determined normal and abnormal functions of the body. Thus, evidence-based facts replaced cultural myths and misconceptions in my young mind. These fueled my desire to become a medical doctor and a researcher in science. Physiology, pharmacology, and the clinical use of drugs to control human physiology. Also, biochemistry in relation to safe anaesthesia, surgery, and critical care. Pain mechanisms, assessment, and management, the science of holistic palliative and hospice care became my passion.

I have had an exciting experience in scientific research from the laboratory to the bedside, which has contributed to the field of anaesthesia and the multidisciplinary and multidimensional treatment of different types of pain. The complexity of "pain", a subjective, sensory and emotional experience, its scientific research from molecular mechanisms to human pain states and suffering (acute and chronic pain) became the main focus and major scientific

contributions of my academic career. Many of my research publications are focused on pain pathophysiology, assessment, management (obstetrics, postoperative and cancer pain), and palliative care. Due to my interest in science, I became the first female medical doctor from my town, pioneer of pain research and palliative care in Nigeria and Africa, teacher, head of department, dean of clinical sciences, member of several national and international organizations, and Fellow of the NAS. I pioneered the foundation of the Society for the Study of Pain, Nigeria (SSPN) in 1998 - a viable chapter of the International Association for the Study of Pain till date, and a not-for profit organization, Centre for Palliative Care, Nigeria (CPCN), which was registered in 2005. With members of CPCN, I also pioneered the establishment of hospice and palliative care services, education, and research in UCH and Nigeria and served as the first head of the UCH Hospice and Palliative Care Unit in 2005 and this developed into a department by 2016. This is the first of such in a teaching hospital in Nigeria.

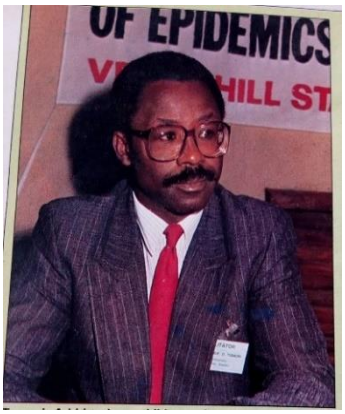
My proudest moment was when I received the highest award of "Honorary Member" of the International Association for the Study of Pain at the International Conference and General Assembly in 2012, the only African on the list till date.

My most challenging period was in 1980 when I had to cope with my final postgraduate examination (M.Med degree of the University of Ibadan) in combination with full time clinical duties in anaesthesia, and pregnancy of my last child. This was overcome by determination, hard work, and my supportive husband.

My advice to young and prospective Nigerian scientists is they must be focused, goal-driven, hardworking, proactive, be able to withstand stress and learn to seek opportunity for self-development locally and internationally.

Oyewale Tomori FAS

Professor of Virology



My field of science is Virology – Veterinary Medicine. I attended the following educational institutions; St. Peter's Primary School, Ilesha – FPSLC, Government College Ughelli – WASC, HSC, Ahmadu Bello University – DVM, University of Ibadan – PhD.

The year before I sat for school certificate examinations (in 1961), we were "forced" to choose, for the West African Examinations Council (WAEC) examinations, 9 subjects of the 11-12 subjects taught from forms 1-4. Having successfully and consistently failed all the 8 examinations for the Latin subject (scoring an aggregate of less than 50 marks out of 800 in all the mid and final year examinations), I did not need a counselor to tell me to avoid Latin , and Geography where my ability to draw maps equaled the scrawl of a 3 year old child.

I grew up with elder siblings who had gone to secondary schools and assured me that certain subjects were "tough" and "hard". Some had gone on to study engineering in the university, and I decided to end up as an engineer. Earlier on, in primary school, I had taken part in a church play in which I acted the part of a lawyer. So popular did I become after the play that I made up my mind to be a lawyer. As my country struggled for independence and we had access to newspapers, the writings of journalists like Peter Enahoro became popular, I switched and decided that journalism was my future career. Reading was a compulsory hobby in my secondary school, and so many books passed through my hands, and ideas came between my eyes and entered my brain. One of such books was one – The Beloved Physician – written about St. Luke, the disciple of Jesus Christ. After reading the book, I knew that it was a "divine revelation" that I was born to be a doctor. This revelation was the near-solid foundation on which I built my future career, and it led me to the choice of studying botany, chemistry, physics, and zoology for the higher school certificate examinations in order to become, not just an ordinary doctor, but a missionary one. The point is, in the absence of a counselor, I counseled myself daily and changed my career depending more on what I read per time.

Though I obtained passes in all the subjects taken for the HSC, it is obvious that I did not pass well "enough" for university admission to pursue a course in human medicine, although I had federal and state government scholarships to read pharmacy and medicine respectively. I ended up reading neither but instead ended up having an exciting time reading veterinary medicine. How I ended up reading veterinary medicine is another interesting story of picking the

course out of a bag containing five papers on which were written any of the following courses: medicine, agriculture, veterinary medicine, pharmacy, and animal science. The lucky dip picked veterinary medicine and so I applied to read veterinary medicine at the university. I graduated as a veterinarian one weekend, and started work the next weekend in the research lab of a human medical institution and never went back to veterinary medicine. It was the outbreak of a new human disease, in a town some 100 kilometers from my veterinary school, that changed the course of my career. I did not fully realise this until much later in life. However, that is another story.

Working with other colleagues to discover and register new viruses and elucidate the diseases they cause; Getting involved, nationally and internationally, in investigating and contributing to the control of virus disease outbreaks such a yellow fever, Lassa fever, Ebola virus disease etc.

Two proudest moments – when I became a Fellow of the NAS in 1991 and when I became a member of the US National Academy of Medicine in 2016.

In 1994, the week-long political upheaval and civil unrest (following the annulled results of the June 12 1993 federal election) brought the country to a standstill, which adversely affected the operations of the research laboratory of the Department of Virology at the University of Ibadan. With the laboratory inaccessible during the 5 days of civil unrest and power blackout, the lab lost all the viruses collected over a period of 50 years. Some of the viruses were known and classified, but many more were unclassified, and may be lost forever. The loss of the bio bank of viruses stored in -80-degree freezers was not only monumental but also irreplaceable. Neither will I, nor science in Nigeria recover from this calamity**.**

The science career must have a humanity aspect. In applying new technology to address scientific questions, always relate your research to the glaring needs of the society in which science is practiced. In short, use the high technology to solve the common health, and other, problems making Nigeria an underdeveloped country. No matter how high your science is, it will remain in the clouds if it does not address the common daily issues and problems ravaging our nation. The relevance of Nigerian scientists lies in using science to address the daily issues of living- what food to eat, what clothes to wear, what type of houses to live in, what diseases to prevent and control. Any other approach is selfishly irrelevant.

Initially, I assumed that I stumbled into a science career, but now I know that my haphazard preliminary scientific journeys, especially in the early years were well ordered Divine steps to exciting decades of never-ending wonders and experiences in the field of science.

Appendix

The 43rd Council Members

S/N	NAME	POSITION
1.	**Professor K. Mosto Onuoha, FAS**	President
2.	**Professor Abubakar Sambo, FAS**	Vice President
3.	**Professor Olukayode Adebowale, FAS**	Treasurer
4.	**Professor Oluwole Familoni, FAS**	Academic Secretary, Physical Sciences
5.	**Professor Sunday Atawodi, FAS**	Academic Secretary, Biological Sciences
6.	**Professor Olatunde Farombi, FAS**	Public Affairs Secretary
7.	**Professor Babajide Alo, FAS**	Foreign Secretary
8.	**Professor Friday Okonofua, FAS**	Chairman, Publications Committee
9.	**Professor Siyanbola Malomo, FAS**	Representative, Physical Sciences
10.	**Professor Domingo Okorie, FAS**	Representative, Physical Sciences
11.	**Professor Chidi Akujor, FAS**	Representative, Physical Sciences
12.	**Professor Kehinde Ladipo, FAS**	Representative, Physical Sciences
13.	**Professor Alex Acholonu, FAS**	Representative, Biological Sciences
14.	**Professor Patience Osadebe, FAS**	Representative, Biological Sciences
15.	**Professor Olanike Adeyemo, FAS**	Representative, Biological Sciences
16.	**Professor Uche Amazigo, FAS**	Representative, Biological Sciences
17.	**Professor Ekanem Braide, FAS**	President Elect
18	**Professor Oyewale Tomori, FAS**	Immediate Past President

THE NIGERIAN ACADEMY OF SCIENCE
ACADEMY HOUSE
8A Ransome Kuti Road, University of Lagos, Akoka, Lagos.
P.M.B. 1004 University of Lagos Post Office Akoka, Yaba, Lagos, Nigeria.
Tel: +234 808 962 2442 Email: admin@nas.org.ng Website: www.nas.org.ng

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