Special Issue: The International Conference on Non-linear Analysis (organized to mark the 70th birthday anniversary of Prof. Charles Ejike Chidume)

ABRIDGED VALEDICTORY LECTURE

C. E. CHIDUME, **FAS, FTWAS, FNMS**

1. INTRODUCTION

I would like thank the Nigerian Mathematical Society for dedicating an issue of the Journal of the Nigerian Mathematical Society on the occasion of my 70th birthday.

I first started my academic career as a *Junior Fellow* in the Department of Mathematics in the University of Nigeria, Nsukka, (UNN) in 1974, after obtaining my BSc Honours degree in Mathematics as the best graduating student in Physical Sciences in June 1973. After teaching in Nigeria for a few years, I got Anambra State Government scholarship and proceeded to Queen's University in Kingston, Ontario, Canada, where I obtained my first MSc degree in Mathematics. Then, I went to Iowa State University briefly before proceeding to The Ohio State University in Columbus, Ohio, USA where I obtained a second MSc degree and PhD degree in Mathematics, in June, 1984. I returned immediately after and assumed duties here at the University of Nigeria (UNN) on *5 July, 1984*.

2. RETURNING TO NIGERIA

Looking at the dates above, one may wonder why, *barely one month after I obtained my Ph.D degree in the United States of America* , I returned home to take up a job at the UNN. I give a short background history related to this. In 1983 and 1984, there were 799 PhDs awarded in the United States and Canada in Mathematics, Mathematics Education, Physics, Computer Science and Operations Research (Source: American Mathematical Monthly published in 1984). Among these PhDs, there were only 3 blacks! One

in Mathematics Education; One in Operations Research and one in Mathematics: it is interesting to note that the PhD in Operations Research was Dr. Adiele Nwosu (of blessed memory) of the Department of Mathematics (UNN) and the one in Mathematics was me. At that time in the United States, there was the so-called Affirmative Action which was in place to help minorities get good jobs. By this Action, as it was explained to me and as I understood it, if any employer hired a minority (black, hispanic etc) at a very high level, that employer would get some matching fund from the Federal Government. Probably as a consequence of this, my office phone was ringing virtually nonstop from several American Universities making me offers for jobs which I never applied for. I resisted the temptation to take up a job in the United States and insisted on returning immediately to UNN, my Alma Mater, (and not to any other University in Nigeria). The phone continued to ring. At one point, my PhD Adviser called me and asked me if I really wanted to return immediately to Nigeria or if I would consider taking up a job in the US. I assured him that I had made up my mind to return to Nigeria. He then told me that if I ever changed my mind and decided to stay in the US, I would let him know, so that he would help me choose a place to go to where people would appreciate me for what I would contribute rather than employ me for the benefit they would get from the Affirmative Action Policy. The highest temptation came when the Chairman of the Department of Mathematics of a well-known American University called me and said, " Charles, we understand you are anxious to return to your country. Why don't you want to work here for a couple of years, make yourself some bucks, before returning home? We really want you to join us. Name your price".

At this point, I would like to thank my dear wife, Dr. (Mrs.) Ifeoma Chidume who stood by me all along. Some of my family members who knew what was going on came to Columbus and tried to convince my wife to put pressure on me to accept a job in the US. She refused to do so and told them that she was fine with whatever I would decide. Thank you, my dear wife. I love you.

3. MOTIVATION FOR RETURNING IMMEDIATELY TO THE UNN

One would then wonder, why was I so bent on returning to the UNN immediately after obtaining my PhD in the United States.

4. MY YEARS AT THE DEPT OF MATHS, UNN

In March 1984, Professor Emeritus, J. O. C. Ezeilo (of blessed memory) wrote to me at Ohio State and invited me to attend the Annual Conference of the Nigerian Mathematical Society in April, 1984 at Bayero University, Kano. After delivering my paper at the conference, representatives of three top Nigerian Universities interviewed me that afternoon and two of them offered me a Senior Lecturer position (I had two published papers then in Thompson Reuter Impact Factor journals and two other papers were under review). The third University, one of the first generation Universities in Nigeria indicated that they would consider me for a Lecturer I position. When Professor J. O. C. Ezeilo saw what was going on, he called me and said, "Charles, if you go to any place except the University of Nigeria, I will be totally disappointed". He then ordered me to go straight to the UNN, tell Professor G. C. Chukwumah (of blessed memory, then the HOD of Mathematics Department) that the Departmental Board should immediately arrange to interview me, and that I have his support. I did as he commanded.

4.1 THE INTERVIEW AND THE APPOINTMENT

When I arrived at the Department, the Departmental Committee was summoned immediately: Prof. G. C. Chukwumah (then, a Reader), Prof. J.C. Amazigo; Professor Rastogi and a few others. I explained to the Board that I have been offered a Senior Lectureship position in two Federal Universities (one in the East and the other in the North). I requested that I be appointed Senior Lecturer. Even though some members of the Board were sympathetic to my request and would not mind recommending this to the University, they assured me that such a recommendation would not be approved even at the Faculty level. At this point, they told me about the *Yellow Book* used for appraising academics. They used it to score me and showed me that even if they gave me the maximum score under each category (which may not be acceptable even at the Faculty level), I would still be short of the minimum score required for appointment as Senior Lecturer. Then, they scored me for a Lecturer I position and I scored above the minimum required for appointment under this category. The Committee assured me that the Department could secure this position for me. I was still thinking about this when Professor Amazigo spoke to me and advised me to accept this offer of Lecturer I being proposed by the Department. He told me that other Universities may offer me a

Senior Lecturer position now, but before they would appraise me again for a Reader or Professor position, they may insist that I must spend at least 10 years for professorial position in their University. He said that this was not the case at the UNN. All that was required was a minimum of 5 years of teaching in the University and if one produced the required number and quality of research papers, one can be promoted to the rank of Full Professor within this period. He concluded by remarking that the way he saw me going and the quality of the work I had done so far, he believed that the UNN was the best place for me.

Professor Gabriel C. Chukwumah joined Professor Amazigo to advise me to accept the proposed offer. After listening to these remarkable great and humble people, I thanked them and decided to accept the offer, if it was given to me. This happened to be one of the best pieces of advice I received in my career. Thank you, Professor John C. Amazigo, FAS. In a few weeks after I returned to the United States, I received a letter of offer of appointment as Lecturer I which I accepted. I returned to Nigeria immediately after my PhD in June, 1984 and joined the UNN on 4 July, 1984.

4.2 WORKING IN THE DEPARTMENT OF MATHEMATICS, UNN; 1984 - NOW

I will split my work in the Department of Mathematics, UNN from 5 July, 1984 to date into 3 PHASES as defined by the following periods:
PHASE I: 5 July, 1984 - 31 December, 1992;
PHASE II: 1 January, 1993 - 14 September, 2009;
PHASE III: 15 September, 2009 to date.

4.3 PHASE I

- **Cancellation of copying of notes during my lectures in Foundations of Mathematical Analysis courses**.
  The Department of Mathematics was kind to me and believed in me. The courses I was assigned to teach after I started work were 3rd year, 4th year and Postgraduate courses. The class size in each of the courses was at most 50 students in the 3rd year courses. This made it possible for me to give *daily* homework in each of the courses, grade the homework and return the graded scripts to the students the following day.
  My first contact with the students in each of my course

was to tell them my horrible experience when I arrived in Canada to study for my MSc degree in Mathematics after graduating as the best student in the Faculty of Physical Sciences here at the UNN. I told them that they were still following the same model that I went through which resulted in my signature in Canada. I told them that the main reason I returned to the UNN was to help change this attrocious method of *reading* mathematics instead of *doing* mathematics. I pleaded with the students to help effect this change by believing me and that I would write my lecture note in detail on stencils, produce copies and distribute to them, *free of charge* at the end of each lecture. There would then be no note-taking during any of my lectures. I insisted that this was the only way I would teach. The students most of whom were skeptical felt they had no alternative but to accept. When I started drawing two dimensional figures/pictures to illustrate deep abstract concepts in Mathematical Analysis, most of the students became excited, were able to solve several problems in textbooks which before now they thought were meant for Oyibo students.

Since 1984 till today, at the UNN, at the International Centre for Theoretical Physics (ICTP) and at the African University of Science and Technology (AUST), students in my classes do not take notes during my lectures. However, I give all of them, well prepared lecture notes,with well motivated examples, homework problems to be handed in and with extra exercises for tutorials. ALL the students who have taken courses in mathematical and functional analysis from me have studied by this model. Most of them enjoy deep abstract concepts in mathematical analysis related areas. They know and do mathematics and publish in top international journals - Elsevier, Springer, etc. Many of them who go to the United States of America for further studies excel. They are sort for in Several American Universities. The following illustrates the point.

In Nov. 2017, I took two of my then PhD students to MASAMU, the students in the Analysis Group came from United States of America, University of Pretoria, Botswana and AUST. All the students were exposed to very advanced new area of Mathematics. An American Professor Emeritus

of Mathematics and myself delivered the lectures. Towards the end of the 2-week training period, the American Professor said, Charlie, your students are top of the line: The two students are here today and it is my pleasure to call them: Mr. Ogonnaya Michael Romanus and Miss. Victoria U. Nnyaba to stand up for recognition.

- **University Mathematics Series: Textbooks**
  After I started work in July 1984, the first surprise I had in the department of mathematics was that there were different exams for the same first year course, depending on the lecturers who taught the courses. Each lecturer set the exam for his/her students depending on what was covered. The quality of the exams was greatly compromised. The obvious consequence of this was that the grade a student obtained in Math 101, say, will depend on who his/her lecturer was. Even though I was a Lecturer I, I proposed that we must have standard textbooks for the basic first year mathematics courses, that everyone must teach from. Then that all exams in these courses must be the same, set by the exam committee of the department. I further proposed that such textbooks must be written by members of the department, every faculty member of the department, from graduate assistants to Professors was invited to be part of the book-writing as an author. Virtually all the academic members of the department welcomed this idea and we decided to write 3 (three) volumes covering the 3 basic mathematics courses for all undergraduate science and engineering students. I suggested the name "University Mathematics", I, II, and III for the 3 volumes and it was approved by the group.

  It is worth mentioning here that during the time I was organizing this, none of the two professors in the department was in Nigeria. Professor J. O. C. Ezeilo was away in Trieste and Professor J.C. Amazigo was in Harvard on sabbatical. So, I was hopping that they would not stop me when they returned. In fact, the contrary was the case. When Prof. J.C. Amazigo returned, he came to my office and said he heard that I had started a book-writing project for first year mathematics courses. He felt this was great and told me he

would like to join. This made my day. During our next book-writing meeting, he was there. Then, I announced with pleasure and excitement that Prof. Amazigo has decided to join the group and that I was therefore handing over the leadership of the group to him. He quickly refused this move and insisted that I should continue since it was my brain child. I pleaded with him and explained that as a distinguished professor of mathematics who had published a well known book in the United State, his editorship of this series would add tremendous value to our efforts. With appeal from all the members of the group, he accepted. With his leadership and editorship of the series, we produced the 3 volumes which were written, directed to students in our region and yet maintaining world standard for courses at that level. These 3 volumes are still being used today, not only at the UNN but in several other universities nationwide.

- **Faculty & Undergraduate Seminars**
  To stimulate research in the department, I started a research course in my area of research for lecturers and some graduate students. I gave lectures to a group every morning for about 3 months. The participants included Dr. Misra and A.N Eke whose PhD thesis I supervised and who later was promoted to the rank of full professor of mathematics.
  In addition to this seminar for faculty, I organized a special seminar in mathematical analysis for top undergraduates students to mentor them. The group included M.O. Osilike, Chika Moore, S.J. Aneka, A. Udomene. I later supervised the PhD thesis of these people. It gives me pleasure each time I remember that these wonderful mathematicians were my doctoral students - Dr. Udomene worked at the University of Port Harcourt, also in South Africa and is now at Umudike, Dr. Aneke is currently a Senior Lecturer in our own department of mathematics; Professor Osilike- our own Director of Academic Planning, former President of the Nigerian Mathematical Society for several years and Fellow of the Nigeria Academy of Science, FAS; Professor Chika Moore, professor of Mathematics, Nnamdi Azikiwe University and former Federal Commissioner, National Population Commission.

- **Grading of Exams in First Year Mathematics Courses**

  After I joined the department of Mathematics in 1984, another surprise I got was that after exams were taken in some first year courses, none of which I taught, I was assigned over 300 of the exam scripts to grade. Each script was about 10 pages long and each page had computations that must be carefully checked. Given the number of scripts I would grade in the courses I taught, it was clear that adding these 300+ scripts would leave me little time to do any meaningful research. Consequently, during the next Departmental board meeting, I raised the issue. I explained that it did not make sense that any lecturer would spend months grading huge number of scripts. I noted that all 9 exams in Actuarial Science, one of the most paying careers in the planet are multiple choice exams. I then suggested that exams in all general first year courses in Mathematics, each with over 3,000 students should be multiple choice exams. The question papers can be arranged in such a way that students sitting close to each other will receive question papers with different order of questions. The departmental board approved this. Dr. Adiele Nwosu (of blessed memory) and myself were given the responsibility to arrange this. I am pleased to state here that in a subsequent exam, over 4,000 scripts in these courses were marked in ONE day, with our graduate students and all lecturers taking part in the grading. Students' results were ready in a couple of days and lectures had time for other academic engagements. I hope that this practice and model is still being used in the department.

4.4 CONTACT WITH ICTP

In 1985, I received a surprising invitation letter to participate in a college on **Semigroup Theory** organised in a place called International Center for Theoretical Physics (ICTP) in Trieste, Italy. In the letter, it was stated that my travel would be covered by the Centre and that during the College, my board and lodging would be covered and I would also receive some per-diem for my local expenses. This was very strange since I never heard of the place.

Moreover, the Centre is one of Theoretical Physics and not that of Mathematics. The only thing that made sense to me was that the topic of the College is also a topic in Mathematics. Since the HOD of the department of Mathematics then, Dr. G. C. Chukwuma, reader, was also an expert in Theoretical Physics, I showed him the letter and he was excited. He told me a lot about the Centre: that it is a world-class centre of excellence in Physics and Mathematics being managed by IAEA and UNESCO of the United Nations; that my invitation without any application, was very strange and a big recognition. He encouraged me to accept the invitation and attend the College. So, I did.

It was a huge College! There were about 150 participants, primarily postgraduate students and fresh PhDs from developing countries. Two groups of world-class Professor from France and the United States of America were Directors of the College. At the end of the College, there was a meeting of the participants, the Directors and the Deputy Director of ICTP to access the College and get feedback. During the meeting, most of the participants were reluctant to speak until I raised up my hand and was permitted to speak. I told the audience that I learnt very little from the College, not because I was weak but because the presentations were poor. I made it clear that my mathematical background was solid and that I had enough preparation to follow any well delivered course in Mathematics. No materials were provided for participants. After I spoke, most of the participants started speaking up, echoing the same sentiments. The Directors apologised and promised to do better in future. A follow up College was proposed for 1987.

In 1986, the Annual Conference of the Nigerian Mathematical Society was held in the department of Mathematics, UNN. The guest speaker was Sir Christopher Zeeman of the Royal Society, UK. He gave a wonderful talk in Catostrophy Theory.

During the Conference, I gave a talk related to Egordic Theory which attracted his interest because one of the best professors in the world in this area of mathematics, Professor Caroline series, was in Mathematics Institute, University of Warrick, UK where he was the Director. In fact, Caroline Series is currently the Editor-in-Chief of the journal,Egordic Theory.

After Professor Zeeman returned to UK, he invited me to visit his Institute to work with Professor Series. He secured a British Council Fellowship for me for this. I was there in 1986 but had to return after spending only two weeks because my father died during the period.

In 1987, I was invited again to ICTP and during my visit, I gave a talk in the regular Mathematics Section Seminar Series. At the end of my talk, the Head of the Mathematics Section, Professor James Eels, invited me to his office and told me he was impressed with my lecture. He told me about the Associateship Program of ICTP and asked me to apply. I did and also asked Professor Zeeman, who I learnt was a member of the Scientific Council of ICTP to be one of my referees. He agreed. Later that year, I was appointed Associate member of ICTP. This meant that I could visit the Centre 3 times in 6 years, any time that I wanted and stay for a minimum of 6 weeks and a maximum of 3 months during each visit. During each visit, the Centre would cover all expenses including travel costs and also pay some generous stipend. I visited in 1988, 1989 and 1990. During each visit, I used the excellent library facilities of the Centre to enhance my research work and to collect research materials for my postgraduate students here at home. I gave at least one talk during each visit. After I gave a talk during my 1990 visit, the Head of Mathematics Section, Professor James Eels called me to his office and informed me he would like to bring some mathematicians in 1991 who would like to collaborate with me there at ICTP. When I told him that I had exhausted my 3 visits, he called the Head of Associateship Program to find out if it was alright for him to invite me to ICTP with funds from mathematics section within the 6 years of my Associateship appointment. He was told that it was alright to invite me as long as the funds did not come from Associateship Program. He immediately offered me a visit to the Mathematics Section for 6 months in 1991.

Promotion to the rank of Full Professor of Mathematics, 1st October, 1989. Considering my publications before obtaining my PhD degree, UNN appointed me Lecturer I position when I joinedthe University in 1984 immediately after obtaining my PhD degree. In 1986, I was promoted to rank of Senior Lecturer. Three years later, on 1st of October, 1989, I was promoted to the rank of Full Professor of Mathematics.

I would like to remark here that ALL the papers I submitted for my promotions were **single-authored**. I never wrote any joint paper with anyone. This was because I supervised my own PhD research work in the US. I had an idea which I believed that, if developed, would solve numerous problems of interest in Nonlinear Operator Theory. Every Professor I explained the idea to felt I was wasting my time, that my idea would not work. After I passed the qualifying exams at the Ohio State University, I was given two options for obtaining a PhD degree: Either to abandon my idea and work with the Functional Analysis group on what the group was working on, or to continue with my ideas and publish 2 papers in journals acceptable to the group. I chose the later. The Holy Spirit became my supervisor. I developed the idea and it worked. I published 4 papers in top journals (Thompson Reuter impact factor journals). I was told to write up my doctoral thesis, I did, and obtained the PhD degree in mathematics in June, 1984. Further development of my idea enabled me to publish copiously and this help me to rise from Lecturer I to Full Professor of Mathematics five years after my PhD degree. This idea has now been developed further by various authors and results obtained are applicable world-wide in this area of mathematics.

- **Sabbatical Leave and Leave of Absence Without Pay (1993 -)**
  1990 was my 6th year in the department of mathematics. So, I was due for a sabbatical leave.
  With an invitation letter to the Mathematics section of ICTP for 6 months in 1991, the Faculty of Physical Sciences approved my application to spend the first 6 months of my sabbatical at ICTP. So, in October 1991, I proceeded to ICTP to spend my sabbatical leave. During the first 3 months, I worked so hard that by December 1991, I decided to have a short break and to visit home for Christmas. Early in 1992, I received a surprising Telex from the Mathematics section of ICTP with the following statement, "We have been trying to get to you telephonically for 2 days without success". I tried to call but could not get through because of the problems of the then NITEL. After about 2 weeks, I went to Enugu to buy my flight ticket with which to return to Trieste to continue my sabbatical leave. There, I went to the main office of NITEL and called. Professor Verjovshy

answered and told me immediately that the Mathematic Group met and decided that if I would be interested and would agree, the group would be pleased to hire me to come and design and head the ICTP Postgraduate Diploma in Mathematics. I was very pleased and responded immediately that I was interested and I thanked him for their kind consideration. He responded

> No, thank YOU. Note Charles that this would mean you will be relocating to Trieste for at least 2 years.

I assured him that this would not be a problem. I returned to Trieste and applied to the University of Nigeria for Leave without pay. At that time, it was a policy of the Council of the University that any faculty who got a job with the Federal Government, any State Governemnt or any International Organisation was entitled to Leave of Absence without Pay for as long as that job lasted.

Based on this, my Leave of Absence without Pay was approved. This job expanded and lasted till September, 2009.

ACKNOWLEDGEMENTS

daughters-in-law, Taffami, Shami and Ibieri amd a great son-in-law, Tony. I love all of you. I can never get tired of my wonderful grand children - Gabriel, Michael, Chibugi, Somtoo, Nonso, Skyla, Luke and Mathew, you kids make my life fun. I love all of you. Finally, I thank the Almighty God who gave me life and has sustained me and my family all these years. Father, without you, I am nothing, take Glory, take Adoration, in Jesus Name, Amen.

OFFICE OF THE ACTING PRESIDENT, AFRICAN UNIVERSITY OF SCIENCE AND TECHNOLOGY, KM 10, AIRPORT ROAD, GALADIMAWA, ABUJA, NIGERIA
E-mail address: `cchidume@aust.edu.ng`

Editor's Note.
The Editor-in-Chief of the Journal of the Nigerian Mathematical Society, on behalf of the Nigerian Mathematical Society, congratulates Professor Charles Ejike Chidume on winning the 2019 AMMSI-Philip Griffiths Prize for Mathematics. This is evidently a well deserved honour.