



## The 6th South Africa UNESCO Engineering Conference

26- 27 September 2019  
North-West University, Mafikeng Campus

# THE 6th SA-UNESCO ENGINEERING CONFERENCE



# M<sub>ain</sub> C<sub>onference</sub>

**Thursday 26 September 2019**

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REGISTRATION (08:00 - 09:00)

**OPENING SESSION** (Programme Directors: **Prof Liezl van Dyk & Mr Cecil Masoka**) **09:00 - 10:30**

Welcome remarks

Prof Marilyn Setlalentoa : DVC Community  
Engagement and Mafikeng  
Campus Operations

Remarks by

Mr Sipho Madonsela : CEO Engineering Council of  
South Africa

Dr Phil Mjwara : Director – General: Science and Innovation

Keynote address

Prof Tebogo Job Mokgoro : Premier of the North West  
Province

Photo opportunity of dignitaries and interviews with the  
media

*REFRESHMENT BREAK (10:30 - 11:00)*

**NATIONAL DEVELOPMENT GOALS (Chair: Prof Eno Ebenso,  
NWU Executive Dean: FNAS) 11:00 - 12:30**

- Dr Nompumelelo Obokoh : Harnessing IP and innovation to grow a knowledge-based economy
- Mr Nkosi Lutho Zibi : Using 4IR to transform and develop the rural economy – **(virtual presentation)**
- Mr Joseph Ndaba : 4IR as a vehicle to advance Underdeveloped Provinces
- Prof Beatrys Lacquet : “Status of postgraduate research training in engineering in SA - a Consensus Study”.

*LUNCH BREAK AND EXHIBITION VISIT 12:30 - 13:30*

**INFRASTRUCTURE FOR THE FOURTH INDUSTRIAL REVOLUTION  
(Chair: Liezl van Dyk) 13:30 - 15:00**

- Prof Menno Van Zaneen : Decolonising the 4IR: Digital Humanities
- Dr Happy Sithole : The role of NICIS in support of the 4IR
- Prof Andrew Robinson : Engineering 4.0 Health in Africa
- Dr N A Tshidzumba : Summary from the previous day's BRICS Energy Workshop

*COFFEE AND TEA BREAK 15:00 - 15:30*

**ADVANCED MANUFACTURING (Chair: Dr Monnamme Tlotleng)**  
**15:30 - 17:30**

- Mr Hector Makgato : TIA Roadmap for advance manufacturing sector of South Africa
- Prof Khumbulani Mpofu : Decolonised manufacturing in the 4IR era, practices, challenges and future projections
- Mr CP Kloppeers : The South African additive manufacturing landscape
- Mr Mpho Madisha : Transformative opportunities by additive manufacturing in the 4IR era
- Prof Chaudry M Khalique : Symmetry analyses and conservative laws for differential equations

GALA DINNER, Mmabatho Palms (18:00 for 18:30)

## Friday 27 September 2019

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### **EQUAL OPPORTUNITIES (Chair: Lebo Maphumulo, ECSA) 09:00 - 10:30**

- Ms Leonie Greyling : Entrepreneurship is a man's world - or is it?
- Ms Bennitta Senyatsi : Decolonising of gender myths for the sustenance of women in engineering
- Mr Toto Matshediso : Funding opportunities within EU context
- Prof Liezl van Dyk : Are inequalities reduced or magnified by 4IR?

*REFRESHMENT BREAK 10:30 - 11:00*

### **EARTH PRECONDITIONS & SUSTAINABLE ENGINEERING (Chair: Prof Rodney Medupe, NWU FNAS) 11:00 - 12:30**

- Prof Elvis Fosso-Kankeu : Winning the NSTF award-Impact of my research
- Dr Sandile Ngcobo : Developing a test-bed device for laser simulation and development
- Prof Lobina G Palamuleni : What do geographers say about water resources management?
- Dr Kingsley Obodo : Ab initio modelling of 20 and 30 materials prediction and characterisation

**CLOSING SESSION: VOTE OF THANKS (Chair: Prof Eno Ebenso  
(Executive Dean: NWU, FNAS) 12:30 - 13:00**

Vote of thanks

1. Prof Liezl van Dyk of NWU
2. Mr Christopher Tsatsawane of ECSA
3. Ms Mmampei Chaba of DSI

CLOSURE

*LUNCH AND EXHIBITION VISIT  
(13:00 - 14:00)*

# P rofiles

## Dr Nompumelelo Obokoh (nee Masubelele)

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As divisional manager for Innovation Support and Protection at the Companies and Intellectual Property Commission (CIPC), Dr Obokoh heads the strategic portfolios of patents and industrial design registration. Before joining CIPC, she was the CEO for AfricaBio, a biotechnology stakeholder association.

Currently she is also serving as a commissioner in the Presidential Commission for the Fourth Industrial Revolution, and is also the chairperson of the NRF Board.

Dr Obokoh has more than 15 years' experience in biotech research, development, training and management. She has led a number of innovative agricultural projects addressing food security and poverty reduction in sub-Saharan Africa through small-scale farmer empowerment and women in particular.

She obtained her PhD in Plant Molecular Biology from the University of Cambridge and worked as a post-doctoral research associate at the Institute of Biotechnology, University of Cambridge where she developed novel and high throughput technologies to decipher the mechanisms of plant growth at molecular and cellular level to improve agricultural productivity.

In West Africa, Dr Obokoh headed the first satellite office (Abuja, Nigeria) of the African Agricultural Technology Foundation (AATF), a not-for profit international organisation. She oversaw and managed innovative public-private partnership programs, and led AATF's strategic initiatives to ensure access and development

of key proprietary agricultural technologies for small-scale farmers in sub-Saharan Africa.

She has also worked as a senior researcher in the Biotechnology Division at the Agricultural Research Council in Roodeplaat and is a recipient of the Rothamstead International African Fellowship Program.

## Joseph Ndaba

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A founder and CEO of the Mahikeng Innovation Hub, Ndaba is a newly appointed commissioner of the Presidential Commission on 4IR and a director of start-up GrindX.

Ndaba's focus is on unearthing and cultivating innovative solutions that will ultimately assist businesses, educational institutions and communities to acclimatize in a changing technological world, while improving efficiency through the use of ICT, entrepreneurial development, research development and innovation. He has been in leadership positions and in the IT and training industry for the past 11 years.

As part of his goal of developing entrepreneurs, Ndaba sits on two boards of the North-West University, the Enactus Business Advisory Board and the Information Systems Department (ISD) Industry Advisory Board.

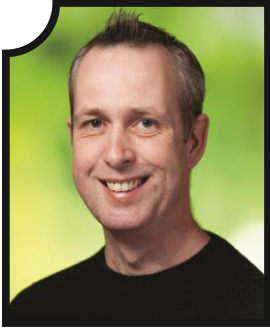
He is also a chairperson of the North West Province Innovation Forum which supports collaboration between industry, government and academia supported by the CSIR and the Department of Science and Technology.

Ndaba has been the recipient of many awards including Top 20 Young South African Most Influential Individual for 2016, Standard Bank Thought Leader 2018, NHBRC Iqhawe Mentorship Award 2019 and Nedbank Group Limited Individual Transformation in Leadership Award 2019.



# Prof Menno van Zaanen

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A professor in Digital Humanities at North-West University, Prof van Zaanen is particularly interested in incorporating the use of computational techniques in the field of humanities.

His PhD in the area of computer science dealt with building systems that learn (linguistic) grammars from plain sequences (sentences). These empirical grammatical inference systems result in patterns that can be used for further analysis of the data, for instance, in applied machine learning, computational linguistics, or computational musicology.

During his MA (computational linguistics) and MSc (computer science), the professor used techniques from the one field and applied it to situations in the other, such as proofing tools and error correction, machine translation, and multi-modal information retrieval. Such techniques can be applied to Humanities data, but for them to be fully successful, the results still need to be interpreted in the context of humanities.

Prof van Zaanen received his PhD in Computer Science from the University of Leeds in 2002 and his MA Computational Linguistics from the University of Amsterdam in 1998 and MSc Computer Science from the Vrije Universiteit Amsterdam in 1997. Before taking up his post at NWU, he was assistant professor at Tilburg University.

# Dr Happy Sithole

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As Centre Manager of the National Integrated Cyber Infrastructure System (NICIS), Dr Sithole's responsibilities include overseeing the development of high-performance computing in the country through the Centre for High Performance Computing (CHPC), roll-out of broadband connectivity for all science councils and universities and ensure long term data management for the research community.

Dr Sithole has a PhD in Materials Science focused on mineral extraction schemes using large-scale simulations. He has applied the simulation techniques in the diamond mining industry where he worked as a process optimisation specialist. He has also worked in

nuclear power plant design as senior process engineer. His work in high performance computing includes strategic development of HPC and technical level design of HPC systems. He is passionate on applications performance on HPC systems, and considers HPC systems development to be driven by the applications requirements. He has pioneered the development of skills in South Africa and the continent.

He supports mega science projects such as the SKA and LHC projects. He sits on steering committees for HPC in different countries and is also a board member of the National Library of South Africa where he is the chair of the ICT Committee. Dr Sithole also participates in the works stream focusing on Infrastructure and Resources of the Presidential Commission on the Fourth Industrial Revolution. Prof Sithole has presented plenary talks in many countries.

# Cornelius Petrus Klopper

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Leading the Additive Manufacturing Research Group (AMRG) at the North-West University, Kloppers has been involved in the teaching and learning environment for more than 10 years.

AMRG is conducting research in the fields of design for additive manufacturing, polymer additive manufacturing, topology optimisation, bio-printing, metal additive manufacturing and more.

Kloppers has a bachelor's degree and master's degree in mechanical engineering from the North-West University with a focus on Thermo dynamic cycle design and is currently enrolled as a PhD student with specialisation in additive manufacturing also known as 3D printing.

His research focus is to investigate the applications of additive manufacturing in a wide variety of industries from the brewing industry to aerospace and medical applications.

Kloppers has presented research from the AMRG at the Smart and Sustainable Manufacturing summit in Manchester, England this year and has established collaborations with various international universities such as Loughborough and the University of Auckland.

He has presented papers at the Rapid Product Development Association of South Africa and is also a member of the management committee of the association. Kloppers is the NWU's representative on the management committee of the collaborative programme in additive manufacturing funded by the DSI with collaborating universities such as Vaal University of Technology, Cape University of Technology, Stellenbosch University, CSIR and Aerosud.

## Prof Chaudry Masood Khalique

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A full professor in the Department of Mathematical Sciences at the North-West University (NWU), Prof Khalique's research specialisation is modern group analysis of differential equations.

Prof Khalique received his PhD degrees from the University of Dundee, in 1979. He worked at the University of Botswana for several years and joined NWU in 1995.

He has supervised eight PhDs, 19 Masters and mentored eight post-doctoral fellows. Prof Khalique has published more than 200 research articles and has delivered plenary talks at many international conferences. He is on the editorial boards of 12 international journals.

## Prof Thebe Medupe

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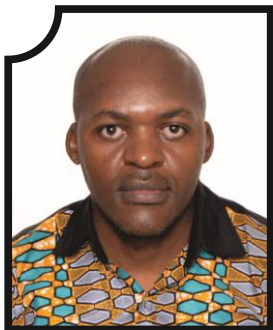
A Research Professor of Astrophysics at the North West University, Faculty of Natural and Agricultural Sciences in the School of Physical and Chemical Sciences. Prof Medupe is also currently the deputy dean: community engagement. A founding director of Astronomy Africa, Prof Medupe is widely known for his work on the *Cosmic Africa* project that attempts to reconcile science and myth. His first encounter with astronomy was at the age of 13 and the 1986 sighting of Halley's Comet which inspired him to build a crude telescope using a cardboard tube with lenses donated by a school lab technician.

Prof Medupe holds an undergraduate degree in physics and a master's and doctorate in astrophysics. He obtained his PhD in Astronomy from the University of Cape Town.

Prof Medupe has written and published numerous research papers on astronomy, particularly asteroseismology. He has published over 50 articles in international journals and several chapters in books. He has graduated four PhD students and five MSc students.

## Prof Elvis Fosso-Kankeu

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An Associate Professor in the School of Chemical and Minerals Engineering at the North-West University, Prof Fosso-Kankeu is involved in research and teaching in the fields of engineering and applied science.

Concerned by the challenges people are facing in South Africa and the rest of the continent, he has dedicated his research to the monitoring of water quality and remediation of water pollution. Projects related to his research include the prediction of the dispersion of inorganic and organic pollutants from industrial areas into the surface-water sources, monitoring of surface-water quality,

development of sorbents and investigation of their behaviour during the removal of pollutants, and photocatalytic degradation of organic pollutants using synthesised catalysts. Working with research groups at the University of Johannesburg and under the agenda of his own research group, Prof Fosso-Kankeu has contributed enormously to the field of water quality.

The holder of a doctoral degree in Extraction Metallurgy from the University of Johannesburg, Prof Fosso-Kankeu achievements include NRF-rating status, being awarded the NSTF Award in Engineering Research Capacity Development in 2019 and various awards at the NWU including a Teaching Excellence Award in 2019.

His expertise in the field, means he is continuously invited by international peers to review manuscripts and is currently reviewing for more than 21 internationally accredited journals. He has published around 170 papers, including conference proceedings and journal articles, 16 book chapters and three books.

He is a member of scientific bodies such as the South African Institute of Mining and Metallurgy, the Water Institute of Southern Africa and the International Mine Water Association.



# Prof Lobina Gertrude Palamuleni

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After receiving her PhD degree from the University of Prof Palamuleni worked at the University of Malawi before moving to North West University where she is a full professor in the Department of Geography and Environmental Sciences.

Her research interests centres on problems of land use and land cover changes, application of remote sensing techniques and geographical information systems to solve environmental problems specifically, water resources. This research has been instrumental in the monitoring and management of water resources in terms of quality and quantity to ensure equitable distribution and access.

She is the Deputy Director in the School of Geo and Spatial Sciences and a member of the Association of African Remote Sensing of the Environment, Society of South African Geographers, The Association of American Geographers and a participant of Water Net/Water Research Fund for Southern Africa.

Prof Palamuleni has published more than 40 research articles and delivered talks at many international conferences. She is a reviewer of more than 10 international journals in the field of water resources management, applied remote sensing and GIS.

She has supervised nine PhDs, 11 masters' and mentored two post-doctoral fellows.

## Cecil Masoka

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Masoka has worked in the private sector and consulted for government. He joined the public sector in 1999 working for provincial and national departments including the Department of Public Service and Administration and the National Department of Health.

In 2003 Masoka joined the Department of Science and Technology (DST) and was responsible for establishing its donor, private sector and philanthropic unit. Between 2007 and 2012 he was seconded to the South African Embassy in Tokyo, Japan, as the DST's senior science and technology representative.

He has worked closely with international funding agencies and championed some of the human capital development programs in the science, technology and innovation sector.

Masoka also established strong and sustainable relations between government and international private sector partners in supporting socio-economic impact programmes that contribute to economic development and sustainable employment creation. He is currently the Director for Multilateral Cooperation at the DST.

## Prof Liezl van Dyk

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One of a few industrial engineers in South Africa who is registered as a professional engineer and rated as an established researcher by the South African National Research Foundation (NRF), Prof van Dyk's extensive work experience includes technical/professional engineering work, academic teaching, research and new programme development and experience in senior management within the South African higher education context.



Prof van Dyk has the ability to recognise and leverage the strengths and talents of others, resulting in optimising their potential while pursuing the end goal. She serves her professional and academic communities on several committees, panels and advisory boards. Her research is focused on technology-enabled optimisation of service systems, specifically within the context of health systems engineering.

In 2009 she became involved with the South African Medical Research Council's (MRC) tele medicine research projects. Telemedicine is the delivery of health care services (medicine) over a distance, enabled by technology. She eventually developed a telemedicine service maturity model for her PhD. The Groupe Speciale Mobile Association Health Directorate adopted this model for their "mHealth Service Maturity Tracking System".

She was part of the organising committees responsible for the academic programme of the 1<sup>st</sup> (2010), 2<sup>nd</sup> (2011) and 3<sup>rd</sup> (2012) South African Telemedicine Conferences and the 16th Conference of the International Society for Telemedicine and eHealth (2012) as well as peer reviewer for three different international conferences related to telemedicine. She also, in collaboration with the MRC, developed and presented post-academic courses on telemedicine and ehealth to health care professionals.

## Bennitta Senyatsi (MBA)

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Getting a truck-driving license built the credibility of Senyatsi and helped her successfully launch Mercedes-Benz Fleet Board in the Cape from where she progressed to managing the northern part of South Africa, Namibia, Botswana and Swaziland. Within a year of joining Nissan South Africa as the national after-sales fleet manager she was awarded the best technical representative in the automotive industry at the SAVRALA Manufacture of the Year 2015 Award, the first female recipient of the award.

Passionate about women empowerment, especially in the field of engineering, she is featured in Dr Hannelie Nel's book *Leadership and Agency by Women*

*Engineers in South Africa*, addressing the challenges faced by women working in male-dominated industries.

With industrial engineering qualifications from the University of Johannesburg (UJ) and Unisa, a transportation management qualification from UJ and a recently completed MBA from the International University of Japan, Senyatsi has the academic backing to add to her experience of over 10 years in the automotive industry.

Having spent over two years living and studying in Japan, Senyatsi gained a broader understanding of the running of a business and the importance of looking after one's human capital for better corporate performance.

Senyatsi is the product marketing manager for the Datsun brand at Nissan South Africa, helping to grow the businesses in the automotive industry.

She is the current Kakehashi Africa country manager, heading the South African chapter of Kakehashi Africa, an all African alumni group of JICAABE master's graduates from Japan.

## Dr Monnamme Tlotleng

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After completing his Masters in Chemical Engineering from the University of the Witwatersrand, Tlotleng joined the Department of Energy in the Coal and Gas Directorate where he worked on the development of the strategy on shale gas fracking and amendments to the Gas Act of 2001. Tlotleng joined the CSIR National Laser Centre (NLC) in 2011 as a doctoral student, holding a Professional Development Program (PDP) scholarship from the Department of Science and Technology (DST).

He holds a doctoral degree in engineering in the field of Materials Science and Engineering, from the University of Johannesburg. His thesis focused on the development of a bio-composite coating of titanium and hydroxyapatite which would serve to bio-integrate and fuse human tissues to the artificially 3D printed titanium implants. It took him about 30 months to complete his doctorate.

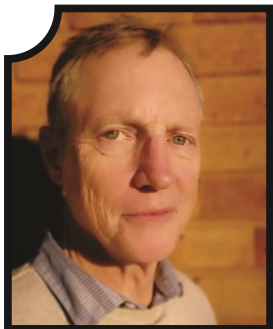
In 2015, Dr Tlotleng was appointed Senior Researcher at the CSIR and Associate Researcher by the University of Johannesburg in the Department of Mechanical Engineering Science. He has effectively supervised and co-supervised students locally and from the Botswana University of Science and Technology.

He has served as secretary and a board member of the Black Scientists, Technologists and Engineering Professionals (BSTEP) and a member of the adjudication panels of the National Science and Technology Forum (NSTF).

In 2017, Dr Tlotleng received the Young Innovation NSFT Recognition Award for the bulk borehole water supply system he built in collaboration with Technology Innovation Agency (TIA) and University of Johannesburg for the community of Lotlhakane village in the North West Province.

## Prof Andrew Robinson

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Deputy Dean Strategy and Business Development in the Health Science Faculty at North-West University (NWU), Prof Robinson is also extraordinary professor (2018), African Unit for Transdisciplinary Health Research (AUTHeR) developing the NWU

School for Health Professionals, and graduate courses in Health Promotion, Public Health for non-health professionals, and solutions for the implementation of the National Health Insurance program.

His areas of expertise are in health systems and program innovation, implementation monitoring and evaluation, communicable and non-communicable diseases, Health Information Systems, and human resources for health.

Prior to his appointment at NWU he was head: Clinical Services North West Provincial Health Department responsible for clinical leadership and governance of interns, community service and foreign health. Projects included the Belgian-South African Study and Consultancy Fund to study and evaluate the province's Routine Health Information Systems with the NWU. From 2006 to 2013 he was the department's deputy director general. During this time social franchise models for

PHC clinics were developed and have now been adopted by the National Department's Ideal Clinic Program and the facilitation of the establishment of the

first health system for community health worker ward-based outreach teams which has been the benchmark for the National Department.

Before joining the provincial government, Prof Robinson was research site director of the MRC's South African Aids Vaccine Initiative (2002-2005), establishing a Phase I and II clinical HIV vaccine research unit with successful completion of the first preventive HIV vaccine clinical trials in South Africa.

# Tumisang (Lebo) Penelope Maphumulo

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Maphumulo is a corporate specialist for the Line Engineering Services Department within Eskom's Group Technology Division. Registered as a professional engineer since 2008, she is a member of two technical groups (TC 7 and 11) at the International Electrotechnical Commission (IEC) and a member of Working Group B2.59 at the International Council on Large Electric Systems (CIGRE).

She serves in the following roles at the Engineering Council of South Africa(ECSA); a member Eskom's Group Technology Division. of Council, chairperson of the Stakeholder Relations Committee and a member of the Central Registration Committee.

A member of the South African Institute of Electrical Engineers (SAIEE), she has over 14 years' experience dominated by high voltage (HV) power transmission lines design. Her competencies include operating, maintenance, performance improvement and refurbishments with a strong powerlines background and vast experience in heading large multidisciplinary projects.

Her master's in Engineering is titled "Consideration to use high surge impedance loading lines (HSIL) in place of series compensation on high voltage transmission lines" and she has published four papers from this research.

Her latest awards include the SAIEE Engineer of the Year in 2017 and Technology and Engineering Award for the Eskom Women Advancement Programme in 2017.

She graduated with a BSc in Electrical Engineering from the Universiti Teknologi Petronas in Malaysia in 2004 and obtained a Master's in Electrical Engineering at Wits in 2018.

# Prof Khumbulani Mpofu

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Prof Mpofu is the Founder and Director of the Rail Manufacturing Centre for Entrepreneurship Rapid Incubator which was one of the 10 incubators mentioned during SONA 2019, and the Gibela Research Chair in Manufacturing and Skills Development at TUT.

In the past he has served as Head of Department – Industrial Engineering at TUT and as senior lecturer, research leader and postgraduate coordinator at the university. He has also been the visiting researcher at the University Ljubljana in Slovenia.

Prof Mpofu is the founder and director of the Rail Manufacturing Centre for Entrepreneurship Rapid Incubator which was one of the 10 incubators mentioned during SONA 2019, and the Gibela Research Chair in Manufacturing and Skills Development at Tshwane University of Technology (TUT).

In the past he has served as Head of Department – Industrial Engineering at TUT and as senior lecturer, research leader and postgraduate coordinator at the university. He has also been the visiting researcher at the University Ljubljana in Slovenia.

To date he has guided more than five doctoral students to completion and more than 20 master's students have been examined and passed examinations.

He has contributed to more than 30 journals and more than 10 book chapters, and to date has registered four patents. Prof Mpofu has also given over 30 presentations at conferences and guest lectures locally and abroad.

In regard to raising funds, Prof Mpofu has been recognised six times at national awards: National Science and Technology Forum, Southern African Institute of Industrial Engineers and Standard Bank Rising Star. He has also received awards from the university for research excellence. To date he has been awarded funding totalling over R50 million for research, innovation, incubation and commercialisation activities.

## Dr Kingsley Obodo

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After earning his B.Tech in Physics and Electronics Technology at the Nnamdi Azikiwe University, Awka in 2007, Dr Obodo joined the African University of Science and Technology, Abuja, Nigeria in 2008. During his time at AUST, he was a visiting researcher at the Indian Institute of Science, Bangalore for nine months, where he worked on “Variation of constraint factor with respect to temperature using indentation techniques”.

In 2011, he started his PhD work at the University of Pretoria (UP) in the Department of Physics on “Quantum mechanical studies of the early actinide compounds”.

Dr Obodo received his PhD in 2014 and continued for a five-months post-doctoral fellowship at UP to finalise research publications.

He subsequently worked at Johnson Matthey Research South Africa as a research scientist on its projects related to emission control and new business units. From there, Dr Obodo worked at the University of South Africa and currently at the North-West University as a post-doctoral fellow.

Dr Obodo has authored over 38 research publications and given several conference presentations.

# N<sub>otes</sub>

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