



Biography of the Distinguished Professor Aderemi Oluyomi Kuku



Background, Personal Life and Discoveries

Professor Aderemi Kuku was born on March 20, 1941 in the Nigerian ancient town of Ijebu Ode to the family of Busari Adeoye and Abusatu Oriaran (Baruwa) Kuku. He is happily married with four children. His research over the years has made remarkable contribution to Non-Commutative Algebra/Number Theory/Geometry. Some of his discoveries and fundamental results include but not limited to:

- Formulating all Higher Algebraic K-theory (abstract topological constructions) in the representation-theoretic language of Mackey functors leading to his discovery of Equivariant Higher Algebraic K-theory and its relative generalizations in the contexts of exact and Waldhausen categories.
- Developing methods of computing Higher K-theory of non-commutative rings such as non-commutative orders and group-rings as well as twisted polynomials and Laurent series rings over orders with applications to the computations of Higher K-theory of virtually infinite cyclic groups in the context of Farrell-Jones conjecture.
- Formulating the famous Baum-Connes conjecture (hitherto available only for group actions) for the action of quantum groups and verifying the conjecture in some situations e.g. for quantum SU_2 .
- Computing K-theory and Cyclic homology and hence non-commutative Chern characters of Lie group C^* -algebras and quantum groups.
- Constructing Profinite (Continuous) Higher K-theory as extraordinary cohomology theory in the context of exact categories and proving several finiteness and l-completeness results for orders and G-schemes (G-algebraic group).

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1. Education

Professor Aderemi Kuku earned his first degree from the Makerere University College, Kampala, Uganda. Under special relationship with the University of London, he graduated with a B. Sc (Special- Honours) in Mathematics in the year 1965. His quest to become an authority in the field of Mathematics continued, as he proceeded to the prestigious University of Ibadan, Nigeria from 1966 to 1971 where he wrote his Dissertation under the supervision of Professor Joshua Leslie. Professor Aderemi Kuku obtained his Doctor of Philosophy (Ph.D. in Mathematics) from the same University in 1971 under the supervision of Distinguished Professor Hyman Bass of Columbia University, New York, as Visiting Scholar from Nigeria.

2. Administrative Life

In 1983, Aderemi Kuku was appointed Head, Department of Mathematics, University of Ibadan, a position he held till 1986. Under Kuku's leadership as the Head of Department, he reviewed the departments undergraduate and Post-graduate programmes and introduced a robust breakdown of postgraduate programmes in Industrial Mathematics, etc.

He was appointed the Dean of Postgraduate School, University of Ibadan from 1986 till 1990. He was responsible for the organization, coordination and improvement of postgraduate training and research throughout the University. In his capacity as the Dean, he initiated new programmes, generated more funds for the school. He also created a Forum for interdisciplinary Discourse, streamlined the regulations of the school, improved the format of presentation of results, etc. The Postgraduate School had over four thousand graduate students, 1030 academic staff spread over nine faculties, one college, three Institutes, with masters degree as well as PhD programs in all faculties; albeit both academic and professional. He was also made the Chairman of the Board of the School, consisting of all Deans of faculties, Head of Departments, all Sub-Deans Post-Graduate in the faculties and all Faculty Representatives. Professor Aderemi Kuku did not limit his leadership skills to the University of Ibadan only, he was also made Chairman of the Committee of Deans of Postgraduate Schools in Nigerian Universities for three years (1987-1990), he spearheaded the harmonization of standards and quality of programs, as well as overall improvement of postgraduate education and research in Nigerian Universities.

As President of the African Mathematical Union (AMU) for nine years (1986-1995), Aderemi Kuku was responsible for organizing and coordinating various mathematical activities all over the continent of Africa. During his tenure, he created four Commissions:

- AMU Commission on Mathematics Education,
- AMU Commission on Pan-African Mathematics Olympiad,
- AMU Commission on History of Mathematics in Africa and,
- AMU Commission on Women in Mathematical in Africa.

He also created a Pan-African Mathematical Sciences Network involving sixteen selected Universities/Research centres in Africa with the aim of enhancing graduate training and research as well as co-operation between North-South and the Southern regions. He also generated funds from various sources to organize sub-regional and regional activities.

From May 1995 to September 1995, as President of the African Mathematical Union, he organized the Fourth Pan-African Congress of Mathematicians which took place at the AI-Ahakhawayn University, Ifrane, Morocco from September 18 to September 26, 1995. Apart from his numerous contributions to the success of the Congress, he gave a plenary mathematics lecture on: "Higher class groups of orders and group-rings". It is worth noting that the General Assembly of the African Mathematical Union (AMU) unanimously decided to make him Honorary President of the AMU (for life) in appreciation of his nine years of meritorious service to the Union.

As Vice-Chairman of the First Congress of African Scientists, which, in 1987, created the Pan-African Union for Science and Technology, he made several contributions to the development of Science and Technology all over Africa.

As a member of the International Mathematical Union Commission on Development and Exchange for eight years (1986-1994), he made contributions on the development and exchanges in mathematical research in developing countries, and other parts of the world.

At the International Congress on Mathematics Education in Quebec, Canada in 1992, he was the organizer of the sessions on "Undergraduate Mathematics Education for Specialists, Future Researchers and Mathematics teachers". Also, at the International Congress of Mathematics Education at Seville, Spain, in July 1996; he co-organized a working Group on International Cooperation in Mathematics Education.

Professor Kuku has organized or co-organized several International Conferences/School Symposia/Congresses. Below are list of key positions and events

- Chairman, Organizing Committee, International Workshop on group Representation and its Applications, Ibadan, Nigeria 1981.

- Chairman, Organizing Committee, International Symposium on Mathematical Modeling, Ibadan, Nigeria, 1984.
- Chairman, Organizing Committee, Second Pan-African congress of Mathematicians, Jos, Nigeria, 1986.
- Chairman, Organizing Committee, International School/Symposium on Algebraic K-theory and its Applications, Ibadan, Nigeria, 1987
- Vice-Chairman, Organizing Committee, First Congress of African Scientists, Brazzaville, Congo, 1987.
- Chairman, Organizing Committee, Foundation Postgraduate courses in Algebra, (organized for National Mathematical Centre, Abuja) Ibadan, Nigeria, 1987.
- Chairman, Organizing Committee, International Symposium on Current Research Trends in Mathematics, Computer Science and Mathematics, Physics, Arusha, Tanzania, September, 1989.
- Chairman, Organizing Committee, Second Foundation Postgraduate Courses in Algebra, National Mathematical Centre, Abuja Nigeria, June, 1992.
- Chairman, Organizing Committee, Third Pan-African Congress of Mathematicians, Nairobi, Kenya, August, 1991.
- Organizer, Sessions on Undergraduate Mathematics Education for Specialists, Future Researchers, and Mathematics Teachers, at the International Congress on Math Education Quebec, Canada, August, 1992.
- Chairman, Organizing Committee, International Symposium on “Mathematics Education in African for the twenty first century”, Cairo, Egypt, September, 1992
- Chairman, Organizing Committee, International Symposium on “Current Research Trends in Mathematics, Computer Science and Mathematics Physics”, Port-Novo, Republic of Benin, January, 1993, Ibadan, Nigeria, January 1994
- Chairman, Organizing Committee, Fourth Pan-African Congress of Mathematics, Ifrane, Morocco, September, 1995
- Co-organizer, Working Group on “International Cooperation on Mathematics Education” at the Eight International Congress on Mathematics Education, Seville, Spain, July, 1996.
- Local Organizer, ICTP School on “Numerical Simulation of Partial Differential Equations”, September, 1996
- Director, ICTP Workshop/Symposium on “Algebraic K-theory and Applications” held in September, 1997.
- Member, Scientific Committee, International Conference on “Quantum Field Theory, Non-Commutative Geometry and Quantum Probability”, Trieste, March 2001.
- Member, Scientific Committee, Workshop on Algebraic Geometry and Strings - K-theory, Derived Categories and Strings, Geneva, Italy, June 18-21, 2002.
- Director, ICTP School and Conference on “Algebraic K-theory and its Applications”, August 2002.
- Organizer: International conference on “Algebraic K-theory and its Applications”, Safi, Morocco, July 25-30, 2004.
- Co-organizer, International Workshop on “Representation theory in Geometry and Physics” IMSP, Porto-Novo, Benin Republic, August 1-17, 2005.
- Director, School and Conference on “Algebraic K-theory and its Applications” ICTP, Trieste, Italy, May 14 to June 1, 2007.
- Organizer, Workshop on “Introduction to Index Theory via K-theory and C^* - Algebras with application to physics” at the National Mathematical Center (NMC), Abuja, Nigeria, June 27 to July 7, 2011.

3. Mathematical Career

Professor Kuku is currently the President of African Academy of Sciences and Distinguished Professor of Mathematics at the National Mathematical Centre, Abuja, Nigeria. He was Professor of Mathematics at the International Centre for Theoretical Physics, Trieste Italy, and William W. S. Clayton Endowed Professor of Mathematics, Grambling State University, Louisiana, US. He has held many visiting Positions at reputable Universities and Research Institutes in the USA, Canada, Europe, Hong Kong, China including, Member, Institute for Advanced Study, Princeton, NJ 2003-2004; Visiting research Professor, Mathematical Sciences Research Institute (MSRI), Visiting Professor Cornell University, etc.

Professor Kuku is one of the world leaders in several aspects of K-theory and connections to commutative and non-commutative Algebra, Number theory, Operator Algebras, Topology, Geometry, Representation theory: a contemporary and multidisciplinary subject that also have applications in mathematical physics, Dynamical systems, Econometrics and Control theory. He has eighty-nine publications and about 500 citations made up of 52 research articles mostly in highly reputable journals, ten books and monographs, and twenty-three articles on topical issues cutting across mathematics education, science and technology.

4. Teaching and Mentorship

Professor Aderemi Kuku has taught in the major areas of fundamental mathematics: Pre-Calculus, Calculus, Abstract Algebra, Linear algebra, Real Analysis, Complex Analysis, Geometry & Topology and Operations Research. He has written a book "Abstract Algebra" suitable for undergraduate and beginning graduate students. He has also taught graduate courses on various topics including: Algebraic K-theory, Commutative Algebra, Algebraic Topology, Algebraic Number Theory, Homological Algebra, Category Theory, Algebraic Geometry, Differential Geometry and Representation Theory and Non-commutative Geometry. His most recent research book Representation Theory and Higher algebraic K-theory xxvii + 442 page published in 2007 by Chapman and Hall is suitable for use by Researchers and giving advanced graduate course in the field. Professor Aderemi Kuku has over 50 years of University teaching and research experience.

In the USA, he taught undergraduate and graduate courses at Columbia University, New York (Summer School) (1971); University of Illinois, Urbana Champaign (Jan.-May, 1982); Cornell University, Ithaca (Jan.-May, 1993); Howard University, Washington DC (Jan.-May, 1994); Miami University, Oxford, Ohio, (2005-2006), the University of Iowa, Iowa City, (2007-2008), and at the Grambling State University, Grambling, LA.

He has supervised nine M.Sc./M.Phil. research projects, two PhDs and seven ICTP Diploma projects. (Note: ICTP Diplomas are equivalent to M.Sc./M.Phil.). He has also supervised and mentored innumerable Post-Docs and mathematicians from Nigeria, Africa, China, India, Latin America, in a nutshell, across the world during his nine-year tenure as a Professor at the International Centre for Theoretical Physics (ICTP) Trieste, Italy.

5. Research Interests and Contributions

Professor Aderemi Kuku has broadened his research on Algebra. His research over the years have focused on Commutative and Non-commutative Algebra /Arithmetic/Geometry through methods of K-theory, Cyclic homology, encompassing Algebra, Number theory, Representation theory, Algebraic topology, operator algebras and some Algebraic Geometry and Differential Geometry. Such usually non-commutative structures; include e.g.

- Orders in algebras over number fields and p-adic fields;
- Group-rings and representations of finite, discrete, profinite, algebraic and compact Lie groups);
- C* - Algebras, and Lie groups C*- Algebras;
- Hopf Algebras and Quantum groups.

Note that cyclic homology and K-theory of the latter two structures belongs to non-commutative geometry. His initial work contributed to the understanding of the LF and NF functions with applications to the computation of Picard group of Algebraic Geometry. Moreso, he also contributed to the understanding of Whitehead groups in group-rings of finite group over the ring of integers in algebraic number fields and p-adic fields as well as Whitehead groups of orders in algebras over such fields. He proved several finiteness results in this direction.

In collaboration with A. Dress, he was able to formulate an Equivariant Higher Algebraic K-theory via the theory of Mackey functors and this Equivariant theory has proved very useful in proving result on Higher K-theory of group-rings. More precisely, if G is any finite group, C an exact category, and T a G -set, we constructed higher algebraic K-functors, as “Mackey functors” from the category of G -sets to the category of Abelian groups, (i.e. functors satisfying certain functorial properties, in particular, the categorical version of Mackey subgroup theorem in representation theory), in such a way as to identify with $K_n(M(RH)) = G_n(RH)$; with $K_n(PR(RH)) = G_n(R, H)$, and, with $K_n(RH)$ for any subgroup H of G where for any ring R with identity, $P(R)$ is the category of finitely generated projective R -modules and $M(R)$ is the category of finitely generated R -modules, (R Noetherian), and $P(RH)$ the category of RH -lattices. He has since generalized these constructions to the cases where G is a pro-finite group and G a compact Lie group. These constructions have also been useful in studying cohomology of groups. His book on ‘Axiomatic theory of induced Representation of Finite Groups’, is an exposition of the theory of Mackey functors in the context of representation of finite groups.

Furthermore, he studied and obtained several finiteness results on Higher K-theory of modules over ‘EI’ categories, i.e. categories in which every endomorphism is an isomorphism. The theory of modules over EI categories is a generalization of modules over group-rings and has topological applications in the study of transformation groups since certain topological invariants reside in the K-theory groups. In a joint work with G. Tang, he obtained explicit computation of the “bar” homology groups of a non-unital ring - a problem arising in higher K-theory and algebraic topology.

Also, in a joint work with M. Mahdavi-Hezavehi, he investigated and obtained interesting results on the algebraic structure of subgroups in the group of units of a non-commutative local ring.

He has also been working on Non-commutative geometry especially entire/periodic cyclic homology and K-theory of involutive Banach algebras, C^* -algebras, group C^* -algebras, Hopf algebras and quantum groups and studying connections (Chern characters) between K-theory and cyclic homology of these structures. In a joint work with D.N Diep and N.Q. Tho, Adeyemi constructed and studied non-commutative Chern characters from K-theory of compact Lie group C^* -algebras and compact quantum groups to their entire/periodic cyclic homology and proved interesting results that the Chern characters are isomorphisms modulo torsion in the case of compact Lie group C^* -algebras and compact quantum groups.

Professor Kuku, in one of his joint works with D.N. Diep, obtained some interesting results on non-commutative Chern characters of some non-compact quantum algebra. More precisely, proved that the periodic cyclic homology groups of the quantized algebra of functions on co-adjoint orbits of connected and simply connected Lie groups are isomorphic to the periodic cyclic homology of the quantized algebra of functions on co-adjoint orbits of compact maximal subgroups, without localization. They also computed the K-groups, periodic cyclic homology and Chern characters of such algebras for quantum half planes and quantum punctured complex plane.

He has also been working on quantum group theoretic formulation of the Baum-Connes conjecture (a celebrated problem in non-commutative geometry). To be precise, let A be a discrete quantum group acting on a C^* -Algebra B and satisfying some regularity assumptions (resembling the proper G -compact action for a classical discrete group G on some space). Kuku, in a joint work with D. Goswami constructed an analytic assembly map from the A -Equivariant K-homology groups to the K-theory groups. He provided a complete formulation of Baum-Connes conjecture for the action of discrete quantum groups as well as verified our formulation for general finite dimensional discrete quantum groups and proved surjectivity of our assembly map for the dual of $SU_q(2)$. In another joint work with X. Guo, he defined and studied wild kernels for higher K-theory of division algebras D over number fields, he proved among other results that it is finite. He also obtained interesting connections between the wild kernels and the subgroup of divisible elements of .of K-groups of the division algebras.

Professor Kuku constructed absolute and relative Equivariant higher Algebraic K-Theory for Waldhausen categories as a generalization of the constructions in four exact categories. Applications to Thomason’s complicial Waldhausen categories are given as well as some finiteness results for some Waldhausen K-groups.

6. Honours, Distinctions and Memberships in Learned Societies

Professor Kuku is a recipient of several Honours:

- President, African academy of Sciences 2014- 2017
- Honorary President, African Mathematical Union (AMU)(for life) 1995 till date
- President, African Mathematical Union 1986-1995
- Fellow, TWAS,–The World Academy of Sciences–For the Advancement of Science in the Developing Countries 1989
- Fellow, African Academy of Sciences 1986
- Member, European Academy of Arts, Science & Humanities 1986
- Fellow, Nigerian Academy of Science 1989, (Academy Secretary, physical Sciences, 1991-1993)
- Foundation Fellow, American Mathematical Society (AMS) 2012
- Fellow, Mathematical Association of Nigeria 1987
- Foreign Fellow, Mongolian Academy of Sciences 2005
- Distinguished Service and Achievement Award USA National Association of mathematician (NAM) 1993
- Special Merit Award, Ogun State of Nigeria 1987
- Member, International Mathematical Union Commission on Development and Exchange 1986-1994
- Member, Mathematics Advisory Committee International Centre for Theoretical Physics (ICTP), Trieste, Italy, 1986-1992
- Vice-Chairman, First Congress of African Scientists, Brazzaville, Congo 1987
- Vice-Chairman, Scientific Committee Organization of African Unity (OAU) 1987; Member, Steering Committee, Pan-African Union for Science and Technology, Congo Brazzaville. 1987-1990
- Member, Board of Trustees, Mathematical Association of Nigeria 1988-1994
- Chairman, UNESCO Committee of African Consultants Scientists, Dakar, Senegal 1987
- Chairman, Science and Technology Committee, Pan-African; Institute of International relation Geneva, Switzerland 1988-1995
- Vice-Chairman, Governing Council, International Centre for Mathematics and Physical Sciences, Porto-Novo, Benin Republic 1989
- Member, UNESCO Advisory Committee of Expert Mathematicians 1987
- Vice-President, Science Association of Nigeria 1983-1994
- Member, Board of Directors, PRELUDE programme Recherches et Liaison Universite et Development Namur, Belgium 1990-1993
- Member, Governing Council, Institute de Recherches Mathematiques (IRMA), Abidjan, Cote D'Ivoire 1993-1997
- Member, International Advisory Committee, International Village for Science and Technology Dar es Salaam, Tanzania 1990

- Head, Department of mathematics, University of Ibadan 1983-1986
- Academy Secretary, Physical Sciences, Nigeria Academy of Science 1990-1993
- Associate Editor (Algebra) Journal of the Nigerian Mathematical Society 1984
- Member, Editorial Board, Journal of the Nigeria Mathematical Society 1984-1990
- Guest Editor, K-theory Journal 1989,2003
- Member, Editorial Advisory Board, Afrika Matematika 1986 -1995
- Life Member National Association of Mathematicians, USA 2010 till date
- Member, Editorial Board, Nigerian Journal of Science 1977-1981
- Honorary Citizenship, City of Huntsville, Alabama, USA 1968
- Business Manager, Science Association of Nigeria 1978-1981
- Member, American Mathematical Society 1971 till date
- Member, London Mathematical Society 1995 till date
- Member, Mathematical Association of America 1994 till date
- Member, Nigerian Mathematical Society 1979 till date
- Member, International Committee, American Mathematical Society 1993-98
- Chairman, Mathematics Section, Science Association of Nigeria 1978-1981
- Member of Council, Nigerian Mathematical Society 1985-1990
- Member of Council, Mathematical Association of Nigeria 1987-1991
- Reviewer, Mathematical Reviews 1991-1997
- Distinguished Visitor, South African Mathematics Society 1997
- Traditional Royal Title - Otunba Ofiran of Ijebu-land (Nigeria) 1993
- African Mathematical Union (AMU) medal 2000
- Virginia Chatelain (Endowed) Lecture, Kansas State University, Manhattan, KS, USA 2007
- Member, International Advisory Committee, National Mathematical Centre, Abuja, Nigeria 2008 till date
- Nigeria National Honors - OON (Officer of the Order of the Niger) awarded by the President, Federal Republic of Nigeria, 2008
- Nigerian National Order of Merit - (NNOM) - the highest honour for Nigerian Academics awarded by the President, Federal Republic of Nigeria. 2009
- William W. S. Claytor Endowed Professor of Mathematics; Grambling State University, Grambling, Louisiana, U.S.A. 2009-2014
- Fellow, African Scientific Institute, (ASI) 2010
- International Conference on Algebraic K-theory and Its Applications in honor of his 70th birthday organized by Nanjing University, Nanjing, China, March 17-21, 2011

- Member, Editorial Board, American Journal of Mathematics and Statistics 2011
- Editor, IMHOTEP–Journal African de Mathematiques Pures et Appliques 2012
- Editor, Studies in Mathematical Sciences 2012
- Editorial Adviser, South Pacific Journal of Pure and applied Mathematics 2012
- Special Issue of the Journal of K-theory-(Published by Cambridge University Press, UK) Volume 12, No 1, 2013 in honor of Professor Aderemi Kuku as
- Proceedings of the International Conference on Algebraic K-theory and its Applications held at Nanjing University China March 17-21, 2011 in honor of his 70th birthday, 2013
- Foundation Fellow of the Nigerian Mathematical Society, (FNMS) 2015.

7. Scholarships, Grants and Prizes

- Professor Aderemi Kuku won many subjects and proficiency prizes while in school
- African Scholarship programme of American Universities (ASPAU) - He declined this offer 1962
- United States Agency for International Development (USAID Scholarship tenable at Makerere University College, Kampala, Uganda (then under special relationship with University of London. 1962-1965
- Shell-BP Proficiency Prize (Makerere) 1963
- Mathematical Departmental Prize (Makerere) 1964
- Travel fellowship awarded by US department of State 1968
- AFGRAD Fellowship 1970-1971
- Travel Award by Deutsche Stiftung fur International Entwicklung” 1980, '84 & '86
- Study Visit Award to Germany by the German Academic Exchange Services (DAAD) 1981
- Canadian Research Council Grant 1982,1993
- Third World Academic of Sciences (TWAS) Travel Grant 1993
- Swedish Institute Research / Travel Grant 1993
- Switzerland National Foundation Research Grant 1996
- Max Planck Institute (Bonn) Research Grant 1994, 2007
- Institute for Advanced Study, Princeton Research Grant 2003-2004
- MSRI, Berkeley California, Research Grant 1982, 2003
- Clay Mathematics Institute Fellowship 2004 2005
- IHES Paris, France Research Grant 2006

8. Position Held

- Member, Institute for Advanced Study Princeton, NJ, USA. Sept. 2003-Aug. 2004
- Visiting Research Professor, MSRI-(Math. Sci. Research Inst) Berkeley, CA, USA. Aug-Dec, 2004
- Visiting Professor, OSU (Ohio State Univ.) Columbus, OH, USA 2005
- Distinguished Visiting Professor, Miami 2005 2006 University, Oxford, OH, USA
- Visiting Professor, Universitat Bielefeld, Germany 2006
- Visiting Professor, IHES, Paris, France 2006
- Visiting Professor, Max Planck Inst. Fur Mathematik, Bonn, Germany 2007 2
- Distinguished Visiting Professor, National Mathematical Centre, Abuja, Nigeria. 2007
- Visiting Professor, The University of Iowa, Iowa-City, USA 2007-2008
- Professor of Mathematics, Grambling State University, Grambling, LA 71245, USA 2008-2009
- William W. S. Claytor Endowed Professor of Mathematics Grambling State University, Grambling, LA 71245, USA. 2009-2014
- Distinguished Visiting Professor, National Mathematical Centre, Abuja, Nigeria. Summer 2009, 2010,2011, 2012, 2013, 2014
- Distinguished Visiting Professor of Mathematics, IMSPInstitut demathematiques etde Sciences Physiques, Porto Novo, Benin Republic,Nov/Dec, 2015.
- Distinguished Professor of Mathematics, National Mathematical Center, Abuja, Nigeria, 2015.