DIRECTORATE OF ACADEMIC PLANNING
& MONITORING
Ahmadu Bello University, Zaria

RESEARCH NEWSLETTER

Celebrating 60 Years of Research Excellence

Celebrating 60th ANNIVERSARY 4th Oct., 1962

DIAMOND JUBILEE
Edition | Oct-Dec. 2022

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From the desk of the Vice Chancellor...

It is with pleasure that I write this foreword for the Maiden Edition of the Ahmadu Bello University Research Newsletter. This is particularly pertinent as it coincides with the Diamond Jubilee of the institution. The University places premium value on high quality research with the aim of positively impacting society. Research is at the core of the tripartite functions of higher education, complimenting the other academic activities of teaching and community service. It is therefore imperative to periodically publish research activities as well as opportunities for fellowships and research/project grants as contained within the newsletter.

I commend the Research and Innovation Unit as well as the Directorate of Academic Planning and Monitoring for initiating this worthwhile venture. I also implore members of the University community to not only peruse the research activities provided but to explore the opportunities for grants and fellowships in order to enhance the quality of research output from the University.

Thank you.
Professor Kabiru Bala

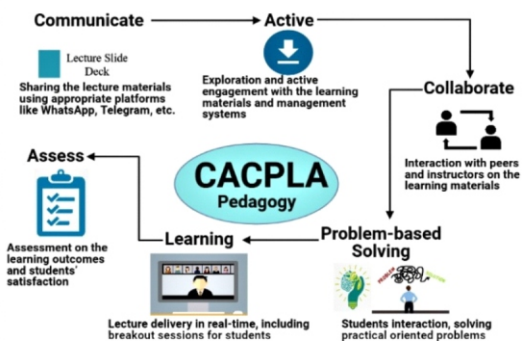
ADVANCING ENGINEERING PEDAGOGIES, KNOWLEDGE AND SKILLS THROUGH THE WORLD BANK 2018 FUNDING FOR THE AFRICA CENTRE OF EXCELLENCE ON NEW PEDAGOGIES IN ENGINEERING EDUCATION (ACENPEE)

The Africa Centre of Excellence on New Pedagogies in Engineering Education (ACENPEE), led by Professor Raymond Bako, was selected by the World Bank in 2018 as a new Africa Centre of Excellence (ACE) Impact Centre. The Project aims at improving the quality, quantity and development impact of postgraduate education in selected universities through regional specialization and collaboration by strengthening the capacities of these universities to deliver quality training and applied research. ACENPEE is focused on enhancing engineering education by experimenting with new teaching methods, developing curricula, assessing how students learn, and moving those findings into the classrooms of tomorrow's engineers. The goal is to educate engineering leaders who can respond creatively and responsibly to 21st-century challenges. ACENPEE's "Certificate in Engineering Education (CEE)" graduate certificate program helps graduate students, faculty members, and industry professionals in engineering and allied STEM fields to improve their teaching and course design skills.

Research activities at ACENPEE are focused in five main areas; (1) Engineering content knowledge application and skills (2) Effectiveness of different engineering education pedagogies in enhancing teaching and learning; (3) Development and production of prototype engineering pedagogy tools for classroom application – Engineering Learning Experiences Designs (E-LEDs); (4) Implementation and evaluation of E-LEDs and (5) Development of new multimedia (pictures, diagrams, animations, videos, etc.) to mediate E-LEDs. To this end, a new pedagogy, Communicate, Active, Collaborate, Practice, Learning and Assessment (CACPLA) was developed at the Centre. CACPLA was coined from the cooperative, hands-on, active, problem-based learning (CHAPL), and the discover, learn, practice, collaborate and assess (DLPCA) pedagogies. These pedagogies are five-components blended learning methods which combines asynchronous and synchronous teaching methods. This pedagogy has led to improved teaching and learning. The key educational and applied research goal of ACENPEE is to use new pedagogies such as the CACPLA pedagogy to enhance the training of engineering professionals with the capacity to identify existing challenges and provide solutions through high level research. The CACPLA concept hinged on CHAPL and DLPCA to create a novel six-component pedagogy that resonates with our academic settings (Figure 1). This pedagogy was adopted to show that an online teaching strategy can initiate a steady transition from physical classrooms to full online instruction for some subjects in engineering. This method has been trialed as an exercise for a module and was used to teach year 3 students of the Dynamics of Machinery course (MEEN 307), year 5 students of the Production Management (MEEN 503) course, and undergraduate students of civil engineering, at the Ahmadu Bello University, Zaria, Nigeria.

ACENPEE is excited at the impact of this pedagogy thus far and presented some interesting datasets at the just concluded American Society of Civil Engineering (ASCE) Geotechnical Congress which focused on the state-of the art practice in Geotechnical Engineering. The research work fits well with ACENPEE's mandate of enhanced pedagogical approaches in teaching engineering content to students. In the quest to further develop, apply and scale the new pedagogy, ACENPEE has initiated the application of the CACPLA pedagogy to postgraduate teaching in Engineering subjects. The advanced exploration of this adaptive teaching approach is cross-cutting over a range of different pedagogical approaches in ACENPEEs' four participating departments viz: Chemical, Civil, Mechanical and Water Resources and Environmental Engineering. The results of this approach so far suggest that ACENPEE can define the progress of CACPLA in two layers: One that combines a mix of continuous teaching practices, and another that embeds these approaches, considering the state-of-the art, in a more robust manner to meet long-term engineering education goals at ACENPEE.

In terms of identifying existing challenges and



The CACPLA Pedagogy

providing solutions through high level research, ACENPEE has supported and carried out research in her relevant engineering disciplines of Chemical Engineering, Civil Engineering, Mechanical Engineering and Water Resources and Environmental Engineering. The various research works covers Sustainable Engineering practices through the concept of circular economy (waste to wealth/beneficial reuse of industrial waste products). Her research activities cover empirical experimental laboratory work which provides a basis for enhanced field or bench scale trials that would further be developed to suitable patented products or solve industrial challenges. ACENPEE has a policy of disseminating research findings within her various thematic areas, through publication in reputable journals. During the course of students' research work, they are given research support and are expected to publish the findings of their research in reputable Scopus indexed journals. To this end, eleven (11) research publications being output of ACENPEE research support, have been published and submitted for verification at different times during the course of this project. It is important to highlight a few:

One of the outcomes of the CACPLA Pedagogy was published in the American Society of Civil Engineering ASCE, Geotechnical Special Publication, GSP 336 Geo-Congress 2022, pp 534 – 543.

From the engineering knowledge and skills standpoint, ACENPEE was involved in the Fabrication of novel kaolin-reinforced hydroxyapatite scaffolds with robust compressive strengths for bone regeneration. In this study, hydroxyapatite (HAp) microparticles obtained from animal bones were synthesized, and for the first time, HAp was reinforced with beneficiated kaolin using the sol-gel route to improve the mechano-biological properties of the bioceramic materials
https://doi.org/10.1016/j.clay.2021.106298

Participants at the Materials characterization training organized by ACENPEE

Another research output from ACENPEE, Box-Behnken experimental design for the process optimization of catfish bones derived hydroxyapatite: A pedagogical approach https://doi.org/10.1016/j.matchemphys.2021.124916. Here, the synthesis, optimization, and evaluation of synthesized hydroxyapatite (HAp) from catfish bones (CB) was carried out to achieve optimum processing conditions and sustainable pedagogical approaches for the preparation of hydroxyapatite scaffolds for tissue engineering.

Participants during one of the training sessions organized by ACENPEE on materials characterization

Research on the Bio-cementation of Lateritic Soil Using Microbial-Induced Calcium Carbonate Precipitation Techniques for Use as Road and Embankment Materials evaluated the potential of using microbes Bacillus coagulan in bio-cementation for improvement of road pavement https://link.springer.com/chapter/10.1007/978-3-030-72543-3_26

In 2022, another research outcome focused on the Utilization of sawdust as a pore-former in the fabrication of ceramic adsorbents for water purification. In this study, kaolin-based ceramic materials with sawdust addition (10 and 20 wt.%) were fabricated using a two-level full factorial design of experiments and the effect of sintering temperature and compaction pressure on the physical, chemical, and mechanical properties of the ceramic materials was investigated. The filtration efficacy of the optimum adsorbent was tested by evaluating the filtration dynamics of water contaminated with heavy metals like zinc (Zn), copper (Cu), nickel (Ni), cadmium (Cd), and lead (Pb), and compared with an adsorbent fabricated without the inclusion of the pore former (sawdust)
https://doi.org/10.1007/s41779-022-00778-3

Research collaborations also exist between ACENPEE through a MoU with Ahmadu Bello University and the International Virtual Engineering Students Teams at the University of Toronto, Canada. The InVEST program aims at finding scalable approaches to enhancing international knowledge, collaboration and experience for students. ACENPEE has engaged actively with a pioneering student Mkpe Ojong Kekung (P19EGME8017). The specific project targets the waste biomass or "empty fruit bunch (EFB)" from processing palm oil, a major export of many tropical countries, Nigeria inclusive. Much of EFB is allowed to rot, as it has little economic value. The key output of this project is an evaluation of the options available for converting EFB to products, such that there is a workable business model for a local circular economy in Nigeria. Supervisors for the project include Professor Graeme Norval and Professor Nicola DeMartini, (University of Toronto), Prof. Fatai O. Anafi and Dr. David Obada (ACENPEE/Ahmadu Bello University)

Research Collaborations and Opportunities

Potentials for Fabricating 3D printers and filaments from electronic and agricultural wastes ACENPEE through the X-TechLab training established within the Agence de Développement de Sèmè City in Cotonou, Bénin. This has led to several research collaborations and there is a collaboration currently under discussion between Seme City and Nigeria, and ACENPEE will coordinate for Nigeria if successful.

Group photo of some participants during the 3D printer training organized by ACENPEE

ACENPEE Centre Leader, Prof. Raymond Bako (right) with Dr. David Obada (left) communicating with online national and regional participants during the training

ACENPEE has a sustainability plan that is focused on maintaining the quality of her education, research, and graduate standards. The plan is anchored on quality assurance mechanisms and financial sustainability. The quality assurance mechanisms involve the carrying out of periodic curriculum review of its education programmes to bring them in line with global standards and industry relevance.

The monitoring and supervision of teaching and learning activities are key to maintaining the quality of education and research as well as the quality of assessment. ACENPEE support staff and student research and insist on adherence to university policy on research procedure and ethics. Students are instructed and advised to uphold academic integrity in all their work, while the Centre employs mechanisms to check research integrity through the use of plagiarism softwares to maintain standards. The Centre works closely with the Directorate of Academic Planning and Monitoring (DAPM) and the School of Post Graduate Studies (SPGS) in the university to ensure the maintenance of academic standards that are consistent with international best practices.

VETERINARY PARASITOLOGY AND ENTOMOLOGY/NATIONAL ANIMAL PRODUCTION RESEARCH INSTITUTE (NAPRI), SHIKA COLLABORATES ON CHARACTERIZATION AND EXPERIMENTAL INFECTION OF HAEMONCHUS CONTORTUS TOWARDS INCREASED PRODUCTION OF THREE BREEDS OF GOATS IN NIGERIA

The Veterinary Parasitology and Entomology and NAPRI under the TETFund National Research Grant (NRF) projects (TETFUND/DESS/NRF/STI/5/VOL.1 and TETF/DR&D/CE/NRF/STI/18/VOL.I) spearheaded by Professor Hussaina Joan Makun has isolated and characterized the phenotypic and genetic structure of adult

H. contortus from the 3 geo-ecological zones to assess the extent and level of diversity of the parasite in Nigeria. The research collaboration also experimented infection rates of H. contortus isolates in three indigenous goat breeds across the northern region of the country. At 4-6 months kids of the 3 indigenous goat breeds showed sunstantial leve of acquired resistance to Haemonchus contortus. High levels of variation in Packed Cell Volume (PCV) and Feacal Egg Count (FEC) in response to the experimental challenge suggest opportunity to select within and between breeds. Therefore combining selection and appropriate management interventions could reduce reliance on anthelmintic drugs and delay or avoid development of drug resistance in GIN. The project was formulated to has breed between the 3 indigenous goats to develop a goat with a genetic potential of reaching 20kg at weaning weight at 3 months (Plate 2). The crosses between the 3 indigenous goat breeds showed an increase by 27% of weaning weight over the individual breeds with the crossbreed between Sahelian buck and Red Sokoto doe exhibiting the highest inrease in weaning weight. The project has identified farmers would benefit from the distribution of improved breeds of bucks to optimise the goat production in the region.

The crossbred goats kids generated from the breeding program

Twenty hectares of pasture developed from the projects

The project had afforded the research team to establish a 20-hectare paddock of Digitaria smutsii pasture for feeding of the goat. A properly managed hectare has the capability of producing 800 bales. The project also propelled us into producing a dehorning paste fortified with our indigenous healing oils. A Master's student from the Department of Veterinary Surgery has been included into the project team to compare our generated dehorning paste with imported dehorning pastes.

DIELECTRICS RESEARCH AT THE MATERIALS SCIENCE RESEARCH LABORATORY, DEPARTMENT OF PHYSICS, FACULTY OF PHYSICAL SCIENCE

The Materials Science Research team, composed of Prof. Abdelghaffar Amoka Abdelmalik (Team Leader), Dr. Aliyu Abdulraheem, Dr. Abubakar Abubakar Khaleed, Dr. Yusuf Musa Abubakar, Dr. Abdulsalam Ismaila Galadima and Mr. Bilyamin Ibrahim is currently working on the effects of electric fields on the properties of materials for high voltage insulation in five principal areas: (i) Properties of engineered insulation materials, (ii) integrity of high voltage insulation materials and system, (iii) electrical ageing, degradation, and breakdown, (iv) high voltage insulation reliability studies, and (iv) nano-dielectrics or dielectric materials made from nanocomposites. All of these are funded by the Tertiary Education Trust Fund (TETFund) through a 2019 National Research Fund (NRF) and three (3) Institution Based Research (IBR) grants in 2021 The team is specifically working on the feasibility of developing an alternative insulating liquid from Nigerian vegetable oil with a focus on non-food grade seed oil, a Natural ester insulating fluid. Oil samples extracted from a number of plant seeds were transesterified to lower the viscosity of the oil to a value comparable to the viscosity of mineral insulation oil. The oil samples were then passed through an epoxidation reaction for the structural modification of the oil to eliminate the unsaturated carbon-carbon double bond which is responsible for the oxidative instability of vegetable oil. The epoxy ester liquid has a slightly higher viscosity as compared with the methyl ester of the oil. The low viscosity when compared with mineral oil, the value of the dielectric loss, and electrical conductivity make the oil a potential alternative insulating fluid. Nanotechnology is then employed in the laboratory to improve the dielectric properties of the ester insulating fluid. We attempted to improve the physicochemical properties, dielectric loss, and breakdown voltage of palm kernel oil ester using Al_2O_3 and TiO_2 nanoparticles. A stable nanofluid was developed from the base methyl ester and functionalized nanoparticles. The dispersion of the nanoparticles at a certain proportion led to an improved dielectric loss and breakdown voltage.

Prepared natural ester nanofluids in the laboratory

Dr. Abdulsalam I. Galadima working with the 35 kV HVDC experimental set-up for oil breakdown test

DEVELOPMENT OF ASSET MANAGEMENT CULTURE IN THE NIGERIAN POWER INDUSTRY

Asset management in the Nigerian power industry is still mostly based on the traditional so-called "corrective maintenance" technique where equipment is allowed to fail and then get repaired or replaced. There is still no emphasis on forensic analysis on the effect of the breakdown on the equipment and/or developing a suitable diagnostic model to minimize avoidable failures. We are working with Kaduna Electricity Distribution Company (KADECO) to develop an asset management model for the reliable operation of oil-filled transformers in the grid network. Oil was collected from some of the power and distribution transformers in the network. Forensic analysis is been performed on the samples using the facilities in our laboratories. We are identifying the ageing signatures in the oil from the oil-filled transformers with the hope to develop a model that could lead to the safe operation of the equipment in the grid network.

Nanopolymeric Research

Polymeric Insulation Materials

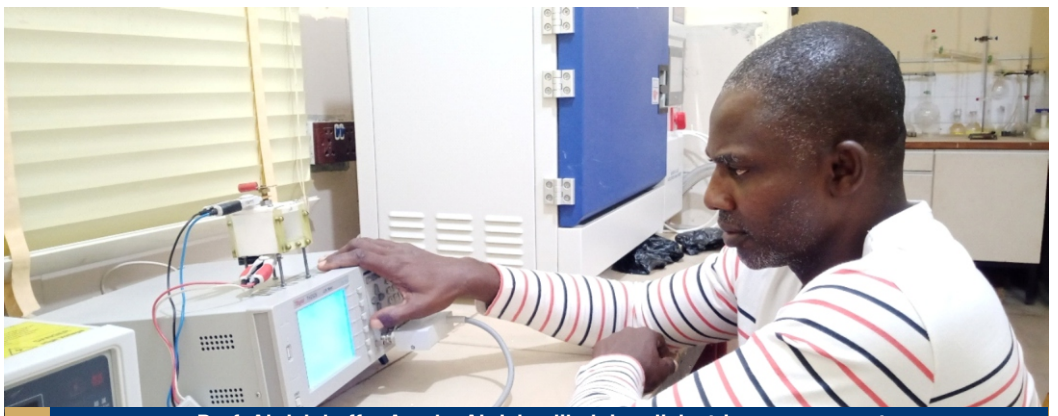
A number of metal oxide particles (micro and nano-sized) have been studied as fillers for polymer composite, and nanoparticles from clay were also considered as fillers for epoxy polymer-based matrix. Aside from clay, there are other naturally occurring resources such as animal shells and eggshells that can serve as cheap resources when used as fillers for polymeric insulation. The team has produced fine powder from cleaned animal shells and studied its influence on the mechanical, thermal, and dielectric properties of an epoxy polymer. We have worked on eggshells and periwinkle shell powder in microsize and trying to reduce the size to nanosize. Nigeria is preparing to establish a nuclear power plant and polymeric insulation is present in the components of nuclear power plants. There is the possibility of interaction between the polymers and neutron and gamma radiation.

Dr. Yusuf M. Abubakar working with the DGA facilities breakdown test

The team is also studying the influence of nanoparticles in the radiation-induced processes in polymeric insulation towards the possibility of developing nano-polymeric insulation with an improved nuclear irradiation-induced degradation process.

POLYMERIC MATERIALS FOR MEDICAL APPLICATION

Polymers are indispensable materials in the manufacture of some medical devices. While several works have been done on gamma-ray as sterilisation radiation, there is very little information available on the study of the effect of electron-beam and X-ray on polymeric materials. The focus of this work is to develop some polymers and their composites and study the effects of selected radiation sources on their properties under different conditions. The long-term stability of the polymer after radiative treatment is studied to establish the relationship between measured parameters and radiation ageing. There is a study on the effects of radiative treatments on the biocompatibility of the polymers to highlight their usability in medical devices. We are attempting to modify the polymers using nanotechnology, study the properties and then identify the polymer blends/nano-particle combinations that are optimally suitable for individual applications.



Prof. Abdelghaffar Amoka Abdelmalik doing dielectric measurement of polymer samples with LCR Bridge test

GEO-ENVIRONMENTAL RESEARCH ON SOIL MECHANICS TOWARDS MITIGATION OF EROSION AND FOR SUSTAINABLE CONSTRUCTION OF ROADS, BUILDINGS AND PHYSICAL INFRASTRUCTURE AT THE DEPARTMENT OF CIVIL ENGINEERING

Preparation of sample of unconfined compression test by Ashiru M. Ashiru a doctoral candidate under the group

Cored specimens for unconfined compression test by Garba Alhaji Murtala, a doctoral candidate under the group

Problematic soils are predominantly fine-grained and are natural geologic deposits located in different parts of Nigeria. The soils exhibit diverse behaviors such as shrinking, swelling and collapsing in repeated cycles when in contact with moisture. This causes excessive settlement, making the soils to fail under relatively low stress conditions. Roads constructed on problematic soils easily fail while buildings erected on such soils usually have deformations and cracks accompanied by settlement. The Geo-Environmental Research Group is lead by Professor K. J. Osinubi. Other members of the team are Professor A. O. Eberemu, Professor T. S. Ijimdiya, Dr. J. Ochepo, E. A. Nyebe and I. Iliyasu. Over the years, the Group has explored the beneficial re-use of industrial and agricultural wastes for improving the engineering properties of such soil. The aim is to make them more durable and reduce the quantity of expensive conventional soil improvement additives such as cement, lime and bitumen, the production of which generates greenhouse gases while depleting natural resources

https://doi.org/10.1007/978-3-030-79638-9_5
https://doi.org/10.1088/1757-899X/1036/1/012029

BIOGEOCHEMICAL PROCESSES IN GEOTECHNICAL ENGINEERING

Some biological processes have lately been found to be useful in improving the quality of some engineering properties of soils using the Microbial-Induced Calcite Precipitation (MICP) technique that is environmentally friendly. MICP is a novel technique that uses bacterial activity to improve or modify the physical properties of soils. This technique uses biogeochemical processes such as bio-mineralization, bio-cementation, bio-clogging, bio-stimulation and bio-remediation to improve the engineering properties of soils such as strength and permeability. The technique involves a cementation process that binds/clogs natural subsurface soils by the hydrolysis of urea (ureolysis) to induce calcite precipitation at particle–particle contact levels in the soil environment. The Geo-Environmental Research Group over the years has explored the potential use of various Gram-positive bacteria species such as Bacillus coagulans (B. coagulans), Bacillus megaterium (B. megaterium), Bacillus pumilus (B. pumilus), Bacillus thuringeiensis (B. th), Sporosarcina pasteurii (S. pasteurii) etcetera to improve soil properties (https://doi.org/10.1007/978-3-030-79638-9_4, https://doi.org/10.32732/jcec.2022.11.1.56, https://doi.org/10.1007/978-3-030-72543-3, https://doi.org/10.1007/s42452-020-1974-2)

Injection of bacteria into soil by Yohanna Paul, a former doctoral candidate working under the group

Urease activity determination through electrical conductivity test by Garba Alhaji Murtala

WASTE CONTAINMENT BARRIER AND COVER SYSTEMS, EROSION MITIGATION USING MICP

Hydraulic barriers and covers are very important in engineered waste containment landfills to prevent the flow of leachate emanating from waste contained in landfills which could further contaminate groundwater. The Geo-Environmental Research Group has explored the use of natural non-expansive lateritic soils and expansive tropical black clay (also known as black cotton soil) as well as soils treated with agro-industrial wastes in designing adequate landfill hydraulic barriers and covers. Also, biogeochemical processes using bacteria have been explored in this field of study using the MICP technique (https://doi.org/10.1061/(ASCE)HZ.2153-5515.0000465 https://doi.org/10.3208/jgssp.v09.cpeg038, https://doi.org/10.3208/jgssp.v09.cpeg049, https://doi.org/10.1051/matecconf/202133704001). The Group is also currently involved in studies on the mitigation of erosion in lateritic and aeolian soils using biogeochemical processes (i.e., MICP) at various laboratories including the Soil Mechanics / Geo-environmental Research Laboratory (SMGRL) and the Nigeria Liquefied and Natural Gas (NLNG) Soil Mechanics Research Laboratory (NLNGSMRL).

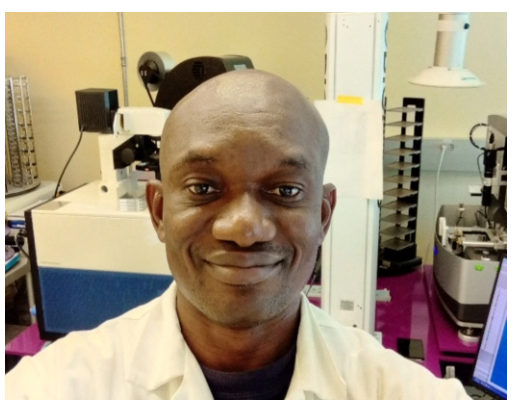
GEO-MATERIAL SITE CHARACTERIZATION

The Geo-Environmental Research Group was engaged in several site characterization as part of community service for some infrastructural developments including:

Geotechnical Investigation and Soil Report for the Proposed Development (Existing Pathology and Officers Mess buildings) at Federal Medical Centre, Jabi – Airport Road, Garki, Abuja, Federal Capital Territory (FCT).

Geotechnical Investigation and Soil Report for Proposed Trauma Centre in Ahmadu Bello University Teaching Hospital (ABUTH), Shika, Zaria, Kaduna State.

RESEARCH NEWS



Emmanuel Oluwadare Balogun, PhD

DR. E. O. BALOGUN FROM THE DEPARTMENT OF BIOCHEMISTRY SELECTED AS A DISCUSSANT AT THE U.S. NATIONAL ACADEMIES OF SCIENCES ENGINEERING AND MEDICINE (NASEM) FRONTIERS SYMPOSIUM FROM 12-14 OCTOBER 2022

Dr. Emmanuel Oluwadare Balogun, a Reader at the Department of Biochemistry and a recipient of the Emerging Global Leader Award from NIH, USA, has been selected to attend and talk at the maiden Frontiers Symposium on Science, Engineering, and Medicine. The U.S. National Academies of Sciences Engineering and Medicine (NASEM) selected 69 out of 800 researchers from Africa and the USA for high level scientific discussion at the Frontiers Symposium. The Symposium, organised and sponsored by NASEM to be hosted by the African Academy of Sciences in Nairobi, Kenya will take place October 12-14, 2022. It will be a gathering of a select "outstanding" African and US researchers to develop pluri-disciplinary research

agenda for tackling global problems. Experts in the field of Global Health, Environment, Engineering, Artificial Intelligence and Material Sciences were invited. The title of Dr. Balogun's presentation is "Design of multi-target drug candidates for African trypanosomiasis". He will leverage on this opportunity to initiate collaborations between ACENTDFB/ABU and other institutions in Africa and USA. Dr. Balogun is an expert on intervention development for neglected tropical diseases with broad biomedical research skills in diverse fields including Enzymology, Parasite Biochemistry, Pathology of Parasitic Diseases, Genomics, Molecular Biology, Protein Science, Bioinformatics and Structural Biology. In addition to his position at ABU, he holds non-paid Visiting Researcher positions at top-ranking institutions such as The University of Tokyo, Japan, and University of California San Diego (UCSD), USA. Dr. Balogun is an international scholar, a recipient of numerous scholarships, fellowships, and research grants from multiple foreign countries such as Japan, United Kingdom, and USA. He has tremendous field and laboratory experience in Biomedical Sciences. Importantly, Dr. Balogun is the first scientist to solve the three-dimensional structure of the enzyme, glycerol kinase from African trypanosomes, and utilizing the information to design the first drug-like inhibitor molecule for any glycerol kinase. Part of his work was recently profiled in one of the world's leading academic journals, NATURE. Worthy of mention, Dr. Balogun has mentored four ABU staff and postgraduate students to win the prestigious Fulbright fellowship. Two of Dr. Balogun's PhD students at ABU are presently on 1-year bench work at his collaborating institution, UCSD, USA

GRANTS AWARDED IN 2022

Principal Investigator	*Title of Research project*	*Co-Investigators*	*Department*	*Faculty/ Institute/ Centre*	*Amount*
GEOPHYSICS WITHOUT BORDERS GRANT 2022 (3/10/2022 to 3/9/2023)					
Joseph OSUMEJE	Determination of underground water potential and water supply in some rural villages in Nigeria	K.M. Lawal, O. Omorogbe, T. O. Unogwu, i. Abdullahi, D. Eshimiakhe, Y. A. Bello, M. Umar	Physics/ GWB Research Group	Physical Sciences	47,989.00 USD
BARAKAT TRUST (09 -2022 to 03-2023)					
Rabiu YUSUF	Archeo-metallurgical study into iron metallurgy around the Sokoto Caliphate, Nigeria	----------	Archaeology and Heritage Studies	Arts	6,500.00 GBP
BOYCE THOMPSON INSTITUTE GRANT (07 -2022 to 06-2023)					
Magdalena Julkwoska, Ramatu Enehezeyi ALIYU (Team Leader, Nigeria)	Improving fundamental understanding of stress resilience by sequencing Nigeria Cowpea diversity panel	Saba B Mohammed, Hauwa Ahmed, Aminu Aliyu, Kayode Sakariyahu, Sadam Suleiman Indabo, Hadiza Usman	Botany	Life Sciences	74,400.00 USD
CROP TRUST Biodiversity for Opportunities, Livelihoods and Development BOLD GRANT (2022-2023)					
Ramatu Enehezeyi ALIYU	Regeneration and Safety Duplication of Cowpea (*Vigna unguiculata L.*) and Rice (*Oryza spp.*) Landraces	Saba B Mohammed, Hauwa Ahmed, Aminu Aliyu, Kayode Sakariyahu	Botany	Life Sciences	34,377.00 USD
WELLCOME TRUST COLLABORATIVE AWARD IN SCIENCE 2022 (01 -02-2022 to 31-01-2027)					
James WALTERS (Univ. of Cardiff), Taiwo Lateef SHEIKH (PI, Nigeria)	Depression Genetics in Africa (DepGenAfrica) in 4 Countries-Nigeria, Uganda, Ethiopia and South Africa	Andrew McIntosh, Gerome Breen, Amelia Crampin, Michele Ramsay, Solomon Tererra & Chisomo Msefula	Psychiatry	Clinical Sciences	Up to 970,000.00 GBP
BATCH 7 TETFUND IBR GRANTS (03 -2022 to 02-2023)					
Nafiu ABDU	Photocatalytic nitrogen fixation using nanostructured materials	Sharhabil Musa Yahaya, Ibrahim Abubakar Aliyu, Bello Mukhtar	Soil Science	Agriculture	1,904,740.50 NGN
Jabir Haruna ABDULKAREEM	Quantitative Analysis of Water Use Efficiency, Greenhouse Gas Emission and Carbon Sequestration from Rice Production in a Tropical Savannah Soil	Aliyu Muhammad Yamusa	Soil Science	Agriculture	1,932,600.00 NGN

Sanusi MUSA	Possible Haemostatic Functions and Mechanisms of Action of Three Selected Plants' Extracts (*Acacia nilotica, Moringa oleifera* and *Telfairia occidentalis*) in Rabbits	Nafiu Faruku	Medical Laboratory Science	Allied Health Sciences	1,840,200.00 NGN
Kabir UMAR	Deciphering the antibacterial properties of *Lawsonia inermis* against Biofilm producing Methicillin resistant *Staphylococcus aureus* at Ahmadu Bello University Teaching Hospital Zaria, Nigeria	Yahaya Usman	Medical Laboratory Science	Allied Health Sciences	1,678.700.00 NGN
Yahaya USMAN	Determination of efflux pump genes expression in clinical isolates of planktonic and biofilm forming pseudomonas aeruginosa in Zaria, Nigeria	Idris Abdullahi Nasir, Kabir Umar	Medical Laboratory Science	Allied Health Sciences	1,906,075.00 NGN
Jimoh ABDULAZEEZ	Evaluation of the ameliorative effect of resveratrol on plasmodium *bergei*-induced malaria in diabetic male Wistar rats	Yusuf Tan ko	Human Physiology	Basic Medical Sciences	1,990,000.00 NGN
Nachamada Solomon EMMANUEL	Evaluation of Lactogenic Parameters and Oxidative Biomarkers in Lactating Female Wister Rats Treated with Monosodium L-Glutamate (Ajinomoto)	Yusuf Tanko	Human Physiology	Basic Medical Sciences	1,743,200.00 NGN
Usman FARRAU	Determination of Prevalence of Stress and its Effects Among 200 Level Students of Faculty of Basic Medical Sciences, Ahmadu Bello University, Zaria	F. A. Dawud, Yusuf Yusha'u	Human Physiology	Basic Medical Sciences	1,744,000.00 NGN
Banlibo Dubo AUGUSTINE	Effect of Formulated Nigerian-Made Medium Chain Triglyceride-Ketogenic Diet on Type I Diabetes-Induced Alterations in the Lungs of Male Rabbits	I. A. Umar, F. A. Dawud	Human Physiology	Basic Medical Sciences	1,894,000.00 NGN
Dogara Jibril KABIR	Evaluation of the Anti-diabetic effects and Biochemical Changes of virgin coconut oil in Alloxan-induced Diabetic Male Wistar Rat	Yusuf Tanko	Human Physiology	Basic Medical Sciences	1,222,000.00 NGN
Khadija Salihu ISA	Effect of Resveratol and Pioglitazone Co-administration on Hyperglycaemia-induced Nephropathy in Type II Diabetic Male Wistar Rats	Jimoh Abdulazeez	Human Physiology	Basic Medical Sciences	1,052,310.00 NGN
Abdullahi Hussein UMAR	The role of sex and ethnicity on inter-individual variability in experimental pain responses among a healthy Nigerian adult population	Ahmed-Sherif Isa	Human Physiology	Basic Medical Sciences	1,774,300.00 NGN

Rabiu AbduSSALAM MAGAJI	Modulation of Neuro-behavioural Responses and Brain Oxidative Stress by Glutathione in Mice Exposed to Chronic Mobile Phone Radiation	Abdullahi Hussain Umar, Abubakar Ibrahim Muhktar	Human Physiology	Basic Medical Sciences	1,900,000.00 NGN
Abdulmalik MUHAMMAD	Effect of Fermented Cabbage (*Brassica olaeracae*) supplementation on Blood Glucose Level and other Physiological Parameters in Streptozotocin-Nicotinamide Induced-Diabetic Male Wistar Rats	Aliyu Mohammed	Human Physiology	Basic Medical Sciences	1,697,000.00 NGN
Umma ABDULLAHI	Effect of tempering treatment on the Post-Weld Properties of Arc-Welded Alloy Steels	Bello Kamil Adeyemi, Muhammad Tukur, Nkou Tochucku	CERT	Centre for Energy Research and Training (CERT)	1,998,000.00 NGN
Lawal AMADU	Sero-prevalence, Knowledge Vaccination Status and Risk Factors of Hepatitis B Infection among Federal Road Safety Corps Personnel Northwest Zone, Nigeria	Muawiya Babale Sufiyan	Community Medicine	Clinical Sciences	1,693,350.00 NGN
Gidado Likko LAWAL	Effect of Interactive Problem Solving and Emotion Regulation in addressing National Security challenge of Armed Banditry in the North Western Geopolitical Zone	Muhammad Rogo Hamza	Educational Psychology & Counselling	Education	1,654,600.00 NGN
Abdulmutalib Gambo DAUDA	Effects of Grazing Reserves Encroachment on peaceful co-existence between farmers and Herders as correlates to Sustainable Agricultural Production in Kaduna State, Nigeria	Zailani Saadu Abubakar	Vocational and Technical Education	Education	1,785,000.00 NGN
Tajudeen Kolawole BELLO	Production of Improved Dilbit/Synbit from Nigeria's Bitumen and Crude Oil Reserves	Muhammed Tijani Isa, Omuyar Raheem Momoh, Suleiman Muhammad Shuwa	Chemical Engineering	Engineering	1,960,000.00 NGN
Abdulkareem ABUBAKAR	Sweetening of Tire-Derived Oil Using Ultrasound-Assisted Oxidative Desulphurisation	Umar Omar Ahmed, Suleiman Yunusa	Chemical Engineering	Engineering	2,000,000.00 NGN
Mansir DODO	Aligning National Housing Programmes in Nigeria to Construction Industry Capacity	R. S. Abdulrahman, Z. H. Ishaq	Building	Environmental Design	1,219,500.00 NGN
Hassan Adaviriku AHMADU	Developing Machine Learning Models for Construction Material Prices in Nigeria	Yahaya Makarfi Ibrahim, Rilwan Shuaib Abdulrahman, Usman Sulaiman Jibril, Muhammad Aliyu Yamusa	Quantity Surveying	Environmental Design	1,233,500.00 NGN
Kulomri Jipato ADOGBO	An assessment of the Glass Ceiling to Women's Career Development in the Nigerian Construction Industry: Myth or Reality	Joy Joshua Maina, Fatima Muhammad Bello	Quantity Surveying	Environmental Design	1,515,000.00 NGN

Abdulmajeed Olaremi SHITTU	A Framework for Measuring Mobility Environment Perception of Urban Travelers	Joseph Sunday Oladimeji	Urban & Regional Planning	Environmental Design	1,959,200.00 NGN
Abrak DAMBO	Growth performance, amino acid and fatty acid content of African catfish, *Heterobrabchus bidorsalis* (Geoffroy Saint-Hillaire, 1809) fingerling fed commercial diet supplemented with livestock slaughterhouse waste meal	E. Y. Yashim, Luka Ibrahim	Biology	Life Sciences	1,654,000.00 NGN
Ibrahim Madu Katsallah GADZAMA	Single and Mixed Effects of Selected Analgesics on Physiological Indices of *Daphinia Magna, Chlorella Sorokiniana* and *Aeruginosa Stains* under laboratory and Mesocosm conditions	Mathias Ahii Chai, Ramatu Idris Sha'aba	Biology	Life Sciences	1,996,642.00 NGN
Sodangi Abdulkarim LUKA	Epidemiological Study and Spatial Distribution of *Unilocular Hydatidosis* in Ruminants Slaughtered in Selected Abattoirs in Northern Nigeria	Iliya Shehu Ndams, Ezekiel Kogi, Andrew Adamu, C. Kogi, C. Yaro, R. T. Bello	Zoology	Life Sciences	1,842,040.00 NGN
Iliya Shehu NDAMS	Can Resveratrol protect against lead poisoning? Using *Drosophila Melanogaster* as a model	D. M. Shehu, Rashidatu Abdulazeez, Muhammad H, Salisu	Zoology	Life Sciences	1,773,476.50 NGN
Abdullahi Balarabe SALLAU	Production, Characterisation and Application of Quercetin - Based Nanoparticles in Bioremediation of Hexavalent Chromium	Uche Samuel Ndidi, Mariam Salifu	Biochemistry	Life Sciences	1,809,480.00 NGN
Usman Kankara MUSA	Radiological and heavy metal assessment of vegetables dried locally along major highways in Northern Nigeria	Rabiu Nasiru, N. N. Garba	Physics	Physical Sciences	1,232,935.00 NGN
Abdelghaffar Amoka ABDELMALIK	Assessment of Ageing signature of Transformers in Kaduna Electricity Distribution Network	Abdulsalam Ismaila	Physics	Physical Sciences	1,591,600.00 NGN
Nurudeen Nasiru GARBA	Investigation of Radiation shielding abilities of some local building materials commonly used in North-western Nigeria	Rabiu Nasiru	Physics	Physical Sciences	1,434,500.00 NGN
Aminu ISMAILA	Development of an Efficient Combustion Technique for Biofuel Utilisations in Small and Medium Scale Industrial Heatings	Muhammad Usman Kaisan, Rabiu Nasiru	Physics	Physical Sciences	1,565,000.00 NGN
Muhammad Sanusi YUSUF	Occurrence of Antimicrobial Resistant Escherichia coli and Dissemination of Antimicrobial Resistance Genes in Some Livestock Farms and Veterinary Clinics in Kano State, Nigeria	Mohammed Bello	Veterinary Public Health and Preventive Medicine	Veterinary Medicine	1,901,000.00 NGN

Daniel Obinna ESONU	Molecular Epidemiology of Cryptosporidium infection in sedentary herds in selected Local Government areas of Kaduna State, Nigeria	Junaidu Kabir	Veterinary Public Health and Preventive Medicine	Veterinary Medicine	1,898,580.00 NGN
Grace Sabo Nok KIA	Evaluation of Rabies Situation and Impacts of Efforts to Control the Disease: Case Study of Sabon Gari Local Government Area, Kaduna State, Nigeria	Jacob K. P. Kwaga	Veterinary Public Health and Preventive Medicine	Veterinary Medicine	1,904,734.00 NGN
Yusuf Musa ABUBAKAR	Influence of Radiation Sterilisation on Polymeric Medical Devices	Abdelghaffar Amoka Abdelmalik	Physical Sciences	Physics	1,896,000.00 NGN
Muhammad Vatsa ABDULLAHI	Fractal Dimensional Analysis of Cellular Response of Blood and Liver to X-Irradiated Rats	Kolawale M. Lawal	Physics	Physics	1,021,250.00 NGN
Joseph O. OSUMEJE	The improvement and evaluation of 3-D resistivity interpretation software for subsurface exploration using a realistic earth model as control	Daniel Eshimiakhe, Yusuf A. Bello	Physical Sciences	Physics	1,540,130.00 NGN
Abdulsalam ISMAILA	Development of Ion Implanted Carbon-Based Surface coatings for Solar Cell Efficiency Enhancement	Abubakar Khaleed Abubakar, Anthony Miller	Physical Sciences	Physics	1,895,603.90 NGN
Abdulhakim ABUBAKAR	Toxicological, Antihyperglycaemic and Mechanistic Studies on *Chlorophytum Alismifolium Baker (Liliaceae)* in Wistar Rats	Idris Mohammed Maje	Pharmacology and Therapeutics	Pharmaceutical Sciences	1,893,100.00 NGN
Ibrahim ISA	Field method for detecting Dengue Virus Serotypes in Humans and Vectoral Competence of Aedes aegypti and Aedes albopictus: A local model of Xenomonitoring	Iliya Shehu Ndams, E. E. Ella	Zoology	Life Sciences	1,900.000.00 NGN
Bayo KAMBA	Evaluation of Mosquitoes and *Wuchereria Bancrofti* populations in persistent transmission areas of selected Local Government Areas of Bauchi State, Nigeria	Ezekiel Kogi, Umar Aliyu	Zoology	Life Sciences	1,820,000.00 NGN
Hajara IBRAHIM	Phytochemical and anti-viral studies of potential herbal remedies for the treatment of SARS-CoV-2 and its symptomatic complications	Umar Habibu Danmalam, Garba Ibrahim, Umar Adam Katsayal, Maryam Aminu, Salisu Shehu, Umar Faruk Shehu	Pharmaceutical Sciences	Pharmacognosy and Drug Development	1,855,212.50 NGN
Abdulmumin Abdulkadir NUHU	Optimisation of Analytical Methods for the Adsorptive Removal of Chlorophenol from Aqueous Matrix by Zeolite Materials prepared from Selected Agricultural Wastes	Z.N. Garba, H. Ibrahim	Chemistry	Life Sciences	1,834,800.00 NGN

Emmanuel Oluwadare BALOGUN	Toward design of novel inhibitor against Phospholipase A2 of *Rrypanosoma brucei gambiense* for development of new drugs for African trypanosomiasis	Oluwafemi Abiodun Adepoju, Bashiru Ibrahim,Orif, Tomoo Shiba	Biochemistry	Life Sciences	1,904,640.00 NGN
Bello MUKHTAR	Development of Pt-Fe2O3/rGO-Biomass Catalyst for Methanol Oxidation Reaction for Potential Application in Dire ct Methanol Fuel Cell	Abdulhamid Hamza, Suleiman Magaji	Chemical Engineering	Engineering	1,838,532.50 NGN
Abubakar Umar ANKA	Assessment of Hepatitis B virus susceptibility and some prevalent immunological markers among blood donors attending Ahmadu Bello University Teaching Hospital Zaria	Tahir Mohammed Ibrahim	Medical Laboratory Science	Allied Health Sciences	1,780,600.00 NGN
Rukayya Adebisi ABDULRAUF	Evaluation of the Effects of Chronic Administration of Apple Cider Vinegar (ACV) on Gastrointestinal Mucosal Integrity, Gut Flora and Some Digestive Enzymes in Male Wistar Rats	Jimoh Abdulazeez	Human Physiology	Basic Medical Sciences	1,631,075.00 NGN
Abdulmumin Zayd ABUBAKAR	Chemical and Anticancer evaluations on the stem bark extract of *Commiphora Africana (Rich) Engl. (BURSERACEAE)*	Abdulrahman ADAMU	Pharmacognos y and Drug Development	Pharmaceutical Sciences	1,902,500.00 NGN
Maryam Baraka AKOR-DEWU	Preliminary Evaluation of Lipid Peroxidation, Some Respiratory and Inflammatory Parameters of Grains Millers in Zaria, Kaduna State	Ramatu Idris, Yahuza Attahiru	Human Physiology	Basic Medical Sciences	1,800,000.00 NGN
Muhammad Tukur IBRAHIM	Molecular Modelling and Structure-Based Design of some non-small Cell Lung Cancer (NSCLC) Therapeutic Agents	Adamu Uzairu	Chemistry	Life Sciences	1,479,000.00 NGN
Zainab Mahmood BAUCHI	Evaluation of the geroprotective and neuroprotective Effect of Minocycline in Adult *Drosophila melanogaster*	Abel Nosereme Agbon, Sohnap James Sambo, Sunday Abraham, Oluwasegun Davis Olatomide	Human Anatomy	Basic Medical Sciences	1,748,200.00 NGN
Abdullahi Umar BELLO	Molecular modelling strategy to design novel anticancer agents against melanoma cells with prediction of their drug likeness and pharmacokinetic properties	Adamu Uzairu	Chemistry	Physical Sciences	1,942,500.00 NGN
Sunday Abraham MUSA	Cytogenetic analysis of Children with Down Syndrome and its associated risk factors in Kano State Nigeria	Abdulhakeem Miko Muhammad	Human Anatomy	Basic Medical Sciences	1,924,900.00 NGN

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