



ANNUAL RESEARCH & INNOVATION REPORT

2020 - 2021

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PROF. OTLOGETSWE TOTOLO
Vice Chancellor, BIUST

FOREWORD

The year 2020/2021 was a challenging one locally, regionally, and globally due to the COVID-19 pandemic. BIUST responded very promptly and set up a Covid19 response committee at a time when the country was in dire need of research-led innovative response strategies. To this, BIUST produced some of the materials and services that were required urgently such as Covid19 monitoring system, sanitizers and soap. The materials were distributed to the local communities as a way of corporate citizenship. During this period, many donors reduced or suspended research budgets, and this affected BIUST research income like any other academic institutions. However, we did not give up.

BIUST recorded some success stories which include winning a research chair, the OR Tambo Research Chair Initiative. This is one of the most prestigious research chairs in Africa and the only research chair that BIUST has so far. The prestige comes with the stiff competition that is involved, and BIUST emerged one of the top ten institutions in Africa that won the award. The chair is supported by The Oliver and Adelaide Tambo Foundation in partnership with South Africa's National Research Foundation (NRF) and the Department of Science and Innovation (DSI); the Canada's International Development Research Centre (IDRC); and the Ministry of Tertiary Education, Botswana.

At the national level, the greatest achievement includes the research award that we received from the Ministry of Tertiary Education in support of the Botswana Satellite project (Botsat1). The project was officially kick-started by HE President Dr Mokgweetsi EK Masisi in Gaborone in December 2020. Additionally, other noteworthy achievements are the establishment of the Mining Centre situated in the Faculty of Engineering, awards granted by the Science Granting Councils Initiative to BIUST researchers, and the NRF Thuthuka grant. The University prides itself in ensuring that all students are well equipped and are market-ready in terms of employability and entrepreneurship. To enhance this, the University has signed Memoranda of Understanding with government owned and private sector companies to promote the relevance of programmes to the market. As the norm, the University hosted the National Science Week alongside the Science, Technology Engineering and Mathematics (STEM) to showcase what BIUST is offering and to get feedback from the stakeholders.

BIUST STRATEGY MAP

Strategic Focus

Based on the foregoing analysis, the essence of the University's strategy is that as Botswana's only international science, engineering and technology University, it must drive the economic and social development of Botswana and have an international outlook; it must exceed the performance and results of its peers; must have strong leadership, a competitive academia, supported by integrated and aligned management capabilities; a sound financial base and entrepreneurship culture which recognizes staff as its main asset.

Mission

Produce world class research and innovation in science, engineering and technology contributing to industry growth and development and advancement of a diversified knowledge-based economy.

Vision

Premier research-based university of science, engineering & technology internationally recognised for the quality and excellence of its teaching and learning by 2023.

Core Values

In carrying out its mission, realizing its vision and in all its actions the University is guided by the following core values:

1. **Equality and Diversity** – fair and equal treatment, respect for the rights, differences, and dignity of others, promoting an inclusive culture for all.
2. **Sincerity and Trust** – genuine, truthful, honest, transparent, integrity, reliability.
3. **High performance and Quality**– hard work, teamwork; strong work ethics;

commitment, dedication, fast-paced, successful, accountability, quality and results-oriented, ambitious, recognition and reward, talented staff, and students.

4. **Innovation** – creative, open-minded, resourceful, entrepreneurial,
5. **Quest for knowledge and understanding** - freedom of thought, inquiry and expression and the encouragement of a questioning spirit.

Financial

- To develop a long-term sustainable business model for BIUST.
- To engage in commercial Science and Technology researched projects in partnership with industry & entrepreneurs.

Stakeholder

- To deliver quality research with tangible applications & products that can support the needs of industry and society.
- To provide responsive (differentiated) programmes that will create excellent career opportunities nationally and globally.
- To ensure quality, academic excellence and the maintenance of high academic standards.

Internal Processes

- To improve the reputation and brand value of BIUST nationally and internationally.
- To develop systems and processes for the governance and efficiency of operations.
- To leverage partnerships for research that develops innovation and technology solutions for economic.
- To manage the financial resources prudently and effectively.

Learning & Growth

- To offer an employee value propositions commensurate with the international University status.

STATEMENT BY THE DEPUTY VICE-CHANCELLOR RESEARCH, DEVELOPMENT & INNOVATION



Prof. Abraham Atta Ogwu
*Deputy Vice-Chancellor Research,
Development & Innovation*

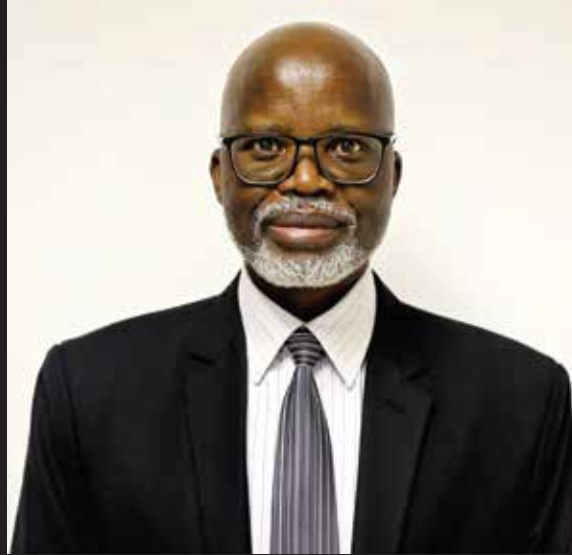
In our quest to ensure that the BIUST research community is fully capable of producing high quality research and the development of products that are of social and economic importance, the mandate of Office of Research, Development and Innovation is currently consolidated in the two directorates of Research & Development and the Technology Transfer. These directorates work as a cohesive unit to assist researchers to deliver quality research with tangible products and services that can support the needs of industry and society. To this end, the Directorate of Research and Development focuses assisting researchers with issues concerning grant application, measurement and evaluation, and project management. The Directorate of Technology Transfer facilitates and assists with issues concerning intellectual property, technology transfer and commercialization, and facilitation of prototyping.

Some of our innovative projects for product development include the Antimicrobial Toilet seat mat initiated by two postgraduate students, bricks, and commercial drones. In the Antimicrobial Toilet project, a total of BWP632,335.00 has been spent thus far. The sodium hypochlorite production from locally available salt, a project which thus far has spent BWP800,000.00. In terms of the sustainable commercial business model, the initiative to take a product to the market was viable with two products: the production of Fly-Ash and Slag Cement Bricks.

As part of the strategic goals of increasing the university's income, a total of BWP16,753,415.00 came in as sources of funding from external bodies including the Simons Foundation, Natural Environment Research Council, Botswana Innovation Hub, The Royal Society through the Future Leaders – African Independent Research (FLAIR) programme, The Royal Academy of Engineering and Global Challenges Research Fund. These are just a few of the innovative projects that are active within the University.

In addition, total research funds in terms of awards received by BIUST Researchers has amounted to BWP30,269,443.00 financing a wide range of disciplines including climate change and planetary science in collaboration with other institutions regionally and internationally. During this period under review, the response rate by BIUST Researchers to funding opportunities had increased significantly.

STATEMENT BY THE DIRECTORATE OF RESEARCH AND DEVELOPMENT



Prof. Ochieng Aoyi
Director, Research & Development

African countries have an obligation to find solutions to the problems in the Continent and Botswana is not an exception. To achieve this, there is a need for a systematic and coordinated approach to seek and apply knowledge relevant to our situation. As a research-intensive university, BIUST is expected to be at the pinnacle of the mountain of knowledge in Botswana and in the region. This is a very high expectation that must be managed very carefully. To meet this expectation, BIUST researchers have been working very hard to acquire resources needed to conduct research that adds quality to life at national and international levels. In 2020, this task came with added challenges including the Covid19 pandemic, which significantly affected the flow of funds as most donors focused their attention on the pandemic. The impact of the pandemic was largely seen in the research outputs and their impact. The year under review received a citation impact of 0.94 compared to the previous year (2019/2020) which recorded a citation impact of 1.05, representing a 0.11 drop. However, for a young institution like BIUST, the citation score is considered good since the international best practice indicates the acceptable score for such an institution is 0.67.

One of the prerequisites for doing research is the ability to attract funding. This was made difficult by the pandemic since a lot of resources were directed towards fighting the pandemic. However, there were some noticeable achievements:

- a.** Intra-Africa Academic Mobility scheme of the European Union funded Planetary and Space Science Project.
- b.** Long-term Europe Africa Partnership on Renewable Energy (LEAP-RE) which aims to make renewable energy available to rural communities of which BIUST is in a consortium of 96 institutions. The project has been awarded 15 million euros of which BIUST will receive 0.24%.
- c.** The cube satellite (CubeSat) project. The cube satellite will serve as Botswana's first satellite to generate useful satellite data to solve developmental challenges in Botswana especially in the agricultural and tourism industries which will influence smart farming, and real-time virtual tourism. In the year 2019/2020 our success rate in attracting external research funds was 40%. This was very good given the fact that many African institutions of higher learning have reported success rates less than 10%. We must collectively strive to keep or improve on this great achievement for which most credit goes to dedicated BIUST researchers who make all of us proud.

DIRECTORATE OF TECHNOLOGY TRANSFER

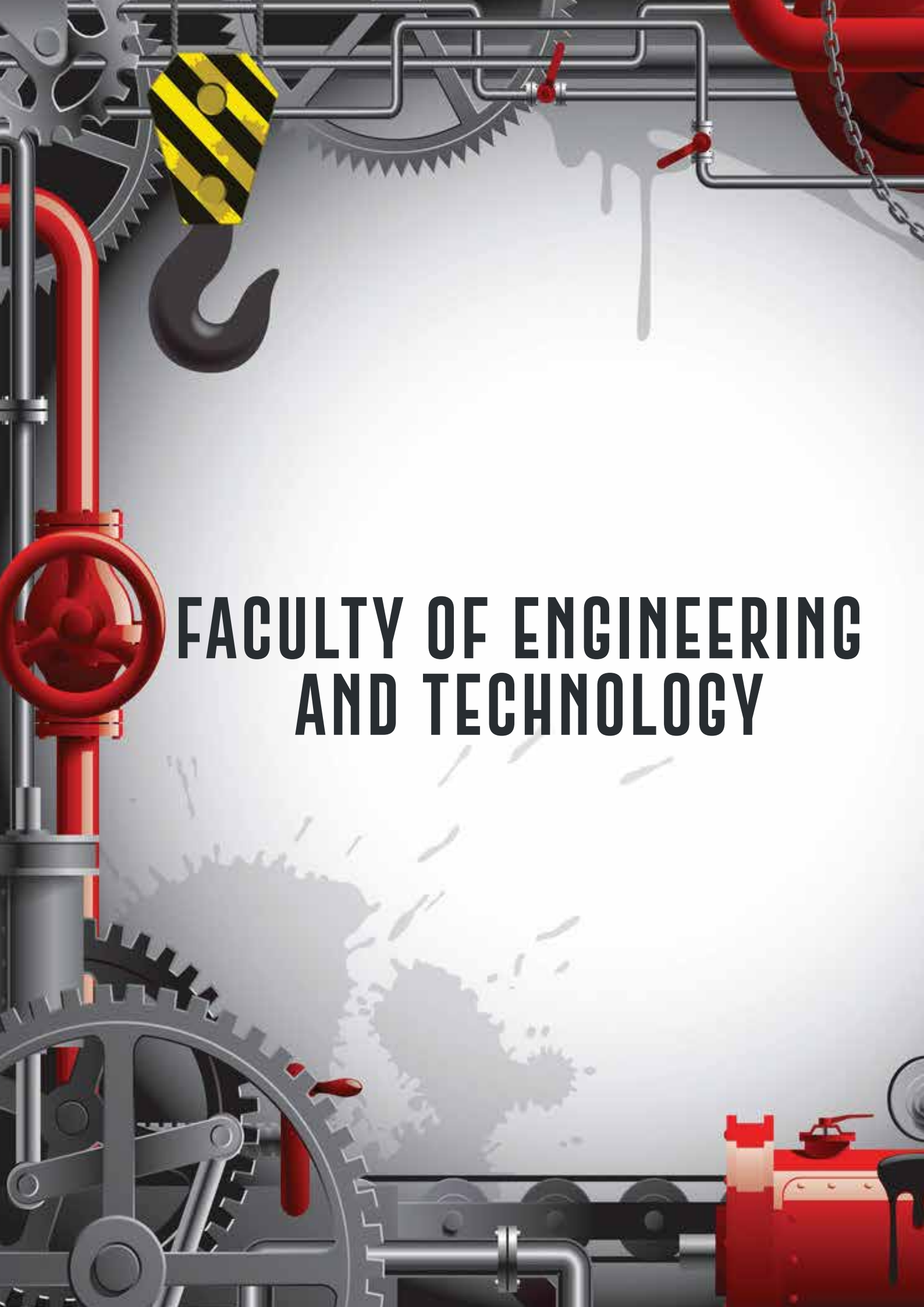


Dr. Dimane Mpoeleng
Acting Director, Technology
Transfer

The mandate of the Directorate of Technology Transfer is to facilitate the administration of world class research undertaken at the University into tangible products and services that positively impacts on industry and society thereby contributing to the uptake of knowledge-based economy initiative in Botswana. This is in line with the University Vision 2023. The Directorate manages the development of technologies from a non-disclosure through feasibility assessment that produces a prototype, and finally commercializing as a product or service. Commercialization is operable through the University's Technology Research Park after protecting the Intellectual Property of the technology.

Established in 2017, the Directorate of Technology Transfer conceived a progressive plan that encompasses imparting outlying knowledge that is not specific to the academic field of the researcher. The university successfully registered to be Technology and Innovation Support Center (TISC) through the World Intellectual Property Organization (WIPO) to enable it to offer specialist assistance in a wide range of services to researchers including patent and trademark search as well as copyrights. The Directorate established, and offered training, to Intellectual Property Champions who were selected from the Faculty of Engineering and Faculty of Science. During the 2020/21 financial year, the University undertook to convert three research projects to products and services and only managed to convert two research projects into products which is a 66% achievement.

The Directorate upholds an environment that is favorable to research taking into consideration that the University researchers are interrupted by other vital academic pursuits like lecturing and publishing. The eliminating bureaucratic red tape continues to be a challenge. Although the Directorate started being allocated budget to work with from the 2019/20 financial year, it still faces the problem of funding which adversely affects both the technical and business feasibility study performed eight projects at the Technology Research Park. Another challenge is that fact that academic peer review papers which are published in journals do not necessarily guarantee the development of products and services that address the needs of industry and society hence the below par contribution to technology transfer.

The background features a complex industrial scene. On the left, a large grey gear is partially visible, with a red pipe and a red valve handle extending from it. A black crane hook with a yellow and black striped safety cap hangs from the top. In the upper right, a network of grey pipes with red valves is shown. The bottom left shows another large grey gear with a red handle. The bottom right features a red cylindrical component, possibly a tank or container, with a red valve handle. The overall color palette is dominated by red, grey, and black, with a white background. The text is centered in a bold, black, sans-serif font.

FACULTY OF ENGINEERING AND TECHNOLOGY

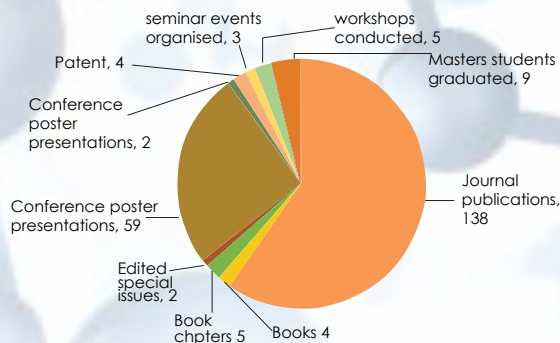
FACULTY OF ENGINEERING AND TECHNOLOGY



Prof. Joseph M. Chuma,
Dean- Faculty of Engineering
& Technology

Research Performance Summary

The Faculty of Engineering and Technology (FET) has done very well in key research activities; with 138 journal publications, 4 books, 5 book chapters, 2 edited special issues, 59 conference presentations, 2 conference poster presentations and 4 patent application submissions. The faculty organized 3 seminar events, conducted 5 workshops, and graduated 9 master's students. For the year 2020/21, the faculty has attracted research funding of BWP 767,774 in terms of awards and BWP 3,374,489 in terms of research income. The faculty achieved excellent performance in research publications and acquiring funding.



Research Income

Awards

BWP 767,774

Research Funding

BWP 3,374,489

Figure 1: FET Research Performance Summary

Faculty Research Focus Areas

The Faculty Research focus areas are guided by the University research focus areas as outlined in the BIUST research strategy. These focus areas are:

1. Climate and Society
2. Natural Resources Management
3. Innovative Technological Products and Services for Economic Development
4. New Frontiers in Science

Faculty Performance in Key Research Activities

Faculty research outputs, activities, events, and awards are consolidated quarterly. The Faculty of Engineering and Technology outputs, activities, events, and awards for the year 2020/2021 are presented below.



4
Patents



138
Journal Articles



9
Book/Book
Chapter



61
Conference
Contribution



2
Editorial Works



5
Membership



8
Seminars/
Workshops



4
External Funding
Awards



9
Postgraduate
Students Graduated

There are five departments in the Faculty of Engineering. These are;

1. Chemical, Materials and Metallurgical Engineering
2. Civil and Environmental Engineering
3. Electrical, Computer and Telecommunications Engineering
4. Mechanical, Energy and Industrial Engineering
5. Mining and Geological Engineering.

Their research performance is summarized below.

Chemical, Materials and Metallurgical Engineering



53
Journal Articles



43
Conference Papers



5
Books/Book
Chapters

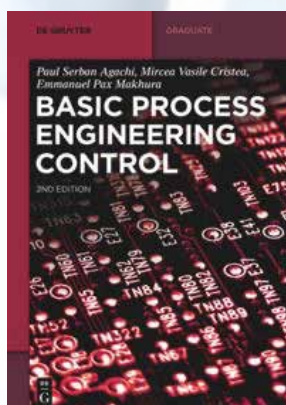


3
External Funding
Awards



1
Postgraduate
Student Graduated

Books



Agachi P.S., Cristea M.V., Makhura E.P. (2020), Basic Process Engineering Control, 2nd edition,

<https://doi.org/10.1515/9783110647938>

This book provides the methods, problems, and tools necessary for process control engineering. This comprises process knowledge, sensor system technology, actuators, communication technology and logistics, as well as the design, construction, and operation of control systems. Beyond the traditional field of process engineering, the authors apply the same principles to biomedical processes, energy production and management of environmental issues. The book also contains study questions at the end of each chapter. New information in the 2nd Edition include the following:

- Solved problems with MATLAB code provided
- Additional information on PLC, electronic valves, and in-pipe pH control.



Manyuchi, M.M., Mbohwa, C., Muzenda, E. and Sukdeo, N., (2020), Environmental Impact Assessments and Mitigation, 9780367220112

Environmental Impact Assessments and Mitigation examines various assessments for developmental projects in the housing, mining, energy, and waste management areas. As the world continues to shift toward concerns over climate change and environmental protection issues, developmental projects must have environmental impact assessments (EIA) conducted as well as environmental management plans (EMP). This book describes how all phases of a project, from planning, to operation, to post operation, must consider potential environmental impacts and their mitigation.

It contains: Numerous sustainable development considerations for key industries. Discussions on how environmental impact assessments are prepared for each stage of a project. Description of different environmental management plans for established projects. Mitigation plans for various potential environmental impacts.

Book Chapters

1. Mwema F. M., Akinlabi E., Oladijo P., Fatoba O.S., Akinlabi S.A., Tǎlu S. (2020), Advances in manufacturing analysis: fractal theory in modern manufacturing "Modern Manufacturing Processes", 1st edition
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Journal Articles

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- energy applications through pyrolysis, *International Journal of Materials, Mechanics and Manufacturing*, vol. 8, no. 2, pp. 46-49.
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Conference Papers

1. Abegunde O., Akinlabi E., Oladijo P. (2020), Developing an empirical relationship for optimizing surface roughness of TiC thin film grown by magnetron sputtering using Taguchi analysis, *Materials Today: Proceedings*
2. Ayodele, O.O., Awotunde, M.A., Adegbenjo, A.O., Shongwe, M.B., Obadele, B.A., Olubambi, P.A. (2020), Synthesis and heating rate effect on the mechanical properties of NiAl intermetallic compound, *Materials Today: Proceedings*
3. Akinwamide, S.O., Akinribide, O.J., Mafafo, M., Phumlani, M., Obadele, B.A., Abe, B.T., Olubambi, (2020), Effect of TiN addition on corrosion behavior of spark plasma sintered 304L austenitic stainless steel in chloride media, *Materials Today: Proceedings*
4. Semetse, L., Obadele, B.A., Raganya, L., Olubambi, P.A., (2020), Wear studies of spark plasma sintered ZrO2 reinforced Ti-6Al-4V alloy, *Materials Today: Proceedings*
5. Ayodele, O.O., Awotunde, M.A., Shongwe, M.B., Obadele, B.A., Babalola, B.J., Olubambi, P.A. (2020), Densification and microstructures of hybrid sintering of titanium alloy, *Materials Today: Proceedings*
6. Raganya L., Moshokoa N., Obadele B.A., Olubambi P.A., Machaka R. (2020), Study of the microstructure and crystal orientation of as- cast Ti-10.2Mo-19.5Nb alloy, *Materials Today Proceedings*
7. Raganya L., Moshokoa N., Obadele B.A., Olubambi P.A., Machaka R. (2020), Investigation of the tensile properties of heat-treated Ti- Mo alloys, *Materials Today Proceedings*
8. Moshokoa N., Raganya L., Obadele B.A., Olubambi P.A., Machaka R. (2020), The effect of solution treatment on the microstructure and mechanical properties of as- cast Ti-Mo alloys, *Materials Today Proceedings*
9. Emmanuel Pax, M., Muzenda, E., Lekgoba, T. (2020), Effect of co-digestion of food waste and cow dung on biogas yield, *E3S Web of Conferences*, Volume 181, Issue 2
10. Babatunde Abiodun Obadele, Ramokone Marcia Mafafo, Walter Roberto Tuckar, Peter Apata Olubambi (2020), Fabrication of AISI 304 Austenitic Stainless Steels with TiN Addition Using Spark Plasma Sintering Method, *Trends in Manufacturing and Engineering Management. Lecture Notes in Mechanical Engineering*, 2020
11. Ramokone Marcia Mafafo, Babatunde Abiodun Obadele, Bruno Pilotti, Walter Roberto Tuckart, Peter Apata Olubambi (2020), Erosion-wear Behaviour of 304 Stainless Steel Reinforced with TiN at Elevated Temperatures, *Trends in Manufacturing and Engineering Management. Lecture Notes in Mechanical Engineering*, 2020
12. Olayinka Oluwatosin Abegunde, Esther Titilayo Akinlabi, Oluseyi Philip Oladijo (2020), Evaluation of Process Parameters Influence on the Mechanical Properties of RF Magnetron Sputtered TiC Thin-Film Coating, *Trends in Manufacturing and Engineering Management. Lecture Notes in Mechanical Engineering*, 2020
13. Olayinka Oluwatosin Abegunde, Esther Titilayo Akinlabi, Oluseyi Philip Oladijo (2020), Temperature and RF Power Effect on the Morphology and Structural Properties of TiC Thin Film Grown by RF Magnetron Sputtering, *Trends in Manufacturing and Engineering Management. Lecture Notes in Mechanical Engineering*, 2020
14. Abegunde, O.O., Akinlabi, E.T., Oladijo, O.P. (2020), Taguchi analysis of surface roughness of tic thin films deposited by rf magnetron sputtering, *Trends in Manufacturing and Engineering Management. Lecture Notes in Mechanical Engineering*, 2020
15. Olayinka, A., Akinlabi, E.T., Oladijo, O. P (2020), Creep behaviour and adhesion properties of tic thin film coating grown by rf magnetron sputtering, *Advances in Manufacturing Engineering. Lecture Notes in Mechanical Engineering*, 2020
16. Baruwa, A.D., Akinlabi, E.T., Oladijo, O.P., Mwema, F.M. (2020), Surface coating processes: From conventional to silane organic compound applications: recent and prospects, *Advances in Manufacturing Engineering. Lecture Notes in Mechanical Engineering*

17. G Charis, G Danha and E Muzenda (2020), A sustainable conceptual model for pyrolysis to power project using lignocellulosic waste, 2nd African International Conference on Industrial Engineering and Operations Management, Harare, Zimbabwe
18. TJ Motlhatlhedii, E Muzenda and TA Mamvura (2020), Char production through the co-pyrolysis of coal and biomass in a fixed bed reactor, International Conference on Energy, Environment and Storage of Energy, Kayseri, Turkey,
19. ZSM Mazhandu, E Muzenda, M Belaid, TA Mamvura and T Nhubu, (2020), Incineration as a solution to Africa's plastic waste challenges: A narrative review, International Conference on Energy, Environment and Storage of Energy, Kayseri, Turkey
20. ZSM Mazhandu, E Muzenda, M Belaid, TA Mamvura and T Nhubu, (2020), Plastic use in a blast furnace as a reducing agent, International Conference on Energy, Environment and Storage of Energy, Kayseri, Turkey,.
21. T Nhubu, E Muzenda, M Belaid and C Mbohwa, (2020), A circumstantial review of the municipal solid waste derived greenhouse gases estimation methodologies, International Conference on Energy, Environment and Storage of Energy, Kayseri, Turkey
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23. JE Bambokela, M Belaid and E Muzenda, (2020), Fostering solar – pv hybrid mini – grids in off – grid agricultural communities of Sub – Saharan Africa: A case of the Republic of Congo, A mini review, International Conference on Energy, Environment and Storage of Energy, Kayseri, Turkey,
24. JE Bambokela, M Belaid and E Muzenda (2020), Preliminary design of biogas – solar pv hybrid mini – grid system for off – grid agricultural communities of Sub – Saharan Africa, International Conference on Energy, Environment and Storage of Energy, Kayseri, Turkey,
25. GT Bare, MM Manyuchi, S Chikosi, C Mbohwa and E Muzenda, (2020), Techno-economic assessment for the production of 400 tpd of sulphuric acid using waste sulphuric gases from coal combustion and pyrolysis, 2nd South American International Conference on Industrial Engineering and Operations Management, Sao Paulo, Brazil,
26. MM Manyuchi, C Mbohwa, and E Muzenda (2020), Application of marketing strategies in the mining sector for continuous growth, 2nd South American International Conference on Industrial Engineering and Operations Management, Sao Paulo, Brazil,
27. MM Manyuchi, C Mbohwa, and E Muzenda (2020), Application of situational leadership model to achieve effective performance in the mining organization teams, 2nd South American International Conference on Industrial Engineering and Operations Management, Sao Paulo, Brazil,
28. MM Manyuchi, C Mbohwa, and E Muzenda (2020), Business survival strategies for small scale miners to remain afloat in turbulent times, 2nd South American International Conference on Industrial Engineering and Operations Management, Sao Paulo, Brazil,
29. T Mudamburi, MM Manyuchi, C Mbohwa, and E Muzenda, (2020), Financial analysis of small scale mining organizations – case study for Zvicherwa Pvt Ltd, Zimbabwe, 2nd South American International Conference on Industrial Engineering and Operations Management, Sao Paulo, Brazil,
30. MM Manyuchi, C Mbohwa, and E Muzenda (2020), The importance of control function in effective operational planning and rational decision making in mining organizations, 2nd South American International Conference on Industrial Engineering and Operations Management, Sao Paulo, Brazil,
31. G Charis, G Danha and E Muzenda (2020), A Preliminary Environmental Analysis Model for The Pyrolysis of Acacia Tortilis Encroacher Bush, International Conference on Energy, Environment and Storage of Energy, Kayseri, Turkey,
32. G Charis, G Danha and E Muzenda (2020), Bangkok, Thailand, Virtual -Conference, IOP Conference series: Earth and Environmental Science (EES), ISSN: 1755-1315),. 2nd International Conference on Resources and Environment Science (ICRES 2020),
33. EP Makhura and E Muzenda (2020), T Lekgoba, Effect of co-digestion of food waste and cow dung on biogas yield, 5th International of Sustainable and Renewable Energy Engineering (ICSREE) Paris, France 2020
34. Raganya, L., Moshokoa, N., Obadele, B.A., Olubambi, P.A. and Machaka, R. (2021), Investigation of the tensile properties of heat treated Ti-Mo alloys. , 2020 International Symposium on Nanostructured and Advanced Materials. Materials Today: Proceedings, 38, 1044–1048.
35. Moshokoa, N., Raganya, L., Obadele, B.A., Olubambi, P. and Machaka, R., (2021), The effect of solution treatment on the microstructure and mechanical properties of as-cast Ti- Mo alloys. , 2020 International Symposium on Nanostructured and Advanced Materials. Materials Today: Proceedings, 38, 1049–1053.
36. Raganya, L., Moshokoa, N., Obadele, B.A., Olubambi, P.A. and Machaka, R., (2021), Study of the microstructure and crystal orientation of as-cast Ti-10.2 Mo-19.5 Nb alloy. , 2020 International Symposium on Nanostructured and Advanced Materials. Materials Today: Proceedings, 38, 1054–1058.
37. O.J. Akinribide, S.O. Akinwamide, B.A. Obadele, O.D. Ogundare, O.O. Ayeleru, P.A. Olubambi. (2021), Tribological behaviour of ductile and austempered grey cast iron under dry environment. , 2020 International Symposium on Nanostructured and Advanced Materials. Materials Today: Proceedings, 38, 1174–1182.
38. Adigun, O.D., Oni, A., Obadele, B.A., Olusunle, S.O., Abegunde, I.E. and Omonubi, K.B., (2021), Effect of stirring on solid solution hardening. , 3rd International Conference on Materials, Manufacturing and Modelling. Materials Today: Proceedings. 46, 7740-7744.

39. Adams, F.V., Akinwamide, S.O., Obadele, B. and Olubambi, P.A., (2021), Comparison study on the corrosion behavior of aluminum alloys in different acidic media. , 2020 International Symposium on Nanostructured and Advanced Materials. Materials Today: Proceedings, 38, pp.1040-1043.
40. Raganya, L., Moshokoa, N., Obadele, B.A., Olubambi, P.A. and Machaka, R., (2021), Investigation of the tensile properties of heat treated Ti-Mo alloys. , 2020 International Symposium on Nanostructured and Advanced Materials. Materials Today: Proceedings, 38, 1044–1048.
41. Moshokoa, N., Raganya, L., Obadele, B.A., Olubambi, P. and Machaka, R., (2021), The effect of solution treatment on the microstructure and mechanical properties of as-cast Ti- Mo alloys. , 2020 International Symposium on Nanostructured and Advanced Materials. Materials Today: Proceedings, 38, 1049–1053.
42. Raganya, L., Moshokoa, N., Obadele, B.A., Olubambi, P.A. and Machaka, R., (2021), Study of the microstructure and crystal orientation of as-cast Ti-10.2 Mo-19.5 Nb alloy. , 2020 International Symposium on Nanostructured and Advanced Materials. Materials Today: Proceedings, 38, 1054–1058.
43. O.J. Akinribide, S.O. Akinwamide, B.A. Obadele, O.D. Ogundare, O.O. Ayeleru, P.A. Olubambi. (2021), Tribological behaviour of ductile and austempered grey cast iron under dry environment. , 2020 International Symposium on Nanostructured and Advanced Materials. Materials Today: Proceedings, 38, 1174–1182.

Postgraduate Student Graduated

Lekgoba Tumeletso

MEng CHEMICAL ENGINEERING (2020)

Project Title: Thermodynamics and Kinetics Studies of Metal Adsorption on Coal Fly Ash Based on a Binary Mixture of Copper and Nickel

Major Projects and Contribution Sodium Hypochlorite Production

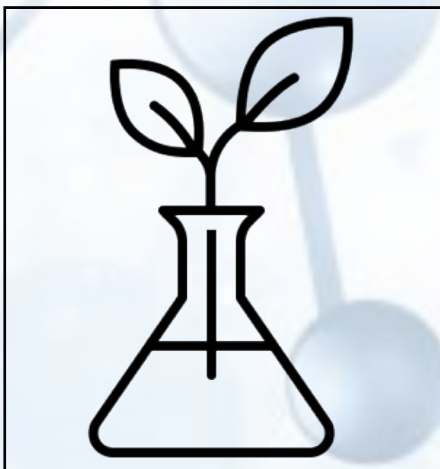


Innovator (internal): Prof. G. Danha

Assistants: Mr. G. Mosanga, Ms. J. Rakereng

Prof. G. Danha is working on producing chlorine, sodium hydroxide and hydrogen from locally available salt (sodium chloride). He is assisted by two postgraduate students, Mr. G. Mosanga and Ms. J. Rakereng. The project commenced in June 2020, and the proposed project end date is June 2022. The team has completed the installation of a module pilot plant for sodium hypochlorite and they will also do some tests for the freshly produced sodium hypochlorite. In the year under review, a total of BWP 80 000.00 had been used in the project.

Integrated Gasification Combined Cycle (IGCC) Power Plant



Innovator (internal): Ms. M. Makoba

Ms. Makoba is working on the production of syngas from Botswana coal through the gasification process. Project objectives include synthetic gas production, mechanical designs & installation, electrical designs installation and product verification & validation. The process of determining the best parameters for syngas production has been completed, and the innovator is currently working on the mechanical design and procuring a gas turbine and a generator. Ms. Makoba started working on the project on the 6th January 2020 and the project end date is October 2022. A total of BWP 202 666.00 has been used so far in the project. The innovator has been allocated an office at the BIUST Technology Incubation Park.

Litter Pyrolysis Proof of Concept Plant



Innovator(internal): Mr. D. Botha

Mr. Daniel Botha is working on a proof-of-concept poultry litter pyrolysis plant where the objective is to set up a Proof of Concept of a 2 tonnes per day plant. He is currently working on the final stages of construction of the plant. The project was given a period of 24 months to be completed and a total BWP 1572 008.00 funds have been used so far in the project. Mr. Botha has been allocated an office at the BIUST Technology Incubation Park.

Liquid and Bar Soap project



Principal investigator: Dr. G. Danha

The project was conceived under the Materials & Mineral processing group which is made up of lecturers in the BIUST's department of Chemical, Material & Metallurgical Engineering, Mr. Steven Majoni from BITRI, and Mr Moses Kabomo from the University of Botswana. A business plan was drawn up for this project with the help of the Local Enterprise Agency (LEA).

Prof. E. Muzenda and Prof. G. Danha win SGCI Awards



Prof. E. Muzenda



Prof. G. Danha



Figure 2: SGCI Award

BIUST's Prof. Edison Muzenda and Prof. Gwiranai Danha have been awarded grants for their respective proposed research work from The Botswana Innovation Hub, and Research Council of Zimbabwe under the Science Granting Councils Initiative (SGCI). Prof. Muzenda has been awarded a research fund for the research project titled "Coal Beneficiation for the Metallurgical Industry", while Dr. Danha's proposed research will be on "Development of Novel Nano-Engineered Reagents for Mineral Froth Flotation". Each project is a collaborative effort with research activities being done in Botswana and Zimbabwe. The grants awarded total 1 million Pula (BWP500,000 each) SGCI Grant Awards to Prof Muzenda, and Dr Danha for the research carried out in Botswana, while a total of US\$60, 000 (US\$30,000 each) will be for the research carried out in Zimbabwe.

Dr. B. Obadele awarded NRF Thuthuka Grant

**National
Research
Foundation**

The NRF Thuthuka grant awarded to Dr. B. Obadele will be used for the development of titanium-based biotribocorrosion resistant biomedical materials.

Civil and Environmental Engineering

13
Journal Articles



1
Conference Papers



5
Workshops Attended



1
External Funding Award

Journal Articles

1. Thumule, S., Elias, K. (2020), Evaluation of waste stabilisation pond units for treating domestic wastewater, *Water and Environment Journal* <https://doi.org/10.1111/wej.12641>.
2. Ayeleru, O.O., Dlova, S., Akinribide, O.J., Ntuli, F., Kupolati, W.K., Marina, P.F., Blencowe, A., OLUBAMBI, P.A. (2020), Challenges of plastic waste generation and management in sub-Saharan Africa: A review, *Waste Management* Vol.110.
3. Lebitsa G., Heymann G., Rust E. (2020), Excess pore pressure generation during slurry deposition of gold tailings, *International Journal of Mining, Reclamation and Environment*.
4. Letshwenyo, M.W., Sima, T.V. (2020), Phosphorus removal of secondary wastewater effluent using copper smelter slag., *Heliyon* Vol.6(6).
5. Sithole, N.T., Okonta, F. and Ntuli, F., (2021), Mechanical properties and structure of fly ash modified basic oxygen furnace slag based geopolymer masonry blocks, *The Journal of Solid Waste Technology and Management* 46(3), 372-383. <https://doi.org/10.5276/JSWTM/2020.372>.
6. Sithole, N.T., Ntuli, F. and Okonta, F., (2021), Fixed bed column studies for decontamination of acidic mineral effluent using porous fly ash-basic oxygen furnace slag based geopolymers, *Minerals Engineering*, Volume 154, 106397, <https://doi.org/10.1016/j.mineng.2020.106397>.
7. Selassie David Mayunga, M. Bakaone (2021), Dynamic deformation monitoring of Lotsane bridge using Global Positioning Systems (GPS) and Linear Variable Differential Transducers (LVDT), *Journal of Data Analysis and Information Processing*, Vol. 9 No. 1 26.
8. Keboletse, K.P., Ntuli, F. and Oladijo, O.P., (2021), Influence of coal properties on coal conversion processes-coal carbonization, carbon fiber production, gasification and liquefaction technologies: A review, *International Journal of Coal Science & Technology*, 1-27, <https://doi.org/10.1007/s40789-020-00401-5>.
9. Mashifana, T., Okonta, F. and Ntuli, F., (2021), Beneficiation of Waste Fly Ash and Phosphogypsum- The Development of a New Material, *The Journal of Solid Waste Technology and Management* 47(1), 70-81, <https://doi.org/10.5276/JSWTM/2021.70>.
10. Matheri, A.N., Ntuli, F. and Ngila, J.C., (2021), Sludge to energy recovery dosed with selected trace metals additives in anaerobic digestion processes, *Biomass and Bioenergy* (144), 105869, <https://doi.org/10.1016/j.biombioe.2020.105869>.
11. Ayeleru, O. O., Dlova, S., Akinribide, O. J., Ntuli, F., Kupolati, W. K., Marina, P. F., Blencowe, A. and Olubambi, P. A., (2021), Challenges of plastic waste generation and management in sub-Saharan Africa: A review, *Waste Management* (110), 24-42. <https://doi.org/10.1016/j.wasman.2020.04.017>.

12. Sithole, N.T., Ntuli, F. and Okonta, F., (2021), Synthesis and evaluation of basic oxygen furnace slag based geopolymers for removal of metals and sulphates from acidic industrial effluent-column study, *Journal of Water Process Engineering*, Volume 37, 101518, <https://doi.org/10.1016/j.jwpe.2020.101518>.
13. Matheri, A.N., Eloko, N.S., Ntuli, F. and Ngila, J.C., (2021), Influence of pyrolyzed sludge use as an adsorbent in removal of selected trace metals from wastewater treatment, *Case Studies in Chemical and Environmental Engineering* (2), 100018, <https://doi.org/10.1016/j.cscee.2020.100018>.

Conference Paper

1. Lekgoba, T., Ntuli, F. and Mosweu, B. (2021), Treatment of Sulphate Rich Process Effluents using Coal Fly Ash, *E3S Web of Conferences* 241, 01002, ICEPP 2020, <https://doi.org/10.1051/e3sconf/202124101002>.

Seminar/ Workshop Attended

1. Ezekiel Kholoma - 19th November 2020: National Water Conservation and Demand Management (NWC&DM) Strategy – Focus Group Discussion, Energy Sector. Department of Water and Sanitation, Cresta Botsalo, Palapye.
2. Ezekiel Kholoma - 30th November 2020: Focussed Group Discussions (FDGs) for the Development of the National Water Conservation & Demand management strategy for the Institutional/Domestic water & Sanitation sector, Department of Water and Sanitation, Tlotlo Conference Centre, Gaborone
3. Ezekiel Kholoma - 24th March 2021: Consultative workshop for the development of the national water conservation & demand management strategy, Department of Water and Conservation, Cresta Botsalo, Palapye
4. Goitseone Malumbela - ERB workshop on training standards held Virtually – 2021
5. Goitseone Malumbela - International Engineering Alliance workshop held in Gaborone – 2020

Major Projects and Contribution

Slag Fly-Ash Bricks project



Principal Investigator: Prof. G. Malumbela

The project was developed with the goal of producing sustainable quality fly ash and slag bricks that reduce the use of river sand and cement. Professor Malumbela together with two former BIUST students worked on this project. They made the brick that was passed through a lab test for quality control and assurance. The project has a business plan, and the office together with the innovators will work together on the selection of a trademark.

Electrical, Computer and Telecommunications Engineering



4
Patents



35
Journal Articles



3
Books/Book Chapters



2
Editorial Work



10
Conference Contributions



5
Membership Positions



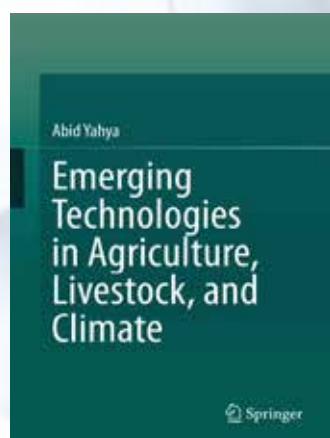
1
Seminars/ Workshops
Organized



3
Postgraduate
Students Graduated

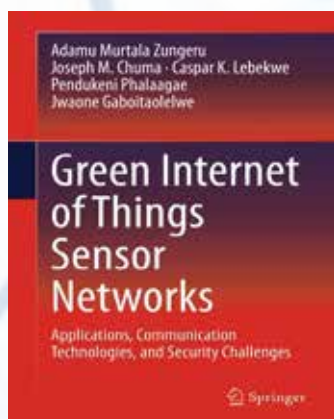
	Patent	Applicants	Date	Application No.
1	Method and System for Sorting of Diamonds	Zungeru, A.M., Modise E.G., Chuma, J.M.	September 2020	PCT/IB2020/058155 (International)
2	Method and System for Sorting of Diamonds	Zungeru, A.M., Modise E.G., Chuma, J.M.	September 2020	AP/P/2020/012636 (Regional)
3	IOT based solar powered irrigation system and method for smart agriculture	Chandan Kumar, Ravi Samikannu, Pankaj Kumar, Vineet Shekher, Saikumar Tara, Gunasekaran Manogaran, Bala Anand Muthu, S.Balamurugan	September 2020	202041037333 (Regional)
4	System And Method for Solar Powered Washing Machine For Industrial Purposes	M.K. Mariam Bee, Deepak Bhushanam, P. Jagadeesh, Ravi Samikannu	September 2020	202041030315 (Regional)

Table 1: Patents applications from Computer and Telecommunications Engineering



Yahya A, (2020), *Emerging Technologies in Agriculture, Livestock, and Climate*, <https://doi.org/10.1007/978-3-030-33487-1>

This book discusses the application of wireless sensor networks (WSN) in environmental monitoring. In addition, the book proposes innovative models to improve agricultural and livestock conditions in Africa. The book also recommends Wireless sensor network-based system for intruder detection and monitoring to minimize the human-animal disputes in Africa, and it addresses how the internet of things (IoT) can enhance agricultural production via remote monitoring technologies.



Zungeru, A.M., Chuma, J.M., Lebekwe, C., Phalaagae, P., Gaboitaolelwe, J., (2020), *Green Internet of Things Sensor Networks- Applications, Communication Technologies, and Security Challenges*, <https://www.springer.com/gp/book/9783030549824>

This book includes innovative methods for advancing green IoT sensor networks and IoT devices. In addition, the book describes the challenges, solutions, and applications for each outlined method. It outlines the design and implementation of smart IoT devices through the solving of example problems.

Book Chapters

- Zungeru, A.M., Ketshabetswe, L.K., Mtengi, B., Lebekwe, C., Chuma, J.M. (2020), "Introduction to Green Internet of Things Sensor Networks," In: *Green Internet of Things Sensor Networks Applications, Communication Technologies, and Security Challenges* https://doi.org/10.1007/978-3-030-54983-1_1

Edited Special Issue

- Ravi Samikannu, Albert A.S, Abid Yahya, Yuvaraja T, Rohini R, Karthikrajan S - Edited the Special Issue "Artificial Techniques: Application, Challenges, Performance Improvement of Smart Grid a Renewable Energy Systems, Intelligent Automation and Soft computing, Tech Science Press, September 2020.

2. Ravi Samikannu, Karthikarajan S, Sampath Kumar V, Srinivasan M, Sivaram M - Edited the Special Issue " Big Data, Analytics and Intelligent Algorithms for COVID-19", Computers Materials and Continua, Tech Science Press, September 2020.

Journal Articles

1. Venkatachary S K., Prasad J., Ravi S., Alagappan A., Baptist L.J., Raj R.A. (2020), Macro Economics of Virtual Power Plant for Rural Areas of Botswana, International Journal of Energy Economics and Policy Volume 10 (5).
2. Manimekalai P., Ravi, S., Ravichandran M. and Antony Raj, R. (2020), Review of Current Status of Fossil Fuel, Renewable Energy and Storage Devices: Context Bangladesh, International Energy Journal. Volume 20, Special Issue 3A. <http://www.rericjournal.ait.ac.th/index.php/reric/article/view/2523>.
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7. Mapunda, G.A., Ramogomana, R., Marata, L., Basutli, B., Khan, A.S. and Chuma, J. M. Indoor Visible Light Communication: A Tutorial and Survey, Wireless Communications and Mobile Computing, 2020. 8881305, 1-46. <https://doi.org/10.1155/2020/8881305>.
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9. Raj, R.A., Ravi, S., Yahya, A. and Mosalaosi, M. Investigation of Survival/Hazard Rate of Natural Ester Treated with Al₂O₃ Nanoparticle for Power Transformer Liquid Dielectric, Energies 2021, 14(5), 1510, 1-25. <https://doi.org/10.3390/en14051510>.
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12. Samikannu R., Rohini R., Murugan S., Diarra B (2020), An Efficient Image Analysis Framework for the Classification of Glioma Brain Images using CNN Approach, Computers, Materials & Continua, Tech Science Press, Vol. 63 (3).
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Conference Contribution

1. Fajemilehin, T., Yahya, A., Aldhaibani, J.A., Langat, K. (2020), Optimizing energy in cooperative sensing cognitive radios, *Communications in Computer and Information Science* Volume 1183
2. Narmatha C, Sivaram M, Manimegalai. P, Ravi Samikannu, Pallavi Murghai Goel, Juveriya Khan (2020), Improved ML Models on Feature Extraction in HIS, *International Conference on Computing and Information Technology*,
3. D Sarathkumar, M Srinivasan, Albert Alexander Stonier, Ravi Samikannu, Narasimha Rao Dasari, Raymon Antony Raj (2020), A Technical Review on Self-Healing Control Strategy for Smart Grid Power Systems, *International Virtual Conference on Robotics, Automation, Intelligent Systems and Energy (IVC RAISE 2020)* 15th December 2020, Erode, India
4. D Sarathkumar, M Srinivasan, Albert Alexander Stonier, Ravi Samikannu (2020), A Research Survey on Microgrid Faults and Protection Approaches, *International Virtual Conference on Robotics, Automation, Intelligent Systems and Energy (IVC RAISE 2020)* 15th December 2020, Erode, India
5. D Sarathkumar, M Srinivasan, Albert Alexander Stonier, Ravi Samikannu, D Vijay Anand (2020), Design of Intelligent Controller for Hybrid PV/Wind Energy Based Smart Grid for Energy Management Applications, *International Virtual Conference on Robotics, Automation, Intelligent Systems and Energy (IVC RAISE 2020)* 15th December 2020, Erode, India
6. BA Tlhabologo, G Molosiwa, O Ongadile, Ravi Samikannu (2020), Design of off-grid solar photovoltaic system using DC-DC topologies for BIUST classrooms, *International Virtual Conference on Robotics, Automation, Intelligent Systems and Energy (IVC RAISE 2020)* 15th December 2020, Erode, India
7. Sukumar Ponnusamy, Ravi Samikannu, BA Tlhabologo, W Ullah, Srinivasan Murugesan (2020), Design and development of microcontroller-based temperature monitoring and control system for power plant generators, *International Virtual Conference on Robotics, Automation, Intelligent Systems and Energy (IVC RAISE 2020)* 15th December 2020, Erode, India
8. D Sarathkumar, Murugesan Srinivasan, Albert Alexander Stonier, Ravi Samikannu, Narasimha Rao Dasari, Raymon Antony Raj (2020), A Technical Review on Classification of Various Faults in Smart Grid Systems, *International Virtual Conference on Robotics, Automation, Intelligent Systems and Energy (IVC RAISE 2020)* 15th December 2020, Erode, India

Membership in External Bodies

	Membership	Title	Faculty Member	Department
1	2021 Region 8 IEEE Botswana Subsection Executive Committee	Chairperson	Dr. B. Basutli	Electrical, Computer and Telecommunications Engineering
2	2021 Region 8 IEEE Botswana Subsection Executive Committee	Secretary	Dr. B. Mtengi	Electrical, Computer and Telecommunications Engineering
3	2021 Region 8 IEEE Botswana Subsection Executive Committee	Treasurer	Dr. B. Sigweni	Electrical, Computer and Telecommunications Engineering
4	2021 Region 8 IEEE Botswana Subsection Executive Committee	Membership Development	Eng. Ms L. Ketshaabetswe	Electrical, Computer and Telecommunications Engineering
5	Frontiers in Robotics and Artificial Intelligence	Guest Editor	Prof. R. Jamisola	Mechanical, Energy & Industrial Engineering
6	International Professional Recognition Council for Research Management, Recognition	Research Management Professional	Prof. J. Chuma	Electrical, Computer and Telecommunications Engineering

Table 2: Membership Awarded to Researchers

Postgraduate Student Graduated

Moni Nayna Ann

MEng COMPUTER & TELECOMMUNICATIONS ENGINEERING (2020)

Project Title: *Vibration Interpretation technique for water leak detection in small diameter pipelines.*

Gaboitaolelwe Jwaone

MEng COMPUTER & TELECOMMUNICATIONS ENGINEERING (2020)

Project Title: *Design And Implementation Of A Secured Smart Home Switching System Based On A Wireless Communication And Self-Energy Harvesting*

Modise Ernest

MEng ELECTRICAL & ELECTRONICS ENGINEERING (2020)

Project Title: *A Joint Analytical Model For X-Ray Luminescence And X-Ray Transmission Diamond Sorting*

Major Projects and Contribution

SMART Energy Meter



Innovators: *Dr. N. Ditshego, Mr. Gaogane(external)*

The SMART Energy Meter is an idea that been designed to solve many limitations of the ordinary home electrical meter by providing services to the consumer through SMS along with other inbuilt features such as tamper-proof, fault detection, etc. Dr. Ditshego together with Mr. Gaogane began working on the SMART Energy Meter on the 4th of August, 2019. An in-house validation of the SMART Meter prototype by the directorate of quality management has been completed, and the Smart Energy meter will be validated by Botswana Power Corporation (BPC) The innovators are currently working on building the SMART Energy Meter App.

Automatic Dog Feeder



Innovator (internal): Dr. N. Ditshego

Dr. Ditshego is working together with Mater Spei College Senior Secondary School to develop an automatic dog feeder. The aim of the project is to design an automatic dog feeder that allows for one or more weeks of dog feeding without the need for human interference. The project is in its final stage, and the innovator has completed work on the design of the model and product design and packaging. Dr. Ditshego started working on the project on the 10th October 2019, and the proposed end date for the project is October 2021. A total of BWP 180 000.00 in funding has been used for the project.

Official Kick Start of Botswanasat-1 Project



His Excellency Dr. Mokgweetsi E.K. Masisi, BIUST Chancellor His Excellency Dr. F. Mogae and Vice Chancellor Prof. O. Totolo



SPNS Research Group Leader, Dr. B. Basutli

Satellite Stall- Students demonstration

BIUST launched the Satellite Project (BotswanaSat-1 Project) in 2020. The project will run for three years. It will be led by BIUST in collaboration with other national Academic and Research institutions. This project is aligned to Botswana's Vision 2036 goals and NDP 11 programmes, and it will contribute to Botswana's envisaged knowledge-based economy.

In addition, the BotswanaSat-1 project will contribute to most of the United Nations Strategic Development Goals (UNSDG) by influencing positive changes in the livelihood pyramid. The project has noticeable contributions to at least 12/17 United UNSDGs. To achieve most of the UNSDGs, we intend to fill some of the gaps by building Botswana's first satellite with a mission that will address the Agriculture and Tourism challenges in Botswana. The project will be led by Signal Processing, Networks and Systems (SPNS) research group. Most of the implementation work will be achieved through engagement of postgraduate students from engineering and science departments. Upon successful completion of the project, SPNS will embark on other satellite missions which will explore other satellite applications such as Communications and IoT.

Mechanical, Energy and Industrial Engineering



22

Journal Articles



1

Conference Paper



2

Workshops Organized



1

Book Chapter



5

Postgraduate Students
Graduated

Book Chapter

1. Kommula, V.P., Uziak J., Oladiran, M.T. and Tjiparuro, Z. (2021), Challenges and Opportunities of using IoT in Engineering Education: The African Perspective. The challenges and new opportunities for Higher Education Industry in a Pandemic-constrained Environment edited by Muduli, K. et al (Editors). Apple Academic Press Inc., Palm Bay, Florida

Journal Articles

1. Ncube, L.K., Ude, A.U., Ogunmuyiwa, E.N., Zulkifli, R. and Beas, I.N. (2020), Environmental Impact of Food Packaging Materials: A Review of Contemporary Development from Conventional Plastics to Polylactic Acid Based Materials, *Materials*. Volume 13. Issue 21. <https://doi.org/10.3390/ma13214994>.
2. Steyn, G.F., van der Walt, T.N., Szelecsényi, F., Perrang, C., Brümmer, J.W., Vermeulen, C., van Der Meulen, N.P., Motetshwane, M.A. and van Heerden, M.R. (2021), Large-scale production of 88Y and 88Zr/88Y generators: A proof of concept study for a 70 MeV H⁻ cyclotron, *Applied Radiation and Isotopes*, 168. 109469. <https://doi.org/10.1016/j.apradiso.2020.109469>.
3. Makoni B. C., Namoshe, M., and Matsebe, O. A front-end technique for visual gold detection and localization – Towards automation of the gold panning process., 2021 SAUPEC/RobMech/PRASA), Potchefstroom, South Africa, 2021, 1-6. <http://doi.org/10.1109/SAUPEC/RobMech/PRASA52254.2021>.
4. Kangunde, V., Jamisola, R.S., and Theophilus, A review on drones controlled in real-time., *International Journal of Dynamics and Control* (2021), 1-15. <https://doi.org/10.1007/s40435-020-00737-5>.
5. Ncube, L.K., Ude, A.U., Ogunmuyiwa, E.N., Zulkifli, R., and Beas, I.N. (2021), An Overview of Plastic Waste Generation and Management in Food Packaging Industries., *Recycling*, 6(1), 12-36. <https://doi.org/10.3390/recycling6010012>.
6. Jacek Uziak, M. Tunde Oladiran, Kurt Becker, Marian Gizejowski (2021), Assessing Chalk & Talk and Power Point Presentation Techniques for Teaching Engineering Courses., *International Journal of Engineering Education* Vol. 37, No. 1, pp. 278–286,

7. Ezekiel, D.M., Samikannu, r., Matsebe, O. (2020), Pitch and Yaw Angular Motions (Rotations) Control of the 1-DOF and 2-DOD TRMS: A survey, Archives of Computational Methods in Engineering 2020.
8. Vivekanandhan Chinnasamy, Sampath Pavayee Subramani, Sathish Kumar Palaniappan, Bhuvaneshwaran Mysamy, Karthik Aruchamy (2020), Characterization on thermal properties of glass fiber and kevlar fiber with modified epoxy hybrid composites, Journal of Materials Research and Technology Vol. 9 Issue 3.
9. Olakanmi, E.O., Malikongwa, K., Nyadongo, S.T., Hoosain, S., Pityana, S.L. Consolidation mechanism, microstructural evolution and corrosion resistance of Inconel 625 coatings, Surface Engineering 2020.
10. Mosalagae, K., Murape, D.M., Lepodise, L.M. (2020), Effects of growth conditions on properties of CBD synthesized ZnO nanorods grown on ultrasonic spray pyrolysis deposited ZnO seed layers, HeliyonOpen Access Volume 6 (7).
11. M. Tunde Oladiran, Jacek Uziak, Zeundjua Tjiparuro. (2020), Students' perceptions of Learning Experiences from the Final-Year Engineering Project., Global Journal of Engineering Education, Volume 22, Number 3 ,
12. Moshokoa, N., Raganya, L., Machaka, R., Makhatha, M.E. (2020), Microstructural and mechanical properties of Ti-Mo alloys designed by the cluster plus glue atom model for biomedical application, International Journal of Advanced Manufacturing Technology 2020. <https://link.springer.com/article/10.1007/s00170-020-06208-7>.
13. Timothy K. Mulenga, Albert U. Ude, Chinnasamy Vivekanandhan (2020), Concise review on the mechanical characteristics of hybrid natural fibers with filler content, AIMS Materials Science, Vol. 7, Issue 5.
14. Elijah, T., Jamisola, R.S., Tjiparuro, Z. and Namoshe, M. (2020), A review on control and manoeuvring of cooperative fixed-wing drones, International Journal of Dynamics and Control. <https://doi.org/10.1007/s40435-020-00710-2>.
15. Keoagile Mogorosi, Tunde Oladiran, Edward Rakgati. (2020), Mathematical Modelling and Experimental Investigation of a Low Temperature Proton Exchange Membrane Fuel Cell., Energy and Power Engineering, Vol. 12, No 11, DOI:10.4236/epe.2020.1211039.
16. Bhuvaneshwaran Mysamy, Vivekanandhan Chinnasamy, Sathish Kumar Palaniappan, Sampath Pavayee Subramani, Chandrasekar Gopalsamy (2020), Effect of surface treatment on the tribological properties of Coccinia Indica cellulosic fiber reinforced polymer composites, Journal of Materials Research and Technology, Vol.9, Issue 6.
17. Bakang M. Mokgethe, Chinnasamy Vivekanandhan, Albert U. Ude (2020), A Review on the advancement of Additive manufacturing in Industrial applications, International Journal of Advanced Research in Engineering and Technology, Vol. 11, Issue 12.
18. Timothy K. Mulenga, Albert U. Ude, Chinnasamy Vivekanandhan (2021), Techniques for Modelling and Optimizing the Mechanical Properties of Natural Fiber Composites: A Review, Fibers, Vol. 9, Issue 1.19. Yashvir Singh, Nishant Kumar Singh, Abhishek Sharma, Manish Kumar Lila, Amneesh Singla, Vivekanandhan Chinnasamy (2021), Brucea Javanica: A novel nonedible feedstock for bio-based lubricant application with the effect of ZrO₂ nanoparticles, Journal of Environmental progress and sustainable energy, Vol 40, Issue 4.
20. Mmereki, W., Jamisola, R. S., Mpoeleng, D. and Petso, T. (2021), YOLOv3-Based Human Activity Recognition as Viewed from a Moving High-Altitude Aerial Camera., 2021 7th International Conference on Automation, Robotics and Applications (ICARA). IEEE, 2021. <https://doi.org/10.1109/ICARA51699.2021.9376435>.
21. Ncube, LK, Ude, AU, Ogunmuyiwa, EN, Zulkifli, R, and Beas, (2021), An Overview of Plastic Waste Generation and Management in Food Packaging Industries. , Recycling, 6(1), 1–25 [12]. <https://doi.org/10.3390/recycling6010012>.
22. Ncube, LK, Ude, AU, Ogunmuyiwa, EN, Zulkifli, R, and Beas, (2021), Environmental Impact of Food Packaging Materials: A Review of Contemporary Development from Conventional Plastics to Polylactic Acid Based Materials. , Materials, 13, 4994, <https://doi.org/10.3390/ma13214994>.

Conference Paper

1. Mmereki, W., Mpoeleng, D., Jamisola, R.S. and Petso, T. (2021), YOLOv3-Based Human Activity Recognition as Viewed from a Moving High-Altitude Aerial Camera, 2021 7th International Conference on Automation, Robotics and Applications (ICARA), 2021. 241 246. <https://doi.org/10.1109/ICARA51699.2021.9376435>

Postgraduate Student Graduated

Kufigwa Babedi

MEng INDUSTRIAL & MANUFACTURING ENGINEERING (2020)

Project Title: Implementation of Lean Manufacturing Tools in an Abattoir: Case study of a Botswana Private Beef Abattoir

Mpodi Emmanuel Karabo

MEng MECHANICAL & ENERGY ENGINEERING (2020)

Project Title: Design Of A Dual Axis Solar Tracker Concept For Photovoltaic Applications

Nyoni Kevin

MEng MECHANICAL & ENERGY ENGINEERING (2020)

Project Title: Evaluation Of Dunaliella Salina Microalgae For Biodiesel Production- A Case Study (Botswana Ash Company)

Thapelo Tsaone Swaabow

MEng MECHATRONICS & INDUSTRIAL INSTRUMENTATION (2020)

Project Title: Predictive Analytics And The Internet Of Things: A Programmable Tool-Kit For Smart Weather

Matsagopane Gaamangwe

MEng INDUSTRIAL & MANUFACTURING ENGINEERING (2020)

Project Title: Design of a gas atomising system capable of producing suitable aluminium powder for Selective Laser Melting (SLM) process

Major Projects and Contribution

Automobile Innovative Project



Innovator(external): Mr. Batshani Sekoto

Supervisor: Dr. Z. Tjiparuro

Mr. Sekoto together with his assistants (two post graduate research assistants) are working on a project of enhancing an off-road vehicle. They began working on the project in November 2020, and the project is expected to be completed in September 2021. The team has completed the task of working on the drawings of the vehicle, building of the vehicle chassis, improving the gear box for reverse drive, and they are currently working on building the rest of the vehicle. So far, a total of BWP 250 000.00 have been spent on the project.

SolaNetwork



Principal Investigator: Dr. T. Bader

Team members: Dr. T. Oladiran, Prof. P. Makepe, Prof. R. Samikannu, Dr. G. Gamariel, Kamogelo Lesole, Keisang Ketshepaone, Thomo Lekagane

The aim of the project is to building a solar network at Jamataka village in the Boteti district which is in line with the objective of determining the opportunities that are achievable for the integrated technology solutions in new and emerging markets such as the Sub-Saharan Africa. The following have been completed in the project.

1. Optimization of existing installation
2. Public Summary of Progress disseminated
3. DESCO established in field trial

The innovators will also work on the SolaNetwork interconnections as well as operational monitoring.

Education For Laser-Based Manufacturing- Prof. E. Olakanmi



Prof. E. Olakanmi



Figure 3: ELbM Scholarship Announcement

The main objective of the ELbM is to help partner institutions with capacity building. The project is funded by the Intra-Africa Mobility Scheme of the Education Audio-visual and Culture Executive Agency of the European Commission. Through the programme, there will be some training opportunities in laser-based manufacturing. The 2021 ELbM scholars (1st Call) commenced their study at BIUST, FUPRE, & JKUAT.

Collaborative Open Design and Manufacturing (CODM)



Dr. N. Gwangwava



Figure 4: Collaborative Open Design and Manufacturing

CODM promotes Open Design and Manufacturing (ODM) among project partners. The project is funded by the Royal Academy of Engineering (RAE) from the United Kingdom (UK). It brings together key players in the product design and manufacturing value chain. This is a collaboration from different stakeholders including learners, educators, training institutions, industry and policy makers. They share knowledge about the project concept and various other cross-cutting subjects such as technology commercialisation, the innovation ecosystem, international collaboration, and more. The concept is an Open-Source Solar Light and Charger (OSSoLiC) that is aimed at offering sustainable energy solutions to the rural communities. The CODM project is expected to promote self-learning, creativity, and innovation, offer technology to all, and transfer skills in design and manufacturing. The model is a paradigm shift from simply building prototypes in training and educational institutions to manufacturing of end user ready products.

Mining and Geological Engineering



15
Journal Articles



6
Conference Papers

Journal Articles

- Nomikos P., Kaklis K., Agioutantis Z., Mavrigiannakis S. (2020), Investigation of the size effect and the fracture process on the uniaxial compressive strength of the banded Alfás porous stone, *Procedia Structural Integrity*.
- Nomikos P., K. Kaklis, Z. Agioutantis, S. Mavrigiannakis, (2020), Experimental characterization and numerical modeling of the fracture process in banded Alfás porous stone, *Material Design & Processing Communication*, pp. 1–15. <https://doi.org/10.1002/mdp2.165>.
- Bineli Betsi, T., Mokane, L., McFarlane, C., Phili, K., Kelepile, T. (2020), Multistage gold mineralization events in the Archean Tati greenstone Belt, northeast Botswana: Constraints from integrative white mica Ar/Ar, garnet U-Pb and sulfides Pb/Pb geochronology., *Precambrian Research* 339, <https://doi.org/10.1016/j.precamres.2020.105623>.
- Kelepile, T., Bineli Betsi, T., Shemang, E., (2020), Metal sources and mineralizing fluids characteristics and evolution of the Khoemacau sediment-hosted Cu-Ag deposits, in the Ghanzi-Chobe Belt portion of the Kalahari Copper Belt., *Ore Geology Reviews*, 10.1016/j.oregeorev.2020.103559.
- Afeni, T.B., Lawal, A.I., Adeyemi, R.A. (2020), Re-examination of Itakpe iron ore deposit for reserve estimation using geostatistics and artificial neural network techniques, *Arabian Journal of Geosciences* Vol 13 (14).
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- Ekoa Bessa, A. Z., Armstrong-Altrin, J.S., Fuh, G. C., Bineli Betsi, T., Kelepile, T., Ndjigui, P.D. (2021), Mineralogy and geochemistry of the Ngaoundaba Crater Lake sediments, northern Cameroon: implications for provenance and trace metals status, *Geochimica Acta*, <https://doi.org/10.1007/s11631-021-00463-5>.

Conference Papers

- Nomikos, P., Kaklis, K., Agioutantis, Z., Mavrigiannakis, S. (2020), Investigation of the size effect and the fracture process on the uniaxial compressive strength of the banded Alfás porous stone, *Procedia Structural Integrity* Volume 26

2. Amankwah, R. and Suglo, R. S. (2020), (2021), Sustaining the Minerals Industry of Ghana – A Challenge to Stakeholders", 6th Biennial UMaT, International Mining and Mineral Conference, Tarkwa, Ghana, (Aug. 4 - 7, 2020), pp. MN 23 – 32.
3. Nomikos P., K. Kaklis, Z. Agioutantis, S. Mavrigiannakis, (2021), Experimental and numerical investigation of the size effect on the mechanical properties of the banded Alfas porous stone, 1st Mediterranean Conference on Fracture and Structural Integrity, Athens, Greece, February 26-28, 2020.
4. Kaklis K., O. Saubi, R. Jamisola, Z. Agioutantis, (2021), A preliminary application of a machine learning model for the prediction of load variation in three-point bending tests based on the acoustic emission signals, 26th International Conference on Fracture and Structural Integrity (IGF26), Turin (Italy) & web, May 26-31, 2021.
5. Kaklis K., Z. Agioutantis, G. Moitse, "Stability analysis for partial pillar extraction recovery (2021), A case study at an underground coal mine in southern Africa, 55th US Rock Mechanics / Geomechanics Symposium, Houston, Texas, USA, 20-23 June, 2021. Ref: 21-A-1599-ARMA.
6. Nomikos P., K. Kaklis, Z. Agioutantis and S. Mavrigiannakis, (2021), Investigation of the size effect and the fracture process on the uniaxial compressive strength of the banded Alfas porous stone, Procedia Structural Integrity, 26, 2020, pp. 285-292. <https://doi.org/10.1016/j.prostr.2020.06.036>

Major Projects and Contribution

BIUST Establishes Mining Centre



*Dr B. Matshediso
Acting Director, Mining Centre*



Figure 5: Newly formed Mining Centre Located in the Faculty of Engineering and Technology

BIUST is in the process of establishing the Mining Centre (MC) to ensure ease of industry absorption by graduate students and provide services to the local mining sector. The MC is housed in the BIUST's Faculty of Engineering and Technology, and it is led by Dr Bonny Matshediso. The BIUST MC intends to bridge the gap in the teaching of applied mining and related sciences and the professional needs of the mining industry. Through the MC, all issues that are related to mining industry value chain, including mining, processing, economics, marketing and finance will be addressed. In addition, the Centre will provide hands-on training opportunities for students and industry professionals, coaching opportunities in mining, project business development, critical mid and high-level skills training, and the development of short courses that are aligned to the needs of the Mining industry.

Dr Matshediso said that the Center will engage more on the professional development of what the mining industry needs by with particular attention on "market intelligence" to identify the skills gaps in the mining sector. He said, "the materials and topics presented, and the practical training offered should therefore be driven by the industry through engagement, and it should not be determined by the academia through a push mechanism."

FACULTY OF SCIENCES



FACULTY OF SCIENCES



Prof. Amare Gessesse, Acting Dean, Faculty of Sciences

Research Performance Summary

The Faculty of Sciences consist of five (5) Departments: Biological Sciences and Biotechnology (BSB), Chemical and Forensic Sciences (CFS), Computer Sciences and Information Systems (CSIS), Earth and Environmental Sciences (EES), Mathematics and Statistical Sciences (MSS), and Physics and Astronomy (PA). The Faculty conducts research aimed at generating new knowledge and training of undergraduate and postgraduate students. In the year 2020/2021 the Faculty had an impressive research performance with over 178 journal publications, three books/book chapters, and contributing to the organization of 4 conferences. The Faculty has also graduated 19 postgraduate students contributing to the training of the next generation of scientists. Although the Faculty has the capacity to train more postgraduate students, obtaining sufficient funding to increase postgraduate enrolment is still a challenge. To address this challenge, staff members work hard to attract external funding with a budget that includes recruiting local and international postgraduate students.

Research at the Faculty of Sciences deals with applied and basic sciences. The research results in the basic science fields are important in pushing the frontiers of knowledge, And the research results in applied science fields are beneficial to society. However, there are still some challenges that makes it hard to translate these research results into tangible products and services.

Faculty Research Focus Areas

Staff members in the Science Faculty are encouraged forge collaborations with other researchers within the faculty and the University as well as nationally and internationally. Staff members are also encouraged to work hard in attracting external research funding. A staff member from the Department of Earth and Environmental sciences, Prof. Gizaw Mengistu Tsidu, won the Oliver Tambo Research Chair. Researchers from four Departments within the Faculty of Sciences (Earth and Environmental Sciences, Chemistry and Forensic Sciences, Biological Sciences and Biotechnology, and Mathematics and Statistical Sciences) are working together on the project.

In addition, the project involves external research collaborators from Africa and Europe, and it the project also contributes to postgraduate students enrollment by support through postgraduate students through research assistantships. Another example is the establishment of a DNA laboratory that will help advance staff and graduate student research at the Departments of Chemical and Forensic Sciences and Biological Sciences and Biotechnology. The Faculty of Sciences has active research in biotechnology, insect science and ecology, forensic sciences, biomathematics, cyber security, materials science, renewable energy, climate, water, waste treatment and bioremediation, geology and mineral resources, etc. In order to further improve research output and to ensure research development that benefits society, the Faculty will further strengthen collaboration with internal and external researchers and engage in multidisciplinary research that is aimed at benefiting society.

Faculty Performance in Key Research Activities

Faculty research outputs, activities, events, and awards are consolidated quarterly. The Faculty of Sciences outputs, activities, events, and awards for the year 2020/2021 are presented below.



6
Review Articles



177
Journal Articles



3
Book Chapters



2
Letter/ Comment/ Debate



4
Conference Paper



1
Editorial Work



4
Seminars/
Workshops



9
Talks/ Presentations



19
Postgraduate Students
Graduated

Biological Sciences & Biotechnology



4
Review Articles



35
Journal Articles



1
Book Chapter



1
Letter



1
Conference Paper



1
Editorial Work



1
Seminars

Book Chapter

1. Musee, N., Leareng, S., Kebaabetswe, L., Tubatsi, G., Mahaye, N. and Thwala. Implications of surface coatings on engineered nanomaterials for environmental systems: status quo, challenges and perspectives. In Handbook of Functionalized Nanomaterials for Industrial Applications. Elsevier. 399-416.
<http://dx.doi.org/10.1016/b978-0-12-816787-8.00014-4>

Journal Articles

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3. Buxton, M., Wasserman, R. and Nyamukondiwa, C. (2020). Spatial *Anopheles arabiensis* (Diptera: Culicidae) insecticide resistance patterns across malaria-endemic regions of Botswana. *International journal of environmental research and public health*, 17(21). <https://doi.org/10.1186/s12936-020-03487-z>
4. Buxton, M., Machekano, H., Gotcha, N., Nyamukondiwa, C. and Wasserman, R. J. (2020). *International Journal of Environmental Research and Public Health*, 17(21). 1-16. <https://doi.org/10.3390/ijerph17218196>
5. McGenity, T. J., Gessesse, A., Hallsworth, J. E., Garcia Cela, E., Verheecke-Vaessen, C., Wang, F., Chavarría, M., Hagglblom, M. M., Molin, S., Danchin, A., Smid, E. J., Lood, C., Cockell, C. S., Whitby, C., Liu, S. J., Keller, N. P., Stein, L. Y., Bordenstein, S. R., Lal, R., Nunes, O. C., Gram, L., Singh, B.K., Webster, N.S., Morris, C., Sivinski, S., Bindschedler, S., Junier, P., Antunes, A., Baxter, B.K., Scavone, P. and Timmis, K. (2020). Visualizing the invisible: class excursions to ignite children's enthusiasm for microbes. *Microbial biotechnology*, 13(4). 844–887.
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6. Gotcha, N., Machekano, H., Cuthbert, R.N. and Nyamukondiwa, C. (2020). Heat tolerance may determine activity time in coprophagic beetle species (Coleoptera Scarabaeidae). *Insect Science/ Early View*.
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7. Kwape, T.E., Chaturvedi, P., Gaobotse, G., Masisi, K., Bati, K. and Majinda, R. (2020). *Myrothamnus flabellifolius* attenuates streptozotocin high energy diet-induced type 2 diabetes in male sprague dawley rats. *Journal of Medicinal Plants Research*, 14(12). 625-637. <https://doi.org/10.5897/JMPR2020.7033>
8. Kabelo, T., Fana, E. and Lebani, K. (2020). Assessment of the sensitivity of primary cells and cell lines to the Southern African Territories (SAT) serotypes in diagnosis of foot-and-mouth disease virus. *Heliyon*, 6(5). e03905.
<https://doi.org/10.1016/j.heliyon.2020.e03905>
9. Letshwenyo, M. W. and Lebogang, L. (2020). Assessment of roughing and slow sand filter modified with slag and clinker ash for removal of microorganisms from secondary effluent. *Environmental Technology (United Kingdom)*, 41(23). 3004-3015. <https://doi.org/10.1080/09593330.2019.1593513>
10. Motlhanka, K., Lebani, K., Boekhout, T. and Zhou, N. (2020). Fermentative microbes of Khadi, a Traditional Alcoholic Beverage in Botswana. *Fermentation*, 6(2). <https://doi.org/10.3390/fermentation6020051>
11. Mazebedi, R. and Hesselberg, T. (2020). A preliminary survey of the abundance, diversity and distribution of terrestrial macroinvertebrates of Gcwhaba cave, northwest Botswana. *Subterranean Biology*, 35. 49-63.
<https://doi.org/10.3897/subtbiol.35.51445>
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15. Mutamiswa, R., Machekano, H., Nyamukondiwa, C. and Chidawanyika, F. (2020). Host plant-related responses on the thermal fitness of *Chilo partellus* (Swinhoe) (Lepidoptera). *Arthropod-Plant Interactions*, 14. 463–471.
<https://doi.org/10.1007/s11829-020-09762-9>
16. Le Ru, B., Capdevielle-Dulac, C., Musyoka, B.Z., Sezonlin, M., Conlong, D., Van Den Berg, J., Clamens, A-L., Cugala, D., Nyamukondiwa, C., Ong'Amo, G. and Kergoat, K. (2020). Phylogeny and systematics of the *Sesamia coniota* Hampson species group (Lepidoptera : Noctuidae: Noctuinae: Apameini: Sesamiina), with the description of three new species from the Afrotropical region. *International Journal of Entomology*, 56(5). 417-435. <http://dx.doi.org/10.1080/00379271.2020.1815574>
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18. Kaur, R., Masisi, K., Molaei, M., Le, K., Fischer, G., Kobue-Lekalake, R. and Moghadasian, M.H. (2020). Anti-atherogenic properties of kgengwe (*Citrullus lanatus*) seed powder in low density lipoprotein receptor knockout mice are mediated through beneficial alterations in inflammatory pathways. *Journal of Applied Physiology, Nutrition, and Metabolism*, 42(2), 169-177. <https://doi.org/10.1139/apnm-2020-0015>

19. Yang, M., Mudabuka, B., Dueck, C., Xu, W., Masisi, K., Fana, E.M., Mpofu, C. and Nfon, C. (2020). Development of two rapid lateral flow test strips for detection of foot-and-mouth disease virus SAT 1 and SAT 3. *Journal of Virological Methods* 291 (2021), 113967. <https://doi.org/10.1016/j.jviromet.2020.113967>
20. Tladi, M., Nyamukondiwa, C., Cuthbert, R.N. and Wasserman, R. (2020). Emergent effects of light and temperature on hatching success of *Streptocephalus cafer* (Branchiopoda Anostraca) resting eggs. *Austral Ecology*. <https://doi.org/10.1111/aec.12934>
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24. Cuthbert, R.N., Dalu, T., Wasserman, R.J., Weyl, O.L.F., William Froneman, P., Callaghan, A. and Dick, J.T.A. (2020). Examining intraspecific multiple predator effects across shifting predator sex ratios. *Basic and Applied Ecology*, 45. 12-21. <https://doi.org/10.1016/j.baee.2020.03.002>
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28. Wasserman, R.J., Sanga, S., Buxton, M., Dalu, T. and Cuthbert, R.N. (2020). Does invasive river red gum (*Eucalyptus camaldulensis*) alter leaf litter decomposition dynamics in arid zone temporary rivers? *Inland Waters*, 11(1). 104-113. <https://doi.org/10.1080/20442041.2020.1802196>
29. Amdoun, R., Sahli, F., Hamadache, K., Ouzzane, A-B., Khelifi-Slaoui, M., Moustafa, K., Hefferon, K., Makhzoum, A. and Lakhdar Khelifi. (2020) Optimization of caulogenesis in *Populus nigra* under lead (Pb) stress via response surface methodology (RSM) and desirability function analysis. *Plant Cell, Tissue and Organ Culture (PCTOC)* 142(1), 41-50. <https://doi.org/10.1007/s11240-020-01827-0>
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31. Buxton, M., Wasserman, R.J. and Nyamukondiwa, C. (2021). Disease Vector Relative Spatio-Temporal Abundances to Water Bodies and Thermal Fitness Across Malaria Endemic Semi-Arid Areas. *Journal of Medical Entomology*, 58(2). 682-691. <https://doi.org/10.1093/jme/tjaa221>
32. Masisi, K., Masamba, R., Lashani, K., Li, C., Kwape, T.E. and Gaobotse, G. (2021). Antioxidant, Cytotoxicity and Cytoprotective Potential of Extracts of *Grewia Flava* and *Grewia Bicolor* Berries. *Journal of Pharmacopuncture*, 24(1). 24-31. <https://doi.org/10.3831/KPI.2021.24.1.24>
33. Esan, A.M., Masisi, K., Le, K., Aluko, R., Olaiya, C.O. and Moghadasian, M.H. (2021). The effect of okra (*Abelmoschus esculentus* (L) Moench) fruit extracts on diabetes markers in streptozotocin-induced diabetes rats. *Archives of Diabetes & Obesity* 3(2). 296-303. <http://dx.doi.org/10.32474/ADO.2021.03.000160>
34. Mutamiswa, R., Machekano, H., Singano, C., Joseph, V., Chidawanyika, F. and Nyamukondiwa, C. (2021). Desiccation and temperature resistance of the larger grain borer, *Prostephanus truncatus* (Horn) (Coleoptera: Bostrichidae): pedestals for invasion success?. *Physiological Entomology*, 46(2). 157-166. <https://doi.org/10.1111/phen.12355>
35. Gaobotse, G., Masisi, K. and Kwape, T.E. (2021). COVID-19 and Medicinal Plants. *Journal of Regenerative Medicine*, 10(2). <http://dx.doi.org/10.37532/jrgm.2021.10>

Review Articles

1. Kebaabetswe, L. and Makhaola, K. (2020). Distribution and genetic variability of sapoviruses in Africa. *Viruses*, 12(5). <https://doi.org/10.3390/v12050490>
2. Mutamiswa, R., Nyamukondiwa, C., Chikowore, G. and Chidawanyika, F. (2021). Overview of oriental fruit fly, *Bactrocera dorsalis* (Hendel) (Diptera : Tephritidae) in Africa: From invasion, bio-ecology to sustainable management. *Crop Protection*, 141. 105492. <https://doi.org/10.1016/j.cropro.2020.105492>
3. Trémouillaux-Guiller, J., Moustafa, K., Hefferon, K., Gaobotse, G. and Abdullah, M. (2020). Plant-made HIV vaccines and potential candidates. *Current Opinion in Biotechnology*, 61, 209-216. <https://doi.org/10.1016/j.copbio.2020.01.004>

4. Tarusikirwa, V. L., Machekano, H., Mutamiswa, R., Chidawanyika, F. and Nyamukondiwa, C. (2020). Tuta absoluta (Meyrick) (Lepidoptera: Gelechiidae) on the "offensive" in Africa: Prospects for integrated management initiatives. *Insects*, 11(11), 1-33. [764]. <https://doi.org/10.3390/insects11110764>

Conference Paper

1. Kaur, R., Masisi, K., Le, K., Fischer, G., Kobue-Lekalake, R. and Moghadasian, M.H. (2020). Dietary Prevention of Atherogenesis is Consistently Associated with Increased Levels of Plasma Erythropoietin in Low Density Lipoprotein Receptor Knock-Out Mice. *Applied Physiology Nutrition and Metabolism* 45(4):S25. <https://cdnsiencepub.com/doi/pdf/10.1139/apnm-2020-0129>

Letter

1. Rahube, T. O. (2021). Cease approach for combating covid-19, antimicrobial resistance, and future microbial threats. *Canadian Journal of Microbiology*, 67(1). 98-99. <https://doi.org/10.1139/cjm-2020-0452> (Biological Sciences)

Editorial Work

1. Rahube, Teddie: Recognition for outstanding editorial work for the Canadian Journal of Microbiology.

Major Projects and Contributions

Anti-Microbial Toilet Seat Mat

Innovators(internal): Ms. Bame Rammala, Ms. Kamogelo Mmereke
Supervisors: Dr. N. Zhou, Dr. C. Muiva



The innovators who are research assistants, Ms. Rammala and Ms. Mmereke are working on developing an antimicrobial toilet seat mat. They started working on this project in May 2019 and they are expected to have completed it in October 2021. The two innovators have achieved their core objective of developing a full composite polymer embedded with nano particles. They are currently working towards shaping the polymer in the desired shape of a toilet seat. A total of BWP 632 335.72 has been used so far in the project. Ms. Rammala and Ms. Mmereke have been allocated an office at the BIUST Technology Incubation Park.

CEASE approach against COVID-19 Antimicrobial Resistance- Dr. T. Rahube

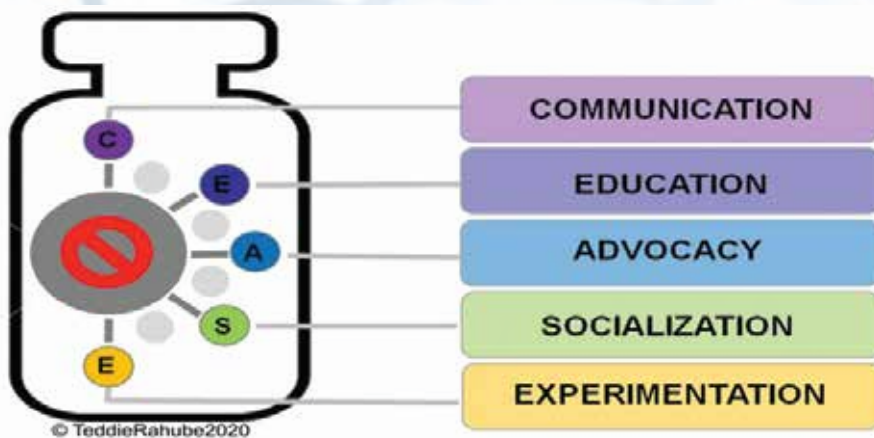


Figure 6: The CEASE Approach Schematic

According to Dr. Rahube, the CEASE approach is a framework that is used to address some of the problems related to COVID-19 pandemic and other microbial threats (AMR) that could arise in the future.



Figure 7: Cover of the Canadian Journal of Microbiology

Dr. T. Rahube's appointment as a Reviewer

Dr T. Rahube from the Department of Biology and Biotechnological Sciences was recognised by the Canadian Journal of Microbiology editorial team the Canadian Journal of Microbiology as one of the outstanding reviewers. Dr Rahube has consistently and expeditiously delivered comprehensive, discerning reviews to the Journal's authors for 7 years. He was appointed an Associate Editor and Editorial Board Member in March 2017.

Chemical and Forensic Sciences



17
Journal Articles



1
Workshop



3
Postgraduate
Students Graduated



1
Book Chapter

Book Chapter

1. Baituti, B. (2020). The Successful Turnover of Photosystem II Core Complexes Using Laser Flash Illumination. In Chemistry. Bulgarian Journal of Science Education. National Publishing House for Education and Science "Az-Bukay". 679-691.

Journal Articles

1. Baituti, B. and Akofang, L. (2020). The Two Alternative Oxidation State Assignments of Manganese Ions: What S2 CW-EPR Multiline (ML) Signal Simulations Reveal? Applied Magnetic Resonance, 51. 389-407. <https://doi.org/10.1007/s00723-020-01190-5>
2. Alula, M.T. and Madingwane, M.L. (2020). Colorimetric quantification of chromium (VI) ions based on oxidoreductase-like activity of Fe₃O₄. Sensors and Actuators B: Chemical, 324. 128726. <https://doi.org/10.1016/j.snb.2020.128726>
3. Alula, M.T., Lemmens, P., Madiba, M. and Present, B. (2020). Synthesis of free-standing silver nanoparticles coated filter paper for recyclable catalytic reduction of 4-nitrophenol and organic dyes. Cellulose 27, 2279-2292. <https://doi.org/10.1007/s10570-019-02945-5>

4. Alula, M.T., Lemmens, P. and Madingwane, M.L. (2020). Determination of cysteine via its inhibition of catalytic activity of silver coated ZnO/Fe₃O₄ composites used for conversion of 4-nitrophenol into 4-aminophenol. *Microchemical Journal*, 156. 104976. <https://doi.org/10.1016/j.microc.2020.104976>
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12. Mbaiwa, F. and Nyepetsi, M. (2020). Molecular dynamics and density functional theory studies of γ -butyrolactone (GBL) + ethanol and γ -valerolactone (GVL) + ethanol liquid mixtures. *Journal of Molecular Liquids*, 319. 114128. <https://doi.org/10.1016/j.molliq.2020.114128>
13. Mazhani, M., Alula, M.T. ad Murape, D. (2020). Development of a cysteine sensor based on the peroxidase-like activity of AgNPs@ Fe₃O₄ core-shell nanostructures *Analytical Chimica Acta*, 1107. 193-202. <https://doi.org/10.1016/j.aca.2020.02.021>
14. Mugoma, S. and Phokedi, G.N. (2020). Suicidal ligature strangulation utilizing double cable ties—A case report. *Forensic Science International: Reports*, 2. 100098. <https://doi.org/10.1016/j.fsir.2020.100098>
15. Mmusi, K.C., Odisitse, S. and Nareetsile, F. (2021). Comparison of CaO-NPs and Chicken Eggshell-Derived CaO in the Production of Biodiesel from Schinziophyton rautanenii (Mongongo) Nut Oil. *Journal of Chemistry*, 2021. 6663722. <https://doi.org/10.1155/2021/6663722>
16. Ngulube, Q., Parekh, C.T. and Majoni, S. (2021). Heavy metals in Blanket Dam and Downstream Weirs, and the Associated Risk to Human Health. *Chemistry Africa*, 4.217–226. <https://doi.org/10.1007/s42250-020-00192-x>
17. Andersen, J. (2021). Assessment of measurement uncertainty using longitudinal calibration data in the forensic context. *Forensic Chemistry*, 23, [100317]. <https://doi.org/10.1016/j.forc.2021.100317>

Postgraduate Students Graduated

Mr. Nicholas Sehube

MSC CHEMISTRY (2020)

Project Title: Quantitative Assessment of static versus dynamics environmental pollution risk from lead pollution of shooting range soils

Ms. Mercy Menong

MSC CHEMISTRY (2020)

Project Title: Uncertainty Estimation on pH measurements: a direct pathway to quality assurance

Mr. Keene Mmusi

MSC CHEMISTRY (2020)

Project Title: Comparison of CaO-NPs and chicken eggshell derived CaO for the production of biodiesel from Schinziophyton rautanenii (Mongongo) nut oil

Computer Science and Information Systems



7
Journal Articles



1
Review Article



1
Talk



3
Postgraduate Students
Graduated

Journal Articles

1. Mayo-Maldonado, J.C., Ruiz-Martinez, O.F., Escobar, G., Maupong, T.M., Valdez-Resendiz, J.E. and Rosas-Caro. (2020). Power shaping control of DC–DC converters with constant power loads. *Control Engineering Practice*, 105. 104639. <https://doi.org/10.1016/j.conengprac.2020.104639>
2. Gobonamang, T.K. and Mpoeleng, D. (2020). Counter based suffix tree for DNA pattern repeats. *Theoretical Computer Science*, 814. 1-12. <https://doi.org/10.1016/j.tcs.2019.12.014>
3. Sehubi, O., Zlotnikova, I. and Hlomani, H. (2020). Open data for sustainable development on a knowledge-based economy: The Case of Botswana. *Data Science Journal*, 19(1). <http://doi.org/10.5334/dsj-2020-044>
4. Semong, T., Maupong, T.M, Anokye, S., Kehulakae, K., Setso, D., Gabanthone, B. and Sarefo, S. (2020). Intelligent load balancing techniques in software defined networks: A Survey. *Electronics*, 9(7). <https://doi.org/10.3390/electronics9071091>
5. Ruiz-Martinez, O. F., Mayo-Maldonado, J. C., Escobar, G., Valdez-Resendiz, J. E., Maupong, T. M. and Rosas-Caro, J. C. (2020). Data-driven stabilizing control of DC–DC converters with unknown active loads. *Control Engineering Practice*, 95. <https://doi.org/10.1016/j.conengprac.2019.104266>
6. Nedev, Z., Zungeru, M.A., Khov, S., Dy, D. and Sov, K. (2020). Algorithm for compressing/decompressing sudoku grids. *Journal of Computer Science*, 16(9). 1319-1324. <https://doi.org/10.3844/jcssp.2020.1319.1324>
7. Loranca, J., Mayo-Maldonado, J., Escobar, G., Villarreal-Hernandez, C.A., Maupong, T., Valdez-Resendiz, J.E. and Rosas Caro, J.C. (2021). Data-Driven Passivity-Based Control Design for Modular DC Microgrids. *IEEE Transactions on Industrial Electronics*. 1-1. <https://doi.org/10.1109/TIE.2021.3065615>

Review Article

1. Nareetsile, F., Matshwele, J., Ndllovu, S. and Ngaski, M. (2020). Transition Metal Complexes with HIV/AIDS Inhibitory Properties. *Chemical Review and Letters*, 140-160. <https://doi.org/10.22034/CRL.2020.230856.1057>

Postgraduate Students Graduated

Mr. Banyatsang Mphago

PHD COMPUTER SCIENCE (2020)

Project Title: Deception in Dynamic Web Application Honeypots: A Game and Interpersonal Deception Theoritic (IDT) Framework Analysis and Design

Mr. Mbiganyi Tapela

MSC COMPUTER SCIENCE (2020)

Project Title: FGPA-based image change detection framework

Mr. Kabelo Germanus Madise

MSC COMPUTER SCIENCE (2020)

Project Title: A multi-sensor approach to Botswana sign language dataset with view of addressing occlusion

Talk/Presentation

1. Integrity in Online Assessment. 28 April 2020. – Dr. TABONA OTENG.

Earth and Environmental Sciences

1
Review Articles



38
Journal Articles



4
Postgraduate Students
Graduated



1
Comment/ Debate



1
Conference Paper



2
Seminar/
Presentation

Journal Articles

1. Okolo, C.C., Gebresamuel, G., Zenebe, A., Haile, M. and Eze, P. (2020). Accumulation of organic carbon in various soil aggregate sizes under different land use systems in a semi-arid environment. *Agriculture, Ecosystems & Environment*, 297. 106924. <https://doi.org/10.1016/j.agee.2020.106924>
2. Kebonye, N. M., Eze, P. N., Ahado, S. K. and John, K. (2020). Structural equation modeling of the interactions between trace elements and soil organic matter in semiarid soils. *International Journal of Environmental Science and Technology*, 17(4). 2205-2214. <https://doi.org/10.1007/s13762-019-02610-1>
3. Franchi, F. and Abebe, A. (2020). Statistically learning Archean carbonate diagenesis. *Precambrian Research*, 348. 105867. <https://doi.org/10.1016/j.precamres.2020.105867>
4. Franchi, F. and Frisia, S. (2020). Crystallization pathways in the Great Artesian Basin (Australia) spring mound carbonates: Implications for life signatures on Earth and beyond. *Sedimentology*, 67(5). 2561-2595. <https://doi.org/10.1111/sed.12711>
5. Franchi, F., MacKay, R., Selepeng, A.T. and Barbieri, R. (2020). Layered mound, inverted channels and polygonal fractures from the Makgadikgadi pan (Botswana) : Possible analogues for Martian aqueous morphologies. *Planetary and Space Science*, 192. 105048. <https://doi.org/10.1016/j.pss.2020.105048>
6. Kaavera, J., Imai, K., Yonezu, K., Tindell, T., Sanematsu, K. and Watanabe, K. (2020). Controls on the disseminated Ni-Cu-PGE sulfide mineralization at the northern Molopo Farms Complex, Botswana: Implications for the formation of conduit style magmatic sulfide ores. *Ore Geology Reviews*, 126. 103731. <https://doi.org/10.1016/j.oregeorev.2020.103731>
7. Kelepile, T., Betsi, T.B. and Shemang, E.M. (2020). Partitioning and distribution of silver in sediment-hosted Cu-Ag deposits: Evidence from the Ghanzi-Chobe Belt portion of the Kalahari Copper Belt. *Ore Geology Reviews*, 124. 103663. <https://doi.org/10.1016/j.oregeorev.2020.103663>
8. Kelepile, T., Betsi, T.B. and Shemang, E.M. (2020). Metal sources and mineralizing fluids characteristics and evolution of the Khoemacau sediment-hosted Cu-Ag deposits, in the Ghanzi-Chobe Belt portion of the Kalahari Copper Belt. *Ore Geology Reviewa*, 122. 103559. <https://doi.org/10.1016/j.oregeorev.2020.103559>
9. Sono, P., Nthaba, B., Shemang, E.M., Kgositintsi, B. and Seane, T. (2021). An integrated use of induced polarization and electrical resistivity imaging methods to delineate zones of potential gold mineralization in the Phitshane Molopo area, Southeast Botswana. *Journal of African Earth Sciences*, 174.104060. <https://doi.org/10.1016/j.jafrearsci.2020.104060>
10. Lentswe, G.B. and Molwalefhe, L. (2020). Delineation of potential groundwater recharge zones using analytic hierarchy process-guided GIS in the semi-arid Motloutse watershed, eastern Botswana. *Journal of Hydrology: Regional Studies*, 28. 100674. <https://doi.org/10.1016/j.ejrh.2020.100674>
11. Oromeng, K.V., Atekwana, E.A., Molwalefhe, L. and Ramatlapeng, G.J. (2021) Time-series variability of solute transport and processes in rivers in semi-arid endorheic basins The Okavango Delta, Botswana. *The Science of the total environment*, 759. 143574. <https://doi.org/10.1016/j.scitotenv.2020.143574>

12. Rajesh, H.M., Safonov, O.G., Belyanin, G.A. and Vorster, C. (2020). A ~2.051 Ga anatectic event and peraluminous leucogranite from the Mahalapye Complex, northern edge of the Kaapvaal Craton : Record of an effect of Bushveld mafic magmatism. *Lithos*, 378-379. 15805. <https://doi.org/10.1016/j.lithos.2020.105805>
13. Rajesh, H.M., Liu, S.J. and Wan, Y. (2020). Mesoarchean TTG magmatism from the northeastern margin of the Kaapvaal Craton, southern Africa : Arguments for an exotic terrane (remnant of Pilbara Craton?). *Precambrian Research*, 337. 105552. <https://doi.org/10.1016/j.precamres.2019.105552>
14. Rajesh, H.M., Knoper, M.W., Belyanin, G.A., Safonov, O.G. and Schmidt, C. (2020). Petalite postdating spodumene in pegmatite as a consequence of the ~2.02 Ga meteorite impact in the Vredefort structure, southern Africa, *Lithos*, 376-377. 105760. <https://doi.org/10.1016/j.lithos.2020.105760>
15. Nthaba, B., Shemang, E.M., Atekwana, E.A. and Selepeng, A.M. (2020). Investigating the Earth Fill Embankment of the Lotsane Dam for Internal Defects Using Time-lapse Resistivity Imaging and Frequency Domain Electromagnetics. *Journal of Environmental and Engineering Geophysics*, 25 (3). 325–339. <https://doi.org/10.32389/JEEG19-057>
16. Wise, R., Hartmann, K., Gummersbach, V.S., Shemang, E.M., Struck, U. and Riedel, F. (2020). Lake highstands in the northern Kalahari, Botswana, during MIS 3b and LGM. *Quaternary International*, 558. 10-18. <https://doi.org/10.1016/j.quaint.2020.08.016>
17. Nthaba, B., Shemang, E., Hengari, A., Kgosidintsi, B. and Tsuji, T. (2020). Characterizing coal seams hosted in Mmamabula Coalfield, central Botswana using pseudo-3D electrical resistivity imaging technique. *Journal of African Earth Sciences*, 167. 103866. <https://doi.org/10.1016/j.jafrearsci.2020.103866>
18. Mengistu Tsidu, G. and Zegeye, M.M. (2020). Comparison of quiet-time ionospheric total electron content from the IRI-2016 model and from gridded and station-level GPS observations. *Annales Geophysicae*, 38(3). 725-748. <https://doi.org/10.5194/angeo-38-725-2020>
19. Berhe, T.Y., Mengistu Tsidu, G., Blumenstock, T., Hase, F. and Stiller, G.P. (2020). Methane and nitrous oxide from ground-based FTIR at Addis Ababa. *Atmospheric Measurement Techniques*, 13(7). 4079-4096. <https://doi.org/10.5194/amt-13-4079-2020>
20. Atiah, W.A., Mengistu Tsidu, G., Amekudzi, L.K. and Yorke, C. (2020). Trends and interannual variability of extreme rainfall indices over Ghana, West Africa. *Theoretical and Applied Climatology*, 140. 1393-1407. <https://doi.org/10.1007/s00704-020-03114-6>
21. Mengistu, A.G. and Mengistu Tsidu, G. (2020). On the performance of satellite-based observations of XCO₂ in capturing the NOAA Carbon Tracker Model and ground based flask observations over Africa's land mass. *Atmospheric Measurement Techniques*, 13(7). 4009-4033. <https://doi.org/10.5194/amt-13-4009-2020>
22. Lassman, W., Pierce, J.R., Bangs, E.J., Sullivan, A.P., Ford, B., Mengistu Tsidu, G., Sherman, J.P., Collett, J.L. Jr. and Billign, S. (2020). Using low-cost measurement systems to investigate air quality: A case study in Palapye, Botswana. *Atmosphere* 2020, 11(6). 583. <https://doi.org/10.3390/atmos11060583>
23. Assamnew, A.D. and Tsidu, G.M. (2020). The performance of regional climate models driven by various general circulation models in reproducing observed rainfall over East Africa. *Theoretical and Applied Climatology*, 142. 1169-1189. <https://doi.org/10.1007/s00704-020-03357-3>
24. Ultra, V.U.Jr. (2020). Fly ash and compost amendments and mycorrhizal inoculation enhanced the survival and growth of *Delonix regia* in Cu-Ni Mine Tailings. *Philippine Journal of Science*, 149(3). 479-489.
25. Ultra, V.U.Jr. (2020). Growth and yield of lemongrass (*Cymbopogon citratus*) in fly ash with nutrient amendments and Mycorrhiza for three-ratoon period. *International Journal of Phytoremediation*, 22(14). 1551-1561. <https://doi.org/10.1080/15226514.2020.1786005>
26. Ultra, V.U.Jr. and Amit, L.M. (2020). Link Between Migration Status and Occupational Health and Safety of Filipino Migrant Workers in South Korea. *Philippine Journal of Science*, 142(2). 417-428.
27. Amit, L.M., Ultra, V.U.Jr. and Song, Y.W. (2020). Predictors of Occupational Health Outcomes of Call Center Workers from Selected Companies in Cebu and Manila. *Philippine Journal of Science*, 149(4). 1189-1199.
28. Khaing, M. and Ultra, V.U. Jr. (2020). Seed Priming Influence on Growth, Yield, and Grain Biochemical Composition of Two Wheat Cultivars. *Journal of Agricultural Science and Technology*, 22(3). 875-888. <http://jast.modares.ac.ir/article-23-29546-en.html>
29. Ultra, V.U.Jr. and Manyiwa, T. (2020). Influence of mycorrhiza and fly ash on the survival, growth and heavy metal accumulation in three *Acacia* species grown in Cu-Ni mine soil. *Environmental Geochemistry and Health*, 43. 1337–1353. <https://doi.org/10.1007/s10653-020-00627-x>
30. Akinyemi, F.O., Ghazaryan, G. and Dubovyk, O. (2021). Assessing UN indicators of land degradation neutrality and proportion of degraded land for Botswana using remote sensing based national level metrics. *Land Degradation & Development*, 32(1). 158-172. <https://doi.org/10.1002/ldr.3695>
31. Akinyemi, F.O. (2021). Vegetation trends, drought severity and land use-land cover change during the growing season in semi-arid contexts. *Remote Sensing*, 13(5). <https://doi.org/10.3390/rs13050836>
32. Kebonye, N. M., Eze, P. N., John, K., Agyeman, P. C., Němeček, K. and Borůvka, L. (2021). An in-depth human health risk assessment of potentially toxic elements in highly polluted riverine soils, Příbram (Czech Republic). *Environmental Geochemistry and Health*. <https://doi.org/10.1007/s10653-021-00877-3>
33. Kebonye, N.M., John, K., Chakraborty, S., Agyeman, P.C., Ahado, S.K., Eze, P.N., Němeček, K., Drábek, O., Borůvka, L. (2021). Comparison of multivariate methods for arsenic estimation and mapping in floodplain soil via portable X-ray fluorescence spectroscopy. *Geoderma*, 384. 114792. <https://doi.org/10.1016/j.geoderma.2020.114792>

34. Kebonye, N.M., Eze, P.N., John, K., Gholizadeh, A., Dajčl, J., Drábek, O., Němeček, K. and Borůvka, L. (2021). Self-organizing map artificial neural networks and sequential Gaussian simulation technique for mapping potentially toxic element hotspots in polluted mining soils. *Journal of Geochemical Exploration*, 222. 106680. <https://doi.org/10.1016/j.gexplo.2020.106680>
35. Eze, P., Molwalefhe, L.N. and Kebonye, N.M. (2021). Geochemistry of soils of a deep pedon in the Okavango Delta, NW Botswana: Implications for pedogenesis in semi-arid region. *Geoderma Regional*, 24. e00352. <https://doi.org/10.1016/j.geodrs.2020.e00352>
36. Gajaje, K., Ultra, V. U., Jr, David, P. W. and Rantong, G. (2021). Rhizosphere properties and heavy metal accumulation of plants growing in the fly ash dumpsite, Morupule power plant, Botswana. *Environmental science and pollution research international*, 28(16), 20637–20649. <https://doi.org/10.1007/s11356-020-11905-7>
37. Franchi, F., Kelepile, T., Di Capua, A., De Wit, M.C.J., Kemiso, O., Lasarwe, R. and Catuneanu, O. (2021). Lithostratigraphy, sedimentary petrography and geochemistry of the Upper Karoo Supergroup in the Central Kalahari Karoo Sub-Basin, Botswana. *Journal of African Earth Sciences*, 173. 104025. <https://doi.org/10.1016/j.jafrearsci.2020.104025>
38. Ramatlaping, G.J., Atekwana, E.A., Molwalefhe, L. and Oromeng, K.V. (2021). Intermittent hydrologic perturbations control solute cycling and export in the Okavango Delta. *Journal of Hydrology*, 594.125968. <https://doi.org/10.1016/j.jhydrol.2021.125968>

Review Article

1. Eze, P. N., Kokwe, A. and Eze, J. U. (2020). Advances in Nanoscale Study of Organomineral Complexes of Termite Mounds and Associated Soils: A Systematic Review. *Applied and Environmental Soil Science*, 2020, [8087273]. <https://doi.org/10.1155/2020/8087273>

Conference Paper

1. Mustafa, S., Van Loon, A., Artur, L., Bharucha, Z., Chinyama, A., Chirindja, F., Day, R., Franchi, F., Geris, J., Hussey, S., Nesamvuni, E., Nhacume, A., Petros, A., Roden, H., Rohse, M., Tirivarombo, S. and Comte, J-C. (2021). Multisector Collaborative Groundwater-Surface Water Modelling Approach to Improve Resilience to Hydrological Extremes in the Limpopo River Basin. *Geoethics and Groundwater Management Congress 2020*, Porto, Portugal.

Comment/Debate

1. Kelepile, T., Betsi, T.B., Franchi, F. and Shemang, E.M. (2020). Corrigendum to "Partitioning and distribution of silver in sediment-hosted Cu-Ag deposits: Evidence from the Ghanzi-Chobe Belt portion of the Kalahari Copper Belt" [*Ore Geol. Rev.* 124 (2020) 103663]. *Ore Geology Reviews*, 127. 103874. <https://doi.org/10.1016/j.oregeorev.2020.103874>

Postgraduate Students Graduated

Ms. Pabalelo Sono

MSC GEOLOGY (2020)

Project Title: Delineation of potential gold mineralisation zones in phitshane molopo area, southeast of Botswana using induced polarization and resistivity measurements

Ms. Thato Norah Seane

MSC GEOLOGY (2020)

Project Title: Electrical resistivity investigation of part of Mmamabula coal field area for structures that influence the subsurface placement of the coal seams

Ms. Charity Kgotlaebonywe

MSC GEOLOGY (2020)

Project Title: Quaternary megapaleolake system inn northwest Botswana: evidence of lacustrine deposition and geographical extent using multiple geochemical proxies

Ms. Legogang Mokane

MSC GEOLOGY (2020)

Project Title: Constraints on the Genesis of Gold Mineralization in the Tati Greenstone Belt of North-eastern Botswana: Insights from Integrative Geochronology and Lead Isotope Compositions

Presentation

1. Impact & Recovery of asteroid 2018SLA in the CKGR, Botswana. 30th July 2020. (FULVIO FRANCHI)

Major Projects and Contributions

Oliver Tambo Africa Research Chairs Initiative- Prof. G. Mengistu



Prof. G. Mengistu

Figure 8: OR Tambo Africa Research Launch

BIUST emerged first among the top ten (10) research institutions that took part in the selection process of where research-based institutions across Africa participated in the OR Tambo Africa Research Chairs Initiative (ORTARChI) selection process. BIUST and other institutions will benefit from a five-year research funding from the US\$15 million that has been availed to the 10 research chair holders. Professor Gizaw Mengistu Tsidu, is the Chair of the Climate Change thematic area. The virtual launch of the ORTARChI was hosted on the 27th October 2020 as part of the O.R Tambo 103rd birthday celebrations.

BIUST planetary and space science project awarded 1.4 million euros

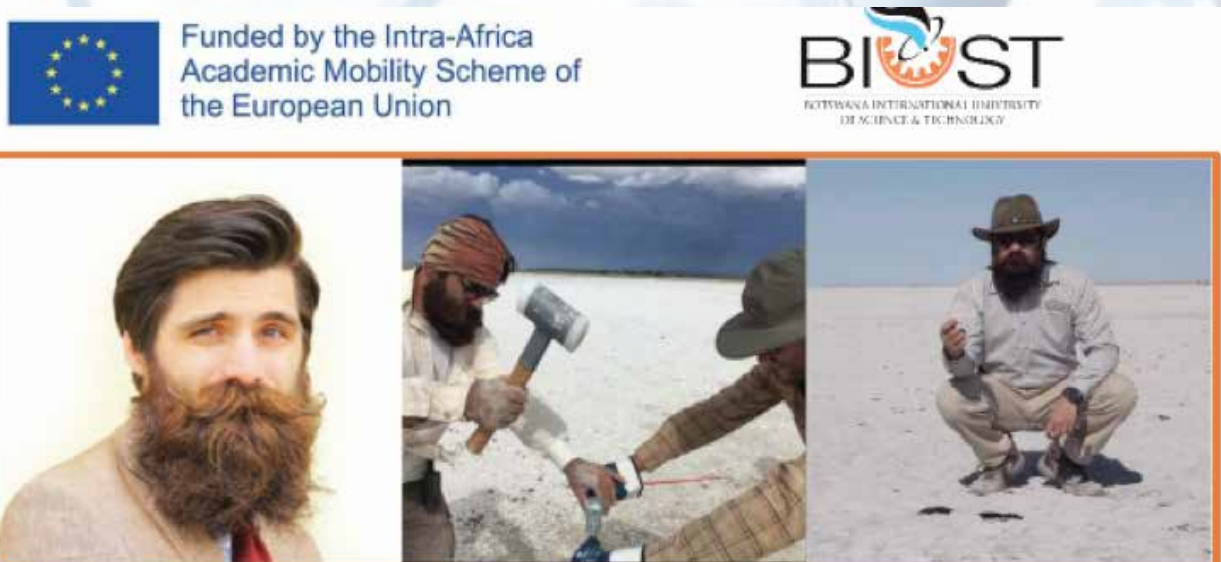


Figure 9: Dr. F. Franchi

BIUST through the lead investigator of the BIUST planetary and space science project was awarded a research grant valued at 1.4 millions of Euros (P18 millions). Dr Fulvio Franchi from the Department of Earth and Environmental Sciences and his research team received funding for creating a "Pan-Africa Planetary and Space Science Network". The project was funded by the European Commission through the Education, Audiovisual and Culture Executive Agency (EACEA) under the Intra-Africa Academic Mobility Scheme. Other collaborators from BIUST include Prof. Gizaw Mengistu, from Earth and Environmental Science Department, and Prof. Gregory Hillhouse, from Physics and Astronomy Department.

The Pan-Africa Planetary and Space Science Network aims to create a mobility scheme for students, academic and support staff amongst member countries from Botswana, Ethiopia, Nigeria, South Africa and Zambia within the field of "Science, Technology, Engineering and Mathematics (STEM)" with particular emphasis on Planetary and Space Sciences. Dr Franchi emphasized that "This mobility project, will develop the next generation of African scientists, leaders, and entrepreneurs by improving access to high quality STEM education, with particular emphasis on Planetary and Space Science".

Mathematics and Statistical Sciences



47
Journal Articles



2
Conference Papers



1
Book Chapter



5
Postgraduate Students
Graduated

Book Chapter

1. Gonpe Tafo, J.B., Nana, L., Tabi, C.B. and Kofane, T.C. (2020). Nonlinear Dynamical Regimes and Control of Turbulence through the Complex Ginzburg-Landau Equation. *Research Advances in Chaos Theory*. <http://dx.doi.org/10.5772/intechopen.88053>

Journal Articles

1. Akindeinde, S. O. (2020). A new multistage technique for approximate analytical solution of nonlinear differential equations. *Heliyon*, 6(10). e05188. <https://doi.org/10.1016/j.heliyon.2020.e05188>
2. Aderogba, A. A., Fabelurin, O. O., Akindeinde, S. O., Adewumi, A. O. and Ogundare, B. S. (2020). Nonstandard finite difference approximation for a generalized Fins problem. *Mathematics and Computers in Simulation*, 178. 183-191. <https://doi.org/10.1016/j.matcom.2020.06.010>
3. Chipepa, F. and Oluyede, B. (2020). The Marshall-Olkin-GompertzG Family of Distributions: Properties and Applications. *Journal of Nonlinear Sciences and Applications*, 14(4). 250-267. <http://dx.doi.org/10.22436/jnsa.014.04.05>
4. Chipepa, F. Oluyede, B. and Makubate, B. (2020). The Topp-Leone-Marshall Olkin-G family of distributions with applications. *International Journal of Statistics and Probability*, 9(4). <https://doi.org/10.5539/ijsp.v9n4p15>
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44. Maiti, S., Shaw, S. and Shit, G. C. (2021). Fractional order model for thermochemical flow of blood with Dufour and Soret effects under magnetic and vibration environment. *Colloids and surfaces. B, Biointerfaces*, 197. <https://doi.org/10.1016/j.colsurfb.2020.111395>
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47. Sastry, D.R.V.S.R.K., Kumar, N.N., Kameswaran, P.K. and Shaw, S. (2021). Unsteady 3D micropolar nanofluid flow through a squeezing channel: application to cardiovascular disorders. *Indian Journal of Physics*, 2020. <https://doi.org/10.1007/s12648-020-01951-9>

Conference Papers

1. Mahanta, G., Shaw, S., Das, M., Mahato, D. and Mohanti, S. (2020). Thermo-Double Diffusion Radiation Effects on the flow of Casson fluid in the Presence of Porous Media and Magnetic field over a stretching Sheet. 2020 International Conference on Renewable Energy Integration into Smart Grids: A Multidisciplinary Approach to Technology Modelling and Simulation (ICREISG), 2020. 158-163. <https://doi.org/10.1109/ICREISG49226.2020.9174545>
2. Zewde, A.B. and Kassa, S.M. (2020). A Method for Solving Some Class of Multilevel Multi-leader Multi-follower Programming Problems In: Le Thi H., Le H., Pham Dinh T. (eds) *Optimization of Complex Systems: Theory, Models, Algorithms and Applications*. WCGO 2019. *Advances in Intelligent Systems and Computing*, 991. https://doi.org/10.1007/978-3-030-21803-4_59

Postgraduate Students Graduated

Mr. Fastel Chipepa

PhD STATISTICS (2020)

Project Title: New and generalized families of life distributions with applications

Mr. Godfrey Bashaga

MSc PURE AND APPLIED MATHEMATICS (2020)

Project Title: Flow characteristics and dispersion during drug delivery in a permeable microvessel

Mr. Thatayaone Moakofi

MSC STATISTICS (2020)

Project Title: Some new and generalized distributions for reliability and lifetime data analysis

Ms. Galetlhakanelwe Motsewabagale

MSC STATISTICS (2020)

Project Title: Dagum Power Series Distributions: Theory and Applications

Ms. Morongwa Gabanakgosi

MSC STATISTICS (2020)

Project Title: Exponentiated Odd Lindley-G Distributions with Applications to Lifetime Data

Physics and Astronomy



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Journal Articles



1

Book Chapter



4

Talks/ Presentations



4

Postgraduate Students
Graduated

Book Chapter

1. Senekane, M., Mafu, M., & Taelle, M. B. (2021). Weather Nowcasting Using Deep Learning Techniques. Data Mining: Methods, Applications and System, 107. DOI: <http://dx.doi.org/10.5772/intechopen.84552>

Journal Articles

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2. Donaldson, L.M., Carter, J., von Neumann-Cosel, P., Nesterenko, V.O., Neveling, R., Reinhard, P.-G., Usman, I.T., Adsley, P., Bertulani, C.A., Brummer, J.W., Buthelezi, E.Z., Cooper, G.R.J., Fearick, R.W. FOrtsch, S.V., Fujita, H., Fujita, Y., Jingo, M., Kheswa, N.Y., Kleing, W., Kureba, C.O., Kvasil, J, Latif, M., Li, K.C.W., Mira, J.P., Nemulodi, F., Papka, P., Pellegrini, L., Pietralla, N., Ponomarav, V., Rebeiro, B., Ritcher, A., Shirikova, N., Sideras-Haddad, E., Sushkov, A.V., Smit, F.D., Steyn, G.F., Swartz, J.A. and Tamii, A. (2020). Fine structure of the isovector giant dipole resonance in Nd 142-150 and Sm 152. *Physical Reviews C*, 102(6). 064327. <https://doi.org/10.1103/PhysRevC.102.064327>
3. Lefatshe, K., Kebaabetswe, L. and Muiva, C.M. (2020). Visible-Light Driven Photocatalytic and Antibacterial Assessment of Ag/ZnO/Cellulose Nanocomposite. *Advanced Science, Engineering and Medicine*, 12(6). 844-852. <https://doi.org/10.1166/asem.2020.2658>
4. Lefatshe, K., Mola, G.T. and Muiva, C.M. (2020). Reduction of hazardous reactive oxygen species (ROS) production of ZnO through Mn inclusion for possible UV-radiation shielding application. *Heliyon*, 6(6). e04186. <https://doi.org/10.1016/j.heliyon.2020.e04186>
5. Lepodise, L.M. (2020). Wide temperature range studies of the low frequency THz spectrum of benzoic acid using FTIR spectroscopy. *Heliyon*, 6(11). e05577. <https://doi.org/10.1016/j.heliyon.2020.e05577>

6. Muiva, C., Lepodise, L.M., Bosigo, R. and Juma, A.O. (2020). Structural analysis and temperature dependent conductivity of $\text{La}_x\text{Cu}_{1-x}\text{O}$ shrimp-like nanostructures synthesised via wet chemical precipitation. *Materials Characterization*, 170. 110707. <https://doi.org/10.1016/j.matchar.2020.110707>
7. Mosalagae, K., Murape, D. M. and Lepodise, L. M. (2020). Effects of growth conditions on properties of CBD synthesized ZnO nanorods grown on ultrasonic spray pyrolysis deposited ZnO seed layers. *Heliyon*, 6(7), e04458. <https://doi.org/10.1016/j.heliyon.2020.e04458>
8. Ndebele, K.K., Tabi, C.B. and Kofane, T.C. (2020). Modulational instability in nonlinear doped optical fiber induced by the cubic–quintic–septic complex Ginzburg–Landau equation with higher-order dispersions. *Journal of the Optical Society of America B*, 37(11). A214-A227. <https://doi.org/10.1364/JOSAB.397313>
9. Chisenga, C., Van der Meijde, M., Yan, J., Fadel, I., Atekwana, E.A., Steffen, R. and Ramotoroko, C. (2020). Gravity derived crustal thickness model of Botswana: its implication for the Mw 6.5 April 3,2017, Botswana Earthquake. *Tectonophysics*, 787. 228479. <https://doi.org/10.1016/j.tecto.2020.228479>
10. Arora, I., Kumar, P. and Sathiaraj, T.S. (2020). Effect of Cd precursor on structure and optical properties of spin coated ZnO:9Cd0:1O films for optoelectronics applications. *Materials Science-Poland*, 38(3). 459-464. <https://doi.org/10.2478/msp-2020-0053>
11. Arora, I., Kumar, P., Sathiaraj, T.S. and Thangaraj, R. (2020). Structure, optical and electrical properties of sol-gel derived $\text{Zn}_{1.5}\text{xSn}_{1.5}\text{xO}_4$ nanostructured films for optoelectronic applications. *Thin Solid Films*, 698. 137871. <https://doi.org/10.1016/j.tsf.2020.137871>
12. Rogov, Y., Kremenets, V., Sapozhnikov, M. and Sebele, M. (2020). Application of Tagged Neutron Method for Detecting Diamonds in Kimberlite. *Instruments*, 4(4). <https://doi.org/10.3390/instruments4040033>
13. Ledatshe, K., Dube, P., Sebuso, D., Madhuku, M. and Muiva, C. (2021). Optical dispersion analysis of template assisted 1D-ZnO nanorods for optoelectronic applications. *Ceramics International*, 47(6). 7407-7415. <https://doi.org/10.1016/j.ceramint.2020.11.079>
14. Muchuveni, E., Sathiaraj, T. S., Magama, M. T. and Dzomba, P. (2020). Effect of annealing on the optical constants of ZnO nanowires for energy harvesting applications. *Journal of Optoelectronics and Advanced Materials*, 22(3-4), 200-204.
15. Etémé, A.S., Tabi, C.B., Mohamadou, A. and Kofane, T.C. (2020). Long-range memory effects in a magnetized Hindmarsh-Rose neural network. *Communications in Nonlinear Science and Numerical Simulation*, 84. 105208. <https://doi.org/10.1016/j.cnsns.2020.105208>
16. Okaly, J.B., Mvogo, A., Tabi, C.B., Ekobena Fouda, H.P. and Kofane, T.C. (2020). Base pair opening in a damped helicoidal Joyeux-Buyukdagli model of DNA in an external force field. *Physical Review E*, 102. 062402. <https://doi.org/10.1103/PhysRevE.102.062402>
17. Sengha, G.G., Fokou Kenfack, W., Siewe Siewe, M., Tabi, C.B. and Kofane, T.C. (2020). Dynamics of a non-smooth type hybrid energy harvester with nonlinear magnetic coupling. *Communications in Nonlinear Science and Numerical Simulation*, 90. 105364. <https://doi.org/10.1016/j.cnsns.2020.105364>
18. Njifon, M.A., Tabi, C.B. and Kofane, T.C. (2020). Few-cycles optical pulses in negative index materials with dispersive permittivity and permeability. *Journal of the Optical Society of America B*, 37(11). A331-A345. <https://doi.org/10.1364/JOSAB.398710>
19. Kofane, T.C., Tabi, C.B., Moubissi, A.B. and Tchawoua, C. (2020). From African “tam-tam” to nonlinear optics [Invited]. *Journal of the Optical Society of America B*, 37(11). A346-A355. <https://doi.org/10.1364/JOSAB.399177>
20. Tah, F.A., Tabi, C.B. and Kofané, T.C. (2020). Hopf bifurcations on invariant manifolds of a modified Fitzhugh–Nagumo model. *Nonlinear Dynamics*, 102. 311-327. <https://doi.org/10.1007/s11071-020-05976-x>
21. Tabi, C.B., Panguetna, C.S., Motsumi, T.G. and Kofane, T.C. (2020). Modulational instability of coupled waves in electronegative plasmas. *Physica Scripta*, 95(7). 075211. <https://doi.org/10.1088/1402-4896/ab8f40>
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23. Megne, L.T., Tabi, C.B. and Kofane, T.C. (2020). Modulation instability in nonlinear metamaterials modeled by a cubic–quintic complex Ginzburg–Landau equation beyond the slowly varying envelope approximation. *Physical review. E*, 102(4-1). 042207. <https://doi.org/10.1103/PhysRevE.102.042207>
24. Tabi, C.B., Etémé, A.S. and Kofané, T.C. (2020). Unstable cardiac multi-spiral waves in a FitzHugh–Nagumo soliton model under magnetic flow effect. *Nonlinear Dynamics*, 100. 3799-3814. <https://doi.org/10.1007/s11071-020-05750-z>
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26. Ulaş, B., Gazeas, K., Liakos, A., Ulusoy, C., Stateva, I., Erkan, N., Napetova, M. and Iliev, I. Kh. (2020). A Comprehensive Study of the Eclipsing Binaries V1241 Tau and GQ Dra. *Acta Astronomica*, 70(3). 219-240. <https://doi.org/10.32023/0001-5237/70.3.4>
27. Zamanov, R.K., Stoyanov, K.A., Wolter, U., Marchev, D., Tomov, N.A., Bode, M.F., Nikolov, Y.M., Marchev, V., Iliev, L. and Stateva, I.K. (2020). An eccentric wave in the circumstellar disc of the Be/X-ray binary X Persei. *Monthly Notices of the Royal Astronomical Society*, 499. 3650
28. Diener, J.P.W. and Scholtz, F.G. (2020). Spin-polarized ferromagnetic state of a cold fermi gas, *Physical Review C*, 102 (5). 055805. <https://doi.org/10.1103/PhysRevC.102.055805>
29. Bosigo, R., Lepodise, L.M., Kuvarega, A. and Muiva, C. (2021). Hydrothermal synthesis of CuO and CeO₂/CuO nanostructures: spectroscopic and temperature dependent electrical properties. *Journal of Materials Science: Materials in Electronics*, 32. 7136–7152. <https://doi.org/10.1007/s10854-021-05423-6>

30. Steyn, G.F., van der Walt, T.N., Szelecsényi, F., Perrang, C., Brummer, J.W., Vermeulen, C., van der Meulen, N.P., Motetshwane, M.A. and van Heerden, M.R. (2021). Large-scale production of 88Y and 88Zr/88Y generators: A concept study for a 70 MeV H-cyclotron. *Applied Radiation and Isotopes*, 168. <https://doi.org/10.1016/j.apradiso.2020.109469>
31. Steyn, G.F., Motetshwane, M.A., Szelecsényi, F. and Brummer, J.W. (2021). Pairing of thorium with selected primary target materials in tandem configurations: Co-production of 225Ac/213Bi and 230U/226Th generators with a 70 MeV H-cyclotron. *Applied Radiation and Isotopes*, 168. <https://doi.org/10.1016/j.apradiso.2020.109514>
32. Djoko, M., Tabi, C.B. and Kofane, T.C. (2021). Effects of the septic nonlinearity and the initial value of the radius of orbital angular momentum beams on data transmission in optical fibers using the cubic-quintic-septic complex Ginzburg-Landau equation in presence of higher-order dispersions. *Chaos, Solitons & Fractals*, 147. <https://doi.org/10.1016/j.chaos.2021.110957>
33. Diener, J.P.W. and Kriek, J. (2021). Instructor's dilemma: Requiring two-dimensional measurements to describe one-dimensional motion, applied to a person walking, *European Journal of Physics*, 42(2). 025002. <https://doi.org/10.1088/1361-6404/abc40f>

Talk/Presentation

1. Astronomy In Botswana: "Dark Skies and Bright Prospects". 21 January 2021. (MIKE BODE)
2. Square Kilometer Array: Building an Observatory to study the dawn of time and the origins of life. 6th October 2020. (MIKE BODE)
3. Neutron Stars and How They Connect the Very Small to the Very big. 27 September 2020. (JACOBUS DIENER)
4. Development of a prototype for detecting large diamonds in Kimberlite. X Tastes of Nuclear Physics Conference. University of Western Cape South Africa, 30th November to 4th December 2020. (MOTSWAKAE SEBELE).

Postgraduate Students Graduated

Mr. Keketso Mosalagae

MSC PHYSICS (2020)

Project Title: OPTIMIZATION OF ZnO NANORODS FOR IMPROVED CARRIER EXTRACTION IN ORGANIC-INORGANIC HYBRID PHOTOVOLTAIC CELLS

Mr. Otsile Tikologo

MSC PHYSICS (2020)

Project Title: BIOLOGICAL SHIELDING CALCULATIONS FOR 10 MeV RHODOTRON ACCELERATOR

Mr. Stuart Marongwe

MSC PHYSICS (2020)

Project Title: Probing quantum gravity through astrophysical observations

Ms. Refilwe Setso

MSC PHYSICS (2020)

Project Title: Assessment of indoor radon concentration levels in Serule, Botswana

Major Projects and Contributions

Dashboard for Visualization of the Development of the COVID-19 Pandemic in Botswana

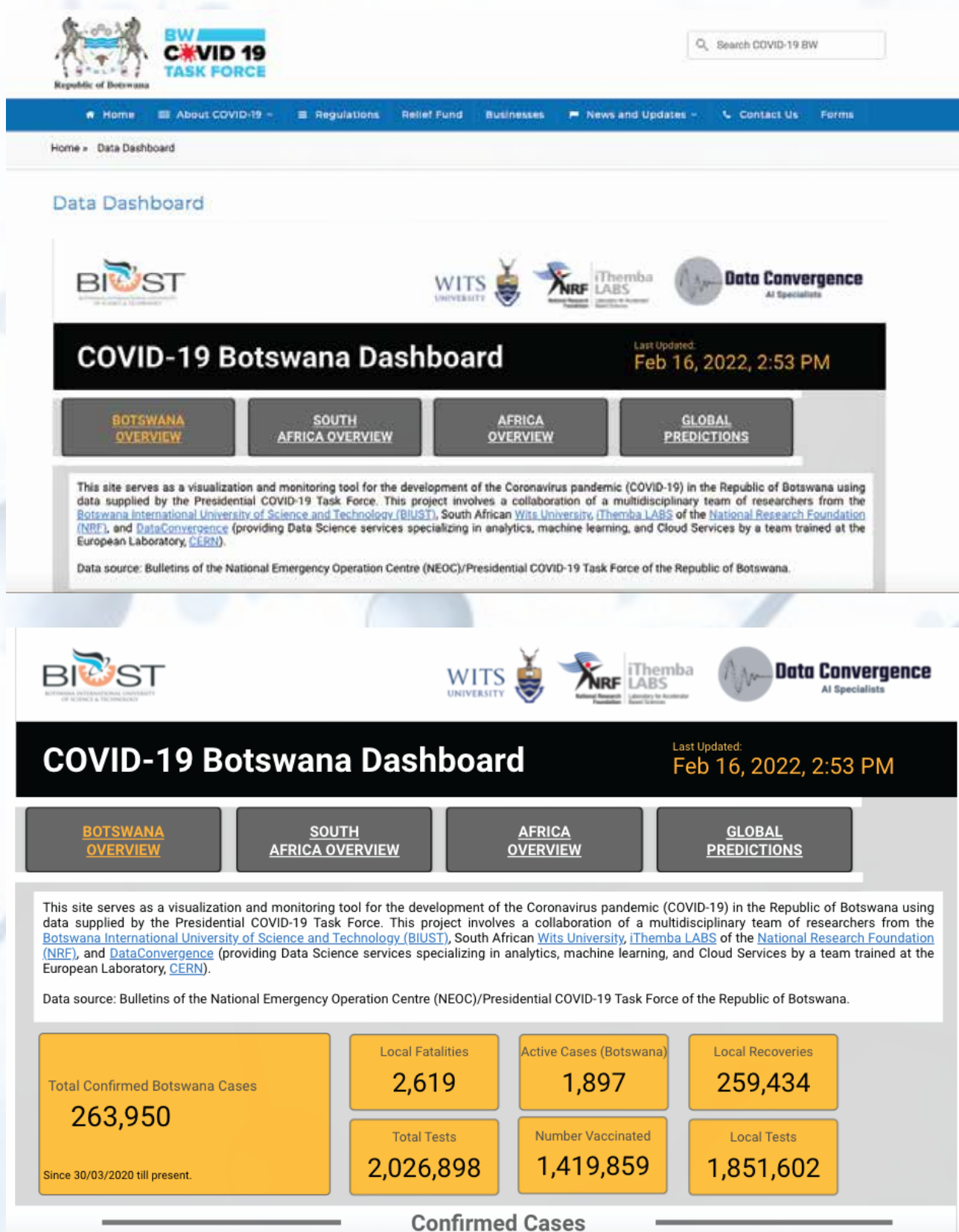


Figure 10: Screenshots of Botswana's COVID 19 Visualization Dashboard

Through partnerships with iThemba Laboratory for Accelerator Based Sciences (iThemba LABS) in South Africa and the University of the Witwatersrand (Wits) School of Physics, staff from the BIUST Departments of Physics and Astronomy have developed a dashboard for visualizing data for the COVID-19 pandemic in Botswana.

These developments are an extension of the existing collaborative relationship between BIUST, iThemba LABS, and Wits University, in the areas of nuclear science, particle physics, and materials science. The linkages in the areas of data analysis are an opportunity for BIUST to extend collaborations with Wits University and iThemba LABS on visualizing and monitoring of the COVID-19 pandemic in Africa. This led to the creation of a dashboard for the Republic of Botswana – see link below: <https://datastudio.google.com/.../Of498d3b.../page/wl9JB>

Research and innovation action (RIA)- Prof Einax



Prof. M. Einax

Figure 11: LEAP-RE Research and innovation action

The Long-term Europe-Africa Partnership on Renewable Energy (LEAP-RE) is a Research and Innovation Action (RIA) that supports Energy Village Projects that promote the use of renewable energy. The main aim of this RIA is to develop joint research and innovation networks to develop affordable renewable energy technologies. One of the major challenges facing the world is the commercialization of Local Renewable Energy Sources. It is against this background that the Energy Village project was established to focus on developing a roadmap on how renewable energy sources can be utilized as stand-alone, reliable, off-grid systems in rural regions, and how research can play a critical role for the development of appropriate innovative solutions.

Prof Mario Einax from the Department of Physics and Astronomy is part of a consortium of 96 institutions and organizations that are involved in the RIA. Some of the members of the consortium include 2 EU partners (University of Vasa, Finland and Scottish Enterprises, Scotland) and 4 African partners (University of Cape Town in South Africa, Addis Ababa Science and Technology University in Ethiopia, Moi University in Kenya, and Makerere University in Uganda). The Energy Village project will be funded for 60 months by the European Union (EU) starting from 2021. As a result of this successful grant application, BIUST is part of the Long-Term Joint EU-AU Research and Innovation Partnership on Renewable Energy (LEAP-RE) programme. The total funding support from the EU is 15 million Euros. However, given the size of the group and funds distribution formula, BIUST will be awarded about 0.24% of the total amount.


BIUST meet Joint Institute for nuclear research- Prof Hillhouse

Figure 12: Virtual meeting of the BIUST and JINR team

The meeting was jointly chaired by BIUST Vice Chancellor-Prof O. Totolo,, and Prof Sharkov, JINR Vice Director and the issues that were discussed included: Recent developments at the JINR in 2020 (Dr Kamanin); Plans for development of scientific infrastructure at BIUST (Prof Hillhouse); Participation in INTERNational REMote Student Training (INTEREST) programme at the JINR (Prof Pakulyak); The next steps, protocols, and the way forward.

In 2020, BIUST signed a Memorandum of Understanding (MoU) with the JINR to cooperate on projects in multidisciplinary areas of Science, Engineering, and Technology. Through funding from Debswana, Mr Motswakae Sebele – who is registered for an MSc Degree in the Department of Physics and Astronomy – was able to work on his project at the Joint Institute for Nuclear Research (JINR) in Dubna, Russia, from December 2019 to December 2020, under the supervision of Prof.Mikhail Sapozhnikov (JINR) and Prof. Gregory Hillhouse (BIUST). His visit to Dubna mainly focused on adding more detectors, as well as calibrating, and testing a prototype for detecting large diamonds in kimberlite using the tagged neutron method (TNM) for selective extraction, thus avoiding breakage through conventional processes involving repetitive crushing, and a maximizing potential income.

The results of Mr Sebele's work were published in the MDPI Instruments, an internationally recognized referred journal, and he also gave an invited talk at the X Tastes of Nuclear Physics Conference hosted virtually by the University of Western Cape South Africa, from 30 November to 4 December 2020. The next step will be to further develop the prototype in Botswana as well as develop associated human capital in science and engineering.



**CENTRE FOR BUSINESS
MANAGEMENT,
ENTREPRENEURSHIP
AND GENERAL EDUCATION
(CBMEGE)**

CENTRE FOR BUSINESS MANAGEMENT, ENTREPRENEURSHIP AND GENERAL EDUCATION (CBMEGE)



Prof. Patricia Makepe, Director, (CBMEGE)

Research Performance Summary

Research performance at the Centre for Business Management, Entrepreneurship and General Education (CBMEGE) was above average. When one looks at the number of journal publications produced by the Centre, performance is heavily skewed towards the Department of Business Management and Entrepreneurship. This is because the Department has the bulk of staff with PhD at the Centre. On the other hand, the Academic Literacy and Social Sciences (ALSS), has been depending only on one PhD member of staff to give research leadership. The Department has recruited a Lecturer who recently joined the department in 2021. The hope is that the two members of staff in the department will now provide the necessary research leadership and mentorship to ALSS staff.

Training of Staff

Some staff members in the department have embarked on their PhD studies, and they are nearing completion of their studies, and having more PhD research performance in the Centre will improve.

Research Output

The team will continue to respond to research calls from the Research Office and other external calls to enhance research. The Centre Director, Prof. P. Makepe emphasised the need for the BIUST Research Office to consider covering other areas of research in seeking out calls for papers in various international journals that are aligned to the mandate of the Centre.

Centre Seminars

The Centre has come up with the initiative to organize monthly seminars for staff to present their work so that they can get constructive feedback from colleagues on how they can improve their research papers or any other project they are working on. These are open to all BIUST staff and they are currently held virtually. To further improve the research output at the Centre, there are collaborative partnerships with different stakeholders to ensure engagement in research that is targeted at the problems faced by different stakeholders which then leads to the development of more utility and value for all the stakeholders. There is a plan in place to transform the Centre to a School that will offer postgraduate programmes and also improve the research output and impact.

Center Research Focus Areas

The Center Research focus areas are guided by the University research focus areas as pronounced in the research strategy. These focus areas are:

1. Climate and Society
2. Natural Resources Management
3. Innovative Technological Products and Services for Economic Development
4. New Frontiers in Science

Center Performance in Key Research Activities

Center research outputs, activities, events, and awards are consolidated quarterly. The Centre for Business Management, Entrepreneurship and General Education outputs, activities, events, and awards for the year 2020/2021 are presented below.



1
Consultancy



13
Journal Articles



2
Book/Book Chapter



4
Conference
Contribution



2
Oral Presentation



2
Membership



4
Seminars/
Workshops

Journal Article Publications

1. Lyken-Segosebe, D.E. and Braxton, J.M. (2020). Investigating engaged scholarship among community development faculty in the Southern African Development Community. *International Journal of Interdisciplinary Social and Community Studies*, 16(1). 1-21. <https://doi.org/10.18848/2324-7576/CGP/v16i01/1-21>
2. Heuser, B., Lyken-Segosebe, D.E. and Braxton, J. M. (2020). Internationalizing a broader view of scholarship: An exploratory study of faculty publication productivity in Boyer's four domains of scholarship in English-speaking universities. *Journal of Comparative and International Higher Education*, 12(Fall). 5-37. <https://doi.org/10.32674/jcihe.v12iFall.1611>
3. Lyken-Segosebe, D.E., Montshiwa, B., Kenewang, S. and Mogotsi, T. (2020). Stimulating academic entrepreneurship through technology business incubation: Lessons for the incoming sponsoring university. *International Journal of Higher Education*, 9(5), 1-18. <https://doi.org/10.5430/ijhe.v9n5p1>
4. Mesuwini, J., Singh-Pillay, A. and Bomani, M. (2020). Perceptions of engineering lecturers and graduates on employability skills: A Case of a TVET College in Kwazulu-Natal, South Africa. *International Journal of Social Sciences and Humanity Studies*, 12 (2). 416-432.
5. Bomani, M., Gamariel, G. and Juana, J. (2021). University strategic planning and the impartation of technopreneurship skills to students: Literature review [Special Issue]. *Journal of Governance & Regulation*, 10(2). 196–203. <https://doi.org/10.22495/jjgrv10i2sart1>
6. Mashingaidze, M., Phiri, M.A. and Bomani, M. (2021). Strategy formulation amongst small and medium manufacturing enterprises: An emerging market case study. *Journal of Governance & Regulation*, 10(1). 158-166. <https://doi.org/10.22495/jjgrv10i1art15>
7. Lyken-Segosebe, D.E. and Braxton, J.M. (2021). Towards a scholarship of practice for university leadership in southern Africa: The two-way practitioner-researcher loop. *International Journal of Higher Education*, 10(1). 93-105. <https://doi.org/10.5430/ijhe.v10n1p93>
8. Kelebonye, B. & Faimau, G. (2021). Botswana Print Media and the representation of Female Victims of Intimate Partner homicide: A Critical Discourse Analytical Approach. *African Journalism Studies*, 429(1). 17-35. <https://doi.org/10.1080/23743670.2021.1884581>
9. Harrington, C., Braxton, J. M., Lyken-Segosebe, D. E., and Genthe, C. (2021, in press). Community college faculty: Perceived value of scholarship. *Community College Journal of Research and Practice*.
10. Mashingaidze, M., Phiri, M. and Bomani, M. (2021). The influence of strategy formulation practices on the perceived financial performance of small and medium enterprises: The Zimbabwean experience. *Southern African Journal of Entrepreneurship and Small Business Management*, 13(1), a343.

<https://doi.org/10.4102/sajesbm.v13i1.34>

11. Mashingaidze, M., Bomani, M. & Derera, E. (2021). Marketing practices for Small and Medium Enterprises: An exploratory study of manufacturing firms in Zimbabwe, *Journal of Contemporary Management*, 18(1), pp 1-26. <https://doi.org/10.35683/jcm20103.114>
12. Bomani, M & Derera, E. (2020). Women Entrepreneurs and Government tenders in Harare, Zimbabwe: Challenges and strategies for survival. *Journal of Contemporary Management*, 17(2), pp.1-18. <https://doi.org/10.35683/jcm19120.67>
13. Matandare, M., Makepe, P.M., Setlhare, L. & Tlhalefang, J. (2021). Crop Production, Livestock Production and Economic Growth in Botswana (1990-2017): An Application of the ARDL Model. *Turkish Journal of Agriculture-Food Science and Technology*, 9(8), pp. 1500-1508. ISSN 2148-127X. Book Chapter(s)
14. Harrington, C., Lyken-Segosebe, D., Braxton, J. M., & Nespoli, L. (2021). Community college faculty engagement in the scholarship of teaching and learning. In M. T. Hora (Ed.). *New Directions for Community Colleges*. No. 195. Teaching and Learning in the 21st Century Community College. Wiley. <https://doi.org/10.1002/cc.20474>
15. Mashingaidze, M., Bomani, M. & Derera, E. (2021). Entrepreneurial Orientation and Business Growth: COVID-19 Implications for SMEs in Zimbabwe (Chapter 11), In 'Baporikar, N. (Ed). *Handbook of Research on Strategies and Interventions to Mitigate COVID-19 Impact on SMEs*. DOI: 10.4018/978-1-7998-7436-2.ch011

Events and Media Coverage

	Activities, Membership Events and Awards	Title	Faculty Member	Department
1	Oral Presentation	Botswana's Informal Sector COVID-19 Recovery Plan	Dr. D. Lyken-Segosebe	Business, Management and Entrepreneurship
2	Oral Presentation	WhatsApp: Panacea for Secondary Education Teaching and Learning in Botswana during and beyond the COVID-19 pandemic?	Dr. D. Lyken-Segosebe Dr G. Gamariel Mr. K. Bagai	Business Management and Entrepreneurship Business Management and Entrepreneurship Academic Literacy and Social Sciences
3	Oral Presentation	ICT Led Technical Education and Vocational Education Training (TVET) Education in Botswana for the 4IR	Prof. P. Makepe	Director, Centre for Business Management, Entrepreneurship and General Education or BME
4	Seminar	2021-2022 BIUST SRC Leadership Training	Staff - CBMEGE	Academic Literacy and Social Sciences Business Management and Entrepreneurship

Table 3: Events and Media Coverage

MYSC Graduation



Figure 13: Hon. T. Rakgare (Minister of MYSC) and Prof. O. Totolo (BIUST Vice Chancellor) handing a certificate of completion to a participant

BIUST in partnership with MYSC successfully hosted the entrepreneurship graduation ceremonies for 26 entrepreneurship graduates who were awarded certificates of the recognition of completing a 'starting your business course'. The two organisations' have positioned themselves as important agents towards promoting socio-economic development through knowledge-based economy. BIUST and MYSC have successfully done this by imparting business skills to budding entrepreneurs in the community.

STEM and National Science Week – PUAP



The banner features the Botswana coat of arms on the left. The main title reads "NATIONAL SCIENCE WEEK AND STEM FESTIVAL 2020" in white text on a blue background. Below this, the theme is stated: "DIGITAL INNOVATION AS A GATEWAY TO PROSPERITY FOR ALL". The dates are "5th – 9th October 2020". A "DATE" label is placed to the left of the dates. On the right, there is a photograph of a person in a lab coat working in a laboratory. Below the main title, there are four logos: "National Science Week" (a lightbulb), "STEM FESTIVAL" (a gear and a person), "NOTE" (a black box with white text), and "BIUST" (the university's logo). A "THIS IS A VIRTUAL EVENT" box with a Zoom icon and the website "www.biust.ac.bw" is on the left. Contact information for enquiries is provided in the center: Directorate of Communications & Public Affairs, Tel: +267 493 1071/77 +267 493 1202/03, Fax: +267 4900102, Emails: media@biust.ac.bw, tshaboeng@biust.ac.bw, bantill@biust.ac.bw, kkgwarapi@gov.bw. The BIUST logo at the bottom right includes the text "BOTSWANA INTERNATIONAL UNIVERSITY OF SCIENCE & TECHNOLOGY".

Figure 14: National Science Week and STEM Festival Announcement

The Botswana International University of Science and Technology (BIUST) hosted the virtual STEM Festival 2020 and National Science Week from the 5th to the 9th of October, 2020 under the theme "DIGITAL INNOVATION AS A GATEWAY TO PROSPERITY FOR ALL". Research, Science, Technology, and Innovation are acknowledged as key transformation factors to drive the country's economic transformation from a resource-based economy into a knowledge diversified economy. Innovation is fuelled by the level of public awareness of STEM and its utility. Both the STEM Festival and National Science Week have similar and complementary goals and objectives. It is in this view that the STEM Festival 2020 and National Science Week celebration were merged to be featured in the same week.

This event aims to consolidate the efforts of educational institutions, industry, and local communities in creating an environment of mutual sharing of research results and experiences for the benefit of Botswana, Africa and the whole world. As the pandemic continues to redefine economic and social norms, policymakers and industries in Botswana need to rapidly adapt to evolving new trends, hence the reason for hosting the STEM Festival 2020 virtually.

In addition to the main theme, the STEM Festival 2020 and National Science Week is based on the sub- themes provided.

1. Digital Innovation for uninterrupted learning
2. Digital Innovation in view of COVID-19 as a catalyst
3. Leveraging digital technology to cushion the effect of COVID-19.
4. Using digital transformation to access the global market
5. Fourth Industrial Revolution in Botswana a fad or a reality.

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Mr. Tabona Kuli

Manager, R&D



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Manager, TT



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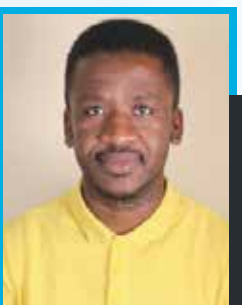
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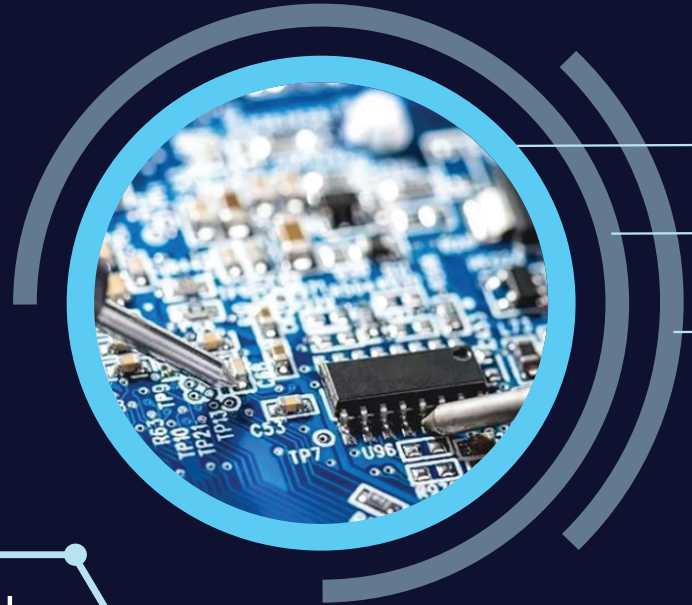
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