

WELCOME ADDRESS

It gives me great pleasure to welcome you to the fifth edition of the KEEP Bulletin.

This edition shares achievements of KEEP realised in inventions, success stories, seminars and competitions won in the College of Engineering.

I am excited to inform you that, the Association of African Universities (AAU) under the Africa Center for Excellence (ACE) Impact Project has awarded a grant of one hundred thousand united states dollars (US\$ 100,000.00) to support activities of the Colleges of Engineering in the West African Sustainable Engineering Network for Development (WASEND) of which College of Engineering, KNUST is the host for the first two years. For more information, kindly visit wasend.org.

Meanwhile, the postgraduate building project for KEEP is currently more than halfway done, at 55% completion, and the anticipated completion date is March 2022.

Also, the KNUST College of Engineering Endowment Fund is operational and is geared towards ensuring the sustainability of KEEP. Contributions are welcome and should be directed to the following bank details:

Account Name: **KNUST COLLEGE OF ENGINEERING
ENDOWMENT FUND**

Account Numbers: **904 000 824 8502 (Cedis Account)**
904 000 952 7588 (US Dollar Account)

Bank Name: **STANBIC**

Swift Code: **SBICGHAC**

Bank Address: **P. O. Box CT 2344 Cantonments, Accra**

Branch: **KNUST**

KEEP sincerely appreciates all alumni who have filled the alumni google form. If you are yet to do so, please follow the link (<https://forms.gle/xnPsNCJXDC28s7kU8>) to complete the information on your basic bio-data; this should not take more than 2 minutes of your time.

We welcome contributions and suggestions from stakeholders and readers to help improve future editions. Please send all such suggestions and enquiries to keep@knust.edu.gh.

I believe it is not out of place to wish you a Happy New Year.

Cheers!



Prof. Kwabena Biritwum Nyarko
(Project Lead, KEEP)

In this edition

- [Seminar on Spray Formation and Combustion in Direct-Injection SI Engines with Diverse Fuels](#) 3
- [KEEP hanging out with Mr. Edmund Fianko](#) 4
- [College of Engineering of KNUST Wins 2021 IEEE Paper Competition](#) 9
- [Research Corner](#) 11

College of Engineering invents **Cocoa Pod Breaker and Separation Machine**



The two halves then fall in a separator which separates the beans from the pod. The beans then fall into a receptacle below, and the husk is thrown out.

Prof. Adom-Asamoah explained that an evaluation of the initial prototype of the invention revealed some lapses in which the pod was not well clamped on the conveyor, resulting in an incomplete separation process, thus affecting its performance and efficiency. A redesign and further fine-tuning have increased the machine's efficiency significantly, being able to process 60 pods per minute. As a result, its rate of efficiency of separating the beans from the pod currently stands at 97%.

He further indicated the intention and interest in mass-producing the machine to meet the needs of farmers.

The Department of Mechanical Engineering of the College of Engineering at KNUST has invented a Solar-powered cocoa pod breaker and separation machine. The machine is expected to help address the increasing challenge of cocoa beans damage during the breaking and separation process, which was hitherto undertaken manually with a machete or cutlass.

The machine was showcased during an exhibition session that displayed some inventions of the College of Engineering at the 9th KNUST Summer School held on Tuesday, 31st August to Friday, 3rd September 2021.

According to the Provost of the College, Prof Mark Adom-Asamoah, the safe removal of the beans from the pod is critical

to the sustainability of the cocoa value chain. However, a lack of machinery and accompanying technology in Ghana to ensure this has led to many post-harvest and processing losses to the country, globally and locally.

“This machine will avert fatigue, the risk of injury among workers, damage to the beans, and low productivity, which are peculiar in the use of a machete”, he said.

The machine comprises two conveyors with loaders and two blades (one at the top and one at the bottom), and a prime mover drives the load.

A demonstration showed that the pods are split into two halves when pushed between the blades.

Production Team

Editor-in-chief: Prof. Kwabena B. Nyarko **Managing Editor:** Kwadwo Nyantakyi Marfo

Content Editor: Irene Otuba Nunoo **Production Editor:** Francis K. N. Nunoo

The Department of Mechanical Engineering Organises a Seminar on **Spray Formation and Combustion in Direct-Injection SI Engines with Diverse Fuels**



captions

The Seminar took place on Wednesday, 7th October 2021. Prof. George Yaw Obeng, Dean of the Faculty of Mechanical and Chemical Engineering, Prof. Albert Sunu, the Head of Mechanical Engineering Department, a section of lecturers and students of the Mechanical Engineering Department, were present at the Seminar.

Dr Ajabofu Angoye, an alumnus of the College, from Imperial College, London led the session. His presentation covered

Spray Formation, Spray Image Processing and Spray Wall Impingements experiments. He further took participants through Airflow Characteristics, Combustion Characteristics and Laser Sheet Flames Tomography.

He ended his presentation with emphasis on deepening the collaboration between KNUST College of Engineering and Imperial College, London. He reiterated that Imperial College has capabilities in machinery, research works and experiments.

He added that a lot of fundamental research and laboratory experiments can be achieved through collaboration.

KEEP HANGING OUT WITH **ING.** **EDMUND FIANKO,**

Ag. Head of Engineering at the National Communications Authority



Mr. Edmund Fianko, Ag. Head of Engineering at the National Communications Authority.

engineering shouldn't be read at the undergraduate level?

Ing. Fianko: I believe it is okay to read Telecommunication Engineering at the undergraduate level. It is what one makes of the programme and not about the programme's title. There are several common courses in the current programme they do before they branch out. Even during our time in Electrical Engineering, we still had electives, either power, telecom or computer controls, before each was developed into a unique programme. The programme can be designed to enable students to move across disciplines if necessary.

KEEP: Could you tell us about your postgraduate studies?

Ing. Fianko: I did my masters in Communication Management at the Buckinghamshire (Bucks) New University in England. It is a management course with applications to the communications industry. I studied courses such as Human Capital Management, Project Management and Strategic Management. The specific industry programme was the Legal Regulatory and Policy Environment for Communications, which discusses things related to the telecommunication industry.

KEEP: What values helped you climb the corporate ladder so quickly?

KEEP: Who is Mr. Edmund Fianko

Ing. Fianko: Mr. Edmund Yirenkyi Fianko is a Telecommunication Engineer and a Reverend Minister of the Methodist Church Ghana. I hail from Akuapem Larteh and attended basic school at St. Martin de Porres School in Dansoman. I attended Pope John Secondary and Junior Seminary in Koforidua for my senior high

school education and then to KNUST, where I studied Electrical and Electronic Engineering. I had my National Service with the National Communications Authority, where I rose through the ranks as an Officer and currently, I am the Acting Head of the Engineering Division.

KEEP: Are you also of the belief that telecommunication

Ing. Fianko: Even though I started from the bottom at the organisation, I had several accelerated promotions along the way, and I will attribute them to three things;

One is applying your gift to your work. By the grace of God, I have excellent writing and editing skills. I was the editor-in-chief of the POJOMAG (Pope Johns Senior High School Magazine). During my third year at the College of Engineering, I played the Young Engineer, the Magazine of the Ghana Engineering Students Association (GESA). I happened to find myself in the regulatory environment at work, where a bulk of our output is writing, so my writing gift came in very handy. I was also made the recorder for the technical committee of the Board of Directors of the National Communications Authority. I was in the room when all of the most critical decisions were made, and all I had to do was to write for them. And I believe that was my single most important advantage, and as time went on, I built trust because I came across as discrete. So, they started asking my opinion about things, which made them look at me favourably, which I believe gave me an edge. So, applying your gift or talent to your work can help you advance quickly.

The second point is that we must invest in our excellence. There are things I taught myself or learned by myself. I buy books, and I read widely on economics, finance and law to help me manage the technical aspect of my work. It enables me to analyse issues a bit more broadly. It has also helped make me rounded in making my assessment of things a bit distinct which then makes you shine because you always have an opinion of things that everyone finds helpful.

Thirdly, I will say it's the grace of God because sometimes people are doing everything they have to do, but nobody seems to recognise or notice their work or efforts. I perceive that God's grace makes the little you do come to notice. And God moves the heart of people in authority to act on your behalf. So, the God factor is significant in one's success.

KEEP: Why the decision to study engineering, specifically electrical engineering?

Ing. Fianko: I took an interest in Engineering because I believed I could do anything I wanted to do. And I chose to study Elective Maths over Biology in Senior High School because I was told studying Elective Maths will give me a broader opportunity after school. I was also not ready to spend seven years in medical school. So, I studied Electrical Engineering because the field of electronics and computing was growing with lots of opportunities back then. It was prestigious at the time and is still one of the most competitive programmes. So, I could choose an elective in either power or telecommunications and majored in telecommunications because there were more innovations. I am passionate about innovations. And I have found in practice that there is always something new; we had 2G, 3G, 4G and now 5G.

KEEP: Do you think enough is being done to encourage postgraduate education in engineering?

Ing. Fianko: I think more can be done to encourage postgraduate engineering education. When research and development is strong, it will motivate people to pursue further knowledge in engineering and apply the

postgraduate knowledge in research and development where ever they find themselves. If Research and Development (R&D) is developed in the industry, it will make a compelling case, and postgraduate studies will be highly rated. The most important thing is the application of postgraduate knowledge, and the missing ingredient is the industrial part of research and development. If we have Research and Development in industry, it will encourage people to acquire postgraduate knowledge in Engineering.

KEEP: Is government responsible for driving this research and development agenda?

Ing. Fianko: Everything rises and falls on leadership. Countries like Korea and China have deliberate government policies to connect industry to research. If there is a deliberate government policy to encourage this, it will help. For example, suppose there is a research idea from the Council for Scientific & Industrial Research (CSIR) and there are certain incentives for investors who will choose to invest in the commercialisation of the ideas. In that case, some businessmen will take it up. We have to be deliberate about specific things to establish relationships and create enabling environments. So, government policy is very important.

KEEP: Do you think there are many opportunities for undergraduates to read postgraduate engineering courses?

mR, FIANKO: There are opportunities, but I will advise that one gets into the industry before doing further studies to gather experience and ascertain the kind of postgraduate course to pursue

and the nature of problems to be solved.

KEEP: Is the assertion of non-satisfactory performance of engineering graduates in the industry a valid one?

Ing. Fianko: It depends on the individual. Some are outstanding ambassadors of the training that KNUST offers, and others who cut corners during their training (do not do assignments and projects on their own but pay people to do it for them) are exposed to the field. It all boils down to the individual's attitude and what they make of the training.

KEEP: How true is the assertion that some graduates lack soft skills?

Ing. Fianko: Not everything can be taught in the classroom. Some skills are learned and developed during extracurricular activities, such as taking school leadership positions and being part of clubs, associations and campus groups. You develop empathy, a sense of responsibility, public speaking along the way. So school is about books and developing soft skills through well balanced extracurricular activities.

KEEP: How can the academia-industry relationship be enhanced?

Ing. Fianko: The KEEP project is an excellent initiative to build and enhance the academia-industry relationship. It is a deliberate and well-structured effort to improve the quality of training and actively involve industry players in the academic space and bridge the gap through industrial internships. I believe we are on the right path.

KEEP: Do you believe that research should be driven by industry?

Ing. Fianko: Yes, it makes research relevant. When real industry problems are investigated in academia, it positions students for a job in that industry, and lecturers get to do a lot of consulting to find solutions to problems. If research projects are carved from industrial issues, they will help solve relevant problems and concerns.

KEEP: You are in the communication and digital industry, how does the future look like, and how should students take advantage of it?

Ing. Fianko: The opportunities are enormous. And new technologies are emerging as well. In Communication, we have value-added services, in which people are developing applications and solutions that add value to telecommunication services. An example is Mobile Money which came up as a value-added service and is now an industry on its own. People in IT can also venture into programming and develop solutions that add value to existing applications. In addition, the Government is seeking to build a digital economy that presents many opportunities for electronic and communications engineering professionals.

KEEP: How did you combine academic studies with church activities as a student?

Ing. Fianko: I understood that, as I engaged in these extracurricular activities, I was developing other relevant skills. One should perceive extracurricular activities as part of the courses they are studying in the University. You

have to make time for extracurricular activities as you would for the courses you study. I believe it is all about balancing your studies and the extra activities you are involved in. In my case, I believe God also gives grace.

KEEP: How have you combined being a reverend minister and your position in the corporate world?

Ing. Fianko: Doing what we did on campus prepared us for where we find ourselves now. I have also learnt to use the team more effectively to get things done, so everything does not depend on me. I have also developed effective time management skills. Learning to be effective and efficient within the little work time available. But above all, the Lord gives grace.

KEEP: Are there any mentors / people you looked up to and would like to appreciate?

Ing. Fianko: I first and foremost want to thank God for bringing me this far. I also want to thank Ing. Dr. Adam Imoro, who was my lecturer and later became a friend who gave me a lot of counsel from his experiences. He opened up to me and taught me from his own mistakes as a career guide. I appreciate him for the role he played in my career growth.

Also, the late Major Retired Emmanuel Owusu Adansi, my first boss, gave me a lot of international exposure, which boosted my confidence. He was Director for Frequency Management at the time. I believe along the way, I benefited a lot from the help of other people, Ing. Henry Kanor, Mr Paarock VanPercy, Mr. Joe Anokye and my family. So, I say thank you to every one of them.

KEEP: What is your final advice for College of Engineering students?

Ing. Fianko: Please use your time in school to have a good relationship with God, secure eternity for yourself because it is your best time to do this, and it gives you a solid foundation and prepares you for all the challenges after school.

You must also apply yourself to diligence and allow the school to pass through you. In that, don't just look for the marks. Make sure that you gain comprehension of whatever it is you do. And always think about life after school. In my final year, I recall spending every Friday in the college library reading newspapers and looking at job advertisements. In doing that,

I was searching for what companies look out for in employing graduates and I will ask myself, "do I have these skill sets and qualities". If I didn't, I asked how do I develop them.

Please, dare to ask questions if you don't know something. You don't have to impress anyone with your ignorance.

Make the most of the opportunity you have and cultivate a positive attitude to life.

Build your relationships as well. I mentioned that, one of my lecturers became very helpful in the early stages of my engineering career. He was a rather difficult lecturer, but he became a mentor. He taught me about cross mentoring. I was helping him with his computer skills, and he was, in

turn, guiding me with my career and professional issues. So, form good relationships with your lecturers and people you have internships with.

KEEP: Thank you very much Mr. Fianko. Since the beginning of the year, we are very grateful for your help; You have been resourceful to the College, from the gap assessment to reviewing proposals for funding in relation to the CoE Innovation project. We want to use this opportunity to express our sincerest appreciation to you. Thank you so much for your priceless advice and for your time.

Ing. Fianko: Thank you too, and I wish you the very best.

Prof. Johnson Asumadu visits KNUST



Prof. Johnson Asumadu (at the left) with Prof. Kwasi Kwafo Adarkwa, former Vice-Chancellor, KNUST.

Prof. Johnson Asumadu, an International Scientific Advisory Board member of KEEP, visited KNUST on 30th September 2021.

Upon arrival at KNUST, he visited the postgraduate building and was satisfied with its progress; he was confident that it would be ready for use by the next quarter of next year. He then paid a courtesy call on Prof. Jerry John Kponyo, the Deputy Project Lead, where he had an extensive talk with him on innovations and entrepreneurship. He talked extensively about the National Science Foundation's Innovation Corps (I-Corps) in the United States, where experiential education to help researchers gain valuable insight into entrepreneurship, starting a business or industry requirements and challenges is

the vision. I-Corps enables the transformation of the invention to impact. The curriculum integrates scientific inquiry and industrial discovery in an inclusive, data-driven culture driven by rigour, relevance, and evidence. He stated that he constituted a team that participated in the exercise a few years ago and after so many presentations and meeting various market players, they were successful.

He then visited the College of Engineering Innovation Centre and was impressed at the students' projects. He was particularly impressed with a drone that had been developed to detect diseases in maize. He tasked the management of KEEP to get in touch with the Council for Scientific and Industrial Research (CSIR) as it will be of immense

benefit to them. Prof. Asumadu stated that in the development of products, end-users should always be taken into consideration or else it becomes an exercise in futility.

Prof. Asumadu, an alumnus of KNUST and a former faculty member visited his former office, now occupied by the Head of Department of Geological Engineering and it was a period of nostalgia for him. He then undertook a tour of the KNUST campus and was impressed with the massive infrastructural development. Prof. Asumadu ended his visit by paying a courtesy call on Prof. Kwasi Kwafo Adarkwa, a former Vice-Chancellor of KNUST and his very good friend with whom he attended primary school and KNUST.

College of Engineering of KNUST Wins **2021 IEEE Paper Competition**



Yaw Obeng Okofo Dartey (at the left) with Elizabeth Ayaw Oduro-Koranteng (at the middle) and Matthew Nana Kyei Siaw (at the right).

Under the College of Engineering KNUST, the Faculty of Electrical and Computer Engineering has won the undergraduate and post-graduate students' categories of the 2021 Institute of Electrical and Electronics Engineers (IEEE) Student paper Competition. The presentation was held virtually on Friday, 27th August, 2021.

The paper competition organised by the IEEE Power and Energy Society (PES) was on the topic; "Water-Energy-Food Nexus in Africa-Technology, Applications, Benefits and Challenges".

The authors of the paper; Mr. Mathew Nana Kyei Siaw, MPhil. Computer Engineering, Miss. Elizabeth Ayaw Oduro-Koranteng, BSc. Electrical/Electronic Engineering and Mr. Yaw Obeng Okofo Dartey, MPhil

Computer Engineering and the Administration Manager, College of Engineering Innovation Centre, were awarded \$400. The organisers also awarded a cash prize of \$500 to KNUST.

The competition saw entries from Ghana, Algeria, Malawi, Nigeria, Kenya, South Africa, Uganda.

The winning paper titled, "Food-Energy-Water Nexus: Food Waste Recycling System", discusses the use of food waste to provide biogas for energy production and water for irrigation purposes. The paper highlighted that a mechanical press could be used to extract liquid from food waste. This liquid is then treated and used for watering crops. The remains from the mechanical press are placed in an anaerobic digester and undergo some reactions to obtain biogas that can produce energy.

Dr. Griffith Selorm Klogo, a lecturer of the Computer Engineering Department received the award on behalf of the faculty. He expressed gratitude to the reviewers and panel for providing such an opportunity for the students.

He appreciated the students for excelling in the international competition and hoped that more students would participate in future student paper competitions.

The IEEE Power Africa Conference is a forum that provides research scientists, engineers, and practitioners the opportunity to present and discuss the latest research findings, ideas, and emerging technology in power systems integration, business models, technological advances, policies, and regulatory frameworks for the African continent.

KEEP Scholars win the **NATIONAL CYBER QUIZ COMPETITION 2021**



Otuekong Ekpo (at the left) with Joseph Atta Yeboah (at the middle) and Solomon Dodoo (at the right)

The 2021 National Cyber Quiz Competition was organised by the Institute of Compliance and Cyber Studies to create awareness about Cyber-Security and its related issues.

The maiden edition of the quiz lasted for five days and was launched on Monday 18th October 2021 and ended on Friday, 22nd October 2021 at Knutsford University, East Legon.

Competing schools were Kwame Nkrumah University of Science and Technology, University of Ghana, University of Cape Coast, Lancaster University, Academic

City College, Valley View University, Central University and Ghana Christian Heritage University.

KNUST was ably represented by Joseph Atta Yeboah, Otuekong Ekpo and Solomon Dodoo Attoh. They are postgraduate students of the Cyber-Security and Digital Forensics programme from the Department of Computer Science. The quiz competition featured questions in information security, cyber ethics, cyber law, emerging technologies like artificial intelligence, and blockchain.

KNUST made history by lifting the trophy for the maiden edition of the Cyber Quiz Competition. KEEP scholars won a cash prize, certificates and a sponsorship for a compliance and cyber analyst course in January 2022.





RESEARCH CORNER

RESEARCH PROFILE

Abigail Adomako

(MPhil Scientific Computing & Industrial Modelling)

Analysis of Convective Parameterization Schemes in Ghana Using REGCM Simulations in the Agro-Ecological Zones



In Ghana, a substantial percentage of farmers practise rain-fed agriculture. Growing seasons are moving throughout agro-ecological zones due to unpredictability in rainfall patterns (both in terms of amount and frequency), putting a burden on this sector of the economy.

We need precise predictions to mitigate the effects of drought, floods, and other weather-related and climate-related disasters. Numerical models are utilized

to make accurate predictions. Increasing the amount and reliability of input data, comprehending atmospheric changes, and parameterization of physical processes all contribute to enhancing these models.

The most important components of these models are most likely the sub-grid parameterization schemes, which explain physical processes that the model cannot directly solve. The purpose of parameterization development

is to understand why models predict the climatic changes, estimate how confident we can be in them, and express why we are confident in them, not just to enhance model performance and get models to agree with each other.

Model parameterised are short-wave and longwave radiation, cloud cover, planetary boundary layers, convection, and many other physical processes. The convective parameterization is a method of forecasting the combined effects of several convective clouds within a single grid unit. This study focuses on convection since it accounts for rainfall and transports heat, distributes moisture, and stabilizes the atmosphere.

Convective parameterization schemes were investigated using RegCM simulations, and the best scheme was chosen to represent each of Ghana's agro-ecological zones.

Improved forecasts would allow us to revisit our most basic understanding of atmospheric processes, and people would be more likely to base personal and financial decisions on projections.

COVID 19 AWARENESS

Cloth Masks, Less Effective in Protecting People Against COVID-19: KNUST Research Findings Reveal



According to a study undertaken by final-year undergraduate students from the Kwame Nkrumah University of Science and Technology's Departments of Medical Diagnostics and Clinical Microbiology, medical masks are more effective than cloth masks in protecting people against microbial pathogen infection.

Covid-19, according to the team, requires the usage of nose masks, which have been found to

limit viral transmission. However, in impoverished countries where medical nose masks are unavailable, cotton nose masks made without standards are utilised. According to the researchers, concerns about the filtering efficacy of these cloth masks have been raised. As a result, the students researched to compare the performance of cloth masks to the medical masks and investigate

the impact of washing and drying cycles on filtration capacity.

The study concluded that medical masks are better at protecting individuals against microbial pathogens infection than cloth masks. The team recommends wearing cloth masks in places where the risk of transmission is low. Also, repeated washing cycles of cloth masks could decrease their filtration capacity over time.

KEEP Info

Location: KEEP in Room 304 on the 3rd floor of the Petroleum Building at the College of Engineering.

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KNUST Engineering Education Project



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To make any enquiries about KEEP, you can send a mail to keep@knust.edu.gh

Contact the Project Manager for KEEP on **0502519057**