



UNIVERSITY
OF ESWATINI

FOSSE

Newsletter

2020



FACULTY OF SCIENCE & ENGINEERING

'A FACULTY THAT RUNS ON
SELF-SUSTAINABLE
ENERGY.'

ISSUE #2

“*Science* is simply the
word to describe a
method of organizing our
Curiosity”

- *Tim Minchin*

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these colleagues who have achieved high levels of excellence in their research areas and have served the University with distinction over many years. Despite operating under the current austere financial environment in which funding for research-related activities is very limited, we observed an increase in the number of Faculty staff who presented their research work at international conferences and workshops. We applaud the efforts of the Faculty staff who sacrificed and travelled to international conferences to represent UNESWA.

The Faculty continues to strengthen its ties with the community through awareness and outreach activities. In 2019, over 15 high schools were visited by the Faculty outreach teams to spread the gospel of Science and to inspire young boys and girls to consider pathways into Science and Engineering careers. With its aptly chosen slogan of “Siyaphambili nge ICT”, the annual ICT fair organised by the Faculty continues to play a major role in promoting ICT awareness and encouraging ICT innovations in Eswatini.

In other 2019 highlights, the 82.56 kW solar photovoltaic (PV) system that was donated by the Republic of China, Taiwan was commissioned in July 2019. The system is now fully operational and provides back-up power to the Faculty and feeds excess electricity to the University grid. The Centre for Sustainable Energy Research was launched by the Honourable Minister of Natural Resources and Energy Senator Peter N. Bhembe in October 2019. The faculty received over E3.5 million in grant funding from several funding agencies to help support the Faculty’s research and outreach projects.

Please read through this newsletter to learn more about the FOSE 2019 highlights. I wish you a healthy and productive 2020.

- Prof. Sandile S. Motsa

It is my privilege to introduce the second issue of the annual Faculty of Science and Engineering (FOSE) Newsletter. We are a “Faculty at work” and in this issue we are pleased to share with you some highlights of faculty activities and events, and achievements of members of the FOSE. Through the annual newsletters, we aim to keep our alumni, students, University community, friends and partners, abreast with the latest news from the Faculty.

In this issue we welcome and introduce 8 staff members who joined the faculty in 2019, and 3 more that re-joined the faculty after completing their studies. Two staff members, Dr. Dickson Karie and Dr. Samkele Tfwala left the employ of the University in the year 2019. We thank these colleagues for the service they rendered to the Faculty during the brief period that they spent at UNESWA.

In 2019, the Faculty introduced two new MSc programmes in Physics and Mathematics which attracted a total of over 30 post-graduate students. The introduction of these new programmes will strengthen the Faculty’s research capacity, particularly in the areas of modelling and theoretical science. A BSc degree in Information Science was also introduced.

On research publications, it is pleasing to note that all departments within the Faculty published articles in international journals. Two members of the Faculty, Prof. T.A.M Mahlaba and Prof. S.K. Mkhonta were promoted to the rank of Associate Professor after a very lengthy review process. We are proud of



Dr Zenzo Polite Ncube

Dr Zenzo Polite Ncube is employed by the University of Eswatini as a Senior Lecturer in the Department of Computer Science where he teaches Theory of Computation, Discrete Mathematics, Computer Programming and other ICT related courses. He has an Honours degree in Mathematics and Computer Science from Cuba, Master’s Degree in Computer Science from the National University for Science and Technology from Zimbabwe and PhD in Computer Science from the North-West University, South Africa. He has taught Computer Science and Information Systems at a number of universities in South Africa and has supervised postgraduate students in Computer Science. He has published research articles in a number of journals as well as in local (SA) and international conferences in Japan, Australia, Canada, Thailand, Germany, United States of America, Kenya, amongst others. Has also reviewed a number of NRF projects and has reviewed research articles for IJCSA, The Scientific World Journal, SAJC, IJCSDF, IJDIWC. He has been a member of organizations such as the Internet Society, SAICSIT, The Society of Digital Information and Wireless Communications (SDIWC), Operations Research Society of South Africa (ORSSA), International Telecommunications Society, HEICTA, NUC4ICT, Northern Cape Broadband Rollout Strategy Group, Provincial Research Chairperson (Mpumalanga province). His research interests include ICT for development, Security in wireless networks, GPU related research, Speech processing especially the use of AI techniques such as neural networks in automatic speech recognition, Graphical Processing Units (GPUs) for speech process in under-resourced languages, Image processing, machine learning, big data/data Science. He is also involved in a number of community projects in and around the country. Dr. Ncube is also an external examiner for a number of universities and has examined doctoral & masters’ research projects,

ICT courses for universities such as North-West University, University of Johannesburg, University of Venda, University of KwaZulu-Natal, University of South Africa, University of Limpopo, Vaal University of Technology, Walter Sisulu University.



Dr Caroline Gurajena

Dr Caroline Gurajena is a committed and passionate lecturer with more than five years of experience in lecturing various Computer Science courses. Dr Gurajena possessing effective teaching techniques which promote a stimulating learning environment that encourages students to participate in active learning. Dr Gurajena holds a doctorate degree in Computer Science from the University of Fort Hare, South Africa, Masters in Computer Science from University of Fort Hare, South Africa.



Dr. Sara Padidar

Dr. Sara Padidar joined the Department of Biological Sciences in July 2019 as a Molecular Biology Lecturer. Previously, she was working with the World Health Organisation (Geneva) identifying challenges and providing sustainable solutions to enable the global health community to meet the goals set in WHO’s End TB strategy and AIDSFree goals. Sara is a public health professional with a strong background in molecular biology research. She is a registered pharmacist and nutritionist with the Medical Dental Council of Eswatini and the Nutrition Society of South Africa. She was the first Head of Department for Pharmacy at the Southern Africa Nazarene University, Eswatini, where she developed the national pharmacy technician training curriculum and graduated the



first cohort of pharmacy assistants and technicians. There she also conducted operational research to understand the impact of the national Standard Treatment Guidelines on prescribing practices in Eswatini. Sara's professional experience extends along the entire health value chain from frontline healthcare provision to basic and translational molecular research. She has managed public health development projects including capacity building and access to nutrition, pharmaceuticals and molecular biotechnology diagnostic tools for HIV, TB and cancer. She has worked across Africa (East, West and Southern), Europe and Asia. Her main research interests lie in the relationship of animals to human health, using animal models to understand the mechanisms of diseases of public health importance, and developing sustainable tools to identify and treat neglected disease for the benefit of vulnerable and marginalised populations.



Dr. Sani Sulaiman

Dr. Sani Sulaiman joined the University of Eswatini in January 2019 as a senior lecturer in the department of Mathematics. He

holds a PhD Mathematics Degree from the University of Botswana, Gaborone since 2015. He is actively engaged in Mathematics of Finance, Operational Research and Optimization of service systems of Economics, Engineering and Environment to date. He has published nineteen articles in these areas. He has taught and tutored Mathematics in several African Universities including the University of Botswana, Gaborone. To date, he has supervised to completion 5 M.Sc. theses, 3 of which led to the award of M.Sc. Mathematics and 2 to the award of M.SEE. Electrical Engineering. Prior to Joining UNESWA, Dr. Sani received the Annual Best Lecturer award for Physical Sciences of the School of Engineering and Applied Sciences, Kampala International University Uganda in December 2018.



Dr. Shell-may Liao

Dr. Shell-may Liao is an experimental high energy/particle physicist. She obtained her PhD in July 2019 and joined the UNESWA physics department in August 2019. She completed her PhD in physics at the University of the Witwatersrand (WITS),

South Africa, where she is part and parcel of the WITS Institute for Collider Particle Physics (ICPP). The WITS ICPP works in collaboration with the European Organization for Nuclear Research (CERN) in Switzerland, which allowed Shell-may the opportunity to travel to CERN for research throughout her postgraduate studies. The collision of protons at an unprecedented centre-of-mass energy of 13 TeV in the recent run (Run 2) of data taking has proliferated the prospect of new physics discoveries at the large hadron collider at CERN. Since the discovery of the Higgs boson back in 2012, focus has shifted towards beyond the standard model physics, which constitutes a bulk of Shell-may's work. In an effort to tap into this new realm of physics, the WITS ICPP developed a model, formulated based on various anomalies observed by both the ATLAS and CMS experiments in Run 1 of data taking. The model introduces a heavy scalar particle as well as an intermediate scalar, which can decay into both dark matter and standard model particles in association with missing transverse energy. During this research, Shell-may led the missing transverse energy performance studies, which were crucial for numerous BSM analyses at the CERN. She went on to further search for new resonances associated with the decays of the hypothesized heavy scalar particle. As a result of Shell-may's studies, the nature of this hypothesized heavy scalar particle is well-understood at the moment and it will be intriguing to see the



evolution of this understanding with the collection of more data in the years to come. Shell-may has also contributed to the instrumentation sector at CERN by participating in radiation studies, which were crucial in detector upgrades, as well as monitored the detector performance in the ATLAS experiment control room. She is also passionate about machine learning and has used machine learning techniques to perform several optimizations for the various analyses that she was part of. Currently, she is collaborating with WITS and has been invited to join the weekly particle physics machine learning group meetings together with her MSc student in order to initiate ties between the WITS ICPP and UNESWA physics department.



Dr. Blessed Muchono

Dr. Blessed Muchono joined the Physics Department, University of Eswatini in August 2019. He holds a PhD in Experimental Condensed Matter Physics from the University of Johannesburg, a Master's degree from the University of Zimbabwe and a BSc (Hons) Degree from the National University of Science and Technology (NUST). Prior to joining UNESWA, Dr Muchono was a Lecturer at NUST in Zimbabwe. His main research interest is in quantum critical behaviour and spin-density-wave-effects in chromium and its alloys. Dr Muchono has experience in the measurement of physical properties using the Physical Properties Measurement System (PPMS), Magnetic Properties Measurement System (MPMS) and neutron diffraction measurements using the Wombart Diffractometer at the Australian Nuclear Science and Technology Organisation (ANSTO) and the SAFARI-1 Research Reactor at the South African Nuclear Energy Corporation (NECSA). He also has research interests in Industrial applications of radioisotopes and in Measurement and instrumentation.



Ms Lungile Sifundza

Ms Lungile Sifundza joined the University of Eswatini in August, 2019 as a Lecturer in the Department of Geography, Environmental Sciences and Planning, and is teaching water resources and water resources planning. She holds an MSc in Water Management from IHE Delft Institute for Water Education (formerly UNESCO-IHE) in the

Netherlands and specializes on Water Resources Management. Ms Sifundza also has a BSc in Agricultural and Biosystems Engineering which was earned from the University of Eswatini. While doing her masters, she has done research on drought management where she produced two conference papers and a scientific article. She presented one of the papers in an international conference (European Geosciences Union General Assembly 2018) held in Vienna Austria. She has worked for the Ministry of Agriculture in Eswatini and the Komati Basin Water Authority (KOBWA) where she gained vast experience on water resources management of transboundary river basins. Her research interests include hydrological modelling, forecasting and developing management frameworks of droughts, impact of climate change on water resources, water resources assessment, including spatial and temporal variability, agricultural (irrigation) water management and impact assessment of global changes (climate, land use and water infrastructure) on hydrology and water resources.



Dr. Zinhle Dlamini

Dr. Zinhle Dlamini holds a PhD degree from Stellenbosch University in Electronic Engineering, an MSc in Aeronautical Engineering from the University of Brighton, UK, and a B.Eng. in Electronic Engineering from the University of the West of Scotland, UK. She is an expert in control systems, flight dynamics and aircraft control. Past research work include Modelling of inflight damage for large commercial aircraft, robustness analysis of fly-by-wire systems and evaluation of aircraft handling qualities under damage condition. An academic Professional with seven years' related industry experience. Previous work experience includes the role of Operations Engineer at MTN Eswatini, and Network Operations Manager at Huawei.

“The important thing is not to stop questioning. Curiosity has its own reason for existence. One cannot help but be in awe when he contemplates the mysteries of eternity, of life, of the marvelous structure of reality. It is enough if one tries merely to comprehend a little of this mystery each day.”

- Albert Einstein



Dr. Mzabalazo Lupupa

Dr. Mzabalazo Lupupa is a lecturer in the Department of Electrical and Electronic Engineering, and has recently returned from his training leave, having been away since 2014. He did his PhD studies at the University of Reading, UK with specialization in wireless communication. His research work was on channel estimation and equalization in massive MIMO systems using fractional-order models. His research interests include system identification in wireless communication systems, massive MIMO systems and fifth generation (5G) wireless communications.



Dr. Thembelihle Dlamini

Dr. Thembelihle Dlamini received his bachelor degree at the University of Eswatini (formerly known as the University of Swaziland), in 2011, then in 2014 received his Master's degree in Electrical Engineering and Computer Science at National Chiao Tung University (Hsinchu, Taiwan), and in the same year he joined the Department of Electrical and Electronic Engineering at the University of Eswatini as a lecturer. From 2016 - 2019, he was part of the European Union Horizon 2020 project called Sustainable

Cellular networks harvesting ambient Energy (SCAVENGE, H2020-MSCA-ITN-2015), as a Marie Skłodowska-Curie Fellow, and also a PhD student at the University of Padova (Padova, Italy), where he was pursuing a doctorate degree in Information Engineering, specializing in Information and Communication Technologies (I.C.T). During his PhD period, his research focus involved the development of core network management procedures for self-organized and sustainable 5G cellular networks. The research work make use of machine learning and control theory techniques, together with energy management procedures. In addition, Dr Dlamini has received training in 5G Cellular Networks and Internet of Things (IoT) at Imperial College of London (London, UK), Energy Generation and Storage at the University of Strathclyde (Glasgow, UK), New scenarios for 5G Mobile Networks: Smart City, Smart Grid, Public Protection and Disaster Relief at the University of Padova (Bressanone-Brixen, Italy), and Testbed Design and Prototyping at Toshiba Research Labs (Bristol, UK). The staff member has recently re-joined the University of Eswatini as a lecturer in the department of Electrical and Electronic Engineering. His research interests includes resource management in 5G systems, machine learning and automation principles in mobile networks. Dr. Dlamini has authored five (5) conference papers and two (2) journals, one (1) book chapter, and he is also a reviewer for Vehicular Technology Conferences and MDPI journals.



Mr. Sandile Dlamini

Mr. Sandile Dlamini, a lecturer in the Electrical and Electronic Engineering Department holds a master's degree in electrical power from Newcastle University and a B.Eng. degree in Electrical and Electronics from the University of Eswatini (UNESWA). He demonstrated his academic excellence when he obtained the Vice Chancellor's award as the best final year student during the October 2015 graduation ceremony together with the Dean's award. During his studies in the United Kingdom, Mr Dlamini undertook a project aimed at reducing the increasing pressure on electricity grids through the integration of solar energy. This is accomplished by the Neutral Point Clamped (NPC) multilevel inverter and space vector modulation (SVM). Other projects include building and testing of a flexible inverter used in control of Brushless DC (BLDC) motor and the design of a high-speed AC motor for a blender with improved efficiency. His vision is to intensify the level of research in the department of Electrical engineering especially when it comes to renewable energy sources. His other research interests include control of power electronic systems; electric vehicles and wireless charging; electric drives; power converters for energy conversion systems.



Prof. Themb'alilahlwa A.M. Mahlaba

Prof. Themb'alilahlwa A.M. Mahlaba is a small mammal physiologist/ecologist with more than 30 years' experience teaching Animal Physiology, Conservation and Ecology courses. He has the same length of experience in practical work, research and student project supervision in the above fields. His more recent research has been focussed on rodent management in and around homesteads as well as in agricultural plantations. Prof. Mahlaba is currently serving as acting head of department (Biological Sciences) after serving four terms as the substantive HoD. He has been a member of numerous university committees including the University Senate and Council, as well as the Faculty of Science and Engineering Board and sub-committees and the Institute of Postgraduate Studies Board. He is involved in national conservation initiatives which include the drafting and implementation of the National Biodiversity Strategy and Action Plan (BSAP) and the Strengthening of Protected Areas Network project. He is also a member of the committee spearheading the country's Man and Biosphere Programme.



Prof. Simiso K. Mkhonta

Prof. Simiso K. Mkhonta joined the University of Eswatini as a Teaching Assistant in the Physics Department in 2002, thereafter, studied towards a PhD in Physics at McGill University, Canada, which was awarded in 2008. He has been with the University since then, promoted to rank of a Senior Lecturer in 2014. He has also worked as a post-doctoral fellow at Wayne State University in Detroit-Michigan (2012-2013). His research focuses on graphene-like materials and 'soft' materials such as liquid crystals and block copolymers. He has been invited to present in a number of international conference meetings, and has received international awards. His recent award was the Africa-Oxford Travel Grant for a summer visit to the University of Oxford, Physics Department in 2018. He is currently the Head of the Department of Physics and an editor of the Scientific African Journal. He is also a member of the Board of Trustees of the Eswatini Environment Fund and the Board of Governors of the Southern Africa Nazarene University.

2019 COHORT OF THE AFRICA OXFORD VISITING FELLOWSHIP PROGRAM

Dr. Vusi Magagula was selected to be part of the 2019 cohort of the Africa Oxford Visiting Fellowship Program. In this program, twenty distinguished African researchers from twelve African countries were selected from nearly two hundred and fifty outstanding applications from thirty countries (see <http://www.afox.ox.ac.uk/news/introducing-the-2019-afox-visiting-fellows/>). Dr. Magagula was part of the twenty fellows who were selected. He was attached for five weeks at Jesus College, University of Oxford, Oxfordshire. He was housed under the Mathematical Institute and worked with Prof. Nick L. Trefethen FRS on solutions of differential equations using rational functions. He was part of the Numerical Analysis Group of the University of Oxford.



Dr. V. Magagula during his stay at the University of Oxford

DEPARTMENT OF CHEMISTRY AWARDED THE INSTRUMENTAL ACCESS AT SEEDING LABS FOR 2019

The Department of Chemistry was selected as the Instrumental Access awardee at Seeding labs for the year 2019. Seeding labs is an organization that donates new and used equipment to developing

countries. In this regard, Dr. Thabile Ndlovu was invited to attend the award ceremony which was held in Boston on the 1st May 2019. She also gave a talk at Boston Renaissance Charter Public School about her research work as well as motivating the students on the 29th April 2019. Dr. Ndlovu was also hosted by Merck International where she gave a talk titled "Coffee Hour with Dr Thabile Ndlovu"



Dr T. Ndlovu addressing students from Boston Renaissance Charter Public School



Dr T. Ndlovu just before her presentation at Merck International offices in Boston, USA



Dr Ndlovu giving remarks at the Seeding labs award ceremony in Boston and the Dr. giving an award to one of the Seeding labs sponsors together with the founding member



Dr. T. Ndlovu receiving the award certificate from Seeding labs

GEP DEPARTMENT AWARDED A GRANT BY ESWATINI ENVIRONMENT FUND

For the year 2019, the Department of Geography, Environmental Science and Planning (GEP) got an award of E150 000.00 from the EEA's Eswatini Environment Fund, towards a project on the rehabilitation of degraded areas in two communities of the country, namely; Elangeni and Ngcayini. The main objective of the project is to demonstrate a range of rehabilitation strategies in collaboration with communities in such a manner that it is possible to do a simple cost-benefit analysis between the different methodologies. This will enable communities to decide for themselves which rehabilitation strategies best suit their needs. The data generated from these selected communities will go some way towards showcasing the options to other communities, thereby facilitating information transfer to more rural communities within the country.



An example of dongas spread all over the country, especially the Middleveld Region

In addition to the rehabilitation of erosion, the project also envisages the co-use of small bio-digesters. The rationale here being that weeds and vegetable waste (including shredded alien plant material) can be used as fuel for the digesters, thereby cutting down on atmospheric emissions that would be generated by burning, but most importantly, providing low cost energy while at the same time proving compost that will further assist in the rehabilitation of degraded and eroded lands. One of the rehabilitation techniques to be used is vetiver grass. The department has taken great strides towards establishing a nursery for the grass, and is currently working towards propagating the grass, a move towards commercialisation. This is especially as a result of the interest the grass has had from stakeholders who are key in environmental protection and rehabilitation. These include World Vision Eswatini, Eswatini Environment Authority and Eswatini Water and Agricultural Development Enterprise (ESWADE), as well as a number of communities that are currently implementing rehabilitation projects under the Environment Fund project.



The GEP departmental vetiver grass nursery at Kwaluseni Campus

The awarding ceremony was held at King Sobhuza Memorial Park, Lobamba, on 04th October 2019. The event was graced by the Minister of Tourism and Environmental Affairs, Honourable Moses Vilakati, members of the EEA board, members of the Environment Fund board, and the awardees who were coming from different communities across the country. Dr. S.D. Mabaso and Dr. S.F. Mamba represented the GEP Department at the awarding ceremony.



The Minister of Tourism and Environmental Affairs, Honourable Moses Vilakati, with members of the EEA Environmental Fund board, and the awardees during the awarding ceremony



Dr. S.D. Mabaso receiving the replica cheque from the Honourable Minister of Tourism and Environmental Affairs, Moses Vilakati, while the chairperson of the Environment Fund Board, Mr Menzi Dlamini and the chairperson of the Eswatini Environmental Authority, Mr Mfanaleni Mkhathshwa look on

As a preparation for the release of the Environment Fund grants, Prof. H. Beckedahl and Dr. S.F. Mamba represented the GEP Department, and attended a Project Management Workshop for all Environmental Fund awardees, held at Caritas, Manzini, on 23-24 October 2019. The workshop was organized and hosted by Eswatini Environmental Authority, and its main purpose was to capacitate the awardees with project management skills, including; budgeting, time management, project closure, and documentation, among other issues.

ROYAL ACADEMY OF ENGINEERING (RAE UK) 2019-2021 FUNDING AWARD

The Electrical and Electronic Engineering Department, in collaboration with Computer Science Department and CELT, won the Royal Academy of Engineering (RAE UK) 2019-2021 funding worth £198 640.87 (approximately E3.6 million) for the High Education Partnership in Sub-Saharan Africa (HEP SSA). In this project, UNESWA as a hub, is partnering with the following academic and local industrial institutions:

- Glasgow Caledonian University (GCU, UK)
- University of Stellenbosch (UoS, SA)
- National University of Science and Technology (NUST, ZIM)
- National University of Lesotho (NUL)
- University of Essex (UoE, UK)
- Local Engineering companies (E.g. EEC, EPTC, RSTP, TouchIT, Jenny Internet, TechSD, Palfridge, RSSC)

The project seeks to build upon effective and innovative practice in all four of the knowledge areas (creation, transfer, commercialisation and exchange) to help sub-Saharan African universities create relevant engineering programmes founded on sound research that will create new engineering companies and new employment opportunities for graduates. It seeks to strengthen research capacity by creating national engineering research agendas, identifying the critical knowledge and skills gaps, and training researchers (knowledge creation); designing outcome or more competence based engineering curricula and delivering it directly into the work place (knowledge transfer); reducing the cost of innovation through the use of virtual tools; designing and piloting entrepreneurship courses for staff and students, and establishing the necessary infrastructure to commercialise their intellectual property (knowledge commercialisation); and finally to build an infrastructure to assist the sharing of knowledge and to encourage more collaboration



between universities (knowledge exchange). Several methods are used to achieve its outcomes including workshops, placements (staff and students), training courses, and the creation of databases and networks.

PROF. HEINZ BECKEDAHL HONOURED WITH THE FELLOWSHIP OF THE SOUTHERN AFRICAN ASSOCIATION OF GEOMORPHOLOGISTS (SAAG)

In September 2019, at the conclusion of the Southern African Association of Geomorphologists (SAAG) International Conference in Chintsa, Eastern Cape, South Africa, Prof. Heinz Beckedahl was honoured with the fellowship of the Southern African Association of Geomorphologists. To highlight is that this is only one of only three fellowships awarded in the 30 years of the Association's history. Prof. Beckedahl was honoured for his long history of dedication to teaching, research and learning, having published close to one hundred papers, books and scientific reports, and graduated in excess of 25 masters students (thesis only) and 15 PhDs, two of which were senior doctorates at German universities. This fellowship also entitles Prof. H. Beckedahl to an honorary life membership of the Association and entitles him to use the letters FSAAG after his name.

PROF. HEINZ BECKEDAHL WAS APPOINTED AS AN EXTRAORDINARY MEMBER OF STAFF IN THE UNIVERSITY OF PRETORIA, RSA

In March, 2019, Prof. Heinz Beckedahl was formally appointed as an extraordinary member of staff in the Department of Geography, Geoinformatics and Meteorology, University of Pretoria, South Africa, giving him supervision rights. Following this appointment, Prof. Beckedahl was appointed and

is currently a principal supervisor of Mr Mthobisi Masilela, a member of staff in the GEP Department, towards his PhD, with Dr Hausmann as co-supervisor).

PROF. HEINZ BECKEDAHL WAS APPOINTED TO THE SOUTHERN AFRICAN ROSTER OF INDEPENDENT ENVIRONMENTAL EXPERTS OF THE UNCCD

Towards the end of 2018, Prof. Heinz Beckedahl was appointed to the Southern African roster of independent environmental experts of the United Nations Convention to Combat Desertification (UNCCD). The UNCCD is a Convention to combat desertification and mitigate the effects of drought through national action programs that incorporate long-term strategies supported by international cooperation and partnership arrangements. It is the only internationally legally binding framework set up to address the problem of desertification, which is based on the principles of participation, partnership and decentralization – the backbone of good Governance and Sustainable Development.

APPOINTMENT OF DR. SABELO N. DLAMINI AS EXTERNAL EXAMINER – UNIVERSITY OF NAMIBIA

Dr. Sabelo N. Dlamini was, in September 2019, appointed as an external examiner by the University of Namibia, under the Centre of Post Graduate Studies. In this assignment, Dr. Dlamini acts as external examiner for Master of Science in Geo-Information Science students where he reviews Master of Science theses ranging from application of Geo-informatics in land use and land cover change mapping, application of Geo-informatics in water quality assessment, remote sensing applications and Geographical Information System modelling.

RECOGNITION OF DR SABELO N. DLAMINI AND DR. SIPHO F. MAMBA FOR OUTSTANDING CONTRIBUTION TO JOURNAL REVIEW

Dr Sabelo N. Dlamini and Dr Siphon F. Mamba have been recognized for their outstanding contribution to the quality of published articles in the Asian Journal of Probability and Statistics and the Asian Journal of Agricultural Extension, Economics and Sociology, respectively.



CONGRATULATIONS TO DR. SAICO S. SINGWANE AND DR. SIPHO F. MAMBA ON SUCCESSFULLY COMPLETING THEIR PHDS

Mr Saico S. Singwane and Mr Siphon F. Mamba successfully completed their with the former's thesis title: 'The Sustainable Management of Community Forests in Swaziland' and the latter: 'Drought, Urban Resilience and Urban Food Security in Kakhoza, Manzini, Swaziland'. They were awarded PhD degrees in April and August at the University of Kwazulu Natal and University of the Western Cape, respectively. To highlight is that Prof. H. Beckedahl was the supervisor of Dr. Singwane's PhD. Dr Singwane presented his work at the Conference of the Society of South African Geographers in Bloemfontein in October 2018. This is at present, under review for publication.



Dr. S.F. Mamba being capped by the UWC Rector and Vice-Chancellor, Prof. Tyrone Pretorius during the August graduation ceremony

DEPARTMENT OF MATHEMATICS AWARDED BID TO HOST THE SAMSA CONFERENCE IN 2021

The Department of Mathematics of the University of Eswatini has been granted the right to host the 40th conference of the Southern Africa Mathematical Sciences Association (SAMSA) in November 2021. The SAMSA's objective is to further research and teaching of Mathematical Sciences in the Southern African countries and beyond through holding of conferences, workshops, academic exchange visits and research stays involving collaborations, as well as through research schools or institutes. Since its formation in 1981, the association has staged 38 annual conferences in Botswana, Eswatini, Lesotho, Malawi,



Mozambique, Namibia, South Africa, Tanzania, Zambia and Zimbabwe. The last time Eswatini hosted the annual SAMSA conference was in the 2000 after previously hosting the conference in 1996, 1994, and 1985. Prof. Motsa led a team of members of the UNESWA Mathematics department to participate in the 2019 SAMSA conference in Blantyre (Malawi) and observe how the international conference is organized and run. The next SAMSA conferences will be hosted by the Eduardo Mondlane University in Maputo from the 24th to 27th November 2020. Hosting the conference will have several benefits for both UNESWA and Eswatini. There will be lasting economic benefits for the country through tourism. The conference will attract delegates from over 20 different countries who will get to know more about Eswatini. The conference will also raise the profile of UNESWA leading to increased enrolment of post-graduate students from other countries. The networking opportunities will result in increased levels of research.



Prof. S.S. Motsa making his remarks during the SAMSA 2019 Conference

TECHNICAL COOPERATION FELLOWSHIPS FROM THE INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA)

Dr Gcina A. Mavimbela received two Technical Cooperation Fellowships from the International Atomic Energy Agency (IAEA) through activities

of the National Energy Planning Team where is the Faculty's Centre for Sustainable Energy Research is a core team member. The first fellowship was on energy demand analysis using the IAEA model MAED (Model Analysis for Energy Demand) in Vienna, Austria. The three week fellowship started on 04 February 2019 and ended on 22 February 2019.



Dr. G.A. Mavimbela at the energy demand analysis training in Vienna, Austria

The second fellowship was on energy statistics (energy balances), energy demand and energy supply modelling using IAEA tools Energy Balance Studio, MAED and MESSAGE, which was held at the Energy Institute EIHP in Zagreb, Croatia. The three week fellowship started on 26 August 2019 and ended on 13 September 2019.



Dr. G.A. Mavimbela at energy statistics (energy balances), energy demand and energy supply modelling in Zagreb, Croatia

APPOINTMENT OF MR. JOHN MAHLALELA AND MR. THEMBELIHLE DLAMINI TO SWAZILAND STANDARDS AUTHORITY TECHNICAL COMMITTEE

Mr. John Mahlalela has been appointed to Swaziland Standards Authority Technical Committee (SWASA TC 36), a committee tasked with reviewing the WD/SZNS SANS 10142-1:2017 - The wiring of premises: Part 1: Low-voltage installations and WD/SZNS SANS 10142-2:2018 - The wiring of premises: Part 2: Medium-voltage installations above 1 kV a.c. standards.

Mr. Thembelihle Dlamini has also been nominated to be part of the technical committee responsible developing the national standard SZNS ISO/IEC 25000 series under the Systems and software Quality Requirements and Evaluation (SquaRE) project initiated by the Prime Minister's office, in collaboration with Swaziland Standards Authority (SWASA). He is currently the Vice Chairman of the technical committee.

INVITE ONTO THE BOARD OF THE INTERNATIONAL ENVIRONMENTAL NGO HANNEL INTERNATIONAL

In the year 2019, Prof. Heinz Beckedahl was invited onto the Board of the international environmental NGO Hannel International with offices in London and Harare.

NEW EXCITING MSC PROGRAMMES IN THE FACULTY

The departments of Mathematics and Physics started offering MSc degrees through the Institute of Postgraduate Studies (IPGS). For the Department of Mathematics, the degree is an MSc in Mathematics, with an option to specialise in either Mathematical Modelling or Financial Mathematics. For the Department of Physics, the degree is an MSc in Physics, with students in this programme required to take some coursework in the first year, which include; quantum computing, high performance computing, advance statistical physics and advanced quantum mechanics. Optional courses include energy and environmental physics, numerical weather predictions, and computational nano-science. The second year is dedicated for research work leading to a submission of a Thesis. The programme is meant to prepare students for computational related professions and for further research in physics related fields. The first cohort consists of 15 self-sponsored students. For the MSc in Mathematics, the first cohort of students is expected to graduate in 2021. Twenty two students were registered for the first time for the MSc program in both Mathematical Modelling and Financial Mathematics. Twelve out of the twenty two students are registered on full time basis and the rest on part time. The department has experts in various fields, including financial mathematics, modelling, mathematical biology, fluid mechanics, numerical analysis, differential equations, mathematical statistics etc.



Mr Mxolisi Shadrack Madonsela

The Faculty of Science and Engineering is proud to present the top UNESWA student of the 2019 graduation ceremony, Mr Mxolisi Shadrack Madonsela. Mxolisi was awarded both the Dean's prize for best student in the Faculty, and the Vice Chancellor's prize for best graduate in UNESWA.

Mxolisi grew up in a rural area of Malindza, in the Lubombo Region. He completed his high school in Manzini Nazarene High School in December 2014. Thereafter, he enrolled for the Bachelor of Science degree in the Faculty, majoring in Mathematics and Physics.

He has been an active student at UNESWA, even serving as a president of the Physics Society. Mr Madonsela is now enrolled for his Masters in Mathematical Sciences at the African Institute of Mathematical Sciences (AIMS) in Muizenberg, Cape Town. His ambition is to further his studies in Theoretical Physics.



UNESWA Vice Chancellor - Prof. J.M. Thwala, RSTP CEO - Mr. Vumile Dlamini, the Dean of FOSE - Prof. S.S. Motsa, the Head of CS Department - Dr. A.S. Metfula and members of the ICT Fair organizing committee

The Department of Computer Science (CS) in collaboration with Royal Science Technology Park (RSTP), Eswatini Investment Promotion Authority (EIPA) and the Government of Eswatini, hosted the 3rd edition of the ICT Fair on the 25th and 26th of October 2019 at the University of Eswatini, Kwaluseni Campus. The ICT Fair was initiated in 2017, to provide a platform for students, individuals and business players in the ICT industry to get an opportunity to showcase their innovative ideas, products and services to the community. The theme of the ICT Fair 2019 was Innovate, Connect, Transform – ICT for Youth. The event had seminars, innovation contest and programming contest.

The event attracted a quite number of pupils from various high schools in the country to encourage them to pursue their professional career in Science, Technology, Engineering and Mathematics (STEM).

In addition to that, the career section of the ICT Fair 2019 was graced by the many guest speakers from the industry (Ms Fulutsa Sibanyoni - EPTC, Mr Nkosingiphile Mthethwa - Nedbank, Mr Samkelo Lushaba - SEDCO, Ms Lindiwe Dlamini - Standard Bank, Mr Mlandvo Simelane - EEC, Mr Sithembiso Dlamini - Entrepreneur, Ms Nontobeko Hlongwane - EEC), academia (Dr Zodwa Makukula - UNESWA, Dr Zinhle Dlamini - UNESWA) and the Government (Mr Bonga Ndlangamandla - eGovernment, Mr Siboniso Vilakati - EBIS). Female learners were encouraged to pursue their career in the STEM field. This is because, across the world, women are under-represented in the STEM fields. However, Swazi women engineers are breaking the mold and shattering stereotypes about women's leadership in a male-dominated field. Therefore, the career section played a paramount role by providing guest speakers with an unprecedented opportunity to empower young girls to pursue STEM studies. Primary and high students were competing in the programming contest category during the event. Various prizes including laptops, tablets and backpacks were won.



The head of CS Department, Dr. A.S. Metfula (far left) with members of the ICT Fair organizing committee and student volunteers



The FNB innovation contest was open to young innovators including programmers from the industry and students from higher and tertiary institutions within the country. GreenBox won the first prize (1st) of E30 000, followed by the second prize (2nd) of E15 000 won by YEMASWATI Solutions and the third prize (3rd) of E10 000 was won by Oasismed.



The Dean of FOSE, Prof. S.S. Motsa, FNB representative, Mr. M. Thwala, and the representative of the Minister of Education and Training, Mrs. M. Shongwe, handing over a cheque of E30 000 to first place GreenBox Team

FNB representative, Mr. M. Thwala, the Dean of FOSE, Prof. S.S. Motsa, and the representative of the Minister of Education and Training, Mrs. M. Shongwe, handing over a cheque of E15 000 to second place YEMASWATI Solutions



FNB representative, Mr. M. Thwala, the Dean of FOSE, Prof. S.S. Motsa and the representative of the Minister of Education and Training, Mrs. M. Shongwe, handing over a cheque of E10 000 to third place Oasismed

In addition to the career section, the ICT Fair 2019 hosted a seminar on the Impact of the 4th Industrial Revolution: Challenges and Opportunities for Innovation and Inclusive Growth in the Kingdom of Eswatini. The carefully selected guest speaker for the seminar was none other than First National

Bank Eswatini Chief Executive Officer, Mr. Dennis Mbingo. The seminar was attended by over 100 people from different ICT related industries such as communications regulator, mobile operators, Internet Service Providers, financial institutions, government ministries, the news media and

the consumers association. The event was officially opened by the Principal Secretary (PS), Mr. Maxwell Masuku from the Ministry of Information, Communication and Technology (ICT) and closed officially by Mrs. Martha Shongwe (representing the Minister of Education and Training).



The Principal Secretary in the Ministry of Information, Communications and Technology (ICT), Mr. M.M. Masuku marking his opening remarks



The Dean of the FOSE, Prof. S.S. Motsa presenting Mrs. M. Shongwe (representing the Minister of Education and Training) with a gift



A section of the delegates and learners from various high schools in the country who attended ICT Fair Career section



Some learners from various high schools in the country who attended the ICT Career Fair



From left to right: Ms. L. Zulu - HRD Specialist, EPTC, Ms. S. Maziya - GM HR, EPTC, Dr. Z. Ngcobo - Librarian, UNESWA, Prof. C. Magagula - Former VC of UNESWA, Mr. P. Dlamini - MD, EPTC, Mr. V. Magagula - GM IT, EPTC, Mr. Phesheya Dube - Representative of Minister of ICT, Prof. J. Thwala - VC, UNESWA, Dr. A.S. Metfula - Head, CS, UNESWA, Prof. H. Gadaga - PVC Academic, UNESWA, Prof. Sandile Motsa, Dean, FOSE, UNESWA, during the graduation ceremony

The CISCO Academy is a result of an MoU that was signed by the University of Eswatini (UNESWA) and the Eswatini Posts and Telecommunications Corporation (EPTC). The MoU was signed on Wednesday, the 2nd of August 2017. The main objective of the MoU was that UNESWA and EPTC will work together to resuscitate the CISCO Academy which had closed over a decade ago at Kwaluseni Campus. The process was started with the training of instructors later in 2017 by a respected trainer from Nelson Mandela University. CISCO classes started in

the Academy in February 2018 with 32 students, 3 of those were from UNESWA and 3 were from EPTC. The rest came from a number of companies and government. There were also school leavers who had just completed Form 5 while some had just completed their degrees here at UNESWA. The first graduation of the Academy was held on the 28th of September 2019. Today, the Academy has over 70 students from all over the Kingdom.



UNESWA Vice Chancellor, Professor J.M. Thwala during the first graduation of the CISCO Academy



EPTC Managing Director (MD), Mr. P. Dlamini delivering his speech, while Prof. S.S. Motsa, Dean of FOSE follows the address closely during the graduation ceremony



Mr. P. Dube, representative of Minister of ICT, making his remarks during the event



UNESWA VC, Prof. J.M. Thwala, representative of Minister of ICT, Mr. P. Dube, one of the CISCO graduates, and EPTC MD, Mr. P. Dlamini during the graduation ceremony

PHYSICS DEPARTMENT

The Faculty outreach team, led and coordinated by the Physics Department, visited seven High schools in 2019. The schools visited were; Ekuthuleni High School, Mhlosheni High School, Nhlanguano Central High School, Ngomane High School, Mhlume High School, Our Lady of Sorrows High School and Hosea High School. The team is comprised of staff members from the Faculty, together with students. The plan is to eventually cover all school in the country.



Ekuthuleni High School inside the Faculty's Physics Department laboratory

ELECTRICAL ENGINEERING AND ELECTRONICS DEPARTMENT

The department is running a school's Outreach programme which aims at addressing engineering skills and diversity challenges by:

- Introducing children and young people to the fun and excitement of Engineering in a university research environment;

- Organising and supporting Engineering events which encourage currently underrepresented groups to apply for Higher Education studies in the field of Engineering;

- Using teams of student and staff volunteers and industry representatives to help make Engineering, Higher Education in general, and the University of Eswatini in particular, accessible, to raise aspirations and to reduce gender/culture stereotypes;

- Providing opportunities for UNESWA students and staff to help inspire the next generation of engineers

and scientists while developing their own transferable skills; Together with the outreach programme the department also accept requests for tours to the department from any school's group. Hands-on activities are organized as part of events. This programme is designed to widen the demographics of the University of Eswatini, Engineering in particular.

In the academic year 2018.19, the EEE Department successfully visited eight (8) schools, namely; Salesian High School, Lozitha High School, Mbekelweni High School, Ngomane High School, Lusoti High School, Mhlume High School, Vuvulane High School, Mbokojweni High School, and Shewula High School.



Faculty outreach team performing a Chemistry experiment at Mhlume High School



Ngomane High School pupils during a Q&A session

Visit Date	School Name	Distance from UNESWA	Total Students
Day 1 13th February 2019 (Manzini)	Salesian High School	10km	134
Day 2 14th February 2020	Lozitha High School	7km	140
	Mbekelweni High School	8km	235
RSSC Neighbouring Schools			
Day 1 24th June 2019 (Lubombo)	Ngomane High School	92km	193
	Lusoti High School	88km	215
Day 2 25th June 2019 (Lubombo)	Mhlume High School	98km	220
	Vuvulane High School	97km	189
Day 3 26th June 2019 (Lubombo)	Mbokojweni High School	108km	170
	Shewula High School	117km	187
TOTAL			1683



Mr Kwanele Vilakati (EEE Student) demonstrating his line follower robotic car



Mr Celucolo Ginindza (EEE Student) demonstrating his greenhouse automation project



Group photo with part of the students at Mhlume High School



Mr S.N. Wicramasinghe demonstrating on oscilloscope usage at Salesian High School



Group photo with students and teachers at Lozitha High School



Group photo with students and teachers at Ngomane High School



Students listening to presentations at Mbekelweni High School



Group photo at Shewula High School including students and teachers

Such an outreach to the schools around Mhlume and Simunye was possible, thanks to the support of Royal Swaziland Sugar Corporation (RSSC) to the value of E43,020.00. The department greatly appreciate the support that was received from RSSC.



RSSC CSI Manager Phindile Dlamini (2nd right) Hands over the replica cheque to UNESWA EEEP team at Simunye Country Club during a presentation ceremony

GEOGRAPHY, ENVIRONMENTAL SCIENCE & PLANNING DEPARTMENT

The GEP Department is engaged in several programmes which include school outreach programmes, environmental awareness and management campaigns, and various community services, among others. As part of its objectives, the GEP Department, through UNIGEPS (students society), participated in different events within and beyond Matsapha. These included environment calendar commemorations, community clean ups, and school environmental awareness.

The department engaged with Zombodze High School in order to develop their environmental club and also plant environmentally sustainable trees, an initiative made possible through collaboration with various stakeholders. This gesture was well received and appreciated by the school authorities. Moreover, the department, through UNIGEPS, engaged with Nguwe Likusasa Letfu at Evelyn Baring High School in the commemoration of World Ozone Day. Furthermore, UNIGEPS co-hosted a clean-up campaign and tree planting at Saim Christian High School which had a positive reception from the area of Mahwalala and the school. In addition, the department receives numerous applications from different schools who are interested in its weather station facility and has hosted at least 15 schools in 2019 that came to learn about weather instruments and their uses in addition to river measurement excursions. The table shows that the department interacted with more than 900 students through this programme.

Date of Visit	Name of School	No. of Students	Activities	Educational Level
09/03/2019	Woodlands High School	25	River studies	Form 5
10/04/2019-11/04/2019	Lozitha National High School	200	Weather Instrumentation	Form 3 and 5
13/06/2019	Thembelihle High School	47	Weather Instrumentation	Form 5
28/06/2019	Mbokojweni High School	32	Weather Instrumentation, River Studies	Form 5
02/07/2019	Malunge High School	46	Weather Instrumentation, River Studies	Form 5
04/07/2019	Sibusisweni High School	15	Weather Instrumentation, River Studies	Form 5
11/07/2019	Lusoti High School	55	Weather Instrumentation, River Studies	Form 5
18/07/2019	Ntjanini Central High School	60	Weather Instrumentation	Form 5
31/07/2019	Nyanyali Primary School	70	Weather Instrumentation	Grades 5-7
01/08/2019	Mkhondvo High School	70	Weather Instrumentation	Form 5
02/08/2019	Mshengu High School	70	Weather Instrumentation	Form 3 and 5
07/08/2019	Dvudvusini High School	45	Weather Instrumentation, River Studies	Form 3, 4 and 5
08/08/2019	Woodlands High School	98	Weather Instrumentation	Form 3 and 5
09/08/2019	Edwaleni High School	60	Weather Instrumentation, River Studies	Form 3 and 5
12/08/2019	Ntunja Primary School	35	Weather Instrumentation, River Studies (interrupted by UNESWA strike)	Grades 6 and 7

Date of Visit	Name of School	No. of Students	Activities	Educational Level
26/08/2019	Mountain View High School	15	Weather Instrumentation, River Studies (interrupted by UNESWA strike)	Form 3 and 5
TOTAL		943		



Evelyn Baring High School teachers and students during the World Ozone Day celebration



Dr. W.M. Dlamini with UNIGEPS students during the World Ozone Day celebration at Evelyn Baring High School



Zombodze High School students listening attentively during the environmental club formation event



Picture of UNIGEPS members taken during the SAIM High School Clean-up campaign



Members of UNIGEPS during SAIM High School tree planting campaign



A group photo of University and Zombodze High School students during the tree planting initiative at Zombodze High



GEP technologist, Mr. M.S. Malinga taking students from Thembelihle High School through instruments kept in a Stevenson screen, and how an evaporation pan is used to estimate the rate of evaporation.

BIOLOGICAL SCIENCES DEPARTMENT

The Department of Biological Sciences through Biology Society were co-organisers of the World Environment Day in collaboration with Somnjalose High school, UNESWA Green Team and GEP Department (through UNIGEPS). The event was held at Somnjalose High School under the theme: Environmental pollution. Activities of the day involved trees planting in the school and litter picking. Prof. Themb'alilahlwa A. Mahlaba and Dr Gaolathe Tsheboeng were part of the organising committee for the event. Furthermore, tree planting was extended to other schools around the country with the second school being Saim High School. This tree planting exercise will be extended to other schools in the country as a way of raising awareness on environmental conservation.



Students were also part of the world environment day celebrations, participating in litter picking



Tree planting was also one of the activities that marked the world environment day celebrations



Dr G. Tsheboeng and the head teacher of Somnjalose High School, Mr M. Mamba, awarding certificate of appreciation to some of the sponsors of the event



A march by the participants to raise awareness on environment pollution



DEPARTMENT OF MATHEMATICS

The Department of Mathematics was invited to participate in the Annual Waterford Students Career Support Initiative (CSI) event by the organizers. The department was represented by Dr. Sulumaini Sani, Dr. Jockonia S. Mathunjwa, Nomkhosi Dlamini and Gift Mavuso (the last two being students). The Annual Waterford Students Career Support Initiative (CSI) Community Project is being sponsored by Old Mutual Eswatini. They delivered motivational speeches to the participants and lectured them on mathematics opportunities. It was held on the 24th of July 2019 at Mavuso Exhibition Ground, Manzini.

Moreover, Dr. Vusi M. Magagula is a member of the Eswatini Association of Mathematical Teachers (ESAMT), responsible for running all mathematics activities of high school students in the Kingdom of Eswatini. As part of community service, Dr. Magagula, together with members of ESAMT committee, successfully planned and ran regional and national events, namely; Mathematics and Science fairs.



Students participating in Manzini Regional Science Fair, November 2019



Students posing with the ESMAT Committee members after writing the South African National contest at the University of Eswatini



Dr. S. Sani, Old Mutual representative, N. Dlamini, G. Mavuso, Dr. J. Mathunjwa, and another Old Mutual representative

LAUNCH OF THE CENTRE FOR SUSTAINABLE ENERGY RESEARCH

The Centre for Sustainable Energy Research was launched by the Honourable Minister of Natural Resources and Energy Senator Peter N. Bhembe on the 17th October 2018. This event was combined with the handover of the 82.56 kW solar PV system, by the Honourable Minister Oliver Harn representing his Excellency the Ambassador of the Republic of China (Taiwan) Jeremy Liang. The launch was supported by the Vice Chancellor's Office, and externally by the Ministry of Natural Resources and Energy, Ubombo Sugar Limited, USA Distillers, Eswatini Energy Regulatory Authority, and Eswatini Electricity Company.



Members of the Faculty of Science and Engineering attending the CSER launch



The Honourable Minister of Natural Resources and Energy Senator Peter N. Bhembe launching CSER



Ms Minky Groenewald, the Climate Change Project Coordinator from the Ministry of Tourism and Environmental Affairs, Climate Change Unit, delivering her speech during the launch of CSER



The Dean of FOSE, Prof. S.S. Motsa, making his remarks during the CSER launch, where he pledged that there would be the launch of other Centres of Excellency soon



The PVC - Admin and the Dean of FOSE leading the Honourable Minister of the Ministry of Natural Resources and Energy, Mr. P. Bhembe, the representative and delegate from the Republic of China-Taiwan Embassy on their way from touring the CSER



CSER coordinator, Dr. M.M. Mathunjwa, leading discussions on how to encourage Eswatini to use renewable energy

The CSER has been operating way before the launch and has a number of projects already in the pipeline:

COMMISSIONING OF THE SOLAR PV SYSTEM

The 82.56 kW solar PV system donated by the Republic of China (Taiwan) was commissioned on 12 July 2019. Since the commissioning, the system has provided more than 62 000 kWh of electricity which is worth more than E100, 000. It consists of 258 monocrystalline solar PV modules rated at 320 W each, 4 inverters that convert the DC power from the panels to AC, and nine inverters that are used to charge batteries that can store 192 kWh of electricity of which 96 kWh is available for use. The batteries are used to back-up the part two science offices, and this power is supplied by the nine inverters, that convert the DC power from the batteries to AC. On bright sunny days the system can produce over 560 kWh and can drop down to as low as around 40 kWh on cloudy days with dark clouds.



The Honourable Minister Oliver Harn handing over the 82.56 kW solar PV system to CSER



University of Eswatini Pro-Vice Chancellor Prof. P.E. Zwane presenting a gift to the Honourable Minister Oliver Harn during the function



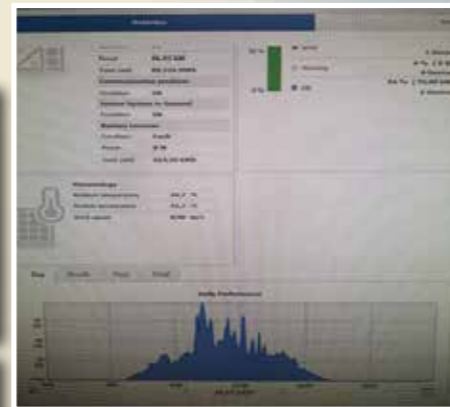
72 storage batteries for 82.56 kW solar PV system, the blue box supplies the university and the two yellow boxes supply the Faculty of Science and Engineering offices when there is EEC power cut



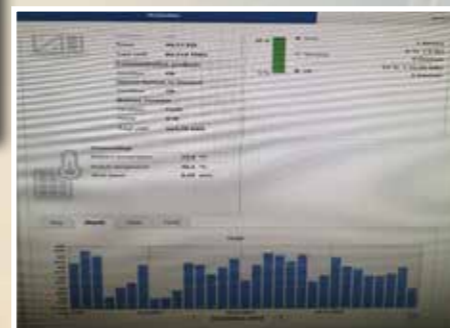
The multi cluster control box for the solar PV system



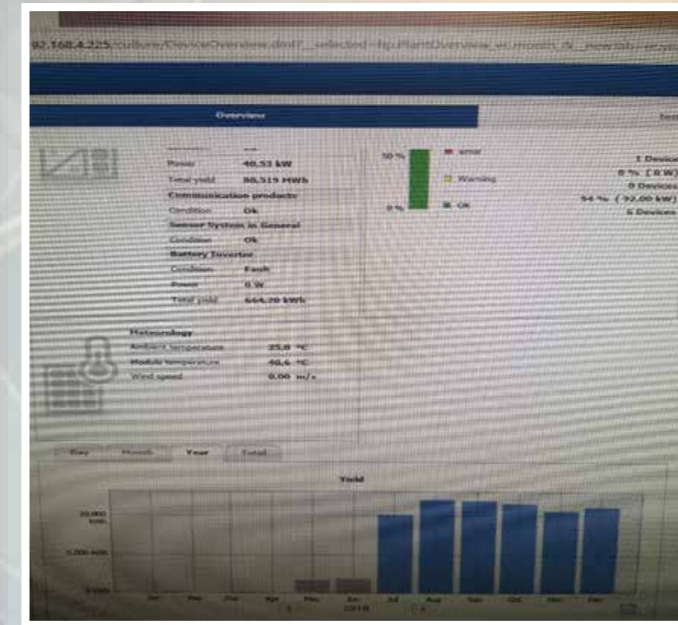
The brain of the system that sends information to a computer for monitoring



Data from the 26th of January 2020



Data for December 2019



Data for 2019, the system started operating in July

SHORT COURSES ON ENERGY

The Ministry of Natural Resources and Energy organised assistance for the CSER from the International Atomic Energy Agency through the University of Cape Town to develop a training programme on energy by way of short courses. The course structures for these courses have now been developed. The next step will be to develop the course content of each course. These courses will be further developed for incorporation in the undergraduate and graduate curriculum.



Members of the Department of Physics attending a workshop on developing short courses on energy

GHG INVENTORY FOR THE ENERGY SECTOR

The CSER is undertaking a project on compiling the greenhouse gas inventories for the energy sector starting from 1990 to 2018 and projecting from 2019 to 2050. The report from this work will form part of the Fourth national Communication to the United Nations Framework Convention on Climate Change (UNFCCC). The project is implemented under the Climate Change Unit in the Department of Meteorology in the Ministry of Tourism and Environmental Affairs.

MEMORANDUM OF UNDERSTANDING

The CSER has in place a memorandum of understanding with the Eswatini Energy Regulatory Authority (ESERA). This MOU will enable the two entities to work together in the development of the energy regulatory framework where the ESERA will task the CSER to undertake studies before issuing regulations so that such are developed based on sound information.

**2019 ESWATINI INNOVATION
HACKATHON**



The Centre for Financial Inclusion (CFI), Central Bank of Eswatini (CBE), Eswatini Communications Commission (ESCCOM), Financial Services Regulatory Authority (FSRA) and University of Eswatini (UNESWA) with support from FinMark Trust (FMT), jointly pioneered the Eswatini Innovation Hackathon to foster data-driven solutions and improve efficiency of and access to financial services in Eswatini. The Department of Computer Science in collaboration with Central Bank of Eswatini, actively participated in the Eswatini Innovation Hackathon competition that was held on 2 – 4 August 2019 at the University of Eswatini, Kwaluseni Campus. The Eswatini Innovation Hackathon was the first edition, a 3-day, non-stop marathon for young innovators, developers and designers, both students and graduates to design and develop next-generation applications to improve on existing credit systems and digital product offering; connect technology with people to bridge the financial inclusion divide in Eswatini; create technological solutions that are built for Eswatini and solve local challenges; and leveraging existing information, networks and human capacity to build innovations and solutions to presented challenges. The first prize of E50 000 was won by the CYBERBEAST team, second prize of E30 000 was won by X-Code team and the third prize of E25 000 was won by INHLAVA team.



UNESWA Vice Chancellor, Prof. J.M. Thwala and the Governor of Central Bank of Eswatini, Mr. M. Sithole, presenting a replica cheque of E50 000 to the CYBERBEAST team



The Governor of the Central Bank of Eswatini, Mr. M. Sithole, presenting a replica cheque of E30 000 to X-Code team



The Governor of the Central Bank of Eswatini, Mr. M. Sithole, presenting a replica cheque of E25 000 to INHLAVA team

**GEP DEPARTMENT
SEMINAR ON
THE THREAT OF
MICROPLASTICS**

The GEP Department, through UNIGEPS, hosted a long awaited inaugural seminar on the 21st of March 2019 themed ‘The Threat of Microplastics – Your Food and the Environment’ with the speakers of the day coming from Eswatini Environment Authority (Mr. Mahlosane Magagula), Matsapha Municipal Council (Mr. Mxolisi Maphanga) and UNESWA (Mr. Sizwe Nxumalo and Dr. Wisdom Dlamini).



Dr. Wisdom Dlamini making his presentation during the seminar



Attendees doing an exercise during the seminar

**SOUTHERN AFRICAN
EXCURSION FOR
POSTGRADUATE
STUDENTS FROM
MARTIN LUTHER
UNIVERSITY OF
HALLE-WITTENBERG,
GERMANY**

The Department of Geography, Environmental Science & Planning (GEP) hosted geography and geography education postgraduate students from Martin Luther University of Halle-Wittenberg in Germany on an excursion in Southern Africa. The excursion, which was scheduled on the 15th to the 25th of August 2019 included GEP postgraduate students who are pursuing their degrees in land and water resources management.

The excursion started with a visit to the Magaliesberg and Hartbeespoort area where the group had an aerial view of the Hartbeespoort dam and the effects of eutrophication on the dam. They also learnt of the history of the area and the geomorphic setting of the landscape. The group then went to the Cullinan diamond mine in Cullinan, north of Pretoria, where they learnt about the history of diamond mining in South Africa, and diamond mining in Cullinan. They were taken into a surface view of the mining site and then into the deep shaft where they were allowed the opportunity to see deep shaft mining processes as they occur.



UNESWA and MLU group photo at Hluhluwe-Umfolozi Nature Reserve



The Martin Luther University and UNESWA students at the Cullinan Diamond Mine, South Africa

The group then travelled to the SOWETO township of Johannesburg where they appreciated the history of gold mining on shaping the socio-economic landscape of Johannesburg. They learnt about the mining period of the apartheid regime and how the socio-economic set up of the time has impacted the socio-economic landscape of SOWETO in present day. The group discussed how environmental degradation caused by gold mining affected and still affect residents of SOWETO. They then moved on to the Hector Pieterse museum and the Mandela family house where they learnt about the uprisings against the apartheid regime in 1976. The excursion proceeded

to the Drakensburg, Hluhluwe-Umfolozi Nature Reserve, Saint Lucia, through to Eswatini where the student got to experience the Mantenga Cultural Village, the Old Ngwenya mine, Bulembu asbestos mine and a tour of the University of Eswatini's Kwaluseni Campus, among other activities.



Prof. H. Beckedahl, Prof. S.K. Mkhonta, Prof. Martin, and Dr. S.D. Mabaso during the meeting



UNESWA MSc ERM students at the Hector Piertesens Museum during the excursion

The visit by the German group also included a meeting between Prof. Martin of the Martin Luther University, and the acting Dean of the Faculty of Science & Engineering, along with the GEP Department. The meeting discussed among other things, the re-enactment of the memorandum of understanding (MOU) between the two universities, from which a number of staff members from GEP Department had benefited. It also discussed possible areas of collaboration in research and other aspects of mutual benefit between the two institutions.

2019 ESWATINI CYBER SECURITY WORKSHOP

The Department of Computer Science hosted a Cyber Security workshop with the Institute for Information Industry on the 1st of November 2019. The workshop was focusing on Network security and Penetration Test. The workshop was held soon after the signing of MoU with the Institute for Information Industry, Taiwan and the University of Eswatini through Computer Science Department. The workshop was conducted in two sessions from 10:00 am to 12:00 and 13:00 to 16:00pm. The first session was for managers and it was attended by seven participants while the second session was for engineers, and it was attended by 15 participants. All the participants received their certificate of attendance.

The Institute for Information Industry is engaged in the development of information and communication technology solutions in Taiwan. The company researches and develops

networking and multimedia technology for local industries, including wireless broadband, mobile multimedia, and Android- and MeeGo-embedded platform technologies as well as sensor network and energy ICT solutions; applications or services; digital education, including future classroom platforms, mobile learning applications, Chinese-language semantic analysis, and e-learning; and green ICT services which include metering infrastructure, distribution management systems and demand response platforms, lighting fusion optimization control systems, and telematics. The company also provides intelligent IT security assessment systems, bidirectional web protection solutions, security event monitor and analysis tools, and cloud-based and data security solutions; assists government agencies in planning and outlining industrial development strategies; and offers industrial promotion, professional talent development, and application promotion services. It also provides WiMAX infrastructure development; cloud computing application service platforms; and wireless broadband communication and application, telematics application, sensor network and smart living residence, and technology services. Institute for Information Industry was founded in 1979 and is based in Taipei, Taiwan.



Cyber Security, Network Security & Penetration test workshop



From left to right: Dr. A.S. Metfula (Head, Computer Science), Prof. S.S. Motsa (Dean, FOSE), Prof. J.M. Thwala (Vice Chancellor, UNESWA), Mr. J. Liang (Taiwanese Ambassador to Eswatini), Ms C. Chow (representative of the Institute for Information Industry), Mr. S.M. Sithole (Lecturer, UNESWA), Mr. L. Dube Sithole (Lecturer, UNESWA), and Mr. S. Shongwe (UPIAC, UNESWA)

GIRLENG WORKSHOP

The GirlEng workshop was hosted by the Electrical and Electronic Department in partnership with the WomEng Eswatini at UNESWA Multi Purpose Hall (MPH) on the 28th September 2019. The workshop aimed at

increasing awareness and make STEM fun, engaging and relatable to secondary school girls. The GirlEng mission is to attract and mentor girls into STEM related fields with a focus on engineering and technology. This is being done through gamification, coding and building projects translating mathematics and Science into everyday challenges. The workshop was attended by 40 high school girls from 7 schools across Eswatini, who are aspiring STEM professionals, drawing inspiration from current female engineers and UNESWA EEE teaching staff. Mr Mhlaliseni Khumalo presented the EEEP project outcomes in this workshop.



Mr M.J. Khumalo making his presentation at the GirlEng workshop



Group photo of participants of the GirlEng workshop held at the UNESWA

9TH AFRICAN REGIONAL CENTRE OF EXPERTISE (RCE) REGIONAL MEETING ON EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD)

The 9th African Regional Centres of Expertise was hosted by RCE Eswatini whose secretariat is based at the Eswatini Environment Authority and co-hosted by the University of Eswatini (GEP Department in the FOSE and the Faculty of Education), and Eswatini Water and Agricultural Development Enterprise (ESWADE). Other members of RCE Eswatini are Ministry of Education, the National Curriculum Centre, Eswatini National Trust Commission and Matsapha Municipal Council.

The theme of the three day meeting was: 'Accelerating progress towards the achievement of sustainable development goals in Africa', which was a response to the post UN Global Action Program, as well as a focus on the implementation of Sustainable Development Goals (SDGs). Discussions focused on critical environment, education and sustainable development issues, with particular attention on how different stakeholders and entities, both public and private, participate in the undertaking of activities aimed at the realization of the future we want. The meeting raised awareness and motivated



The Minister of Tourism and Environmental Affairs, Mr Moses Vilakati taking a group photo with participants of the meeting during the opening ceremony

local and regional stakeholders to upscale their commitment to the implementation of the Sustainable Development Goals (SDGs) and ESD Agenda.

The meeting was officially opened by the honourable Minister of Tourism and Environmental Affairs, Mr. Moses Vilakati, and the Pro Vice Chancellor (PVC), Prof. Gadaga made the welcome remarks. Other notable participants of the meeting were the Acting Director of Eswatini Environment Authority and the former Vice Chancellor, Prof. Cisco Magagula. On the eve of the 6th, the Vice Chancellor, Prof. Justice Thwala hosted the participants over dinner, which was held at the Cardiff Hall, Luyengo Campus.

Last day saw participants go for an excursion which involved visiting the university farm at Lu8yengo Campus, and a visit to a land rehabilitation project at Sihlangwini, Siphofaneni. GEP Department was well represented in the meeting, with UNIGEPS students serving as rapporteurs and Dr. Sizwe Mabaso serving as a facilitator in two sessions during the meeting



Dr S.D. Mabaso with GEP Department students who are members of UNIGEPS, and were volunteers/participants in the meeting

CSER HOSTS AN ENERGY SYSTEMS CURRICULUM DEVELOPMENT WORKSHOP

The CSER developed a draft Energy Systems Curriculum through the support of the Energy Department in the Ministry of Natural Resources and Energy and the IAEA. The IAEA funded the visit of an expert on energy systems from the Energy Research Center at the University of Cape Town (UCT) to help the centre develop the curriculum. The expert

mission started on 21 October 2019 and ended on 25 October 2019. The Energy Department worked with the centre in funding and organizing a stakeholder consultation on the curriculum on 5th December 2019, in Mbabane.

DEEP LEARNING INDABAX 2019

The University of Eswatini, through the Department of Computer Science, hosted IndabaX on the 12th and 13th of April 2019 with support from the Deep Learning Indaba consortium. It was a two-day workshop consisting of structured tutorial lectures and practical sessions by established researchers from multi-disciplinary fields including Computer Science, Mathematics, Statistics and Geosciences. The tutorial lectures covered the fundamentals of machine/deep learning algorithms and their applications in various disciplines. The practical sessions were done concurrently in two different venues; Lab1 – Python programming and Lab2 – RStudio programming.

The aim of the workshop was to support local researchers in Eswatini to enhance and strengthen local and international links for future collaboration, build research capacity and improve the students and young researchers' career opportunities. The workshop aimed to achieve the following objectives:

- Improvement of research capacity of students and researchers through machine learning techniques in order to

address real-life problems

- Contribute local content to the existing machine learning applications
- Empowerment of Women in Machine Learning in Swaziland

The workshop was attended by more than 100 participants including students, lecturers, professionals and research practitioners from the industry, public and private institutions. These include the University of Eswatini (UNESWA), Southern Africa Nazarene University (SANU), Eswatini Christian



Evolution and Revolution of Machine/Deep Learning presented by Mr. S. Masango



Dr S.G. Fashoto presenting on Machine Learning and Deep Learning Fundamentals



Dr Nickson Karie presenting on Diverging Deep Learning Cognitive Computing Techniques in Cyber security and Digital forensics



First row, from left to right: Mr Dube, Dr Karie, Dr Metfula (Head, Computer Science, Prof Motsa (Dean, Faculty of Science and Engineering), Dr Fashoto, Dr Ncube, Dr Mashwama and other delegates from various institutions including UNESWA



Ms Hlobile Shongwe presenting on developing a prediction of the stock exchange market in Swaziland using Support Vector Machine (SVM)



Dr Vusi Magagula presenting on Application of Linear Algebra in Machine Learning and Deep Learning

University (ECU), University Research Co. LLC (URC), Royal Science and Technology Park (RSTP), and Royal Swaziland Police Service.

**PAN AFRICAN
CONFERENCE
ON SCIENCE,
COMPUTING AND
TELECOMMUNICATIONS
(PACT) 2019**

engineers and scientists in the continent, develop strong technical foundations and skills and lead to new small to medium enterprises within the African sub-continent. The conference also sought to encourage the emergence of functionally skilled technocrats within the continent.



Acting Vice Chancellor, Prof. Zwane and the Dean of the Faculty of Science and Engineering, Prof. Sandile Motsa. Prof. Wallace Chigona, Prof. Atsushi Ito and Prof. Christian Omlin

The University of Eswatini, through the Department of Computer Science, in partnership with Melbourne Institute of Technology, Australia and River Publishers hosted first-ever an African Conference on Science, Computing and Telecommunications Conference in the Kingdom of Eswatini from 10th to 13th of March, 2019. One of the goals of PACT is to improve productive interactions in a community of intellectuals in Africa in order to facilitate a research environment which stimulates and promotes the multi-disciplinary exchange of ideas in and around Science, Computing and Telecommunications. The main objective of PACT is to support and stimulate active productive research which could strengthen the technical foundations of

The conference brought together over 40 ICT professionals from the industry, Ministry of ICT, academia and students. Twenty Eight (28) papers were presented by the delegates that had come from various countries across the globe including Japan, Norway, Nigeria, Uganda, Kenya and South Africa.

Its opening ceremony was officiated by the Acting Vice-Chancellor, Prof. Pinky Zwane and the Dean of the Faculty of Science and Engineering, Prof. Sandile Motsa. Prof. Wallace Chigona delivered his keynote address, and his address was followed by two plenary sessions and two parallel sessions.



Dr Z.G. Makukula presenting on Mathematics of Machine Learning. A case of Ordinary Differential Equations (ODE)



Mr Brian Matsebula presenting on Microsoft Azure for Machine Learning



Prof. A. Ito receiving a gift from the then Acting Vice Chancellor, Prof. P. Zwane, UNESWA, while the Dean of FOSE and Head of CS look on



Prof. C. Omlin receiving a gift from the then Acting Vice Chancellor, Prof. P. Zwane, UNESWA networking that had taken place. He also announced that the next PACT conference will be taking place in Namibia.

Prof. Atsushi Ito and Prof. Christian Omlin delivered keynote addresses for the second and third days, respectively. And each keynote address was followed by two plenary sessions and two parallel sessions. In the last days of the conference, the Acting Vice Chancellor presented gifts to the keynote speakers at a cocktail/gala night, and the delegates enjoyed a picnic and a game drive at the Hlane Royal Game Park.

In the closing remarks, Dr. Andile Metfula, the Head of Computer Science Department conveyed his gratitude to all delegates, particularly to the Technical Program Committee Chair (Prof. Agbinya), the Vice Chair (Prof. Adeyeye Oshin), the Keynote Speakers, the Paper Reviewers, the Session Chairs, the Delegates, the University Management, the Faculty Dean in his capacity as the Conference General Chair. He extended his thanks to the Local Organizing Committee headed by Dr. Fashoto for their efforts and expressed his satisfaction with the interactive nature of the discussions while congratulating the delegates on the extensive



From left to right: Prof W. Chigona (from UCT) receiving a gift from the then Acting Vice Chancellor, Prof. P. Zwane, UNESWA

**2019 CSET ODL
CONFERENCE**

The Faculty of Science and Engineering established a committee to look at how the Faculty's programmes can be offered in the Institute of Distance Education (IDE). To benchmark the concept of offering practical subjects using distance education, the University of South Africa

(UNISA) was contacted. The committee was then invited to attend the 2019 CSET ODL Conference, hosted by the College of Science, Engineering and Technology, on the 21st and 22nd November 2019, as guest presenters. The conference was mainly attended by UNISA lecturers. Two members of the committee; Dr. Thabile Ndlovu and Dr. Vusi Magagula, represented the Faculty, and Dr Ndlovu gave a presentation titled 'Feasibility of offering Science & Engineering Programmes at the Institute of Distance Education – A case study for the University of Eswatini'. The presentation was warmly welcomed by the UNISA staff, who especially felt that they also still share some of our concerns. They further voiced their willingness in assisting the Faculty where they can.



Dr. T. Ndlovu and Dr. V. Magagula listening attentively during the conference



Dr T. Ndlovu making the presentation during the conference



Dr. T. Ndlovu and Dr. V. Magagula posing for the lenses with colleagues from UNISA

**INTERNATIONAL ACADEMIC
CONFERENCE ON ENGINEERING,
TECHNOLOGY AND
INNOVATIONS (IACETI)**

Dr T. Dlamini attended the International Academic Conference on Engineering, Technology and Innovations (IACETI) which was held in Cape Town, South Africa, on the 25th of November 2019. The conference was organized by Academics World and it was intended to provide a platform for researchers to share research results about engineering, technology and innovations. In the conference, a paper titled “MEC-enabled Energy Cooperation for Sustainable 5G Networks Exploiting the Location Service API” was presented by Dr. Dlamini. The work was presented under the theme of joint design of transmission/energy management for energy trading within smart electricity-grid. In the research work a new evolution within the mobile network paradigm is presented where the energy that is harvested and stored in energy storage devices is transferred from one location to another (energy deficient area) via a power packet grid network. The enabler for such process is mobile edge computing and virtualization techniques.



Dr. T. Dlamini (3rd from right) with other participants of the conference

**38TH CONFERENCE OF
THE SOUTHERN AFRICA
MATHEMATICAL SCIENCES
ASSOCIATION (SAMSA), 2019**

Prof. Sandile S. Motsa, Dr. Joseph Malinzi, Dr. Peter Mhone and Dr. Vusi Magagula participated in the 38th Conference of the Southern Africa Mathematical Sciences Association (SAMSA) which was hosted by the Malawi University of Science and Technology (MUST) in Blantyre, Malawi from the 25th to 28th November 2019. The conference was also supported by Mzuzu University (MZUNI), the University of Malawi (UNIMA), the Lilongwe University of Agriculture and Natural Resources (LUANAR) and the Catholic University of Malawi (CUNIMA). The conference attracted over 100 presenters from over 20 African countries. The theme of the conference was “Mathematical Sciences: A Catalyst for Sustainable Development”. The honourable Minister of Education, Science and Technology of Malawi, Dr Susuwele Banda (MP) officially opened the conference. Also present at the official opening ceremony were the Secretary for Education, Science and Technology, Mr Justin Saidi, the Director of Higher Education, Prof. Samson MacJessie-Mbewe and the Chairman of the Council of the Malawi University of Science and Technology, Dr Andrew Daudi. Over 100 mathematicians representing over 20 universities from Africa, Europe and the United States participated in the week-long conference.



Dr. T. Dlamini at the International Academic Conference on Engineering, Technology and Innovations, Cape Town, South Africa



by Professor Kelly Chibale who is the founder and director of H3D drug discovery and development centre at the University of Cape Town.

ANALYTICAL VALIDATION OF METHODS WORKSHOP

Ms Nomcebo M. Ngwenya, Mrs Nothando B. Sithole, Mr Melusi M. Matsebula and Dr. Sandile B. Simelane attended a workshop on analytical validation of methods at University of Eswatini on the 23rd – 26th July 2019. The workshop, hosted by National Laboratory Association of Eswatini (NLAE), trained 14 laboratory scientists from different institution around the kingdom on validation of analytical methods.

Prof. S.S. Motsa, Dr. J. Malinzi, Dr. V.M. Magagula and Dr. P. Mhone at the SAMSA 2019 Conference (#SAMSA2019)

FRANK WARREN CONFERENCE, 2019



A group photo of the Frank Warren 2019 participants at the Drakensburg, South Africa

Dr Sandile B. Simelane attended the Frank Warren conference at Alpine Heath Resort, Drakensberg, South Africa on the 7th-11th July 2019. The Frank Warren is the premier Organic Chemistry conference under the South African Chemical Institute (SACI). The 2019 focus was; green chemistry, synthetic organic chemistry, natural products and medicinal chemistry. The Frank Warren lecture was delivered



Chemistry staff members with other laboratory scientists at the validation of analytical methods training workshop in UNESWA

POLICY AND DIPLOMACY FOR SCIENTISTS WORKSHOP

Dr Sandile B. Simelane attended a workshop on Policy and Diplomacy for Scientists: Introduction to responsible research practices in chemical and



Dr. S.B. Simelane together with other participants at the Policy and Diplomacy workshop in Trieste, Italy

biochemical sciences in Trieste, Italy on the 9-13 September 2019. The workshop ultimately seeks to bridge the gap between scientists and policymakers, and to promote the adoption of responsible and sustainable research practices by scientists worldwide. The workshop further discussed capacity building opportunities available for researchers in developing countries.



Dr. T. Ndlovu and Ms T. Shabangu with Mr S. Dlamini (first from left), Ms A. Ndlovu and the SASTA president at the SASTA Conference

SASTA 2019 CONFERENCE AND VISITS TO THE SUGAR TERMINAL AND SUGAR MILLING RESEARCH INSTITUTE (SMRI) LABORATORIES

Dr. Thabile Ndlovu and Ms Thulile Shabangu attended the SASTA – 2019 conference which was held in Durban from the 21st to the 23rd August 2019. This was meant to increase the understanding of the sugar industry because the Faculty is working on establishing a Sugar laboratory in collaboration with Eswatini Sugar Association. The trip also involved a visit to the Sugar terminal Laboratory as well

as Sugar Milling Research Institute (SMRI) laboratories to gain an insight on how a sugar lab looks like and what tests are required.



Dr. T. Ndlovu at the sugar terminal where a hip of sugar is shown in the background

1ST EMS AFRICA SUMMER SCHOOL ON SAR REMOTE SENSING

Dr. Sizwe D. Mabaso attended the 1st edition of the EMS Africa Summer School on SAR Remote Sensing which was held at Wits Rural Facility, Hoedspruit, Limpopo, South Africa. The course was on the basics and applications of synthetic aperture radar (SAR) remote sensing for environmental monitoring, featuring a mixture of theory lessons and corresponding practical tutorials. The tutorials particularly focused on Sentinel-1 time series data (backscatter intensities) and their analysis with open source software (ESA's SNAP toolbox, SARbian OS).



Dr. S.D. Mabaso listening attentively to a presentation, together with other participants, during the training

(UNISA) under the theme: Abstract Mathematics and Mathematical Modelling with Applications. The conference was aimed at creating new partnerships and enhancing current collaborations. Prof. Motsa was very pleased to meet up with his former lecturers Prof. Melusi Khumalo and Dr. Londiwe Masinga who are now faculty members at UNISA. Also, in picture are Dr. Phumlani Dlamini and Dr. Simphiwe Simelane, both Emaswati, who are lecturers at the University of Johannesburg.



Dr. S.D. Mabaso with other participants of the summer school pose for a group photo with the course instructors

AFIRM: ACM SIGIR/SIGKDD AFRICA SUMMER SCHOOL ON MACHINE LEARNING FOR DATA MINING AND SEARCH

Dr Gcina A. Mavimbela attended AFIRM: ACM SIGIR/SIGKDD Africa Summer School on Machine Learning for Data Mining

INTERNATIONAL CONFERENCE ON MATHEMATICAL SCIENCES AND APPLICATIONS (ICMSA)

Prof. Sandile S. Motsa attended and presented a talk at the International Conference on Mathematical Sciences and Applications (ICMSA) held in Saint George Hotel, Pretoria, South Africa. The conference was hosted by the University of South Africa



Prof. S.S. Motsa with Prof. M. Khumalo, Dr. L. Masinga, Dr S. Simelane and Dr. P. Dlamini during the conference

and Search from 14-18 January 2019, hosted by the University of Cape Town in South Africa. The main focus of the school was enabling researchers to learn about modern challenges and methods in information retrieval (IR) and data mining.



Dr. G.A. Mavimbela with other participants of the summer school

THE FUTURE OF SCIENCE CONFERENCE, 2019

Dr. Joseph Malinzi attended The Future of Science Conference that took place from the 7-9 July, 2019 at the African Institute for Mathematical Sciences in Kigali, Rwanda. The idea of this conference was to bring together top researchers from around the world to interact with postgraduate students and young researchers from Africa in a very informal and interactive setting. The programme included talks on selected promising areas of research at a non-specialist level that a post-Masters level student in the sciences or mathematics would be able to follow. Topics included fundamental physics, cosmology, machine learning, mathematical biology, and selected areas of applied and pure mathematics.



Dr. J. Malinzi with other delegates during the Future of Science Conference

INTERNATIONAL CONFERENCE ON MATHEMATICAL METHODS AND MODELS IN BIOSCIENCES (BIOMATH19)



A group photo of the BIOMATH19 Conference that Dr. J. Malinzi attended in Poland

Dr Joseph Malinzi participated in the annual International Conference on Mathematical Methods and Models in Biosciences (BIOMATH19) which took place from 16 to 22 June 2019 at the Institute of Mathematics of the Polish Academy of Sciences in Bedlewo, Poland. It is a multidisciplinary meeting forum for researchers who develop and apply mathematical and computational

tools to the study of phenomena in the broad fields of biology, ecology, medicine, biotechnology, bioengineering, environmental science, amongst others. The 2019 conference was also used as an occasion to celebrate the 60th birthday of one of the conference organizers, whose contribution to mathematical biology cannot be disregarded, Prof. Jacek Banasiak. The 2020 Biomath Conference will take place from 21 to 26 June 2019 in Salt Lake, Ballito-South Africa.

HEALTH IMPACT ASSESSMENT OF THE COAL MINING SECTOR IN SOUTH AFRICA

In June to August, 2019, Dr. Sabelo N. Dlamini, conducted a Health Impact Assessment of the Coal Mining Sector in South



Africa. Among the key focus areas were to investigate the health impacts of thermal coal mining activity for electricity generation and explore the health impacts of coal as an energy option for various businesses and industries in South Africa to augment the unstable electricity supply grid from ESKOM. He presented a draft manuscript on 20/09/2019 at Sandton Convention Centre, Johannesburg, South Africa on the assessment.



Dr S.N. Dlamini with his team conducting field work at one of the coal mining sites in Witbank

UNIVERSITY OF JOHANNESBURG (UJ) POSTGRADUATE SYMPOSIUM

The following members of the Electrical and Electronic engineering department, Dr M. Lupupa, Mr J. Mahlalela, Dr Z.Z. Dlamini, Mr W. Nyembe, Mr J.S. Manong'a, Mr M.J. Khumalo and Mr T.L. Dlamini attended a postgraduate symposium at the University of Johannesburg on the 11th of October 2019. The symposium was organised by the Department of Electrical and Electronic Engineering UJ, and Mr T. Dlamini presented his work entitled 'MEC-enabled Energy



Members of staff from the EEE Department at the symposium. From right, Dr. M. Lupupa, Mr. J. Mahlalela, Dr. Z.Z. Dlamini, Mr. W. Nyembe, Prof Bokoro (UJ) host, Prof S. Shongwe (UJ Host) Mr. J.S. Manonga, Mr. M.J. Khumalo, and Mr. T. Dlamini at the University of Johannesburg

Cooperation for Sustainable 5G Networks Exploiting the Location Service API'.

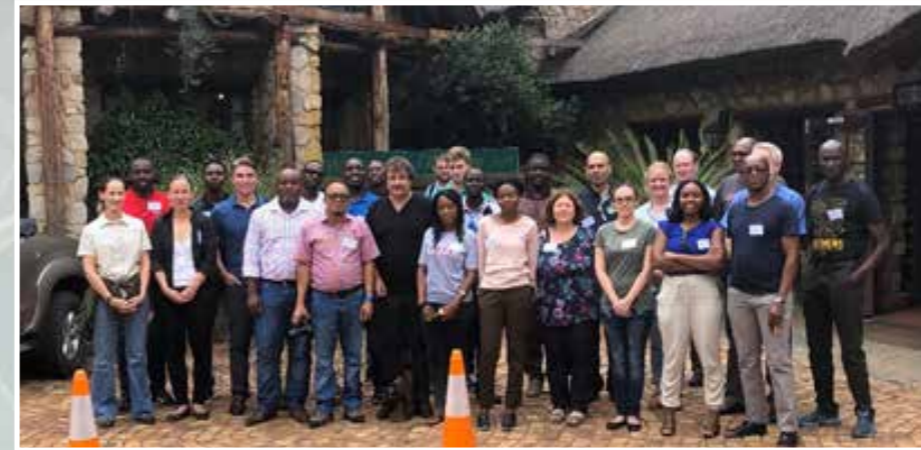
THE 13TH AFRICAN SMALL MAMMAL SYMPOSIUM (ASMS)

Mr. Mnqobi Mamba, Prof. Themb'alilahlwa Mahlaba and Prof. Ara Monadjem attended the 13th African small mammals symposium held in Mekelle University in Ethiopia from the 16th to 21st September 2019.



The 13th African Small Mammal Symposium (ASMS), Mekelle University Ethiopia, September 16 -21, 2019

During the conference they presented papers on: Influence of sugar cane plantations on the population dynamics and community structure of small mammals in a savanna-agricultural landscape (Mamba M. Fasel N. J., Mahlaba T., Austin J. D., McCleery R. A., Monadjem A), The role of isotopes and traditional taxonomy in identifying cryptic African bat species (Plenary talk by Prof A. Monadjem) and Domestic and wild predators around rural homesteads (Mahlaba T.A.M., Monadjem A., McCleery R and Belmain S.R).



Dr T. Mahlaba and Prof A. Monadjem posing for a group photo during Rodents in challenging environments Conference held at The Farm Inn, Pretoria, South Africa, 5-6 February 2019

RODENTS IN CHALLENGING ENVIRONMENTS

Prof. Themb'alilahlwa Mahlaba and Prof Ara Monadjem attended a conference on rodents in a challenging environment. The Conference held at The Farm inn, Pretoria, South Africa on 5th -6th February 2019. The conference theme was centred around small mammals particularly rodents that are found in extreme environments such as agricultural monocultures, arid deserts, north pole, etc. During the conference Prof. T. Mahlaba presented a paper on domestic and wild predators around rural homesteads while Prof A. Monadjem's presentation was on rodents in challenging environments: the example of sugarcane plantations.

WORKSHOP ON MAMMALIAN MORPHOMETRICS

Prof. Themb'alilahlwa Mahlaba and Prof Ara Monadjem attended a workshop on Mammalian Morphometrics held on the 7th -8th of February 2019 in Ditsong National Museum of Natural



Prof. T. Mahlaba and Prof A. Monadjem (both in the group photo) attended a workshop on mammalian morphometrics, held at Ditsong National Museum of natural history

History. This workshop was organized at University of Venda in Pretoria. The workshop was on the introduction and training on a range of established and new tools and approaches to quantify the morphology of small mammals (in particular craniodental morphology) and to relate aspects of their morphology to systematics, allometry, ontogeny, growth and ecology.

THE SOUTHERN AFRICAN ASSOCIATION OF GEOMORPHOLOGISTS (SAAG) ANNIVERSARY BIENNIAL CONFERENCE

Prof. Heinz Beckedahl and Mr. Mthobisi Masilela attended the SAAG (Southern African Association of Geomorphologists) 30th Anniversary Biennial Conference in Chintsa East, East London. Prof. Beckedahl was responsible for the post-conference workshop. The symposium was preceded by an excursion through the then Transkei, and was followed by a two-week excursion through Southern Africa. The conference, touched on many issues which included soil processes, land degradation, land rehabilitation and management and cosmogenic nuclides in geomorphology, among other issues. It is in this conference that Prof. Beckedahl was honoured with the distinguished Fellowship of the Association award. In the conference, Heinz presented two papers, while Mthobisi presented one.

NUST-NELGA HUB SYMPOSIUM ON LAND GOVERNANCE IN SOUTHERN AFRICA

Dr. Saico S. Singwane attended, together with Prof. Absalom M. Manyatsi, the Director of University Research Centre, a Regional Symposium on Land Governance (Theme: Land Governance Challenges and Opportunities in Southern Africa) which was held on the 3rd to the 4th of September 2019 at the Namibia University of Science and Technology (NUST) Hotel School, Windhoek, Namibia. NUST is a Southern Africa Node for the Network of Excellence on Land Governance in Africa (NELGA). The Symposium was a culmination of a scoping study on Land Governance carried out by nine (9) country teams comprising researchers from universities and research institutes from each participating country. The participating countries include Zambia, South Africa, Lesotho, Botswana, Eswatini, Malawi, Namibia, Zimbabwe

and Mozambique. In the Symposium the Eswatini team. They presented a paper on ‘Land Governance in Eswatini’.

NATIONAL VALIDATION WORKSHOP OF THE 6NR TO UN CONVENTION ON BIOLOGICAL DIVERSITY (UNCBD)

Dr. Wisdom M. Dlamini attended a National Validation workshop of the 6NR to UN Convention on Biological Diversity (UNCBD), on the 5th September, 2019 at Bethel Court, Ezulwini, which was convened by the Ministry of Tourism and Environmental Affairs. The purpose of the workshop was to validate Eswatini’s draft 6th National Report to the United Nations Convention on Biological Diversity and to solicit information on existing initiatives aimed at conserving biodiversity. Dr. Dlamini gave a presentation on “Veld fires trends and their threat to biodiversity”. The presentation focused on trends in observed forest fires and their actual and potential effects on biodiversity, with specific reference to Eswatini’s fauna and flora.

IMPROVING ESWATINI’S DROUGHT PREPAREDNESS AND RESILIENCE WORKSHOP

Dr. Wisdom M. Dlamini and Dr. Sizwe D. Mabaso attended a workshop on Improving Eswatini’s Drought Preparedness and Resilience, on the 18th September 2019 at Royal Villas, Ezulwini, which was convened by the National Disaster Management Agency (NDMA), with support from the World Bank and the European within the framework of the ACP-EU Natural Disaster Risk Reduction Programme. The workshop was aimed at soliciting support amongst various stakeholders involved in aspects of drought management in the development of the country’s Drought Preparedness and Early Warning System. The GEP Department is seen as a crucial stakeholder as this system is expected to be supported by the use of geospatial data.

WORKSHOP TO DISCUSS THE DRAFT ON CLIMATE CHANGE BILL

Dr. Wisdom M. Dlamini represented the University at a workshop that discussed the Draft on Climate Change Bill, on the 18th September 2019, at Happy Valley Hotel, Ezulwini. The workshop was convened by the Ministry of Tourism and Environmental Affairs. The Kingdom of Eswatini, as a party to the United Nation’s Framework Convention on Climate Change, aims to develop legal framework for the coordination and implementation of climate change activities in the country. As such, a bill was developed by the Ministry of Tourism and Environmental Affairs for which comments and input were solicited. The University, represented by the GEP Department, took part in the discussion of the preliminary document and climate change issues in the country.

APPLICATION OF GIS TO PERFORM INTEGRATED CONTEXT ANALYSIS (ICA) FOR FLOOD, DROUGHT AND FOOD SECURITY MONITORING WORKSHOP

Dr. Wisdom M. Dlamini, Dr. Siphso F. Mamba and Dr. Sabelo N. Dlamini attended a workshop on Application of GIS to perform

Integrated Context Analysis (ICA) for Flood, Drought and Food Security monitoring hosted by World Food Programme (WFP) at the George Hotel in Manzini, Eswatini, which first ran from the 19th to the 23rd August 2019. Then on November 13th, the three attended a second phase of the workshop at the Mountain Inn Hotel in Mbabane, which focused on validation of results. WFP and the DPM’s office are initiating a process of conducting an Integrated Context Analysis, a collaborative and consultative analytical and programming tool that helps orient geographic discussions for intervention, based on geographical overlaps of different levels of food insecurity and natural shocks. Dr. W.M. Dlamini, representing the GEP Department, is part of the geographic information systems (GIS) working group which is tasked with collating geospatial data for the ICA process. Draft terms of reference for this working group have been drafted, a key component of which includes the promotion of geospatial technologies, including unmanned aerial vehicles, for disaster response and risk reduction.

EDUARDO MONDLANE UNIVERSITY WORKSHOP

Prof. Sandile S. Motsa and Dr. Vusi M. Magagula facilitated in the Workshop em Métodos Numéricos para a Resolução de Equações Diferenciais Ordinárias e Parciais which was hosted by the Department of Mathematics and Informatics of the Eduardo Mondlane University in Maputo from the 23rd to 24th of September 2019. Students were taught the basics of spectral methods and were trained on how to solve differential equations using pseudospectral methods. The workshop offered hands-on training on pseudo-spectral collocation methods for solving ordinary differential equations with emphasis on implementation in MATHEMATICA and MATLAB (these are state of the art software in numerical analysis). The Eduardo Mondlane University (Portuguese: Universidade Eduardo Mondlane; UEM) is the oldest and largest university in Mozambique. The UEM is located in Maputo and



A group photo of Dr. W.M Dlamini, Dr. S.N. Dlamini, Dr. S.F. Mamba and delegates during the CIA workshop at the George Hotel in Manzini



Prof. S.S. Motsa and Dr. V.M. Magagula with other participants of the workshop

has about forty thousand students enrolled.

GREEN CLIMATE FUND WORKSHOP

Dr. Wisdom M. Dlamini and Dr. Sizwe D. Mabaso attended the Green Climate Fund Workshop to Discuss Eswatini's Climate Action Priorities and Funding Options, 15th November 2019 at the Royal Villas Hotel, Convened by the Ministry of Tourism and Environmental Affairs. The Green Climate Fund (GCF) Country Programme consultation workshop was organized by the Ministry of Tourism and Environmental Affairs through the GCF Readiness Support Project for Eswatini. The main objectives of the workshop was to present Eswatini's climate action priorities to be part of the country programme which is a strategic framework for engagement with the GCF and further make a call for project ideas that will be used in creating a pipeline of projects/programmes. This pipeline is a key component of the country programme. The University is

expected to play a key role in the design and implementation of projects, particularly those related to knowledge generation and research.

MODELLING IN THE CONTEXT OF AFRICAN HEALTH CONFERENCE

Dr. Joseph Malinzi participated in the Modelling in the Context of African Health, a joint conference of UKZN (under the African Health and Big Data flagships) and the CoE-MaSS (WITS) that took place from the 14-16 October, 2019 at Protea Hotel Edward in Durban, South Africa. All researchers involved in projects in the broad area of African Health were invited to attend this conference. The intention was to bring together those who require mathematical modelling in their work and those who are mathematical modellers in order to foster collaborations. Postgraduate students, in particular, were encouraged to attend.

SOUTH AFRICAN NUMERICAL AND APPLIED MATHEMATICS (SANUM) CONFERENCE, 2019

Prof. Sandile S. Motsa, Dr. Vusi M. Magagula, Dr. Zodwa G. Makukula, Dr. Mekonnen S. Ayano, Dr. Joseph Malinzi and Dr. Peter Mhone attended the South African Numerical and Applied Mathematics (SANUM) conference which was hosted by the Department of Mathematics, University of Pretoria, Hatfield, South Africa, 27th – 29th March 2019. They all presented talks on their research they are currently engaged on. South African Numerical and Applied Mathematics (SANUM) is a special interest group for South African and international academics in the areas of applied mathematics, numerical analysis, and scientific computing, and a yearly (typically three-day) symposium with presentations and posters on these and related topics. The symposium currently rotates between three host institutions: Stellenbosch University, the University of Pretoria, and the University of the Witwatersrand. It serves as the annual symposium for the Applied and Numerical Mathematics research theme of the NRF Centre of Excellence in Mathematical and Statistical Sciences (CoE MaSS).

FIRE MODEL INTERCOMPARISON (FIREMIP) WORKSHOP

Dr. Wisdom M. Dlamini attended a Fire Model Intercomparison (FireMIP) Workshop, 21st-27th October 2019 in Kruger National Park, South Africa, convened by the School of Animal Plant and Environmental Science of the University of Witwatersrand and Yale University, USA. As a pyrogeography researcher in the country, Dr Dlamini made a presentation on fire trends as influenced by various climatic and anthropogenic drivers in addition to networking with regional and international scientists in the field. The attendees ranged from people responsible for running and maintaining the ~10 fire models in the project, to ecologists and earth system scientists who are interested in using the results of the project, or in engaging with the modelling process. Presentations and discussion centred on fire modelling with a specific focus on model development, applications, scaling and future projections (under climate and land use change).

Valley Hotel. The purpose of the workshop was to discuss areas of improvement in the administration of Environment Assessments, as well as to share experiences on best environmental practices. One of the key issues that was also discussed was the inclusion of the 'social component' in an assessment of project impacts, hence the process is now referred to as an Environmental and Social Impact Assessment (ESIA) rather than an EIA, as it had been commonly referred to.



Dr. S.F. Mamba, Dr. S.N. Dlamini and Dr. W.M. Dlamini during the EIA workshop at the Happy Valley Hotel, Ezulwini

ENVIRONMENTAL IMPACT ASSESSMENT WORKSHOP

Dr. Sabelo N. Dlamini, Dr. Sipho F. Mamba and Dr. Wisdom M. Dlamini attended an Environmental Impact Assessment (EIA) workshop held on the 29th November at the Happy

LAUNCH OF THE 2019 HUMAN DEVELOPMENT REPORT FOR THE KINGDOM OF ESWATINI

Dr. Sipho F. Mamba attended a workshop on the Launch of the 2019 Human Development Report (HDR) for the Kingdom of Eswatini held on the 9th December 2019 at Hilton Hotel in Mbabane. The HDR as a powerful voice provides an overview of the country's progress on human development issues, simultaneously acting as a roadmap on the country's planned interventions towards improving the welfare of the human population in the Kingdom, and improving it a holistically. Among the key issues raised by the report include inequalities in the 21st century, and how they weaken social cohesion and economic growth, and damage people's trust in government, institutions and in each other and captured that such inequalities can potentially ring people onto the streets on extreme cases. By looking beyond income, beyond averages and beyond today, the report presented analysis, ideas and policy options to tackle inequality's drivers, with the recognition that many inequalities are the symptom of an unfair system rather than the cause.

GREEN CLIMATE FUND READINESS PROCESS IN ESWATINI

Dr. Samuel S. Seyama, Prof. Heinz Beckedahl and Mr Ian van Zuydam attended a workshop on Green Climate Fund Readiness Process in Eswatini on the 25th February 2019 held at the Royal Villas. The workshop was aimed at sensitizing stakeholders on climate issues and the available funding for climate related issues through the Ministry of Tourism and Environmental Affairs.



Participants listening attentively during the Sustainable Land and Water Management Information Sharing workshop



Dr W.M. Dlamini, Dr S.S. Seyama and Mr I. van Zuydam with GEP Students during the Sustainable Land and Water Management Information Sharing workshop

SUSTAINABLE LAND AND WATER MANAGEMENT INFORMATION SHARING

Dr. Samuel S. Seyama, Dr. Sizwe D. Mabaso, Dr. Wisdom M. Dlamini, and Mr Ian B. van Zuydam represented the GEP Department at a Sustainable Land and Water Management information sharing workshop on 4th December 2019, held at the Royal Villas, Ezulwini. The workshop was aimed at developing a body of knowledge on land and water issues, with students from the Department who are undertaking research in partnership with ESWADE, under the Smallholder Market-Led Project/Climate Smart Agriculture for Resilient Livelihoods (SMLP/CSARL) project.

THE 20TH WATERNET/WARFSA/GWP-SA SYMPOSIUM

Dr. Sizwe D. Mabaso, together with Prof. Roy B. Vilane from the Department of Agricultural Biosystems and Engineering (ABE), Faculty of Agriculture, attended the 20th WaterNet/WARFSA/GWP-SA Symposium, which was held in Fourways, Johannesburg, South Africa. The conference ran from the 30th October 2019 to the 1st November 2019, under the theme ‘Integrated Water Resources Development and Management: Leaving No

One Behind for Sustainable Water Security in Eastern and Southern Africa’. WaterNet is a regional network of university departments, research and training institutes specializing in water. The network aims to build regional institutional and human capacity in Integrated Water Resources Management (IWRM) through training, education, research and outreach by harnessing the complementary strengths of member institutions. The GEP Department is a member of the network, together with ABE Department. In the symposium, Dr. Mabaso presented two academic papers. Moreover, he acted as an adjudicator in the sub-theme ‘Water, Ecosystems and the Environment’.



Dr. S.D. Mabaso from GEP Department and Prof. R.B.T. Vilane from ABE Department at the symposium



Participants of the WaterNet 2019 symposium

INTERNATIONAL WORKSHOP ON BIOTECHNOLOGY IN TAIWAN

Ms. Thulile Shabangu and Mr. Wiseman Nyembe were members of a delegation from UNESWA that attended training on Biotechnology in Taiwan. The purpose of the training was to introduce participants to current Biotechnology techniques which solve the 21st century problem. The workshop was held in Taipei, Taiwan from 24-28 July in 2019. This workshop has come at the right time for us in the Department



The VC – Prof. J.M. Thwala, together with Ms T.Q. Shabangu, Mr. W. Nyembe and other delegates from UNESWA attended training on Biotechnology in Taiwan

of Biological Sciences as we work towards introducing BSc in Biotechnology. The skills and knowledge gained by Ms Shabangu will go a long way in making this a reality.

SOUTH AFRICAN NEMATOLOGICAL SOCIETY MEETING

In May 2019, Prof. Heinz Beckedahl was invited to present one of the key note address at the 22nd South African Nematological Society, held at the Kloppenheim Estate in Mpumalanga Province, South Africa, from 12-14 May,

2019. The title of the address was: Land Degradation, Erosion Control and Rehabilitation of Soil Erosion in Southern Africa.

27TH INTERNATIONAL CONFERENCE ON SOFTWARE, TELECOMMUNICATIONS AND COMPUTER NETWORKS (SOFTCOM 2019)

Mr. T. Dlamini recently attended the 27th International conference on Software, Telecommunications and Computer Networks (SoftCom 2019) in Split, Croatia, which was held from the 19th - 21st of September 2019. The conference was co-organized by the University of Split, Croatian Communications and Information Society (CCIS) and co-sponsored by the IEEE communication Society. The conference was organized within the framework of communications software, services and applications, telecommunications and computer networks. In the conference, Mr. T. Dlamini presented his work on core network management procedures for sustainable 5G cellular networks, which was a summary of his PhD research work. This work applied machine learning algorithms and control theory based principles for managing 5G cellular networks that are capable of energy harvesting. The work was done under the theme of Sustainable Cellular Networks Harvesting Ambient Energy which was funded by the European Union Horizon 2020.



WOCCOM 2019 WORKSHOP/ CONFERENCE

Prof. Sandile S. Motsa, Dr. Godwin Ugwunnadi and Dr. Zodwa P. Makukula participated in the 12th annual Workshop and Conference on Computational Mathematics (WOCCOM2019) which was hosted by the School of Mathematics, Statistics and Computer Science of the University of KwaZulu-Natal from 1 – 5 July 2019. The main organizers of the conference/workshop were Prof. S.S. Motsa, Prof. P. Sibanda (UKZN), Dr. V.M. Magagula, Dr. S.P. Goqo (UKZN), and Dr. H. Sithole-Mthethwa (UKZN). The workshop was dedicated to learning and teaching numerical methods for solving differential equations in engineering and science. The main objective was to upskill and provide support for postgraduate applied mathematics students and early career academics, with interest in developing or learning new methods for finding approximate solutions of both ordinary and partial differential equations that describe the dynamics of various phenomena in engineering and the sciences. Prof. Motsa was the key resource person and facilitated a hands-on programming session on new techniques for solving initial value problems. Dr. Z.P. Makukula gave a plenary talk on solving differential equations using the spectral homotopy analysis method. Dr G. Ugwunnadi presented a talk on Approximating a Common Fixed Point for Finite

Family of Demimetric mappings in CAT(0) Space.



Prof. S.S. Motsa giving his talk during the conference



A group photo of the WOCCOM 2019 Workshop/Conference

ENERGY TRAININGS AND PLANNING WORK SESSIONS

Dr Gcina A. Mavimbela attended three trainings organized by the Department of Energy in the Ministry of Natural Resources and Energy. These trainings are part of the technical cooperation between the Government of Eswatini and the IAEA in building local capacity in energy planning. The first training started on 25 March 2019 and ended on 5 April 2019 in Manzini, Eswatini with a focus on energy demand and an introduction to energy supply modelling using the IAEA model MESSAGE. The second training started on 6 May 2019 and Ended on 17 May 2019 in Mbabane, Eswatini and was an

expert mission by the IAEA on energy supply modelling using the IAEA MESSAGE model. The third training started on 24 June 2019 and ended 5 July 2019 in Mbabane, Eswatini and was an expert mission on Energy Finance using the IAEA FINPLAN model and a review of Eswatini's energy demand model.

3RD BLACK IN ARTIFICIAL INTELLIGENCE (AI) WORKSHOP AND CONFERENCE

Dr. Stephen Fashoto won a travel grant to attend and present a paper during the third Black in Artificial Intelligence (AI) Workshop and conference (co-located with NeurIPS 2019) at the Vancouver Convention Center, Vancouver, Canada from 8 December 2019 – 14 December 2019. He presented a paper titled 'Models for predicting global solar radiation using artificial neural network' during the conference. Black in AI is a place for sharing ideas, fostering collaborations and discussing initiatives to increase the presence of Black people in the field of Artificial Intelligence. Black in AI is a subset of Neural Information Processing Systems (NeurIPS) The NeurIPS annual meeting is to foster the exchange of research on neural information processing systems in their biological, technological, mathematical, and theoretical aspects.



Dr. S. Fashoto during the conference

THIRD ANNUAL ESWATINI BIODIVERSITY SYMPOSIUM

The Third Annual Eswatini Biodiversity Symposium, 16th October 2019 at King Sobhuza Memorial Park, convened by the All-Out Africa, Izele and The Darrell Institute of Conservation Ecology (University of Kent). All Out Africa hosted workshop on the Izele ecotourism platform combined with the Third Annual Biodiversity Symposium. During the Symposium, presentations were made by both local (predominantly UNESWA) and international researchers on biodiversity field studies of relevance for conservation in Eswatini. Most importantly, a model for biodiversity field research was discussed.

Dr. Sara Padidar, Prof. Themb'alilahlwa A. Mahlaba, Dr. Thabile Ndlovu and Dr. Gaolathe Tsheboeng were some of the presenters during the symposium. The titles of their papers: "Love thy enemy as thyself-unlocking the potential of snake venom" (Dr Padidar); Analysis of water quality in the Usuthu basin (Dr Ndlovu); Potential threats to the conservation of riverine plant communities in the Kingdom of Eswatini (Dr. G. Tsheboeng) and Threats to the conservation of biodiversity in the Kingdom of Eswatini (Prof. Mahlaba). In addition to this there were presentations made by MSc students in collaboration with their supervisors. These were: Activity patterns and home range of rusty-spotted genet in a low lying savannah (Ms. Gcinile Ndzinisa, Prof. Ara Monadjem and Dr. T.A. Mahlaba); Influence of sugar cane plantation on the population dynamics and community structure of small mammals in a savannah – agricultural landscape (Mr. Mnqobi Mamba, Prof. A. Monadjem and Dr. T.A. Mahlaba); Effects of pine timber plantations on conservation of understory plant species at Bhunya, Kingdom of eSwatini (Mr Manqoba Vilakati and Dr G. Tsheboeng; and Intergrating field based methods and remote sensing for monitoring riparian woodland vegetation (Ms Thandile Gule and Dr G. Tsheboeng). Also in attendance was Dr. Wisdom M. Dlamini from GEP Department.



Prof. T.A.M. Mahlaba made a presentation on threats to the conservation of biodiversity in the Kingdom of Eswatini



Dr. T. Ndlovu making her presentation on analysis of water quality in the Usuthu Basin



Dr. Padidar during her presentation titled "Love thy enemy as thyself-unlocking the potential of snake venom"



Dr. S. Nkambule and other attendees of COMA2019 pose for group photo

CONNECTING MINDS AFRICA 2019

Dr. Sifiso M. Nkambule attended the Connecting Minds Africa (COMA2019) Conference which was held on 25th – 27th September 2019, in Nairobi, Kenya. The conference, which was co-organised by the African academy of Sciences and the Royal Society, was aimed at hosting your African academics at post-PhD level of education to convene a discussion on how to harness the future of research in Africa and it was themed “For the Africa we want”.

In the conference, Dr. Nkambule presented a paper, titled: Studies of molecular collisions relevant for atmospheric surfaces. The event saw about 150 Researchers from 20 countries come together to discuss the future of Africa. This conference was the first of its kind and convened young African scholars to share their research and connect with other scholars to build mutually supportive networks to drive the development of science, technology and innovation on the continent. The outcome of this conference was to build a vibrant community of young scholars committed to brokering connections that enhance their career progression, while also accelerating their contribution to Africa’s strategy for research and development.



Dr. G. Tsheboeng presenting his paper titled ‘Emerging issues on the conservation of riverine plant communities in the Kingdom of Eswatini: A reflection after 50 years of independence’

50-50 CELEBRATIONS CONFERENCE

Dr. Gaolathe Tsheboeng presented a paper during the 50-50 conference hosted by the Department of History to jointly celebrate the 50 years of independence of the Kingdom of Eswatini and His Majesty King Mswati III’s 50th birthday. The title of the paper presented by Dr Tsheboeng was Emerging issues on the conservation of riverine plant communities in the Kingdom of Eswatini: A reflection after 50 years of independence. The paper gave insights on the global, regional and local challenges in the conservation of riverine ecosystems and possible solutions.

WORKSHOP ON IDE BIOLOGY MAE MODULE WRITING

On the 8th to 12th April 2019, Dr. Gaolathe Tsheboeng attended a workshop for developing training manuals for the University of Eswatini (UNESWA) Mature Age Entry Scheme (MAES). This workshop culminated in development of combined Science manual which is used for teach mature age entry. The co-authors of the manual were staff members from the Faculty of Science and Engineering, namely; Dr. G. Tsheboeng (Biological Sciences), Dr. S.M. Nkambule and Dr. N.T. Zwane (Physics), Dr. G.C. Bwembya and Dr. D.G. Vilakati (Chemistry).

1. **J. Malinzi** and I. Amima (2019). A moving boundary problem for tumor-immune interactions. Southern Africa Numerical and Applied Mathematics Conference (SANUM2019), University of Pretoria, South Africa, March 27-29, 2019.
2. **J. Malinzi** and I. Amima (2019). A free boundary model for tumor-immune interactions. International Conference on Mathematical Methods and Models in Biosciences (BIOMATH19), Bedlewo, Poland, June 16-22, 2019.
3. **M.S. Ayano**, 43rd symposium on numerical and applied mathematics university of Pretoria (SANUM); paper presented Numerical investigation for MHD mixed convective couple stress channel flow in a porous medium considering chemical reaction effect, 2019, South Africa.
4. **M.S. Ayano**, Pan African conference on science, computing and telecommunication; Paper presented entitled Effect of stratification and cross-diffusion in MHD micropolar fluid flow over an inclined stretching cylinder, 2019, Eswatini.
5. **V.M. Magagula**, 43rd symposium on numerical and applied mathematics university of Pretoria (SANUM); paper Modeling the spread of a virus in a computer network, 2019, South Africa.
6. **S.S. Motsa**, Mathematica Demonstration Application For Solving Arbitrary Boundary Value Problems Using High Order Compact Finite Difference Schemes, International Conference on Mathematical Sciences and Applications (ICMSA-2019), September 25-27, 2019, Saint George Hotel, Pretoria, South Africa (Hosted by the University of South Africa)
7. **S.S. Motsa**, Developing block hybrid methods using collocation: towards quasi-linearisation, Twelfth Annual Workshop On Computational Applied Mathematics And Mathematical Modeling, 1 - 5th July 2019, University of KwaZulu-Natal, Pietermaritzburg, South Africa
8. F.M. Samuel and **S.S. Motsa**, Improved Trivariate Spectral Collocation Method of Solution for Two-dimensional Nonlinear Initial boundary Value Problems via Domain Decomposition, Pan African International Conference on Science, Computing and Telecommunications, UNESWA, March 11 – 13, 2019
9. Musawenkhosi Patson Mkhathshwa, **Mekonnen S. Ayano** and **Sandile S. Motsa**, MHD Free Convection Flow of Chemically Reacting Casson Fluid from Vertical Surface in Porous Media Considering Ohmic Dissipation, Pan African International Conference on Science, Computing and Telecommunications, UNESWA, March 11 – 13, 2019
10. **Sulaiman Sani**, Theophilus Kesaap Ekpa, Abdurrahman S. Hassan and Zayna Kalyankolo (2019). Designing Optimal PicoGrids for Non-SmartPhones: Sufficient Mathematical Conditions. Proceedings of PACT 2019, 191-200, ISBN 978-0-9872129-2-4 Proceedings PACT 2019 University of Swaziland, Swaziland March 10 - 13 201
11. **SM Jahidul Islam**, Zulfiker Haider Chaudhury, Saiful Islam (2019), A Simple and Secured Cryptography System of Cloud Computing. Canadian Conference on Electrical and Computer Engineering (IEEE CCECE 2019), paper #1570534039, Edmonton, AB, Canada.
12. Saiful Islam, **SM Jahidul Islam**, Mst. Jahanara Akhtar, Md. Nurul Islam Khan (2019), Energy Balanced Clustering Using Balancing Nodes for Wireless Sensor Network. International Conference on Computer Communication and Informatics (ICCCI -2019), Coimbatore, INDIA. ISBN 978-1-5386-8259-3 ©2019 | IEEE Conference Record # 45675
13. Saiful Islam, **SM Jahidul Islam**, Mst. Jahanara Akhtar, Md. Nurul Islam Khan (2019), Intra-Cluster Communication Technique Re-using TDMA Idle Slots of Wireless Sensor Networks. International Conference on Computer Communication and Informatics (ICCCI -2019, Coimbatore, INDIA.

14. Saiful Islam, Md. Nurul Islam Khan, **SM Jahidul Islam**, Mst. Jahanara Akhtar (2019), Cluster Head Selection Technique Using Four Parameters of Wireless Sensor Networks. International Conference on Computer Communication and Informatics (ICCCI -2019), Coimbatore, INDIA. ISBN 978-1-5386-8259-3 ©2019 | IEEE Conference Record # 45675
15. **Simelane S. B.** Science & Technology capacity building in developing countries. Policy and Diplomacy for Scientists: Introduction to responsible research practices in chemical and biochemical sciences. 9-13 September 2019. International Centre for Theoretical Physics (ICTP), Trieste, Italy.
16. **Masilela M.D., Beckedahl H.R.**, Haussmann N., (2019). A Review of Caves in Granite and Granitoid Rock – the Case of Gobholo Caves in Eswatini (Swaziland), Southern African Association of Geomorphologists Conference, Chintsa, Eastern Cape, RSA.
17. Le Roux J., **Beckedahl, H.R.**, Grundling A. and Sumner P. (2019): The Prediction and Spatial Distribution of Wetlands in Eswatini (Swaziland).
18. Lindeque, G.H.L and **Beckedahl, H.R.** (2019). Moving From Land Degradation Assessment Data to Informed Decision Making at Country Level: A Case Study from South Africa.
19. Manyatsi, A.M. and **Singwane, S.S.** (2019). 'Land Governance in Eswatini'. NUST-NELGA Hub Symposium on Land Governance in Southern Africa, Windhoek, Namibia - 2-4 September.
20. **Dlamini S. N.** (2019). Health impact assessment of the thermal coal mining sector in South Africa. Draft manuscript. Presented on 20/09/2019, (Sandton Convention center, Johannesburg, South Africa).
21. **Dlamini W.M.** (2019). National Validation Workshop of the 6NR to UN Convention on Biological Diversity (UNCBD), 5th September, 2019 at Bethel Court, convened by the Ministry of Tourism and Environmental Affairs.
22. **Singwane S.S.**, Nhlengethwa B., **Mabaso S.D., van Zuydam I.B. and Mamba S.F.** An assessment of socio-economic impacts of the climate smart gardens project in low income residential areas in Eswatini: A Case of Mbabane City. 20th WaterNet/WARFSA/GWP-SA Symposium in Johannesburg, South Africa 30th October – 1 st November 2019.
23. Malinga V., **Mabaso S., Matondo J. and Singwane S.S.** Irrigation water use and its influence on Lusutfu River flow in the Lowveld of Eswatini. 20th WaterNet/WARFSA/GWP-SA Symposium in Johannesburg, South Africa 30th October – 1st November 2019.
24. **Dlamini W.M.** (2019). Workshop on Improving Eswatini's Drought Preparedness and Resilience Workshop, 18th September 2019 at Royal Villas, convened by the National Disaster Management Agency.
25. **Dlamini W.M.** (2019). Workshop to Discuss the Draft on Climate Change Bill, 18th September 2019 at Happy Valley Hotel at Happy Valley Hotel, Convened by the Ministry of Tourism and Environmental Affairs.
26. **Dlamini W.M.** (2019). Third Annual Eswatini Biodiversity Symposium, 16th October 2019 at King Sobhuza Memorial Park, convened by the All-Out Africa, Izele and The Darrell Institute of Conservation Ecology (University of Kent)
27. **Dlamini W.M.** (2019). Workshop to Discuss the Draft on Climate Change Bill, 18th September 2019 at Happy Valley Hotel at Happy Valley Hotel, Convened by the Ministry of Tourism and Environmental Affairs
28. **Ndlovu Thabile**, (2019). Water purification (waste dye removal) using exfoliated graphite. Oral presentation. Exceed-Swindon regional experts' workshop, Durban, South Africa. 5-9 May 2019.

29. **Thembelihle Dlamini**, Ángel Fernández Gambín, “Adaptive Resource Management for a Virtualized Computing Platform via Lookahead”, 16th Annual IEEE International Conference on Sensing, Communication, and Networking (SECON), Boston, USA: IEEE, June 2019
30. **Thembelihle Dlamini**, “Core Network Management Procedures for Self-Organized and Sustainable 5G Cellular Networks”, International Conference on Software, Telecommunications and Computer Networks (SoftCom 2019), Split, Croatia: IEEE, September 2019
31. **Thembelihle Dlamini**, “MEC-enabled Energy Cooperation for Sustainable 5G Networks Exploiting the Location Service API”, International Academic Conference on Engineering, Technology and Innovations (IACETI 2019), Cape Town, South Africa: Scopus, November 2019
32. Maad Shatnawi and **Ehab H.E. Bayoumi**, “Brushless DC Motor Controller optimization Using Simulated Annealing”, 19th International Conference on Electrical Drives & Power Electronics (EDPE'19), The High Tatras, Slovakia, 24-26 September 2019.
33. **S. Padidar** (2019). Love thy enemy as thyself-unlocking the potential of snake venom. The 3rd annual Eswatini Biodiversity Symposium held at King Sobhuza memorial park on the 16th of October 2019.
34. **G. Tsheboeng** (2019). Potential threats to the conservation of riverine plant communities in the Kingdom of Eswatini. The 3rd annual Eswatini Biodiversity Symposium held at King Sobhuza memorial park on the 16th of October 2019.
35. **T.A. Mahlaba** (2019). Threats to the conservation of biodiversity in the Kingdom of Eswatini. The 3rd annual Eswatini Biodiversity Symposium held at King Sobhuza memorial park on the 16th of October 2019.
36. G. Ndzinisa, **A. Monadjem** and **T.A. Mahlaba** (2019). Activity patterns and home range of rusty-spotted genet in a low lying savannah. The 3rd annual Eswatini Biodiversity Symposium held at King Sobhuza memorial park on the 16th of October 2019.
37. M. Mamba, **A. Monadjem** and **T.A. Mahlaba** (2019). Influence of sugar cane plantation on the population dynamics and community structure of small mammals in a savannah–agricultural landscape. The 3rd annual Eswatini Biodiversity Symposium held at King Sobhuza memorial park on the 16th of October 2019.
38. M. Vilakati and **G. Tsheboeng** (2019). Effects of pine timber plantations on conservation of understory plant species at Bhunya, Kingdom of eSwatini.
39. T. Gule and **G. Tsheboeng** (2019). Integrating field-based methods and remote sensing for monitoring riparian woodland vegetation. The 3rd annual Eswatini Biodiversity Symposium held at King Sobhuza memorial park on the 16th of October 2019.
40. Nthabiseng Modiba, Sunday Ojo, **Zenzo Ncube**. An Ontology-Based Model for Cyber Security Awareness Education. Proceedings of 4th International Conference on the Internet, Cyber Security and Information Systems 2019, vol 12, pages 169–179
41. **Zenzo Ncube**, Nontokozo Mpofo, Armstrong Kadyamatimba A deep reinforcement learning approach to autonomous driving among human drivers. eResearch Africa 2019: Data Science for Development, 15 – 18 April 2019, University of Cape Town
42. **Stephen G Fashoto, Elliot Mbunge**, Models for predicting global solar radiation using artificial neural network, Black in AI, Neural Information Processing Systems, Vancouver Convention Center, Vancouver, Canada from 8 December 2019 – 14 December 2019

1. Lwazi Charles Mahlalela, Cintia Casado, Javier Marugán, Santiago Septien, **Thabile Ndlovu**, Langelihle Nsikayezwe Dlamini, Synthesis of platelet-like BiVO₄ using hyperbranched polyethyleneimine for the formation of heterojunctions with Bi₂O₃, Applied Nanoscience (2019). <https://doi.org/10.1007/s13204-019-00977-8>
2. Pinky E Zwane, **Thabile Ndlovu**, Thulisile Mkhonta, Mike T Masarirambi, Justice Thwala, Effects of enzymatic treatment of sisal fibres on tensile strength and morphology, Scientific African (Accepted)
3. Ababu T. Tiruneh, **Tesfamariam Y. Debessai, Gabriel C. Bwembya**, Stanley J. Nkambule (2019). Variable chlorine decay rate modeling of the Matsapha town water network using EPANET program, Journal of Water Resource and Protection, 11, 37-52.
4. **Gabriel Chew Bwembya**, Paul Junior, **Justice Mandla Thwala**, Siphon Samuel Mamba, **Tesfamariam Y. Debessai**, Nomfundo Dlamini (2019). Assessment of the levels and potential health risk posed by selected organophosphate pesticide residues in vegetable farms in Manzini region, Eswatini, International Journal of Bioorganic Chemistry, 4(1), 53-63.
5. Nothando B. Sithole, **Justice M. Thwala, Gabriel C. Bwembya** (2019). Synthesis and characterization of a periodic mesoporous organosilica molecular imprinted polymer for removal of DDT, Journal of Harmonized Research in Applied Sciences, 7(1) p, 7-14.
6. Ababu T. Tiruneh, **Tesfamariam Y. Debessai, Gabriel C. Bwembya**, Stanley J. Nkambule (2019). A Mathematical Model for Variable Chlorine Decay Rates in Water Distribution Systems, Modelling and Simulation in Engineering, 1-11.
7. Sithole Nothando Beautiness, **Thwala Justice Mandla, Bwembya Gabriel Chew** (2019). Determination of DDT and its Metabolites in Marula Products in Eswatini using a Molecular Imprinted Polymer, International Journal of Development Research, 9(6), 28352-28357.
8. **Magagula, V. M., S. S. Motsa**, and P. Sibanda. “A new bivariate spectral collocation method with quadratic convergence for systems of nonlinear coupled differential equations.” Applied and Computational Mathematics 18.2 (2019): 113-122.
9. Ayano, Mekonnen S., **Vusi M. Magagula**, and **Sandile S. Motsa**. “Effect of Stratification and Cross-diffusion in Magneto hydrodynamics Micropolar Fluid Flow Over an Inclined Stretching Cylinder.” Pan African International Conference on Science, Computing and Telecommunications Book of Proceedings.
10. **Magagula, Vusi Mpendulo**. “On the Multidomain Bivariate Spectral Local Linearisation Method for Solving Systems of Nonsimilar Boundary Layer Partial Differential Equations.” International Journal of Mathematics and Mathematical Sciences, 2019 (2019).
11. Sithole, Hloniphile, Hiranmoy Mondal, **Vusi Mpendulo Magagula**, Precious Sibanda, and **S. Motsa**. “Bivariate Spectral Local Linearisation Method (BSLLM) for Unsteady MHD Micropolar-Nanofluids with Homogeneous–Heterogeneous Chemical Reactions Over a Stretching Surface.” International Journal of Applied and Computational Mathematics 5, no. 1 (2019): 12
12. F.M. Samuel, **S.S. Motsa**, A highly accurate trivariate spectral collocation method of solution for two-dimensional nonlinear initial-boundary value problems, Applied Mathematics and Computation, Volume 360, (2019), Pages 221-235
13. Otegbeye O, **Motsa SS**, Ansari MS. An application of paired quasilinearization on double-diffusive convection flow over a cone embedded in a porous medium in the presence of nanoparticles. Heat Transfer—Asian Res. (2019);1-27.

14. Sicelo P. Goqo, Hiranmoy Mondal, Precious Sibanda, **Sandile S. Motsa**, A multivariate spectral quasilinearisation method for entropy generation in a square cavity filled with porous medium saturated by nanofluid, *Case Studies in Thermal Engineering* 14 (2019) 100415
15. H. Sithole, H. Mondal, V. M. Magagula, P. Sibanda, **S. Motsa**, Bivariate Spectral Local Linearisation Method (BSLLM) for Unsteady MHD Micropolar-Nanofluids with Homogeneous-Heterogeneous Chemical Reactions Over a Stretching Surface, *International Journal of Applied Computational Mathematics* (2019) 5:12 <https://doi.org/10.1007/s40819-018-0593-8>
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