

LECTURES

The high-profile lecture programme lends the festival its trademark international flavour, and proudly welcomes esteemed international and South African scientists and researchers to this celebration of science.

AUDIENCE:	Grade 10+
CAPACITY:	200/900
PRICE:	R25

Start	End	Speaker, Organisation Title	Venue
WEDNESDAY, 8 MARCH			
11h00	12h00	Professor Lubertus Klumperman , Stellenbosch University <i>Polymers ... so much more than your plastic shopping bag!</i>	Monument Olive Schreiner Hall
13h00	14h00	Professor Shivani Bhardwaj Mishra , Unisa <i>An aqueous molecular synergy with philosophies of science, nature and life: The universal perceptions</i>	Monument Olive Schreiner Hall
15h00	16h00	Bianka Reyneke , Welkom Gimnasium Secondary School <i>I found the Link</i>	Monument Olive Schreiner Hall
18h30	19h30	Maren Seehawer , Oslo and Akershus University College, Norway <i>How local Elders improved our Science Classes</i>	Monument Olive Schreiner Hall
THURSDAY, 9 MARCH			
13h00	14h00	Dr Muthoni Masinde , Central University of Technology <i>Downscaling Africa's Drought Forecasts through integration of indigenous and scientific drought forecasts</i>	Monument Olive Schreiner Hall
15h00	16h00	Christopher Ettmayr , East London Industrial Development Zone <i>A journey into the field of renewable energy – an Eastern Cape experience</i>	Monument Olive Schreiner Hall
18h30	19h30	Dr Lindsay Magnus , SKA SA <i>Seeing stars in dirty pictures: Life as a radio astronomer in the Karoo</i>	Monument Olive Schreiner Hall
FRIDAY, 10 MARCH			
13h00	14h00	Professor Michael Kosch , South African National Space Agency <i>Travel through Space and discover the mysteries of Sprites: First recordings of these dazzling lights in South Africa</i>	Monument Olive Schreiner Hall
15h00	16h00	Jim Adams , NASA (retired) <i>The Journey to Pluto and Beyond</i>	Monument Olive Schreiner Hall
Brian Wilmot Lecture Please note: This lecture forms part of the Scifest Africa Official Opening			
18h30	20h30	Dr Henrietta Wakuna Langmi , CSIR, DST-HySA Infrastructure <i>Hydrogen Energy: a real solution to a real problem</i>	Monument Guy Butler Theatre
SATURDAY, 11 MARCH			
13h00	14h00	Dr Phila Clive Sibandze , South African National Space Agency <i>The journey of a satellite</i>	Monument Olive Schreiner Hall
Christina Scott Memorial Lecture			
18h30	19h30	Dr Claire Lee , CERN, Switzerland <i>The Building Blocks of the Universe - from Quarks to the Cosmos</i>	Monument Olive Schreiner Hall
SUNDAY, 12 MARCH			
13h00	14h00	Professor Jane Catherine Ngila , University of Johannesburg <i>Why and how do we manage water quality and South Africa?</i>	Monument Olive Schreiner Hall
18h30	19h30	Professor Jon Davis , Western Michigan University USA & NNMU SA <i>Using Educational Technology to Learn Mathematics – What is Possible?</i>	Monument Olive Schreiner Hall
MONDAY, 13 MARCH			
13h00	14h00	Andrea Blignaut & Charles Murray Hofmeyr , Woodhill College, Pretoria <i>Robot designed to access terrain inaccessible to humans</i>	Monument Olive Schreiner Hall
18h30	19h30	Dr Robert Campbell , Nurture Health Group, Port Elizabeth <i>Kata to grow - Neuroplasticity, scientific thinking and opportunities to learn...</i>	Monument Olive Schreiner Hall
TUESDAY, 14 MARCH			
13h00	14h00	Professor Mike Bruton , Mike Bruton Imagination <i>Why is science important?</i>	Monument Olive Schreiner Hall
15h00	16h00	Dr Holly Nel , Rhodes University <i>Microplastics, a "macro" problem</i>	Monument Olive Schreiner Hall

WEDNESDAY, 8 MARCH

11H00 12H00

Professor Lubertus Klumperman**Stellenbosch University**

Polymers ... so much more than your plastic shopping bag!



Everybody knows plastic shopping bags, toys, etc. These plastics are made of large molecules, polymers. Much less well known is the fact that polymers play an essential role in many high-tech applications. In this presentation, Prof Klumperman will explain how polymers are made and also give examples of current and future applications of polymers. One application is the delivery of drugs in such a way that the drug has reduced side-effects. Another application is in the continuous development of smaller, better and faster components for computers and cell phones. What we try to do is to design polymer molecules that are expected to possess specific properties. This process is very similar to what architects do when they have certain expectations when their designs are built. Prof Klumperman will try to show in his presentation that the whole process of design, synthesis and testing of polymers requires a lot of creativity and can in many ways be compared to architecture and building as you know it.

Bert Klumperman was born in the Netherlands in 1962. After his Masters degree from the University of Twente he worked in industry for nine years. From 1998 he became part-time involved with Stellenbosch University and from 2007 he is full-time employed at Stellenbosch University, where he currently is a Distinguished Professor and holder of a South African Research Chair. Bert has won many awards such as the South African Chemical Institute Gold Medal, the Sasol Chemistry Innovator of the Year Award, the NSTF Lifetime Award and the Stellenbosch University Chancellor's Award.

Bert is the father of four sons and one daughter, and since last year he has one grandson. Apart from his passion for polymers and chemistry, he has been playing musical instruments ever since he was ten years old. Initially he played the clarinet and saxophone, but for the past 17 years he has been playing the oboe.

This lecture is supported by the National Science & Technology Forum.

13H00 14H00

Professor Shivani Bhardwaj Mishra**University of South Africa**

An aqueous molecular synergy with philosophies of science, nature and life: The universal perceptions



Human behaviour is often ignorant of the visible philosophies of the water molecule and its role in participating in various natural processes. This triatomic molecule speaks volumes about the morality, humility, sustainability, strength, weakness and its ability to unite physical forms of nature. Water is the only solvent considered as a Holy liquid and used in religious ceremonies globally, reflecting its ability to cleanse the soul and eradicate impurities from the body and mind.

The concept of evaporation of water from the surface of water bodies indicates the ability of water to acquire enough kinetic energy to rise despite surface tension. The strength of the water molecule in chemical science lies in the fact that it can create rust on the strongest steel and iron bodies via corrosion. The diverse chemical compounds in concrete need the water molecule as a binder to develop structurally strong materials referring to the philosophy of unity in diversity in engineering sciences.

Prof Shivani Bhardwaj Mishra was born in India with a disciplinary defence culture background and parents who stood by her academic difficulties, motivating her to combat the challenges. Attracted by the imaginative world of science she soon realised that the importance of knowledge transfer from her peers in science was not easy and that she needed to invest extra effort to learn and understand it more simplistically. She is the recipient of many grants and a panel member for NRF grant applications, reviewer of international journals and a member several scientific bodies. She was recently awarded Distinguished Women Scientist (second runner up) by the DST's Women in Science Award. She is a NRF C3 rated researcher and was recently acknowledged as a "Fellow of the Royal Society of Chemistry". She is also a Top 10 researcher at the University of Johannesburg and was one of Unisa's Research Awards CSET Awardees for excellence in research and innovation.

This lecture is supported by the Department of Science & Technology's Women in Science Award programme.

15H00 16H00

Bianka Reyneke**Welkom Gimnasium Secondary School**

I found the Link



The development of perceptual motor abilities is key in processing sensory information in pre-schoolers. This study was conducted to determine the influence of perceptual motor abilities on school performance in pre-school. Perceptual motor ability scores were gathered in 10 pre-schools, and assessed from 2005 – 2015. These scores were used to compare visual perception and fine motor scores. The results were compared to find a link between perceptual motor abilities prior to the study and their current performance. The study found that perceptual motor ability in pre-school does have an effect on school performance in high school, specifically Mathematics and Physical Science.

Bianka Reyneke was born on 5 March 1999, at the turn of the millennium. She is currently in Grade 12 at Welkom Gimnasium Secondary School where she is the Deputy Head Girl. She is usually in the Top 5 in her grade. She is a very keen young sports woman and is captain of the girls' 1st Hockey team. She is also a dancer and does Modern, Tap and Hip-Hop. In 2016, Bianka participated at the South African Championships of Visual Arts and was selected to present the country in Los Angeles with her girl group called the Levels of Adrenaline. She is also fond of debating and public speaking for which she has represented her region.

She wants to study Bio-kinetics, with the aim of specialising in child-kinetics as she would love to develop, stimulate and play with children. She believes that she has a special gift for teaching. Bianka sees herself on a farm one day having a flock of sheep and chickens. She loves to be outdoors and will probably have her own practice, just not too far from the farm. She says her favourite food is chocolate - if you can call it a food.

Bianka Reyneke is an ESKOM EXPO for Young Scientists Scifest Africa Awardee supported by Scifest.

THURSDAY, 9 MARCH

18H30 19H30

Maren Seehawer**Oslo and Akershus University College, Norway**

How local Elders improved our Science Classes



Science teachers do their best to engage their learners in classroom science, but learners find science difficult. The science curriculum seems to be one thing, and the knowledge learners grow up with at home, the things that matter in their daily lives, are a very different story. Does this sound familiar?

What if the knowledge children receive from their grandmothers and communities mattered in class? What if learners could discuss the advantages and disadvantages from so-called "Western science" and indigenous knowledge in the classroom and learn about the strengths and weaknesses of both ways of knowing? The South African science curriculum invites teachers to teach indigenous knowledge, but gives little guidance about how to do this.

In 2015, five Grahamstown science teachers (grade 5 to 12), in collaboration with Maren Seehawer, a 3rd-year PhD researcher from Norway, explored the outcomes of integrating indigenous knowledge into their regular teaching activities. It was surprising how much knowledge the learners had to contribute, how previously bored learners became engaged and enthusiastic, how teachers and children learnt from each other – and how the science classroom became more relevant and connected to learners' daily lives. This lecture presents lessons learnt from this research and from an ongoing educational journey.

Maren Seehawer is originally from Germany, but holds a Master's Degree from the Institute of Development Studies (IDS) in Brighton, England, and currently lives, studies and raises her 3-year-old in Oslo, Norway – although she uses any excuse to spend time on the African continent. She is a passionate advocate for exploring how the educational environment for African learners could be improved. Besides pursuing her PhD at Oslo and Akershus University College, Maren teaches in a Master's Programme on international education. She is proud to have an isiXhosa name given to her by her Grahamstown co-researchers after the end of their collaborative research in 2015. You can ask her about her name when you meet.

13H00 14H00

Dr Muthoni Masinde**Central University of Technology**

Downscaling Africa's Drought Forecasts through Integration of Indigenous and Scientific Drought Forecasts



In the wake of increased occurrences of drought being witnessed in Sub-Saharan Africa, more localized drought mitigation strategies are on the agenda of many researchers and policy makers in the region. Integration of indigenous knowledge on droughts with seasonal climate forecasts is one such strategy. The main challenge facing this integration, however, is the formal representation of highly structured and holistic indigenous knowledge. In this presentation, we demonstrate how the use of ICTs can address this challenge. Indigenous knowledge on droughts from four communities has been modelled and will be presented.

Muthoni is a computer scientist with BSc, MSc and PhD degrees in computer science from the University of Nairobi, the Free University of Brussels and the University of Cape Town, respectively. She has developed a novel tool that accurately predicts droughts in the developing countries of Africa. The tool taps into the rich African indigenous knowledge on natural disasters and augments it with ICTs. The novelty and relevance of this contribution was recognized by the International Telecommunication Union (ITU), BBC, Reuters and the New York Times and saw her emerge the winner of the 2016 Department of Science and Technology's Distinguished Young Woman Scientist: Research and Innovation.

Muthoni is currently teaching at the Central University of Technology where she also doubles up as the Head of the Department of IT. She is actively involved in research in the area of The Internet of Things. Included in her achievements is her role as the founder and Head of the Unit for Research on Informatics for Droughts in Africa where a number of IT postgraduate projects have been spawned, and producing over 30 scientific publications and presentations at international conferences.

This lecture is supported by the Department of Science & Technology's Women in Science Award programme.

15H00 16H00

Dr Christopher Ettmayr**East London Industrial Development Zone**

A journey into the field of renewable energy – an Eastern Cape experience



Christopher Ettmayr holds a PhD in Economics. His focus covers renewable energy and certain policies that the South African government utilises to try to maximise the potential benefits that could be derived from this sector. His presentation will highlight developments of the renewable energy sector in the Eastern Cape and the specific opportunities that have arisen from this. More particularly, it will highlight some case studies and good news stories of people now working in this field. The presentation will conclude with a future picture of where this sector is potentially headed, and the future opportunities that are still to emerge.

Dr Ettmayr does not have any crazy animals such as a giraffe, although with four dogs at home it does sometimes feel like he is living in a zoo. His profession can be quite interesting at times as it takes him into manufacturing facilities all over the world, and gives him the opportunity to interact with many different nationalities while trying to persuade new entities to invest in the industrial development zone for which he works. He often feels like his job must be similar to the Discovery programmes "How it's Made", or "Extreme Factories", as he frequently experiences similar environments.

FRIDAY, 10 MARCH

18H30 19H30

Dr Lindsay Magnus**Chief Scientist, Square Kilometre Array (SKA),
South Africa**

Seeing stars in dirty pictures: Life as a radio astronomer in the Karoo



The Square Kilometre Array (SKA) is an international collaboration to build the world's largest and most sensitive radio telescope. The SKA will have a collecting area of one square kilometre (one million square metres), and will consist of thousands of receptors (dishes) located across Africa, and aperture array antennas located across Australia.

SKA SA is currently constructing the MeerKAT radio telescope, consisting of 64 receptors, 90km outside Carnarvon, Northern Cape. MeerKAT is a precursor to the SKA and will be integrated into SKA Phase 1.

In July 2016, Minister of Science and Technology, Mrs Naledi Pandor MP, released the MeerKAT First Light image. With only 16 of the eventual 64 receptors, the image showed 1,300 galaxies in a small patch of sky covering less than 0.01 percent of the entire celestial sphere, compared to 70 known in that location prior to MeerKAT.

Learn more about SKA and MeerKAT, discover what MeerKAT saw at first light, and find out how you can get involved in radio/astronomy in South Africa.

Dr Lindsay Magnus was born in Bulawayo, Zimbabwe, and matriculated at Kingswood College, Grahamstown in 1993. He registered at Rhodes University to read Law and Accounting in 1994, but saw the error in his ways and converted to a BSc in 1995, and later completed a MSc in Physics. He went on to complete his PhD in Physics at the University of KwaZulu-Natal (UKZN), and oversaw the SuperDARN HF radar project at the South African research station in the Antarctic.

Between his studies he also held lectureship and research positions at the institutions now known as Walter Sisulu University and SANSA.

With two glorious summers on the ice under his belt, Lindsay gained a unique perspective into managing scientific research equipment in remote locations. In 2011, he was appointed to SKA SA's Science Commissioning Unit and promoted to the facility's Head of Operations in January 2017.

This lecture is supported by the Square Kilometre Array, SA.

13H00 14H00

Professor Michael Kosch**South African National Space Agency**

Travel through Space and discover the mysteries of Sprites: First recordings of these dazzling lights in South Africa



Triggered by lightning, sprites are optical gas discharges which occur between the top of thunderstorms and space. They are a bright but very brief phenomenon which can be seen by the naked eye – if you look carefully! Despite the fact that they are quite common and easily visible, especially in a lightning-rich country like South Africa, sightings have rarely been reported. The South African National Space Agency (SANSA) recently took on the challenge of capturing the first images of sprites in South Africa. Using a night vision camera these elusive lights were recorded from Sutherland in January 2016.

This presentation will take you on a journey of discovery as we uncover the mysteries of sprites. Take a peek at rare footage of sprites recorded from space, from aircraft and from the ground in South Africa. Prof Kosch will have you on the edge of your seats during a live demonstration where he will generate a sprite using a petrol engine ignition system and a vacuum chamber.

Prof Mike Kosch was born, raised and educated in Durban, South Africa. Following a life-changing experience over-wintering at the South African Antarctic Research Station (SANAE), he embarked on a career in space research. He has lived and worked in Australia, Germany, Japan, Norway, UK and USA over a period of 23 years before returning to South Africa in 2014 to take up the post as Chief Scientist at the South African National Space Agency. He particularly loves travelling to Antarctica and the Arctic, including adventures close to the North Pole and to the South Pole itself. When Mike isn't chasing sprites, or studying space, he's likely to be found off-roading in his 1981 Land Rover, dogsledding in the Arctic, or photographing auroras. He is a lover of deserts, frozen lands, wildlife and high-tech gadgets.

This lecture is supported by SANSA.

15H00 16H00

Jim Adams**Deputy Chief Technologist, NASA (Retired)**

The Journey to Pluto and Beyond



Is Pluto a planet, a Kuiper belt object or a dwarf planet? Launched on January 19 2006 to find out, the New Horizons probe was sent on a 9-year trek across the solar system to gather data from one of the most endeared and debated bodies in our solar system. After a gravity assist at Jupiter the tiny spacecraft gained enough extra speed to arrive at Pluto on 14 July 2015. Because of the distance (5 billion kilometers) the massive amount of data collected from the fly-by has only just been fully returned. The spectacular images have stunned even the planetary scientists working on the mission. What have they learned about the enigmatic Pluto? Where to next and what does the future hold for the tiny probe? Join NASA Deputy Chief Technologist (Retired), Jim Adams, to find out.

Jim Adams has over 35 years of aerospace experience. Recently retired from NASA, he has directed, or been involved in, over 30 spaceflight missions to explore the Earth, the Sun, and most of our Solar System. He last served as NASA's Deputy Chief Technologist, advising the Administrator on NASA's technology portfolio and advocating the use of new technology throughout the Agency, influencing \$6B annually. Jim has also served as NASA's Deputy Director of the Planetary Science Division. He was responsible for \$1.5B annually and for many well-known missions including Mars Science Laboratory, Pluto - New Horizons, DAWN to Ceres and Vesta and MESSENGER to Mercury. He led a comprehensive assessment of the Nation's Pu-238 production capability and infrastructure, as well as many other independent reviews of Agency capabilities. He has been awarded four medals for outstanding service and leadership by the Agency. Jim holds a B.S. in Physics from Westminister College in New Wilmington, PA and a M.S. in Electrical Engineering from Villanova University in Villanova, PA.

This lecture is supported by the US Embassy in South Africa.

SATURDAY, 11 MARCH

18H30 19H30

Dr Henrietta Wakuna Langmi**Council for Scientific and Industrial Research,
DST-HySA Infrastructure**

Hydrogen Energy: a real solution to a real problem

**Brian Wilmot Lecture**

With the rising human population growth and the increase in the standard of living there has been a rise in energy demand across the globe. Most of the energy consumed in our society today comes from fossil fuels. However, the rapid depletion of fossil fuel reserves and the increase in carbon dioxide emissions as a result of burning fossil fuels, have led to the search for alternative sources of energy. For several reasons, hydrogen is considered a promising alternative but unlike fossil fuels, it must be produced from another substance. In a strict sense, hydrogen is an energy carrier like electricity. However, despite hydrogen being an attractive energy carrier there are still challenges associated with its efficient production, storage and utilisation in fuel cells. Since its discovery centuries ago, hydrogen has been used in a variety of industrial applications. Researchers have been working on developing hydrogen and fuel cell technologies that can be used for vehicle, stationary and portable power applications. Dr Langmi will take you through the vision of using hydrogen as a clean energy carrier in the so-called "Hydrogen Economy."

Dr Langmi has lived on three continents, and is currently a key programme manager and principal researcher at Hydrogen South Africa Infrastructure Centre of Competence at the Council for Scientific and Industrial Research (CSIR). She holds a PhD from the University of Birmingham, and an MSc from Imperial College, London. Her research interests are in the fields of materials science and sustainable energy technologies, with hydrogen storage research being at the core. She is a NRF-rated researcher, a registered Professional Natural Scientist, and a member of the South African Chemical Institute, Royal Society of Chemistry and American Chemical Society and a recipient of several awards. In 2016, she received the Distinguished Young Woman Researchers South African Women in Science Award (second runner-up).

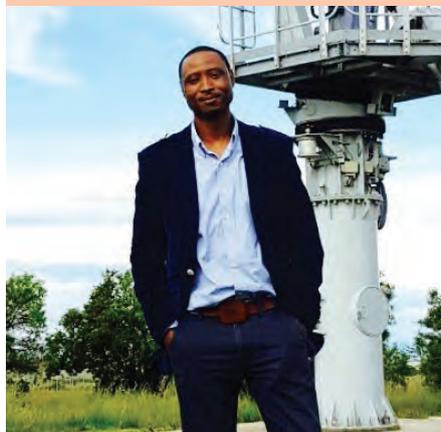
This lecture is supported by the Department of Science & Technology's Women in Science Award programme.

Please note: This lecture forms part of the Scifest Africa Official Opening

13H00 14H00

Dr Phila Clive Sibandze**SANSA**

The journey of a satellite



How many times did you rely on a satellite today? From creature comforts like DSTV and mobile apps to critical navigation and communication technology; satellites improve everyday life on Earth. This presentation will take you on a journey through the life of a satellite. From designing and building a satellite to launching it into orbit and downloading valuable data. The talk will also highlight the pivotal role of the South African National Space Agency (SANSA) in developing the nation's next Earth observation satellite.

Dr Phila Sibandze completed his Bachelor of Science and honours degree at the University of Fort Hare. He then furthered his studies at the University of KwaZulu Natal where he obtained his Master of Science Degree; his research focused on investigating the use of satellite data in identifying Cannabis when intercropped with maize. Having worked with Umvoto Africa and the Agricultural Research Council he then joined SANSA as a Remote Sensing Researcher. When Dr Sibandze is not seeking solutions for societal benefit through space based technology at SANSA, he spends most of his time taking landscape photographs, playing soccer, watching movies, reading books, off-roading and spending time with his son.

This lecture is supported by SANSA.

18H30 19H30

Claire Lee**CERN, Switzerland**

The Building Blocks of the Universe - from Quarks to the Cosmos

**Christina Scott Memorial Lecture**

We live in an incredible universe, and deep inside every one of us is the desire to understand it. However, to understand the whole, we first need to know and understand the parts. What is this world we are living in? What pieces do you need to build this universe of ours? And, in what special ways do these pieces fit together? Over the past 50 years, we have refined our understanding of the universe as a whole, and of all the pieces that make it up. Working together, theorists and experimentalists have put together what we call the "Standard Model" of particle physics: a "universe set" of building blocks, the set of fundamental particles from which we can make up everything we know. But, as it turns out, there is a lot we still do not know - in fact, everything we do know only makes up about 5% of the universe. What is the other 95% of the universe made of? Well, with the Large Hadron Collider (LHC), at CERN, we are trying to find out!

Born and raised in South Africa, my love of science brought me across the world to work on the biggest experiment on earth. As a particle physicist on the ATLAS experiment at the Large Hadron Collider (LHC) at CERN, I play with the building blocks of the universe, investigating the debris of billions of proton collisions to help us learn more about the world we live in. When I am not hunting for particles through terabytes of data, my family and I love snowboarding in the Alps and eating all the melted cheese we can find.

This lecture is supported by the Embassy of Switzerland.

LECTURES

SUNDAY, 12 MARCH

13H00 14H00

Professor Jane Catherine Ngila

University of Johannesburg

Why and how do we manage water quality and South Africa?



South Africa is among the water-stressed nations of the world, with approximately 10% of her population being without access to safe drinking water. South Africa is also among the few countries in the world that enshrines the basic right to sufficient water in its constitution. Factors affecting water scarcity include; population growth, global climate change; industrial discharge into water systems; water supply misuse through illegal connections; and dams collapsing structures in different parts of the country; and lack of smart water resource management. Efforts at the University of Johannesburg to address water challenges include the development and application of advanced technologies such as nanotechnology which has a great potential to improve the efficiency of the water treatment processes.

Professor Ngila holds a PhD in Chemistry from the University of New South Wales, Australia. Her teaching career began in high schools in Kenya and as a Tutorial Fellow at Kenyatta University. She has held Lecturer positions at Kenyatta University, University of Botswana, and University of KwaZulu Natal and is currently Professor of Chemistry at the University of Johannesburg where she was formerly the Head of Department of Applied Chemistry. She is a Member of the Academy of Science of South Africa (ASSAf) and the Winner of 2016 Department of Science and Technology (DST) Distinguished Women in Science Award in Physical Sciences and Engineering. She has received funding awards from the German Academic Exchange (DAAD), the Australian International Development Assistance Bureau (AIDAB), NRF, Water Research Commission, CSIR, Eskom, Third World Academy of Sciences, Organization for Women in Science for the Developing World and Organization for Prohibition of Chemical Weapons in the Netherlands. She serves on boards for Water South Africa Journal, Africa Utility Week on Clean Power and Water, NRF Review Panels, and is an Adjudicator of L'Oreal UNESCO awards for Women in Science in the Sub-Saharan African Programme.

This lecture is supported by the Department of Science & Technology's Women in Science Award programme.

18H30 19H30

Professor Jon Davis

Western Michigan University USA & NNMU SA

Using Educational Technology to Learn Mathematics – What is Possible?



Technological innovation continues to change numerous facets of our lives from how we get information to how we travel from one place to another. Yet, if one looks at the technology present in a mathematics classroom today and compares it to the technology present in a mathematics classroom at the dawn of the twentieth century, there would be few noticeable changes. Why? This presentation shares with the audience what we have learned about the barriers that influence mathematics technology use in the classroom. Despite these barriers, an array of technologies has been developed to help school age children learn mathematics. The presentation will share with participants a collection of available mathematical technologies ranging from an iPad application for primary age children to help them develop a deep understanding of number to computer algebra systems that have the ability to solve the vast majority of mathematics problems that students will encounter throughout grade 12. The presentation will end by illustrating how available forms of mathematical action technology could be harnessed to address topics appearing in the South African mathematics curriculum.

Dr Davis is an Associate Professor of Mathematics Education at Western Michigan University, and a Fulbright Teaching Scholar at Nelson Mandela Metropolitan University. His research interests include curriculum, reasoning-and-proving, and mathematics technology. He enjoys mountain biking, swimming, and hiking. This is his first trip to South Africa.

MONDAY, 13 MARCH

13H00 14H00

Andrea Blignaut and Charles Murray Hofmeyr

Woodhill College, Pretoria

Robot designed to access terrain inaccessible to humans



When miners are stuck in mines, it can be dangerous to send rescue squads down without knowing if the area is structurally safe. Surveillance robots already exist but can be very expensive and are typically used for tactical surveillance. Andrea Blignaut and Charles Murray Hofmeyr aimed to create a robot that is simple to control and will record the area, making it safer for the workers and the job easier. The robot had to be capable of being sent in, recording the area, and exiting unharmed, but not be an extraordinary loss if something were to happen to it. This will ensure that many workers and architects, when surveying abandoned mines or building sites, know that it is safe to approach or enter.

Andrea Blignaut is a 16-year-old pupil at Woodhill College. She takes IT, History and Physical Science as her electives, and has a passion for writing. She took on the GrottoBot Challenge to change her female classmates' opinions on coding and software design, and that is what led her to Scifest Africa. She is also an avid lover of musical theatre, Grease and Wicked being her favourite musicals.

Charles Murray Hofmeyr is currently in Grade 11 at Woodhill College. He has attended Woodhill College since Grade 000 and he intends to matriculate from Woodhill College in 2018. Charles Murray has decided to study to become a medical practitioner. His main interest in this field is Diagnostic Radiology in which he would like to specialise. One of his favourite subjects is Information Technology and he can spend hours writing programmes and exploring on his computer. He is also currently doing his Gold Level of The President's Award and serves on their Gauteng Youth Committee. He was nominated to represent the school on M-Net's Spellbound programme in December. He enjoyed the nerve-racking television appearance and finished as the runner-up in his group.

Andrea Blignaut and Charles Murray Hofmeyr are ESKOM EXPO for Young Scientists Scifest Africa Awardees supported by Scifest Africa and Raspberry Pi.

TUESDAY, 14 MARCH

18H30 19H30

Dr Robert Campbell**Nurture Health Group**

Kata to grow - Neuroplasticity, scientific thinking and opportunities to learn...



What does “out-of-the-box” really mean?

In this entertaining and innovative train-your-brain to adjust-your-boundaries, and expand-your-horizons talk, Dr Campbell will take you on a journey of neurons, synapses, and down paths of knowledge and practice that draws on research by Mike Rother and that will deepen everything you already know and possibilities for learning what you do not know about yourself, science and the universe.

Dr Rob Campbell is a medical scientist, a motivator for everything that is positive, and a rehab doctor. Not the drug kind, but the traumatic brain injury kind. He is the Medical Director of the Nurture Health group of hospitals that deal with all kinds of traumatic injury: Paraplegia, Quadriplegia, Guillain Barre, Stroke, Heart Attack and Palliative care. He is a strategist and generally an all-round nice guy. He is also the Strategic Systems and Planning Director for the design company, Bad Apple, where his knowledge of the strategic principles of Lean Thinking is applied. He's an expert witness and testifies in cases around South Africa and he is also a medical software developer.

In his free time [he has free time ..?] Rob is a MasterChef extraordinaire, fly fisherman, and lover of Crosby, Stills, Nash and Young, U2 and Bob Dylan.

13H00 14H00

Professor Mike Bruton**Mike Bruton Imagineering**

Why is science important?



Science is under fire around the world as people are questioning the value of science and of science-based products. Significant scientific discoveries, such as evolution, global warming and climate change, are being questioned. Furthermore, anti-science and pseudo-science views are gaining popularity, especially through social media. We cannot afford to have a situation in which society undervalues science. Science not only provides the basic tools for us to understand our built and natural environments but also provides the theoretical framework for the development of new technologies that allow us to improve our standard of living while also living more sustainably. The scientific method also provides us with an objective way of thinking and problem solving that is useful in all walks of life. Based on his experience carrying out scientific research and teaching science in societies that value science, and some that don't, a strong argument is presented for society to appreciate the value of science and the benefits that it brings to all the inhabitants of the planet.

Mike Bruton has been doing scientific research, teaching science and objecting to the status quo since childhood. His recent experience in Bahrain and Saudi Arabia has made him realize that a country can be technologically advanced yet scientifically bankrupt. His hobbies include writing, watching fishermen, collecting clothes pegs and not using social media. He lives in Cape Town with his wife, Carolyn, three dogs, a cat and millions of bacteria that he has delegated to produce compost for his garden.

After doing and teaching science throughout his life, Mike Bruton has reached his second childhood and now spends time with the little critters that fascinate him, such as beetles, ants and spiders, as well as children. For fun, he measures how fast beans grow, photographs dead fish and talks to the bacteria in his compost heap! He also asks himself difficult questions about the meaning of life, and needs the help of some bright young minds to answer these questions.

15H00 16H00

Dr Holly Nel**Rhodes University**

Microplastics, a “macro” problem



Microplastics are minute particles of plastic debris that have proliferated within the marine environment due to the manufacturing of synthetic polymers since the mid-20th century. Although, microplastics have been studied since the 80s, the extent of microplastic pollution in the southern hemisphere, particularly southern Africa, is largely unknown. The ingestion of these plastic particles by marine biota may have both physiological and ecological implications, acting as vectors for the transfer of chemical pollutants into the tissue resulting in bio-magnification through the food chain. The overarching aim of our research is to understand the extent of microplastic contamination along our coastline, and determine whether marine invertebrates are ingesting and translocating these particles into their tissue.

Dr Nel holds a PhD from the University of KwaZulu Natal for her work on bivalve ecophysiology. However, her passion lies in pollution and more recently in microplastic pollution, which is her current focus as a post-doc at Rhodes University. She hopes to continue this work in order to educate the public and find solutions to this increasing global phenomenon. In her spare time, she has recently started to make bags with designs inspired by the marine waste crisis, as well as shopping bags used from discarded fabric catalogues. She believes that every plastic consumer has a responsibility to understand the effect poor waste disposal has on the environment, and the role we should take in reducing this problem.