

# Physics Comment

*A Southern African Physics Magazine*



**LAUNCH OF THE MeerKAT RADIO TELESCOPE ARRAY**



**Editors:** Professor Deena Naidoo, Dr. Hellen Chuma and Dr. Buyi Sondezi

# Physics Comment – Vol. 11, Issue 2 – July 2018

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## Editor's Note

This edition of the PC Magazine cites many important events in South Africa. The month of July marked the much anticipated launch of the MeerKAT radio telescope array, which was graced by many dignitaries: Deputy President of South Africa, Mr. David Mabuza (Keynote Address), the Programme Director, Minister of Science and Technology, Ms Mamoloko Kubayi-Ngubane, Ministers and Former Ministers, Ambassadors and High Commissioners, Square Kilometre Array (SKA) International Organisation Board of Directors and Distinguished International Guests - (Page 6).

During the month of May, a new telescope named MeerLICHT was inaugurated at the South African Astronomical Observatory (SAAO) near Sutherland that will be an "eye of the MeerKAT radio array", the country's precursor to the SKA. The DST Director-General, Dr. Phil Mjwara addressed the congregation and partners on the importance of the multi-national project and emphasised that South Africa had chosen astronomy as the field of science to show its abilities in research on a global scale, to bolster technological development in the fields of telecommunication, Big Data and large scale computing, and as the field best able to bring science to the people. Professor Patrick Woudt is a co-investigator in this project - (Page 26).

During the month of June, the University of Free State hosted a very successful Annual Conference of the SAIP. A number of high level invited plenary presentations were delivered by local and international speakers and at the conference, a new initiative "Physics in Industry Day" was launched that attracted a large cohort of participants. Another milestone to note was the awarding of the SAIP De Beers Gold Medal to Professor Patricia Whitelock for her immense contribution to Physics in South Africa and internationally - (Pages 9-11, 21).

With best wishes from the editorial Team.



Professor Deena Naidoo



Dr. Hellen Chuma



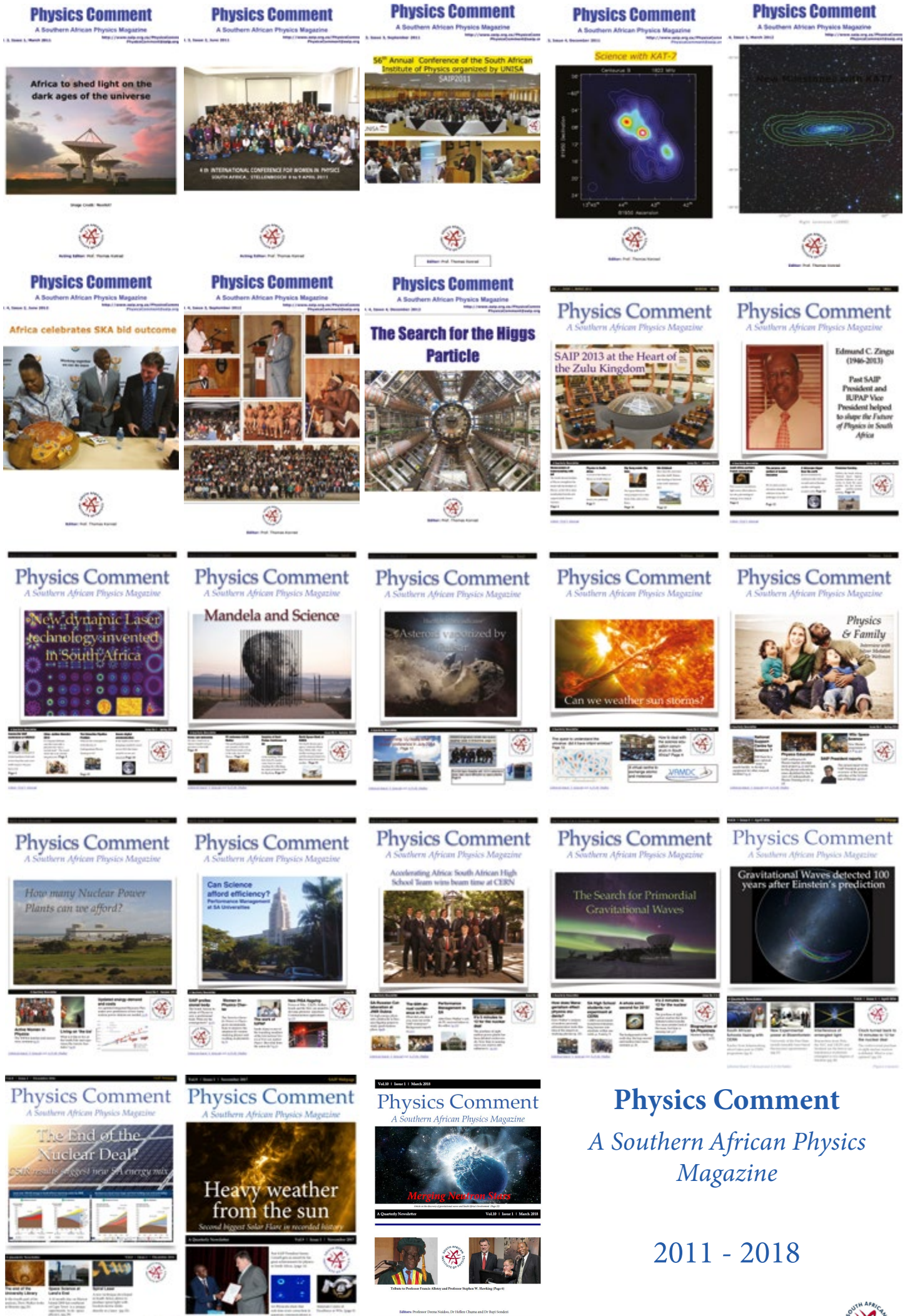
Dr. Buyi Sondezi

**SAIP Office Contribution:** Ndanganeni Mahani & Brian Masara (Content)  
Tebogo Mokhine (Layout and Design)

*Physics Comment is a journal published by the South African Institute of Physics (SAIP) and appears quarterly. The vision of the SAIP is to be the voice of Physics in South Africa.*



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# Physics Comment

## A Southern African Physics Magazine

2011 - 2018



## *President's Corner: Message from Professor Patrick Woudt on behalf of the Council of SAIP*

As this edition of Physics Comment goes to print, we have just witnessed the inauguration of the MeerKAT radio telescope array in Carnarvon, Northern Cape, on Friday 13 July 2018. The Deputy President of the Republic of South Africa, His Excellency Mr David Mabuza, unveiled a plaque at the core of the MeerKAT to mark the completion of this transformational science facility. The first images taken by the full MeerKAT array of the Galactic centre are truly spectacular. The SAIP council congratulates Dr. Rob Adam, the Managing Director of the South African Radio Astronomy Observatory, and his entire team, with this remarkable achievement.



*Professor Patrick Woudt, President of the SAIP at the launch of the MeerKAT radio telescope.*

A congratulatory message was sent from SAIP on 13 July 2018 to Dr. Rob Adam on the MeerKAT launch which can be found online at:

<http://www.saip.org.za/index.php/news-and-events/other-events/453-congratulations-on-meerkat-launch>.

We have also just had two successful conferences in June and July. Around 380 people attended the 63rd annual conference of the SAIP at the University of the Free State in Bloemfontein. The conference started with a workshop on “Applications on Luminescence”. Throughout the week there were a great number of highlights, including the Physics in Industry Day, excellent plenary lectures, the Women in Physics in South Africa lunch, a public talk in the evening as well as visits to the Planetarium and Boyden Observatory. And of course the excellent student talks and the many student prizes!

A particular highlight on the evening of the gala dinner was the announcement of the winner of the 2018 SAIP De Beers Gold Medal: Professor Patricia Whitelock. Congratulations Professor Whitelock! Professor Whitelock will give an invited plenary talk at the annual conference in 2019. I would like to thank Professor Koos Terblans and the colleagues from the University of the Free State, as well as Tanya Schmidt from Eastern Sun and her team, for a wonderful conference! Next year, the University of Venda will host the 64th annual conference of the SAIP.

The South African Institute of Physics is one of many partners involved in the organisation of the African School of Physics. The fifth edition of the African School of Physics in 2018 (ASP2018) was held in Windhoek, Namibia. Around 80 students from across the African continent came to Windhoek for three weeks to take part in ASP2018 in June and July. Concurrently with the African School of Physics, a teachers workshop and the African Conference on Fundamental Physics and Applications was held, hosted by the University of Namibia and the Namibian University of Science and Technology. A good number of SAIP members took part in this very successful conference and school, supporting this important program. Congratulations to the colleagues from Namibia, and Ketevi Assamagan and his team, for hosting a very successful ASP2018. The next African School of Physics will be held in Morocco in 2020.

Looking forward to SAIP activities in August, I wish all the colleagues who will take part in the National Science Week 2018. Through the hub-and-spoke model of the SAIP, at least ten Physics departments in South Africa are involved in a broad range of activities coordinated by the SAIP office. SAIP activities in the National Science Week will be preceded by a teacher's workshop in Limpopo. Finally, I would like to wish all the learners who will take part in the 2018 South African Physics Olympiad all the best.

The full annual report presented by the President at the Annual General Meeting of the 63rd conference of the SAIP hosted by the University of the Free State in Bloemfontein can be found online at:

<http://www.saip.org.za/index.php/news-and-events/other-events/452-saip-annual-reports-2018>.

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## ***SAIP2018 Held at UFS 25 – 29 July 2018***

By Ndanga Mahani (SAIP Office)

The SAIP2018 annual conference was hosted by University of the Free State, in Bloemfontein, from 25 – 29 June 2018. The welcome event was addressed by SAIP2018 Conference Chair, Professor Koos Terblans, HOD Physics (UFS); UFS Rector, Professor Francis Peterson; and SAIP President, Professor Patrick Woudt.



*Entrance to the SAIP2018 Conference Venue.*



*Group Photo: SAIP2018 Annual Conference.*

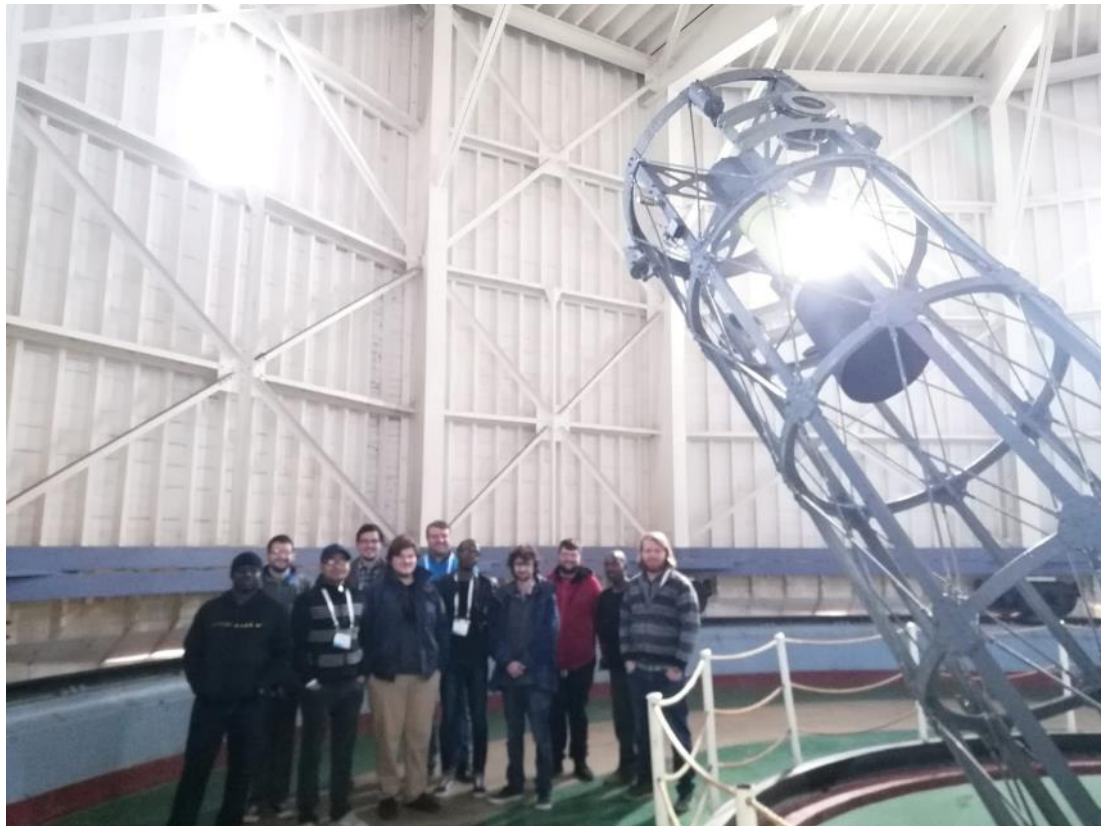
### Conference Highlights

**Excursions to Planetarium (26 & 28 June):** there were two excursions to the Planetarium, situated at the Naval Hill in Bloemfontein.



*South African National Space Agency's Pierre Cilliers and Michael Kosch with their students from Michigan University at the Lamont Hussey exhibit in the Boyden Museum during the SAIP conference (Photo Credit: Boyden Observatory and the Naval Hill Planetarium Facebook Page).*





*North West University Space Science Team at the Planetarium (Photo Credit: NWU Space Science Facebook Page).*

**WiPiSA Lunch (Wednesday, 27 June):** WiPiSA lunch meeting was held at the Scaena Building, where the Forum Chair, Dr. Buyi Sondezi, welcomed and chaired the session.

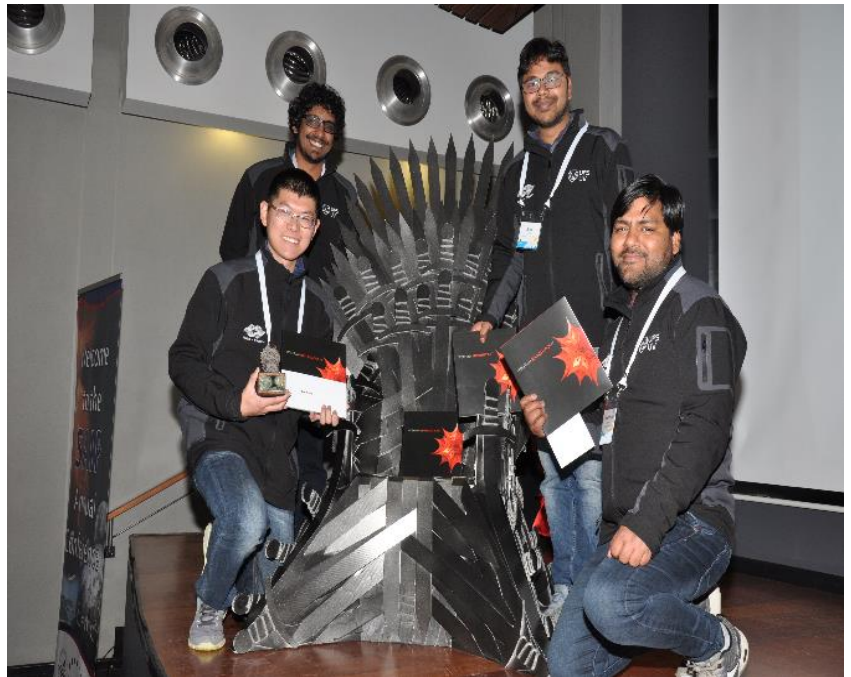


*Dr. Buyi Sondezi introducing the speaker for the WiPiSA lunch.*



Professor Mmantsae Diale giving a talk entitled “South African Women in Physics Progress” at the WiPiSA lunch meeting.

**Physics Bowl (Wednesday, 27 June):** The theme for this year was “Game of Thrones”, the overall winner was UFS, congratulations to them.



**Public Lecture (Wednesday, 27 June):** Professor Markus Böttcher (North West University) gave a public lecture entitled “The Multimessenger Universe - A New Era of Astronomy”. In his talk, he introduced the exciting developments as well as prospects of multi-wavelength and multi-messenger astronomy. He also provided the insights into the most violent phenomena in the Universe.

**Physics in Industry Day Launch (Thursday, 28 June):** SAIP successfully launched the Physics in Industry Workshop at the 63rd annual conference. The half-day workshop consisted of parallel sessions. Both local and international speakers encourage application of research in industry and motivated delegates to create a culture of innovation in Physics (*See full report on Page 21*).

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## ***Professor Patricia Whitelock Awarded 2018 SAIP De Beers Gold Medal***

The 2018 SAIP Gold Medal was awarded to Professor Patricia Ann Whitelock for her outstanding research career in astronomy and astrophysics, and for her distinguished and extensive contributions to leadership, education and human capacity development of the Physics and Astronomy community.

### **Citation SAIP Gold Medal 2018**

The SAIP Gold award is made for outstanding achievements in any of the following facets of any branch of Physics: research, education, technology and industrial development. As the highest standards are applied, the award is intended to be the greatest distinction that is conferred in South Africa for achievements in Physics.



*Professor Patricia Ann Whitelock - SAIP Gold Medallist 2018.*

Professor Whitelock is an NRF A-rated researcher who has authored and co-authored 190 peer-reviewed journal articles over her career. Her research is focused on our understanding of the late stages of stellar evolution and mass-loss of evolved stars, the structure of the Milky Way galaxy, and the stellar content of the local group galaxies.

Her scientific work has been cited over 8000 times. Professor Whitelock's association with the South African Institute of Physics is long and distinguished. She has been a member since 1985, she chaired the Astrophysics group between 1990 and 1997, she served on

council from 1997 to 2005, and as president from 2001 to 2003. Under her leadership, the SAIP started the "Future of Physics" initiative in 2001. She was elected an honorary member of the SAIP in 2008.

During Professor Whitelock's career she has held various important positions. She served as deputy director, acting director, and director of the South African National Facility for Optical Astronomy, the South African Astronomical Observatory.

She also served on the NRF executive from 1998 to 2003. She currently is the chair of the Scientific Council of the Strasbourg Astronomical Data Centre and is a member of two executive committee working groups of the International Astronomical Union: 1) Global Coordination of Ground and Space Astrophysics, and 2) Women in Astronomy.

Professor Whitelock's contribution to the development of the astronomical community in South Africa is extensive. She helped to establish the National Astrophysics and Space Science Program where she served as the first chair of its steering committee between 2002 and 2013.

She was also one of the key drivers behind the successful bid by South Africa to host the international Office of Astronomy for Development of the IAU.

She served on its founding steering committee and currently serves on the steering committee of Southern African Regional Office of Astronomy for Development.

By awarding the 2018 SAIP Gold Medal to Professor Whitelock, the SAIP bestows onto her the greatest distinction that is conferred in South Africa for achievements in Physics.

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## *Professor Mmantsae Moche Diale awarded SARChI Research Chair in Clean and Green Energy*

**By Professor Mmantsae Moche Diale, University of Pretoria**



*Professor Mmantsae Moche Diale.*

A focused and dedicated scientist, a community builder in the physics teaching and research landscape, Professor Mmantsae Moche Diale, Associate Professor in the Department of Physics at the University of Pretoria has been awarded a prestigious Research Chair in Clean and Green Energy by the National Research Foundation (NRF). She is the founder and leader of her own group in Solar Energy Collection and Conversion Research.

The Research Chair is part of the South African Research Chair Initiative (SARChI), which is funded by the Department of Science and Technology. SARChI's objectives are to expand the scientific research and innovation capacity of South Africa; improve South Africa's international research and innovation competitiveness, while responding to the social and economic challenges of the country; attract and retain excellent researchers and scientists; and increase the production of masters and doctoral graduates.

With expertise in semiconductor physics, Professor Diale is an advocate for clean renewable energy. She explained that the objective of the Chair is to significantly increase the number of high quality, well-trained graduates in the energy landscape of South Africa, while also catering for candidates from the Southern African Development Community and other parts of Africa.

The National Development Plan aims to eliminate poverty and reduce inequalities by 2030. South Africa has the capability to achieve this goal by drawing strengths from its people, growing an inclusive economy and promoting leadership and partnerships throughout society. She said: 'The Plan aims to improve economic infrastructure, where the first three objectives are focused on provision of electricity, with at least 20 000 Mega Watts of this capacity derived from renewable resources. The actions to be taken include the move to less carbon-intensive electricity production which includes the freest renewable energy resource, the sun.'

Professor Diale explained that ‘the current situation with energy supplies is that most of the electricity is derived from coal, with nuclear energy from Koeberg and a gradual introduction of renewables in the form of photovoltaics (PV), wind and hydroelectric power. While renewables are still very expensive as compared to conventional energy supplies, solar PV has reduced in price by approximately 70% in recent years, allowing for an introduction of solar panels to non-grid users.’

While independent power producers have been granted an opportunity to expand even without licences, the NDP issues are not well addressed. ‘Most of the informal settlement citizens cannot afford to buy a solar panel or establish a power plant – thus continuing to be poor with ESKOM’s management issues,’ said Professor Diale. The Chair hopes to reduce the price and supply by redress in the renewable energy sector; produce new technologies made in South Africa, thereby creating sustainability in the economic sector.

She said that the Chair will follow an interdisciplinary approach, putting energy research within different science disciplines, including physics, chemistry, engineering, materials science and biology. ‘Energy plays a very important role in economic upliftment and poverty reduction as it gives access to communication methods that improves national education standards. All businesses require a stable electricity supply: for production, sustainable profits, stable workforce and poverty reduction.’

Professor Diale explains that ‘affordable fuel production using photovoltaic generation of electricity to power electrolysis, a holy grail for decades, is now within reach, thanks to recent progress due to new and cheap catalysts, based on earth-abundant materials, and the advent of Halide Perovskites (HaPs) as a basis for one of the materials to be included in the high performance PV cell.’

Furthermore, Liquid Fuels from artificial photosynthesis (AP), as are used today are ‘amazingly compact to store and carry energy. This makes the production of solar cells sustainable, while keeping them affordable, which is of major importance.’ The integration of PV/AP will then be used to make solar energy accessible to non-grid communities in South Africa, with PV providing electricity when the sun goes up and liquid fuels providing energy when the sun goes down. Professor Diale’s interest in energy was sparked from the time she was growing up in a village, ‘with power cables passing through our village’ but there was no power station so people did not have electricity. ‘My dad had a generator to light up our home and do his business of developing photographs and running movies.’ After many meetings with the authorities, her family was the first to install electricity in their home in the village.

Professor Diale is a late-comer to the South African research landscape, ‘Before I came into research, I worked in industries where I was testing electric motors, then became a teacher of physical science,’ she said. She was mentored by Professor David Cahen from the prestigious Weizmann Institute of Science in Israel, in materials for PV research.

She enjoys research collaborations in Senegal, Ghana, Zambia, Tanzania and Uganda. All these connections are in solar energy materials research, including nanotechnology and semiconductor physics. She has been involved in a consortium applying for European Union and World Bank mobility funding with African scientists. ‘The World Bank has granted us funding with the consortium to work on nanotechnology research in water purification,’ she said.

Professor Diale is passionate about human capital development. She is the founder of Women in Physics in South Africa, addressing the issues that affect women’s acceleration in Physics research. She also founded the Black Science and Technology and Engineering Professional Association, to address the plight of Technikon (University of Technology) trainees who have not been able to graduate due to lack of experimental training facilities. In this project, Professor Diale has been awarded over R25 million in five years, to run the project.

Finally, Professor Mmantsae Moche Diale is a passionate first year lecturer who believes that ‘without proper support of under-performed matriculants, we are losing potential candidates for future leaders in the country’.

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## ***Professor Mmantsae Diale (UP) wins the 2017/2018 NSTF Engineering Research Capacity Development Award***

**By Professor Mmantsae Moche Diale, University of Pretoria**

The field of my work is on collection and storage of solar energy to reduce the effects of carbon dioxide in the atmosphere, consequently climate change. This work is clearly different from other established energy platforms like nuclear and coal, which are both harmful and dangerous to the environment. The United Nations has long desired that all people on the planet have access to electricity.

This millennium goal can only be reached if we have energy technologies that will be accessible at low cost and without disruptions due to unforeseen natural consequences. In addition, the technologies must be protected by policies to avoid using them as weapons of mass destruction and disrupt peace and security.

South Africa, occupies the best position in the universe where solar irradiation is available to all. What is needed is technologies that will collect and store this valuable cheap resource. I have an equation I use: Photovoltaics combined with artificial photosynthesis is a process that will be valuable for developing communities to produce electricity at low cost and be able to provide its storage.

I have been nominated for exceptional performance as a researcher in systems for solar energy collection and conversion, from materials development to devices fabrication, using semiconductors.

Solar energy technologies are easily available and have become cheaper and affordable. The big issue is time dependence: what happens when the sun goes down including conditions of maximum clouds covering. This calls for storage of solar energy in other technologies including batteries, hydrogen and methane.

In addition, researchers need to take into account reduction of carbon dioxide in the atmosphere, addressing global warming and its effects on the environment. In the past few years, Professor Diale has done significant progress in her research from materials development to device fabrication for solar cells and photoelectrochemical device for water splitting to produce hydrogen.

We have used sustainable earth abundant hematite (iron oxide) generally known as rust to split water into hydrogen and oxygen. Hydrogen is a much-needed solar fuel for solar energy storage.

In photovoltaics, we have used the amazing perovskites with Si to produce solar cells that are easy to fabricate at low cost. When perovskites are grown on the known and well understood material like Si, we hope to achieve better technologies in the quest for clean environment and solar energy. ZnO, Al doped ZnO and ZnO nanorods were developed to enhance solar energy collection. This research is able to pave the way for sustainable energy for all, being clean and low cost.

The work towards green and clean energy solutions started at the University of Pretoria in 2014, following calls for researchers to join the existing programs to solve the world energy crisis. The energy issues are escalating proportionally with world population. When I started with a special focus on solving the world energy problems, the world population was six billion and we had not yet experience load shedding in South Africa.

Today the world population has reached plus seven billion, making it an urgent issue to address the energy crisis, while South African ESKOM is at the brink of collapse due to non-payment from users and illegal connections. Furthermore, a related problem emerged due to carbon dioxide emissions in the atmosphere, which is actually an old monster that was not given proper attention at its first announcement.

Climate change is a direct result of carbon dioxide from fossil fuels, creating a veil over the sky, trapping heat and finally increase temperatures in an exponential form. While solving the world energy issues, researchers need to work towards clean and green energy production, focusing particularly on renewables.

South Africa occupies a position in the world map that makes it have a huge access to solar irradiation, encouraging a direction towards photovoltaic energy solutions.

The future energy requirement is inspired by nature, using biological materials to harness solar energy, called bio-inspired solar energy research. This technology combines the knowledge of natural photosynthesis with artificial photosynthesis, through mimicry. This is where cheap and easy to synthesise materials are required to be used as both cathode and anode in the desired device. The best materials in this case must be stable in water – the natural example being algae growing comfortably on stone (iron oxide).

The system is a natural device that we are mimicking to have solar energy collected in a sustainable manner. In this work, I have made a good progress in the development of iron oxide with a few papers with my collaborators. In 2017, I hosted a successful symposium at Material Research Conference from 26 November to 1 December 2017: On the way to sustainable solar fuels, with colleagues from Italy, Germany and Switzerland: [www.mrs.org/program/ES02](http://www.mrs.org/program/ES02).

I collaborate with colleague, Dr. Artur Braun, from Empa in Switzerland on the iron oxide project. The collaboration started in 2014 during the Joint Research Project Funding between Switzerland and South Africa. The results of this project made me an emerging researcher since I changed my focus to this future energy solution.

In this project we have published a few papers in accredited journals, including our collaborations with Zambia. The photovoltaic project started at Weizmann Institute of Science, where I collaborate with Professor David Cahen. We have published one article in Journal of Applied Physics on the new perovskites materials for solar cell applications. We also presented a paper at the Photovoltaics Solar Energy Conference in 2014 on hybrid organic and inorganic solar cells.

The available resources for this project were directly from my collaborators. I had spent time at Weizmann Institute of Science, to engage in systems development for improved solar cells.

We started with inversion layer type device which was using the well-researched silicon, with organic matter as a way of fabricating solar cell at low cost. My collaborators had equipment to do the work while I brought the understanding of current transport mechanisms, which would explain why the efficiency of the devices would differ. I then bought a small solar simulator required for the characterization techniques of the solar cell. At the University of Pretoria, we have incorporated Thermal Admittance Spectroscopy with the solar simulator to study defects in perovskites grown at Weizmann, producing a first paper on this subject in Journal of Applied Physics on Methyl Ammonium Lead Bromide.

The devices made have produced more than 22% efficiency in less than 10 years, as compared to the established Si solar cells, which took decades to have about 25% photo conversion efficiency.

The growth of hematite was done at Empa in Switzerland and characterization of materials here at the University of Pretoria. With this group, we are taking part in competition in EU sunrise project to produce devices that will produce a system that is independent of the grid by 2012.

As we believe that the best future technologies for solar energy is to produce the storage using photovoltaics. Thus, our research is from optimization of hybrid organic/inorganic solar cell to harness solar energy and create a device that collects and store solar energy. We have already fabricated a biomimetic photoelectrochemical cell for solar hydrogen production. Thus, my research is hoping to make electricity available to the world population from sunrise and beyond sunset.

Collection of solar energy requires materials that will be able to collect all visible band. Such materials will be used to make tandem solar cells – ranging from ultraviolet to infra-red. Our studies have shown that we have achieved and put together information in published papers on wide bandgap materials like GaN and ZnO.

GaN is a material that responds well in the UV and with bandgap engineering, we have move the material to blue region. ZnO has responded well in the UV to blue, going on to make nanorods for incorporation in devices.

The rods enhance light collection. The inclusion of green matter in light collection systems is to flow with the green leaf device already demonstrated by other groups elsewhere.

Different technologies are expected to hit the markets in few years; an emerging economy like ours must not be left behind. Thus, the work we do in development of energy technologies for renewables is an excellent direction for readiness in the decades to come – when life will be without fossil fuels.

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## *SAPhO2017 Gold Medallist, Angus Thring, Receives SAIP Medal*

The South African Physics Olympiad (SAPhO) Gold Medallist, Angus Thring, was presented with the SAIP Medal at the Annual SAIP Conference gala dinner in Bloemfontein. Angus was a learner at Bishops in Rondebosch, Cape Town, Western Cape. He scored 86% to win the Olympiad.



*From the left: SAIP President, Professor Patrick Woudt, Angus Thring and Case Rijsdijk (SAPhO Convener, SAIP Honorary Member).*

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## *Student Prizes at SAIP2018 Gala Dinner (Monte Bello Estate, Tafelkop Farm, Bloemfontein)*

### **Space Science/ Astrophysics Division**

The prizes for the Astrophysics-Space Science division are as follows:

#### **Astrophysics**

Best Poster: *Drikus du Plooy* – UFS

Best Honours Talk: *Trystan Lambert* – UCT

Best MSc Talk: *Michael Sarkis* – Wits

Best PhD Talk: *Joint prize to Izak van der Westhuizen (UFS) and Carlo van Rensburg (NWU)*





*Astrophysics Division Winners with SAIP President and Division Chair, Dr. Brian van Soelen.*

### **Space Science**

Best MSc: (Shared) Mr Bernad Mmame - UKZN

(Shared) Mr Jabus van den Berg - NWU

(Shared) Mr Phillip Heita - NWU/CSIR

Best PhD: Mr Michael Heyns -UCT/SANSA

Encouragement prize: Mr Njabulo Mbanjwa – UKZN



*Space Science Division Winners with SAIP President and Division Chair, Dr. Du Toit Strauss.*

### **Photonics Division**

Best MSc Oral (sponsored by Hensaltdt) - R3500: Channay Naidoo - UJ

Best MSc Poster (sponsored by NMISA - R3500: Charmaine Sibanda - SU

Best PhD Oral [Spectroscopy] (sponsored by SAIP) – R3500: Andre de Bruyn - SU

Best PhD Oral [Quantum] Optics (sponsored by Stellenbosch Student Laser Chapter) - R3500: *Bienvenu Ndagano* - Wits

Best PhD Poster (sponsored by SAIP) - R3500: *Nokwazi MPhuthi* - Wits

### Applied Physics

Best MSc Oral - R3500: *Elvin Chizenga* - UJ

Best MSc Poster - R3500: *Rorisang Sitoboli* - Wits

Best PhD Oral - R4500: *Graham Daniels* - NECSA

Best PhD Oral – R4500: *Dina Oosthuizen* – UFS/CSIR

Best PhD Poster - R4500: *Robert Nshimirimana* - NECSA



*Applied Physics Division Winners with SAIP President and Dr. Phil Ferrer.*

### Division for Physics of Condensed Matter and Materials Publications

Undergrad/Hons Essay:

*No entry*

MSc Publication 1: Condensed Matter/Materials Science:

*No entry*

Wirsam MSc Publication 2: Semiconductor Physics/Technol:

*Edward Lee, R.E. Kroon, J.J. Terblans, H.C. Swart (UFS)*, Synthesis and characterisation of  $Y_2O_3$  phosphor co-doped with bismuth and ytterbium ions for application in solar cells, *Physica B: Condensed Matter*, 535 (2018) 102–105.

Goodfellow PhD Publication Award:

*DN Oosthuizen (UFS/CSIR), HC Swart and D Motaung*, In depth study on the notable room- temperature  $NO_2$  gas sensor based on CuO nanoplatelets prepared by sonochemical method: Comparison of various bases. *Sensors and Actuators B* 266 (2018) 761–772.

## Presentations

Honours oral: *Tshidi Malibe - UL*

PST Sensors Honours Poster: *A Mazibuko - UL*

MSc Oral (Semiconductor/Technol): *E Lee - UFS*

MSc Oral (Condensed Mat / Mat Sci): *LJB Erasmus - UFS*

Wirsam MSc Poster 1 (Condensed Mat / Mat Sci): *Ms M Baloi - Wits*

MSc Poster 2 (Semiconductor/Technol): *MJ Mphuthi - UFS*

Frank Nabarro PhD Oral: *Z Tshabalala - UFS/CSIR*

Vacutec PhD Poster (Condensed Mat / Mat Sci): *Mahmoud Mahmoud - Wits*

Vacutec PhD Poster (Semiconductor): *Abdu Barde - Wits*



*Division for Physics of Condensed Matter and Materials Winners with SAIP President and Dr. Rudolph Erasmus.*

## Nuclear, Particle and Radiation Physics Division

MSc Oral winner: *Ms Thuthukile Khumalo - UZ/iThemba LABS*

MSc Oral runner-up: *Mr Masedi Masekane - UNISA*

MSc Poster winner: *Ms Onesimo Mtintsilana - WITS*

PhD Oral winner: *Ms Sandile Jongile - SU/iThemba LABS*

PhD Oral runner-up (joint): *Mr Abraham Aava - WITS/iThemba LABS*

*(joint): Mr Kehinde Tomiwa - WITS*

PhD Poster winner: *Mr Kgashane Malatji - iThemba LABS/SU*



*Nuclear, Particle and Radiation Physics Division winners with SAIP President and Division Chair, Dr. Simon Mullins.*



*Group photo of all the student prize winners.*

## *Physics in Industry Day SAIP 2018 Report*

By Dr. Iyabo Usman, University of the Witwatersrand

The first of its kind, Physics in Industry Day was launched on Thursday 27th of June 2018 during the SAIP2018 Conference that was held at the University of Free State Bloemfontein. The first two sessions of the Applied Physics Divisions were allocated for the program which was graced with many enthusiastic researchers and postgraduate students. This level of interest received has spouted the needs for informative program like this on a continuous basis for a long time planning. Speakers at the event includes Mr Brian Masara (the SAIP office), Dr. Dave Rogers (Nanovation France), Professor Ernest van Dyk (PV Insight and NMU), Dr. Margaret Mkhosi (Director of CNSS, NNR South Africa) and Dr. Darryl Naidoo (CSIR).

From the discussion session, the following points were noted;

- Dr. Igle Gledhill pointed out the significant contribution that this valuable program is going to yield by promoting the career opportunities in industry and commerce which will serve interest to young physics graduates and postgraduates.
- A researcher from Stellenbosch University indicated that industries need to participate in the discussion during the next SAIP Physics Industry Day.
- Dr. Phil Ferrer also highlighted the needs to involve directors of companies as guest speakers in the next Physics in Industry Day program.
- Dr. Mun'delangi Vestergaard (Japan) stated it is important for discussion into challenges faced by small entrepreneurs in realising how their research ideas from the laboratories can be transformed into consumer product and consequently into commercialisation markets. Therefore, presentation on the topic "From research to commercialisation" should be included in the next program of Physics in Industry Day.
- There is a need to involve Physics Graduates who are already working in the industries to share their views. This can be achieved by setting up a database of physicists in industry
- A very important problem was stated as "Physics graduates were not being taught about business" as part of their curriculum. Therefore, a continuous development workshop to be included in the winter school every year as part of Physics in Industry day. This will help by integrating business related courses in the postgraduate program. Mr Masara pointed out that Institute of Physics UK has a CPD course that can be incorporated into the curriculum. But an experienced entrepreneur pointed out that a specialised business school with long years of experience will be required for delivering the course not just any Professor from a Business School.
- There should be an interaction platform between physicists, industries, commerce and venture capitalist.
- There is a need to involve different government departments e.g. DTI, Department of Women Affairs, and Department of Public Enterprises for their contributions into the program sustainability.

Lastly, Professor Van Dyk pointed out that the large number of attendance shows more interests but it is taking away more time slots from Applied Physics Division sessions, therefore suggested to have separate sessions in parallel with the Winter School(s) during the upcoming SAIP conferences. Further discussion will follow on the strategic planning to aid continuation of the program and long term sustainability.



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# *IEEE-sponsored School of Instrumentation in Particle Physics*

**Report by Professor Bruce Mellado, University of the Witwatersrand and iThemba LABS**

On Saturday July 7<sup>th</sup> we kicked off the Institute of Electrical and Electronics Engineers (IEEE) Nuclear and Plasma Sciences Society (NPSS) International School for Real Time Systems in Particle Physics 2018. The school was co-sponsored by the IEEE Nuclear and Plasma Sciences Society and the South Africa - CERN consortium and it was held at iThemba LABS in the Western Cape 7<sup>th</sup>-17<sup>th</sup> 2018. The School was chaired by Professor Christian Bohm from Stockholm University and by Professor Bruce Mellado from the University of the Witwatersrand and iThemba LABS.



Its intention is to give practical experience with developing and controlling mid-range real time experiments. Hands-on experience is very important. The school provides lectures and laboratory exercises, given by experts in radiation measurements with state-of-the-art experience. The lectures introduce firmware, software and web based programming (for remote control), and show how this can be used in different areas of science. In order to minimize the hardware cost Raspberry Pis are used as controllers. This should be an advantage when the students later develop their own systems. The Raspberry Pi operating system is similar to Linux which means that it supports many of the standard Data Acquisition software tools.

The goal of the school was:

- To train students in the area of radiation detectors and its applications.
- To enhance the development of real-time system in South Africa.
- To promote the participation of young scientists in radiation measurements and related fields.

## **Lectures**

The lectures covered the following areas:

- The history of detectors
- Introduction to radiation instrumentation detectors
- Programmable logic - FPGAs
- Introduction to readout, trigger and control architectures
- From resistor to high energy physics experiments
- High speed signals, impedances, reflections and grounding
- Waveform digitizing and signal processing
- Photo, Geiger and silicon detectors
- Introduction to networks
- Unix shell basics

- Introduction to the RCDAQ data acquisition system
- Real-time data visualization and control using modern web technologies
- Signal levels and bus standards
- Raspberry Pi
- HEP detectors – overview and examples
- Instrumentation for harsh and severe environments
- Application of fundamental physics in medicine
- Detectors for astrophysics
- Writing papers and preparing presentations – some hints

## Laboratory Exercises

The exercises are of three types: first the two exercises on Thursday, second the four exercises on Friday and Saturday and last the voluntary FPGA workshop on Sunday July 8<sup>th</sup>. The two exercises on Thursday will be given parallel with half the students in each group, switching after lunch. Similarly, the four parallel half day exercises on Friday and Saturday will each be given to one quarter of the student group, again switching after lunch. This will allow all of the students to participate in all of the exercises.

*Sunday July 8<sup>th</sup> 08:30-16:30*

- FPGA workshop: Practical exercises in FPGA programming (only about 20 students)

*Thursday July 12<sup>th</sup> half day exercises*

- Raspberry Pi/RCDAQ: Practical exercises with a Raspberry Pi, the operating system Raspbian (Linux derivative) and a complete data acquisition program (RCDAQ).
- Control using modern Web technologies: Practical exercises developing an experiment control server using a Raspberry Pi that can be accessed via a web browser.

*Friday July 13<sup>th</sup> and Saturday July 14<sup>th</sup> half day exercises*

- HVcontrol: Use a Raspberry Pi and a dedicated HV-board to generate the high voltage for a Photo Multiplier Tube connected to a scintillator. This set-up is then used to record gamma radiation from different sources.
- Waveform capture: Add a waveform capture module to the HV-control set-up to analyze pulse shapes and start time. Use a two PMT/scintillator configuration to extract position information
- PET demonstrator: Exercises with a demonstration system for detectors and for the principles of Positron Emission Tomography
- TimePix: Exercises with a silicon detector development board



IEEE NPSS and South African research agencies consider Women In Engineering an important initiative that should be strongly promoted. A special WIE event is scheduled for the afternoon and evening Wednesday July 11<sup>th</sup>.

The following lecturers participated:

- Abdallah Lyoussi, CEA Cadarache, France
- Bruce Mellado, Wits University, iThemba LABS, SA
- Christian Bohm, Stockholm University, Sweden
- Cinzia Da Via, Manchester University, UK
- Martin Grossmann, PSI, Switzerland
- Martin Purschke, BNL, USA
- Masaharu Nomachi, Osaka University, Japan
- Michael Holik, IEAP CTU, Czech Republic
- Patrick Le Du, IPN Lyon, France
- Stefan Ritt, PSI, Switzerland
- Vladimir Vicha, IEAP CTU, Czech Republic
- Zhen-An Liu, HEP, China

After a rigorous selection process 50 students were selected to attend the school. More info can be found at: <https://indico.cern.ch/event/661919/overview>.

A site of the School is also available at the Czech Technical University in Prague:

<http://www.utef.cvut.cz/recent-events/2018-07-17/ieee-npss-international-school>.

A Women in Science event was held at iThemba LABS on Wednesday, July 11<sup>th</sup>. The event was hosted by an IEEE-sponsored school of instrumentation in Particle Physics. The event was organized and chaired by Professor Cinzia Da Via, from the University of Manchester in collaboration with Professor Igle Gledhill from the University of the Witwatersrand and Dr. Joyce Mwangama from the UCT who also chairs the IEEE WIE (Women in Engineering) affinity group in Cape Town. Three prominent speakers addressed the audience: Professor Diane Grayson, from the University of the Witwatersrand, Dr. Zinhle Buthelezi, from iThemba LABS and Dr. Joyce Mwangama from the UCT.







The event, aimed to encourage the discussion amongst men and women on issues related to biases in scientific working environments, was attended by the participants of the school, iThemba LABS staff members and a selected group of motivated learners and teachers from Thandukulu High-School.

Professor Diane Grayson holds a PhD in Physics from the University of Washington and an honorary doctorate in science teacher education from Umeå University in Sweden. She is passionate about helping students succeed through taking a scholarly approach to teaching and curriculum design that promotes effective student learning.

She has served on the Council of the South African Institute of Physics, the International Commission on Physics Education and the STEM Committee of the Academy of Science of South Africa. She has worked as an academic and in management at the University of KwaZulu Natal, UNISA, University of Pretoria and the Mathematics, Science and Technology Education College, and also ran her own consultancy, Andromeda Science Education.

From 2012-2017 she was a Director at the Council on Higher Education, where she was responsible for the system-wide Quality Enhancement Project, designed to promote student success at all higher education institutions.

In 2018 she joined the University of the Witwatersrand as Senior Director: Academic Affairs. Dr. Zinhle Buthelezi holds a PhD degree in Experimental Nuclear Physics from the University of Stellenbosch. She is a Senior Research Scientist at the Department of Subatomic Physics, iThemba LABS, South Africa. Her research interest is in Experimental High Energy Particle and Nuclear Physics, and she is the Coordinator of the South Africa-ALICE team at iThemba LABS, and Deputy Team Leader of the SA-ALICE Collaboration. She is also Scientific Secretary of the South Africa – CERN Programme.

Dr. Joyce Mwangama received her BSc degree in Electrical and Computer Engineering and MSc in Electrical Engineering from the University of Cape Town (South Africa) in 2008 and 2011 respectively. In 2012 she began her study towards a PhD in the Centre for Broadband Networks and joined the Department of Electrical Engineering at the University of Cape Town as a lecturer in 2015.

Joyce received multiple research awards including the Google Anita Borg Scholarship and the L'Oréal-UNESCO Sub-Saharan Women in Science Fellowship. Joyce was a member of the IEEE MGA Women in Engineering Committee (2015-2017). She has previously served as the IEEE Region 8 Women in Engineering Coordinator (2013-2014), IEEE South Africa Section Students Activities Coordinator (2011-2013), IEEE South Africa Section Young Professionals Chairperson (2011-2013) and IEEE Student Branch Chairperson University of Cape Town (2009-2010).

Following presentations, Professor Grayson moderated QA Session and Round Table Discussion with the speakers on the theme of “Women in STEM (Science, Technology, Engineering and Mathematics) – Networking, Mentoring and Professional Development in South Africa”.

The discussion was lively and involved both females and males. It was a terrific experience where students opened up about their own encounters, expectations and views on the subject. The discussion was frank on issues that too often get hidden under the rug. Attention was drawn to unconscious biases and the need to bring these to the surface in discussions with peers and academic staff.

More information about the event can be found at:

<https://indico.cern.ch/event/661919/timetable/?view=standard>.

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## *DST Director General Unveils the MeerLICHT Optical Telescope on Africa Day 2018*

Department of Science and Technology Director General, Dr. Phil Mjwara unveils the new telescope at the South African Astronomical Observatory (SAAO), near Sutherland in the Northern Cape. Here is the clip: <https://twitter.com/SAGovnews/status/999926169985273856?s=08>. Also present, as part of the delegates was Professor Patrick Woudt, who is the current SAIP President and co-principal investigator of the MeerLICHT telescope.

The new telescope will be an “eye of the MeerKAT radio array”, the country’s precursor to the Square Kilometre Array (SKA). MeerLICHT, which means “more light” in Dutch, is an optical telescope that will simultaneously scan the Southern Skies together with MeerKAT. This creates a truly unique combination where astronomers will always be studying stars and galaxies in two parts of the spectrum at the same time.

The project is a Dutch – South African – United Kingdom collaboration involving researchers from six different institutes from the respective partner countries. It was decided to launch it on Africa Day to recognise and celebrate both our incredible African skies and the important partnerships between Europe and Africa that have led to this innovation.

MeerLICHT is a good example of projects aligned to the objective of the Multi-wavelength Astronomy (MWA) strategy, which was approved by the Department of Science and Technology (DST) in 2015.

The MeerLICHT telescope will be housed at the Sutherland Observatory, run by the South African Astronomical Observatory.

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## *2018 Global Survey of Mathematical, Computing, and Natural Scientists!*

You are invited to participate in the 2018 Global Survey of Mathematical, Computing, and Natural Scientists which part of an interdisciplinary collaboration of eleven partners, supported by the International Council for Science (ICSU), which aims to better understand the problems mathematical, computing, and natural science academics and practitioners are facing around the world.

The data are being collected by the non-profit Statistical Research Center of the American Institute of Physics. Responses to this survey are voluntary, and your individual information will be held in strict confidence.

Please forward this survey to anyone who has studied or worked in mathematics, computing, natural sciences, or the history and philosophy of science and technology.

For more info please follow this link: <http://saip.org.za/.../446-2018-global-survey-of-mathematical...>

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## *IUPAP Newsletter*

We would like to inform you that the June 2018 issue of the IUPAP newsletter is now online for your browsing. You can view it via the link

(<http://iupap.org/.../IUPAP-Jun2018-web-ilovepdf-compressed.pdf>) or directly from the website (<http://iupap.org/newsletter/>).

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## *Like the SAIP Facebook Page*

Like the SAIP Facebook page to stay in touch with the latest news, events and job opportunities within the South African & International Physics Communities.

If you have interesting physics related activities, events and opportunities you want to be posted please let us know and share those great moments with the community.

<https://www.facebook.com/South-African-Institute-of-Physics-1660099704207118/>

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## *Connect with SAIP on LinkedIn*

The physics community can now connect with SAIP on LinkedIn click on the link below to connect with friends in physics community in South Africa: <https://www.linkedin.com/company/18078401/>

Happy networking!!

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## **CRITICAL SKILLS VISA LETTER**

The South African Institute of Physics is now a SAQA registered professional body hence it can provide critical skills letters required for the application of a Critical Skills VISA and Permanent Residence Permits to Registered Professional Physicist.

An application for a Critical Skills Work Visa has to be accompanied by proof that the applicant falls within the critical skills category and the following:

1. A confirmation, in writing, from the professional body, council or board recognised by the South African Qualifications Association (SAQA), in terms of Section 13(1)(i) of the National Qualifications Framework Act, or any relevant government department confirming the skills or qualifications of the applicant and appropriate post qualification experience.
2. If required by law, proof of application for a certificate of registration with the professional body, Council or board recognised by SAQA in terms of Section 13(1)(i) of the National Qualifications Framework Act.
3. Proof of evaluation of the foreign qualification by SAQA and translated by a sworn translator into one of the official languages of the Republic.

SAIP is recognised by SAQA and can provide you with the confirmations you require to comply with requirements 1 and 2 above.

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## Register as a Professional Physicist with SAIP

The SAIP is inviting its members to register as Professional Physicists (Pr.Phys) with SAIP.

- The short abbreviation for the designation will be Pr. Phys.
- A member registered with SAIP as a Professional Physicist can use the letters Pr.Phys after their name e.g. George Brown Pr.Phys.

### Who can apply?

Physics is a basic science that is a basis for all science and technology disciplines. This results in its graduates working in every sector imaginable. Therefore, we must cater for a wide range of industries and economic sectors. Hence any physicists who graduated with at least Physics Honours Degree working in either; industry, commerce, government, academia, research, theoretical physics, experimental physics, and uses physics skills and thought processes in their job/career.

**A person first has to qualify to be an SAIP Ordinary member before they can be registered as a professional physicist.**

This designation will represent the highest standard of professionalism, competence and commitment to keep pace with advancing knowledge in the field of physics. It is hoped this designation will give a professional standing and recognition of physics by the South African society.

### Justification

Academic qualifications are only the beginning of a career in physics and its applications. The need for continuing professional development is widely recognised to be the mechanism by which professionals maintain their knowledge after the formal education process has been completed. Pr.Phys demonstrates a commitment to maintaining competence, continuing your professional development and abiding by an acceptable code of conduct.

### Benefits to physicist

- The certification as a Professional Physicists will be an important addition to a physicist's personal credentials.
- When competing for a job the designation will distinguish one from other applicants with similar qualifications but no professional designation.

### Benefits for employers

- Supports the recruitment process many recruiters these days want to know if one has a professional designation
- Can be used as criteria for promotion, skills and salary benchmarking
- Demonstrates to someone who possesses this designation believes in professionalism, continuous skills development, belonging to a professional body and acceptable ethical standards

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## Register as Professional Industrial and Physical Science Technologists (Pr.PhysTECH)

Pr.PhysTECH Designation: The SAIP would like to inform the physics community that a second professional designation, the Professional Industrial and Physical Science Technologists (Pr.PhysTECH) has now been registered with SAQA under professional designation ID: 899.

Pr.PhysTECH registered members also qualify to request a critical skills VISA support letter from SAIP.

Pr.PhysTECH will cater for applied physicists, industrial physicists, technicians and technologists and graduates with physics-based qualifications working in academia, research and industry; who apply physics-based scientific-methods, techniques, concepts and principles in research, testing, measurement, monitoring, design, and installation of equipment, products, and processes.

For more info visit: <http://saip.org.za/.../442-professional-industry-and-physical...>

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## JOIN SAIP MEMBERSHIP

Physics is a basic science that is a basis for all science and technology disciplines. This results in physics graduates working in every sector imaginable. Therefore, SAIP caters for a wide range of industries and economic sectors.

SAIP membership includes any physicists who graduated with at least physics related degree working in either; industry, commerce, government, academia, research, theoretical physics, experimental physics, and uses physics skills and thought processes in their job/career.

### Why Professional Membership is Important

Academic qualifications are only the beginning of a career in physics and its applications. The need for continuing professional development is widely recognised to be the mechanism by which professionals maintain their knowledge after the formal education process has been completed. By becoming a member of a professional society, one demonstrates their commitment to maintaining competence in their field through continuing your professional development from activities such as conferences, schools and workshops and abiding by an acceptable code of conduct. Membership of a professional society is an important addition to a physicist's personal credentials for example when competing for a job membership of professional society will distinguish one from other applicants with similar qualifications but no professional affiliation.

1. **Stay informed** - News flashes and alerts to are sent directly to your email. A quarterly magazine, Physics Comment, will keep you briefed on physics news, government policy and jobs in industry and academia.
2. **Specialist Groups and Networking** - Through the various activities of SAIP, networks have been established with the African and International Physics communities, to benefit all our members. You'll make important new contacts and forge lifelong professional relationships by getting involved in a specialist group.
3. **Save Money** - You'll receive discounted rates for SIAP conferences, and have the benefit of paying affiliate membership fees for IOP membership.
4. **Employment opportunity information** -Job advertisements will be displayed on our new website and mailed to members from time to time.
5. **Access to current information on sources of funding grants and scholarships** -Exclusive service provided to our members via a direct email system.
6. **Scientific meetings** - The annual conferences and workshops provide learning opportunities for different specialisation areas and varying degrees of experience.
7. **Especially for the global physics community** - You'll have the opportunity to partake in events organised by the SAIP for the Physics community in South Africa as well as Africa: developmental workshops, schools, and conferences.
8. **Additional resources** - Your membership privileges also include information and guidance when applying for and acquiring visas to study, participate in the scientific meeting and research opportunities in South Africa and abroad. There is also an exclusive member-only area on our website.
9. **Career guidance and resources**- Career assistance is provided to all members to find their career path in industry or academia.
10. **Opportunities to win awards for excellence** - SAIP recognises contributions to physics in SA by awarding two different medals and various student prizes at the annual conference.
11. **Teaching and Learning Resources for schools** - As part of our growing outreach programme we provide teachers and learners with the tools and opportunities to allow and motivate more learners to follow careers with physics as a background

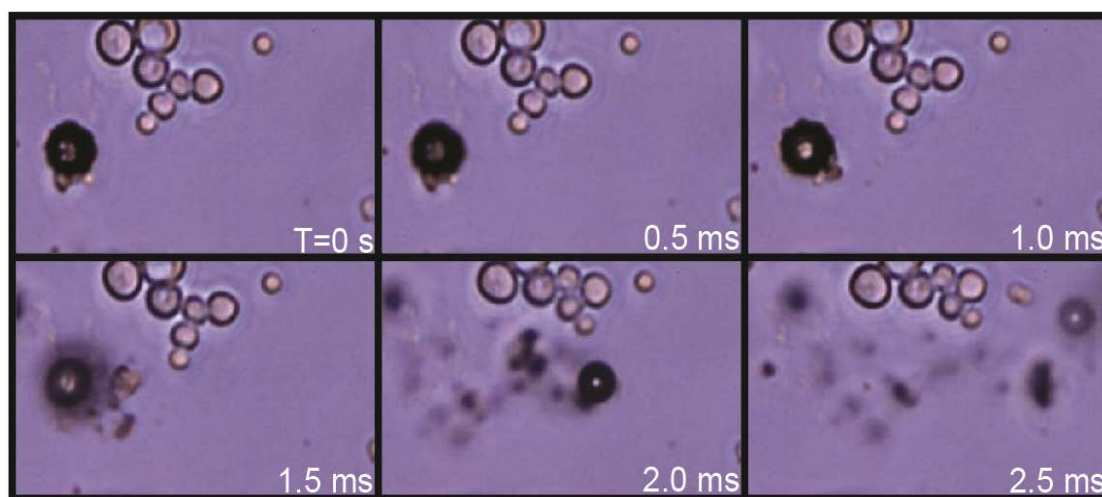
JOIN SAIP TODAY CLICK THE LINK BELOW FOR MORE INFORMATION ON HOW TO APPLY:

<http://www.saip.org.za/index.php/members/membership-info>

### *From cosmos to clinic: using Star Wars seismics for diagnosis and therapy*

Report by Professor Michiel Postema, University of the Witwatersrand

Ultrasonic imaging is becoming the most popular medical imaging modality, owing to the low price per examination and its safety. However, blood is a poor scatterer of ultrasound waves at clinical diagnostic transmit frequencies. For perfusion imaging, markers have been designed to enhance the contrast in B-mode imaging. These so-called ultrasound contrast agents consist of microscopically small gas bubbles encapsulated in biodegradable shells. In his inaugural lecture presentation at the University of the Witwatersrand, Johannesburg, Professor Michiel Postema explained the physical principles of ultrasound contrast agent microbubble behaviour and their adjustment for drug delivery including sonoporation are described. It is a challenging task to quantify and predict which bubble phenomenon occurs under which acoustic condition, and how these phenomena may be utilised in ultrasound-assisted therapy. Aided by high-speed photography and other futuristic toys, our improved understanding of encapsulated microbubble behaviour leads to more sophisticated detection and delivery techniques. As a consequence, pancreatic cancer is now being treated with a combination of microbubbles and sound. At the University of the Witwatersrand, several projects have been started on the manipulation of blood. Furthermore, so-called antibubbles have been tested for imaging and delivery. Curiously, several of the sonic drug delivery techniques presented are remarkably similar to some of the weapons in the Star Wars saga.



*Antibubble consist of a liquid droplet inside a gas bubbles. Here, a 20- $\mu\text{m}$  antibubble is forced to release its contents during sonication, whilst “regular” microbubbles remain intact.*



Michiel Postema received an MSc degree in geophysics from Utrecht University, The Netherlands, in 1996, a Doctorate (PhD) in the physics of fluids from the University of Twente, Enschede, The Netherlands, in 2004, and a Higher Doctorate (DSc) in life sciences from the University of Tours, France, in 2017. Following a postdoc position in Bochum, Germany, and a lecturing position in Hull, England, he was granted a personal Emmy Noether grant by the German Research Council in 2009 and a collaborative grant from the French Research Council in 2010. In 2010, he obtained the Chair in Experimental Acoustics over lecturing of the acoustics courses and concentrated on research treat inoperable pancreatic cancer. Following his sabbatical at Wits,

he was appointed Visiting Professor at the Department of Electrical and Information Engineering in 2015. In parallel, he held interim positions as Professor and Head of the Department of Ultrasound at the Institute of Fundamental Technological Research of the Polish Academy of Sciences in 2016, and Le Studium Fellow at Université François-Rabelais de Tours, France, in 2017. Since February of this year, he has been full-time Distinguished Professor of Biomedical Engineering at Wits. Michiel's particular expertise lies in analysing medical microbubble behaviour under sonication and in high-speed photography. He also explores non-medical applications of bubbles and droplets in sound fields. At Wits, he focusses on the ultrasonic detection and treatment of malaria, and the investigation of antibubbles, droplets, and micromaterials for targeted drug delivery.

### *SAAO Prize PhD Scholarship Call for Applications*

The South African Astronomical Observatory (SAAO) invites applications for the SAAO Prize PhD Scholarship from academically excellent students who wish to pursue PhD studies in optical or multi-wavelength astrophysics. Applicants must be South African citizens who have or are studying towards, an MSc degree in physics, astrophysics, or a closely related area.

The scholarship will be based at SAAO, successful applicant will be expected to register at a South African university by end of February 2019. To apply, send a motivation letter, CV, and academic transcripts to [scholarship@sao.ac.za](mailto:scholarship@sao.ac.za), and arrange for two reference letters to be sent to the same address.

Closing date is 3 August 2018.

For more info please visit: <https://www.sao.ac.za/scholarships>.

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## Modelling acid deposition over South Africa using high-performance computing

High-performance computing is making it possible for research teams to model atmospheric deposition of acid over South Africa.

The study by the Water Research Commission (WRC) is conducted over the Highveld region of the country due to its high density of acid emissions arising mostly from power generation and petrochemical plants. It is the first attempt at such large-scale deposition research in South Africa.

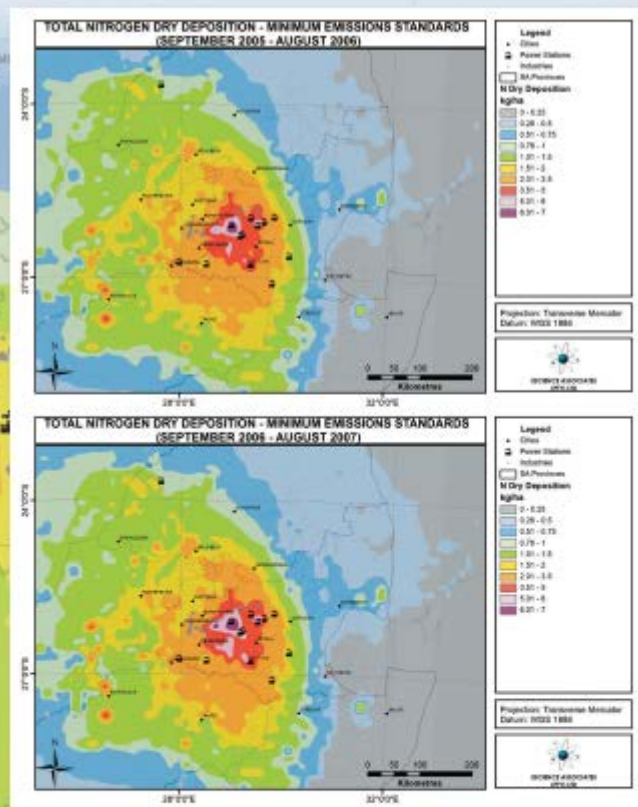
The WRC, through its appointed company, eScience Associates, is using the Centre for High Performance Computing (CHPC) for the long-term modelling and verification of wet and dry acid deposition and is investigating the impact of power generation stack emission limits on the acid deposition.

The study models acid deposition caused by sources of acidic precursors like sulphur dioxide, nitrogen dioxide and ammonia to enable estimation of the impact of atmospheric deposition on the agricultural soils of the interior, as well as potential salinity impacts to runoff from various catchment areas.

The computational power of the CHPC has made it possible to model over 20 years of historical acid deposition over the study region. With help from researchers at the CHPC, an existing model has been adapted to enable wet and dry deposition output simultaneously. Without high-performance computing, it would have taken 20 weeks to run all the modelling, compared to the two weeks it took on the Lengau supercomputer of the CHPC.

The project is significant as it looks at the economic and environmental impact of the deposition of anthropogenic salt emissions on water users in the strategic heartland of South Africa. It is also looking at the expensive decision arising from the location and technology of new power stations and industrial plants (such as the possible need to retrofit flu gas desulphurisation).

The project is significant as it looks at the economic and environmental impact of the deposition of anthropogenic salt emissions on water users in the strategic heartland of South Africa.



For more information, please contact

Dr Charles Crosby – Senior Research Scientist  
Tel: 021 658 3976 • Email: ccrosby@csir.co.za

[www.chpc.ac.za](http://www.chpc.ac.za)

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## *Upcoming Conferences & Workshops*

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### *CCP2018 XXX IUPAP Conference on Computational Physics*

REGISTRATION AND ABSTRACT SUBMISSION NOW OPEN for the CCP2018 IUPAP Conference taking place on July 29 – August 2, 2018, at the University of California, Davis.

This annual meeting, sponsored by the International Union of Pure and Applied Physics, alternates international venues. CCP2017 was in Paris, France, in July 2017.

The CCP2018 Conference brings together members of the international community of computational physics researchers to present their latest results, exchange information, and develop collaborations. CCP2018 welcomes contributions in broad-based areas under the umbrella of computational physics in both basic and applied subjects.

The CCP2018 website is: <https://lnkd.in/eB2AzjU>

Questions regarding CCP2018 can be sent to: [ccp2018@ucdavis.edu](mailto:ccp2018@ucdavis.edu)

For more info follow this link: <http://saip.org.za/.../opportunit.../444-ccp2018-conference-call>

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### *The 23rd International Workshop on Quantum Systems in Chemistry, Physics, and Biology (QSCP-XXIII) 23-29 Sep '18*

You are being invited to "The 23rd International Workshop on Quantum Systems in Chemistry, Physics, and Biology" (QSCP-XXIII), that will be held in the Kruger Park area, South Africa, on September 23-29, 2018. QSCP is a prominent conference series that covers a wide range of topics, bringing together researchers from around the world with cutting-edge contributions to the description of a broad range of quantum systems and phenomena.

For further details, please visit our web page, <https://sites.google.com/view/qscp-2018> (under construction). If you have any question, do not hesitate to contact the local organizers at [qscpxiii@gmail.com](mailto:qscpxiii@gmail.com) with a copy to [qscp.etal@gmail.com](mailto:qscp.etal@gmail.com).

Sincerely,

Professor Liliana Mammino

Chair of the Organizing Committee

University of Venda, South Africa

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### *20th SAASTEC CONFERENCE – 26 to 29th Nov 2018*

The 18th SAASTEC Conference will be held at the Vuwani Science Resource Centre, (University of Venda) Thohoyandou, Limpopo Province from the 26 – 29th November 2018. In celebration of 2018 being Nelson

Mandela's Centenary Year, the theme for the conference is: "Making Madiba Proud....".

For more info please visit: <https://saastec.co.za/conference/>.

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# **International Conference on Physics Education (ICPE) 2018**

## **1 – 5 October 2018**



The ICPE2018 will be co-hosted by the South African Institute of Physics (SAIP) and the School of Physics, University of the Witwatersrand (WITS) jointly with The International Commission on Physics Education (C14) of the International Union of Pure and Applied Physics (IUPAP). The conference will be held at the Misty Hills Hotel and Conference Centre, Muldersdrift, Johannesburg, South Africa located close to the Cradle of Humankind, a World Heritage Site and from the famous Pilanesberg National Park.

The main theme of the conference is: "Physics Education for Development: a focus on context". A number of subthemes will be finalised in due course. The scientific program will comprise of a diverse range of international high-level presentations consisting of plenary talks, parallel oral and poster sessions, teacher workshops/symposia and sessions for Women in Physics.

### **IMPORTANT INFORMATION: DATES, ABSTRACT SUBMISSION AND REGISTRATION DETAILS**

Late Abstract Submission Closing Date: 17 August 2018

On-line Registration: Open

For more information visit: <http://events.saip.org.za/conferenceDisplay.py?confId=93>.

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## **Conference on Surfaces, Coatings and Nanostructured Materials (NANOSMAT-Africa)**

### **19-23 November 2018**

The first ever African Chapter of the established "International Conference on Surfaces, Coatings and Nanostructured Materials" (NANOSMAT-Africa) to be held in Cape Town, South Africa during 19-23 November 2018.

NANOSMAT is an established name in Nanoscience and Nanotechnology conferences. NANOSMAT conferences provide a unique platform for discussing key aspects of materials-related Nanoscience and Nanotechnology. The first ever NANOSMAT conference was held in 2005 at the University of Aveiro in Portugal. Since its inception in 2005, NANOSMAT has rapidly established itself to become a leading conference in the field of nanomaterials related nanoscience and nanotechnology. The NANOSMAT conference series foster the gathering of talented and truly international people to exchange ideas, share new knowledge and technical know-how in the broad NANO fields.

Key NANOSMAT highlights include: NANOSMAT Prize, NANOSMAT Lecture, Outstanding Young Scientist Award, Young Scientist Lecture Competition, Poster Competition, Technical Workshops, Exhibition, Special Sessions, Poster Sessions, Expert discussion forums, short courses, workshops and tutorials.

A number of Nobel Laureates have given plenary and keynote lectures at NANOSMAT conferences, including Professor H. W. Kroto (USA), Professor Jean Marie-Lehn (France), Professor Peter Grunberg (Germany), Professor Albert Fert (France) and Professor Andrei Geim (UK).

NANOSMAT has produced a number high quality special issues of international peer-review journals such as Applied Surface Science (Elsevier), Thin Solid Films (Elsevier), International Journal of Hydrogen Energy (Elsevier), Nanomedicine (Elsevier), International Journal of Energy Research (Wiley), Journal of

Nanoscience and Nanotechnology (American Scientific Publishers), Catalysis Today (Elsevier), Journal of Materials Science (Springer), Microelectronic Engineering (Elsevier), Surface & Coatings Technology (Elsevier) etc. The guest editors of the above mentioned special issues have been members of the core NANOSMAT steering committee.

For more information visit:

<http://saip.org.za/index.php/news-and-events/other-events/437-nanosmat-africa-2018>.

## Deadline for submissions for the September 2018 issue of Physics Comment is 15 September 2018

### Physics Comment Editorial Policy

Physics Comment is an electronic magazine for the Physics community of South Africa, providing objective coverage of the activities of people and associations active in the physics arena. It also covers physics-related ideas, issues, developments and controversies, serving as a forum for discussion. It is not a peer review journal.

Physics Comment publishes innovative reports, features, news, reviews, and other material, which explore and promote the many facets of physics. Physics Comment endeavours to:

- support and inform the physics community
- promote membership of the South African Institute of Physics
- promote the understanding of physics to interested parties and the general public
- represent the readers' point of view
- focus on issues and topics of importance and of interest to the physics community

We accept submissions on any physics-related subject, which endeavours to inform readers and to encourage writers in their own researches. We aim to be politically, socially and geographically inclusive in the articles, which we commission and receive. Therefore we shall not discriminate according to political or religious views. Physics Comment does not support or endorse any individual politician or political party. However, contributions, which are being published, may contain personal opinions of the authors.

It is our desire to present unfettered the opinions and research of our readers and contributors. All articles submitted for publication are subject to editorial revision. Such revisions, if necessary, will be made in cooperation with the author.

The views expressed in published articles are those of the authors and are not attributed to the Editorial

The Editor will make the final determination of the suitability of the articles for publication.

#### Declaration by Author

When an author submits material for publication, this means:

1. The author(s) assures the material is original, his/her own work and is not under any legal restriction for publication online (e.g., previous copyright ownership).
2. The author allows PC to edit the work for clarity, presentation, including making appropriate hypermedia links within the work.
3. The author gives PC permission to publish the work and make it accessible in the Magazine's archives indefinitely after publication. The author may retain all other rights by requesting a copyright statement be placed on the work.

Authors should respect intellectual integrity by accrediting the author of any published work, which is being quoted.

#### Publication Deadlines

Physics Comment is published four times a year.

Issue	Closing Date	Publication Date
Issue 1	28 February	15 March
Issue 2	31 May	15 June
Issue 3	31 August	15 September
Issue 4	30 November	15 December

#### Specification and Submission of Content

**Editorial Tone.** As the voice of the physics community, the magazine will create a provocative, stimulating, and thoughtful dialogue with the readers; and provide a variety of perspectives that reflects the dynamism of the physics community.

**Article types.** The magazine is devoted to articles, reports, interesting facts, announcements and recent developments in several areas related to physics:

**Manuscripts.** Solicited manuscripts will be judged first for reader interest, accuracy and writing quality. The editor reserves the right to request a rewrite, reject, and/or edit for length, organization, sense, grammar, and punctuation.

**Re-use.** The publisher reserves the right to reuse the printed piece in full or in part in other publications.

**Submission and Format.** Manuscripts must be submitted to the editor on or before the designated due date. Manuscripts must be submitted electronically, on the prescribed Microsoft Word template available for download from <http://www.saip.org.za/PhysicsComment/>. Manuscripts are to be

submitted directly to the editor: [PhysicsComment@saip.org.za](mailto:PhysicsComment@saip.org.za).

**Style.** AP style is followed for punctuation, capitalization, italics and quotations.

**Photography and Illustration.** All solicited photography and illustration should be part of an article and will be judged first for technical quality and editorial appropriateness. The editor and art director reserve the right to request revision or reject any material that does not meet their criteria. The publisher reserves full rights to all solicited photography and illustration, including the right to reprint or reuse graphic material in other publications.

## Categories of Content Contributions

**Technical articles and reports:** These are generic articles of about 1 500 words plus diagrams and pictures. A technical article covers a relevant feature topic. Articles are authored by the writer and publishing a 40-word resume of the author could enhance its credibility. By submitting an article that has been previously published the author confirms that he/she has the right to do so and that all the necessary permissions have been received. The acknowledgement must be made within the article.

**News:** These are short editorial items usually not more than 250 words. Full-colour pictures must be clearly referenced on the editorial submission and on the picture or picture file.

**Advertorials:** Advertorials could be published when supplied by the client. We recommend a maximum of 500 words plus one or two pictures for maximum impact. A PDF file of the laid out advertorial should be emailed to the client along with an MS Word file of the text and separate image files of the pictures. It is the client's responsibility to ensure that the advertorial is correct as it is, in fact, a paid for advert page.

**Letters to the Editor:** Letters to the Editor are encouraged. The Editor reserves the right to edit for length and format. The Editor will not change the political position of the initial letter. Physics Comment does not publish anonymous letters.

**Advertising Policy:** The Editorial Board will determine advertising prices for Physics Comment, subject to approval by SAIP Council. The objective will be to obtain revenue to maintain and develop the magazine. Physics Comment offers classified advertising to subscribers of the magazine for free. The advertisements must be a maximum of 60 words including the telephone number, and there is a limit of three free classifieds per subscriber, per issue. Advertisements may include a photo, which may be reduced in size or resolution by the editor to optimize loading time. All items or opportunities, which are being advertised for free, should be physics-related. The Editor reserves the right to refuse any advertising, which does not conform to the objectives of the magazine.

## Submission of Articles

All articles must be submitted on the prescribed template available for download from <http://www.saip.org.za/PhysicsComment/>

