July 2020

President's Report

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1 Introduction and Overview

This report gives the highlights of the South African Institute of Physics (SAIP) activities for the period July 2019 – July 2020.

The SAIP is a non-profit, voluntary and professional body for physics that was established in 1995. It has a membership of over 4200 that is made up of professionals, researchers, academics, teachers, university students and learners.

SAIP Mission: To be the voice of physics in South Africa**.**

The SAIP Main Objectives

- To promote the study and research in physics and related subjects and to encourage the applications thereof.
- To further the exchange of knowledge among physicists through conferences and publications.
- To uphold the status of and ensure a high standard of professional conduct among physicists.
- To promote physics for socio-economic development in South Africa.
- To provide the government with policy advice and act as a sounding board in Science and Technology.
- To make a difference by offering a wide range of services and projects addressing various community and
- Developmental needs in the physics community and related stakeholders.

The SAIP's current main strategic focus is to improve the physics education pipeline through various initiatives with the following goals;

1) Addressing the challenges of human capital in the National System of Innovation (NSI) both qualitatively (rates of knowledge production) and quantitatively (number of PhDs produced).

2) Building the Science Engineering and Technology (SET) human capital pipeline by including disadvantaged communities in physics and making resources available to both learners and educators hence universities and colleges will have a greater pool of students from which SET student can be drawn.

3) Contribute to societal transformation by expanding the numbers of scientists from previously disadvantaged communities.

4) Contribute to societal transformation by expanding the numbers of women and girls in science and technology.

5) Better quality teaching will lead to better quality students hence increased PhD throughput.

On behalf of the South African Institute of Physics (SAIP), I would like to express our profound gratitude to the Department of Science and Innovation (DSI) for continued support rendered to the physics community in the country. The DSI supports physics through various channels too numerous to mention. However, we would like to especially thank the DSI for the continued support of the SAIP Office to cover our operational expenses which cannot be covered through restricted projects funding. The DSI support has helped the SAIP to leverage additional projects focused restricted financial support for physics developmental programmes, for example.

1) The Allan Gray Foundation will be supporting the SAIP with R1 million per year for the next three years (2020/21 – 2022/23) to fund the Physics Teacher Development Project and Increase the Involvement of Women in Physics in South Africa, and
2) During the 2018/19 financial year various other donors contributed a combined R3.5 million towards various projects and activities of the SAIP.

1.1 SAIP activities during COVID pandemic

The activities of the SAIP and the physics community have been severely affected by the COVID-19 pandemic. As we continue to monitor the ongoing developments related to COVID-19, our priority is to approach the situation with extreme caution to ensure the health and safety of our employees, members and stakeholders.

In view of these developments, the SAIP had to suspend a number of its activities which include the SAIP2020 Annual Conference, outreach activities, teacher development activities among others. There are several implications of COVID on the physics enterprise some of these include,

1) Operational impact
   - Most of our activities require face-to-face interactions, for example, conferences, physics outreach activities, promoting women in physics and physics teacher development. These have been severely affected by COVID hence we had to cancel activities since March 2020 to date. What will be the impact on conferences going forward? Will people feel free and safe participating in conferences, we may see a drop in attendance.
   - The community we serve do not all have access to the internet and laptops such that it is difficult to start running these activities online.
   - Careers for those who cannot work from home for example technicians may be affected.
   - Will there be jobs for early career physicists?
   - Physics start-ups and Small Medium Enterprises (SMEs) may be closed because of the economic impacts of the pandemic.

2) The second aspect is funding. Our projects funding and donor funding is also related to the above activities and some of our donors are having to cut funds because they are uncertain of the impact COVID will have on their finances, hence it also has financial implications on our operations.
   - Govt cutting it budgets and Universities also reporting budget constraints.
   - Postgraduate research funding maybe be affected.

3) Are we going to produce well-grounded physicists in the period of COVID19? Physicists must be exposed to laboratories and practical work, but with the current pandemic it is not possible to run labs, only final year students have been are allowed to access universities. Hence both training of teachers who require laboratories, undergraduate students and postgraduate MSc and PhD students are affected. For example, postgraduate student research work will need to be extended.

4) What about the quality of incoming first years who may have not finished the syllabus and training? Is it not going to affect our physics education pipeline?

However, on a positive note, there is an opportunity to highlight the role of physics and science in solving socio-economic problems. The African governments now can see more reason why they must fund more science and technology e.g. role of biophysics and structural biology, role of synchrotrons, in solving the COVID problem.

Investigations are currently underway to see if we can have some level of activities such as outreach, conferences online. Discussions are also at an advanced stage with the Department of Basic Education officials on the possibility of offering teacher development workshops online. We have geared our office to support our activities and membership through the technology such as video conferencing (Skype or Zoom) to meet remotely to maintain "social distancing".

The SAIP leadership is working on a post COVID19 strategy review which we will share with the community once it is finalised. We will keep you informed of these and other developments.

The International Union of Pure and Applied Physics has issued a statement on COVID which can be found here

https://iupap.org/about-us/iupap-statement-on-covid-19-relating-to-meetings-and-carbon-footprint/

The spread of Covid-19 can be controlled by each and every one of us by acting responsibly and following the guidelines as provided by the World Health Organisation.

2 SAIP Governance and Leadership

The SAIP is governed by an elected council and elected division chairs. The SAIP office secretariat runs the day to day activities of the institute.

2.1 SAIP Council 2019 – 2021

A new council was elected in July 2019 as follows:

Name	Council Position / Portfolio
1. Prof Deena Naidoo (Wits)	President
2. Prof Makaiko Chithambo (Rhodes)	President-Elect
3. Prof. Patrick Woudt (UCT)	Past-President
4. Prof Ernest Van Dyk (NMU)	Treasurer
5. Prof Regina Maphanga (CSIR)	Secretary
6. Dr Rudzani Nemutudi (iThemba Labs)	Fundraising
7. Dr John Bosco Habarulema (SANSA)	Conferences
8. Prof Iyabo Tinuola Usman (Wits)	Industrial Liaison
9. Dr Rudolf Erasmus (Wits)	Awards and Standards & Physics Comment
10. Dr Zama Katamzi-Joseph (SANSA)	Marketing and Outreach
11. Dr Richard Harris (UFS)	Physics Education & Physics Comment
12. Dr Eric Maluta (University of Venda)	Physics Education
13. Mr Brian Masara (SAIP)	Executive Officer

2.2 Task teams of the SAIP Council

The SAIP council currently has four active task teams:

1) A task team on collaborative publishing (established in 2014, and chaired by Prof Igle Gledhill),
2) A task team on the future of NITheP (established in 2017, and chaired by Prof Patrick Woudt),
3) A task team on matters around SAIP conference proceedings (established in 2018, and chaired by Prof Makaiko Chithambo), and
4) A task team on Physics Education (established in 2018 and chaired by Prof Martin Ntwaeaborwa).

2.3 SAIP Division Chairs

The SAIP currently has seven divisions, one forum, and one working group. Following the election of division and forum representatives in 2018, the following people have been elected as chairs of the respective divisions and forums of the SAIP for the period 2018-2020:

Division / Forum	Chairperson / Co-chairs	Institution
1. Nuclear, Particle and Radiation Physics Division	Prof Bruce Mellado Dr Rudolph Nchodu	Wits iThemba Labs
2. Division for Physics of Condensed Matter and Materials	Dr Rudolph Erasmus	Wits
3. Division for Physics Education	Dr Sam Ramaila	University of Johannesburg
4. Applied Physics Forum	Prof Phil Ferrer	Wits University
5. Division for Astrophysics and Space Science	Dr Zama Katamzi Dr Brian Van Soelen	South African National Space Agency University of the Free State
6. Division for Theoretical and Computational Physics	Prof Alan Cornell	University of Johannesburg
7. Photonics Division	Dr Herman Uys	Stellenbosch University
8. Forum for Women in Physics	Dr Sylvia Ledwaba	University of Limpopo
9. Biophysics Working Group	Prof Tjaart Kruger	University of Pretoria

2.4 SAIP Office

The SAIP office is located in Pretoria at the CSIR campus. It is headed by the Executive Officer, Mr Brian Masara.

Other Officers are**:**

1. Ms Queen Thabethe - Secretary and Administration Assistant
2. Ms Ndanganeni Mahani - Projects Officer
3. Mr Tebogo Mokhine - IT Support Officer

3 International Representation

The SAIP represents South Africa as the national adhering body to the International Union of Pure and Applied Physics (IUPAP) as well as the International Union of Pure and Applied Biophysics (IUPAB).

The South African national committee of the IUPAP has submitted a request to the NRF and ICSU South Africa to increase the number of shares from three to five in recognition of the consistent excellent representation of South African experts on commissions of interest to South Africa.

3.1 IUPAP representation

The following South African physicists were elected on IUPAP commissions and executive council, respectively, for the period 2017-2020:

3.2 IUPAP executive council

1)	Dr Rudzani Nemutudi	Associate Secretary-General
2)	Prof Nithaya Chetty	Vice President at Large (New Members)

3.3 IUPAP commissions

1)	Prof Adri Burger	Commission 4 - Astroparticle Physics (Vice-chair)
2)	Prof Trevor Sewell	Commission 6 - Biological Physics (member)
3)	Prof Azwinndini Muronga	Commission 11 - Particles and Fields (member)
4)	Prof Mmantsae Diale	Commission 13 - Physics for Development (member)
5)	Prof Deena Naidoo	Commission 14 - Physics Education (Vice-chair)
6)	Prof Markus Bottcher	Commission 19 - Astrophysics (member)
7)	Prof Regina Maphanga	Commission 20 - Computational Physics (member)

3.4 IUPAP working groups

1)	Prof Igle Gledhill	Working Group 5 - Women in Physics (associate member, past chair)
2)	Dr Simon Mullins	Working Group 14 - Accelerator Science (member)

3.5 IUPAB representation

South Africa has good representation on the International Union of Pure and Applied Biophysics (IUPAB). SAIP is a tier 3 member of IUPAB, and Prof Trevor Sewell was elected in 2017 on to the council of IUPAB at the 2017 IUPAB meeting in Edinburgh. In 2018, the SAIP submitted a request to the NRF to incorporate the payment of the annual membership fee of IUPAB through the formal structures of ISCU South Africa. We are awaiting the outcome of this request.

3.6 Membership

The SAIP is a voluntary learned society for Physics in South Africa. The SAIP registered as a **voluntary professional body** with South African Qualifications Authority (SAQA) in 2015. The SAQA criteria for the recognition of professional bodies were subsequently changed over the years to include a condition that no voluntary professional body will be allowed to operate in an area where a **statutory professional body** exists. Due to the new requirement, and the existence of the South African Council for Natural and Scientific Professions (SACNASP), SAQA will no longer be renewing the SAIP voluntary professional body recognition which was due for renewal in 2020.

Discussions and consultations are currently underway to resolve the above matter. The SAIP is of the view that a person is free to have several designations, for example, some of the professional members of SAIP already belong to several statutory bodies such as SACNASP, Health Professions Council (HPSA), South African Council of Educators (SACE) etc., they join the SAIP for the physics, and physicists work in diverse areas not just natural science. SAIP is of the view that physicists should have freedom of association as enshrined in the constitution to belong to any professional body they have any number professional designation they want just like in other countries like UK and Canada where there also have specific professional designations for physicists.

Discussions and consultations are currently underway to resolve the above matter. The SAIP would, therefore, like to inform our members that while the professional body discussions are ongoing with the concerned parties, the SAIP will do the following;

a) suspend processing any new professional membership (Pr.Phys and PrPhysTECH)
b) suspend processing any Critical Skills VISA support letters,
c) a letter with more details will be sent to professional members, and
d) while the SAIP engages relevant stakeholders in the above matter, all other activities of the SAIP will run as usual fulling our mission “To be the Voice of Physics in South Africa”.

3.6.1 Membership statistics

The table below shows the growth of SAIP membership over the years.

Category	Jun-2020	Jun-2019	Jun-2018	Dec-2017	Dec-2016	Dec-2015
Associate	71	71	69	58	37	17
Emeritus	5	6	6	6	6	6
Institutional	3	3	3	3	3	3
Fellow	17	18	18	17	17	17

Category	Jun-2020	Jun-2019	Jun-2018	Dec-2017	Dec-2016	Dec-2015
Honorary & Emeritus	37	37	38	38	37	36
Ordinary	261	264	254	250	250	237
Pr. Phys	313	284	240	225	181	142
Pr. Phys TECH	53	37	4	-	-	-
Retired	9	9	8	7	7	7
Students	271	272	252	242	230	189
Subscribers	1	1	1	1	2	2
E-members (non- paying)	3501	3257	2970	2530	2200	53
Total	**4542**	**4259**	**3863**	**3377**	**2970**	**709**

4 Africa-UK Physics Partnership Programme

The SAIP has been working with UK partners in a proposed **Africa-UK Physics Partnership Programme.** The Institute of Physics (IOP), the Association of Commonwealth Universities (ACU) and a network of partners are proposing an ambitious Africa-UK physics partnership programme to address the Global Challenges using the capabilities that physics can provide. This work stems from initial conversations between the UK Government's Department for Business, Energy and the Industrial Strategy (BEIS) and the IOP. The project will include the following partner-countries: Ethiopia, Ghana, Kenya, Malawi, Nigeria, Rwanda, South Africa, Tanzania, and Uganda. We hope this project will help in unlocking the potential of the African physics community through sustainable capacity building in problem-based physics training, and innovation-focused research, to empower physics in Africa to make fundamental discoveries, and significantly address global challenges. A feasibility study was completed, and we will keep you updated on the progress.

Thank you all those institutions that participated in the project online survey https://af-uk-physics.limequery.com/757244 for this project.

We will circulate the project feasibility report and theory of change once these are finalised.

5 Teacher Development Project

Physics Teacher Development is one of the flagship activities of the SAIP, and this project recently received a boost in funding through a 3-year grant of R1million per year from Allan Gray that will run from 2020 – 2023.

Following the SAIP 2019 Annual Conference at Polokwane, a teacher development workshop was held in the Limpopo province from 15-18 July 2019 this was in partnership with the Department of Science and Technology (DST) through NRF- SAASTA.

5.1 Mastec Teacher Training Workshop (15-18 July 2019)

A 4-day SAIP-SAASTA Teacher Training Workshop was held at Mastec, Seshego in Polokwane. SAASTA funded the workshop in partnership with Limpopo Provincial Department of Education as part of the Pre-National Science Week Science Engagement Programme. The South African Institute of Physics (SAIP) current strategic focus is on improving the physics education pipeline. In line with this strategy, the SAIP is implementing projects such as Physics Teacher Development to enhance the skills of physics teachers in content. By leveraging the SAIP Annual Conference as a vehicle for promoting science engagement and leaving a legacy within the host geographic area.

The educators came from Capricorn North and South districts. Each district group attended a two-day workshop. The following SAIP members served as facilitators.

Name	Institution	Subject	Topic
1. Prof Thuto Mosuang	University of Limpopo	Physics	Electrodynamics
2. Mr Molamo Ally Letsoalo	University of Limpopo	Physics	Optical Phenomena
3. Mr Netsianda Makondelele	University of Limpopo	Physics	Work, Energy and Power
4. Dr Vusi Ludwig Mulaudzi	University of Limpopo	Chemistry	Electro-chemical cells & Reaction Rate
5. Ms Mmaphefo Patricia Mothapo	University of Limpopo	Chemistry	Acids & Bases
6. Dr Eric Maluta	University of Venda	Physics	Electricity
7. Dr Joseph Kirui	University of Venda	Physics	Electrodynamics
8. Mr Solomon Ravhengani	University of Venda	Physics	Electrodynamics
9. Mr Ephraim Ramurafhi	University Venda	Chemistry	Electro-chemical cells & Reaction Rate
10. Dr Lordwell Jhamba	University of Venda	Physics	Optical Phenomena
11. Mrs Sophie Mulaudzi	University of Venda	Physics	Work, Energy Power
12. Mr Patric Monama	University of Johannesburg	Chemistry	Acids and Bases, Electro-chemical cells & Reaction Rate
13. Prof David Wolfe	IOP UK/ International Collaborator	Physics & Chemistry	Electricity and Magnetism
14. Ms Ndanganeni Mahani	SAIP	Coordinator	

Conclusion

The workshop was successful with the hands-on training and assistance from all stakeholders and the district officials from both Capricorn North and South. They rotated during classes and assisted in administering registers and questionnaire. Some of the educators asked possible partnership with the Limpopo based facilitators (University of Limpopo - UL & University of Venda), they also arranged for a visit to Vuwani Science Centre & UL so that their learners can do be exposed to practical demonstrations. The zeal and passion from educators during classes were evident, with some even challenging the facilitators.

The SAIP would like to thank SAASTA for their generous financial support for the workshop. The workshop was a massive success. The district officials went beyond their line of duty to make sure all was well. The facilitators gave their best, starting with the preparation, which ended late at night each day. Some left their offices for more than two weeks as they attended the SAIP2019 Annual Conference as well as our international collaborator, Prof David Wolfe (London UK) to be at the training workshops. Special gratitude to Mr Mukwevho, who arranged all logistics for the educators since the planning meeting.

Statistics and Impact

A total of 178 physical science educators were trained,

- Capricorn North attendance was 102
- Capricorn South was 76

Sunday Facilitators' Planning Meeting at the hotel.

Official Opening for Group1, from right to left; Mr Mukwevho introducing Dr Tsanwani (Head, Mastec Centre)

Capricorn North Team and facilitators group photo.

Capricorn North Team and facilitators group photo.

6 South African Physics Olympiad

The SAIP has launched the South African Physics Olympiad (SAPhO) to identify young South Africans with abilities in physics, in the hope that these students will continue to study physics at tertiary institutions and universities within South Africa.

The project already has an impact as top-performing students are continuing in physics.

- The 2005 Gold winner – Michael Mahale studied up to MSc at UCT then received a PhD in the US and is now teaching at UCT.
- Another SAPhO winner, Heidi Berg went on to do a Masters in Electro-Mechanical Engineering and now runs a top Electro-Mechanical Consultancy in Cape Town.
- Mr Conrad Strydom the 2016 Gold Award winner from Hermanus High in the Western Cape become South Africa's top achiever in the Matric Class of 2016, and he is currently studying Theoretical Physics at the University of Stellenbosch. He received a full scholarship from SKA.

7 Outreach and Public Understanding of Physics

The SAIP outreach and public understanding of physics has the following aims

- To create a greater pool of maths and science learners from which SET students can be drawn.
- To build the SET Human Capital pool of skills required for the National Development Plan (NDP), Industrial Policy Action Plan (IPAP), Strategic Infrastructure Projects (SIPs), DSI National Innovation Strategy, Basic Sciences Framework and critical projects such as Nanotechnology Initiative and Square Kilometre Array (SKA).
- Contribute to increasing the number of PhDs in SET, according to the NDP South Africa targets to increase the number of PhDs per million of the population from about 40 to 100; and the number of academic staffs with PhDs from 40% to 75%.
- Contribute to societal transformation by expanding the numbers of scientists and engineers from previously disadvantaged communities and also addressing gender and equity concerns, and,
- Ultimately contributing to the transformation of the South African Economy towards a Knowledge-based economy.

7.1 SAIP Hub & Spoke Model

To increase the SAIP footprint, visibility, accessibility and impact, the SAIP is implementing a HUB and SPOKE model. The model has departmental & institutional representatives who work with the SAIP office to implement various physics developmental projects in their regions.

7.2 SAIP National Science Week 2019 – "Physics and Climate Change"

NSW 2019 theme was "Facing the harsh realities of Climate Change". In line with the year's theme, the SAIP ran events under the banner 'Physics and Climate Change'. The SAIP presented some resources on how physics research is helping us understand climate change and how physics is also helping us mitigate the effects of climate change, hence improving our quality of life and saving the planet!

The resources developed can be downloaded below;

1. Pre-recorded Public Talk on 'Climate Change A Physics Perspective' link:
https://drive.google.com/file/d/1S9R6VCmS6iI5-FydLw66WfxRpyweYcrH/view?usp=sharing

2. NSW PowerPoint Presentation on Physics & Climate Change link:
http://saip.org.za/images/NSW2019%20Physics%20of%20Climate%20Change%20Final.pptx

3. Summary of Physics & Climate Change Audio Mini Clip link:
http://saip.org.za/images/Physics%20%26%20Climate%20Change%20Summary.m4a

Activity 1: SAIP Developed a Pre-recorded Public Talk on 'Physics of Climate Change and how physics can help mitigate climate change' also a Recorded PowerPoint Presentation was compiled, designed and distributed.

Activity 2: SAIP coordinated the bookings of multiple radio talks by physicists with the main discussion centred around Physics of Climate Change.

Activity 3: SAIP ran a high school quiz on Physics and Climate Change on 19 August 2019.

7.2.1 Publicity of Physics Radio Slots Schedule

Station Name	Location	Person Interviewed/ Institution	Date	Listenership Stats
Markaz Sahaba Online Radio	Overport, Durban Lenasia Jhb	Dr Eric Maluta University of Venda	03 August 2019 12:45	Online audience of more than Million listenership in the Sab Saharan region including the UK, UAE and the Gulf region.
		Mr Lutendo Phuthu University of Venda	06 August 2019 12:10	
		Mr Tshifhiwa Ranwaha University of Venda	08 August 2019 12:45	
Chanel Islam International	On DSTV Gauteng Ormonde, South Africa	Mr Tshifhiwa Ranwaha University of Venda	05 August 2019 16:10	More than a million listeners worldwide
Voice of Community	Ermelo Mpumalanga	Mr Thembinkosi Dyeyi Walter Sisulu University	7 August 2019 2 pm	250000 covering the seven municipalities under the Gert Sibande District Municipality.
Barberton Community Radio BCR	Mpumalanga	Mr Tshifhiwa Ranwaha University of Venda	8 August 2019 Between 8:30	about 40 000 average listeners

Station Name	Location	Person Interviewed/ Institution	Date	Listenership Stats
Vukani FM	Cala, Queenstown, Eastern Cape	Prof Golden Makaka University of Fort Hare	8 August 2019 17:45	Vukani FM has a listenership of about 125 000
Kumkani FM	East London Eastern Cape	Mr Lutendo Phuthu University of Venda	13 August 2019 16:20	has 85 000 listenership
		Mr Thembinkosi Dyeyi Walter Sisulu University	14 August 2019 16:20	
Radio Helderberg NPC	Western Cape	Mr Ngwarai Shambira University of Fort Hare	16 August 2019 13:30	about 50 000 regular listeners

7.2.2 NSW 2019 Statistics

Category	Number
Learners	574 (2484 learners on the mailing list)
Educators	105
Other (includes researchers, academics & students)	4177 SAIP Mailing list
Facebook Posts (1 Post)	621 People Reach
General Public (Figure is too high because of 7 coordinated Radio Programmes)	± 2 545 000

7.3 SAIP at Scifest

Scifest Africa, South Africa's National Science Festival is a project of the Grahamstown Foundation supported by DST. It is an annual event established in 1996 to promote public awareness, understanding and appreciation of science, technology, engineering, mathematics and innovation. The SAIP participates every year at Scifest.

7.3.1 Scifest 2019

SAIP took part in Scifest 2019.

The 2019 theme was "Discover your element" which celebrates the International Year of the Periodic Table of Chemical Elements as proclaimed by the United Nations. The theme also celebrates several anniversaries in the history of chemistry including the 150th anniversary of the periodic table's creation by Dmitry Mendeleev in 1869, 350 years since the discovery of phosphorus, the categorisation of 33 elements in 1789 by Lavoisier's, and Döbereiner's law of the triads in 1829.

SAIP stand was bigger and better with more interactive exhibitions as Rhodes Physics Department has also brought the Maths and Statistics Departments, under supervision of Prof Makaiko Chithambo.

The team with the girl learners after encouraging them to follow careers in STEMI.

The Maths, Physics and Statistics team photograph.

Learners are solving Maths puzzles.

7.3.2 SAIP Impact at Scifest Events

The learners ranged from primary level up to grade 12, and they were most excited and eager to learn more about applications of physics. Most of the foundation and intermediate phase learners showed interest in taking Physical Science and pure Maths as subjects. The learners also took the opportunity to ask physics questions relating to challenges they face in understanding some aspects of physics in their schoolwork.

The educators were excited to receive the Physics Pedagogy booklet and that their learners engaged with demonstrations relating to their maths and physical science syllabus. Educators were also intrigued about the SAIP Teacher Development Programme model will soon be at their proximity, as SAIP in collaboration with Eastern Cape Education Department programme.

The undergraduates were keen to know about the existence of SAIP, types of membership, projects and conferences. The general public also engaged in our fun, interactive exhibitions.

7.3.3 CERN Future leaders Workshop @ SAIP2019

A delegation of SAIP Student members (MSc and PhD Students) that were attending SAIP2019 visited the Drendon Secondary School on July 10th for an outreach event. The event was organized by Phuti Ntsoko Rapheeha, an MSc student at Wits University, who is wrapping up his thesis on the search for particles in the universe with the ATLAS detector at the European Laboratory CERN. Phuti is a graduate of the Drendon Secondary School, where he was a top student and learned to work tirelessly.

The event focused on the SA-CERN research activities such as high-tech, programming, Big Data, data analytics and machine learning. These skills are pivotal to prepare the country for the 4th Industrial Revolution.

Below is a photo of the delegation of MSc and PhD physics students with the Principal of the Drendon Secondary School, Mr Moloko Knox Matsapola.

Phuti opened the event with a keynote presentation about what Particle Physics does and why it is so essential to understand the origin of mass in the Universe and other mysteries that surround us. Phuti spoke about the status of the understanding of matter in the Universe, in that we know very little and much research is still needed to further our insight. He also spoke about the Higgs boson, the particle responsible for giving mass to known elementary particles that can also give us the key to understand the rest of the matter in the Universe, or Dark Matter. Phuti also led the questions and answer session that followed the four presentations, where quite many learners made inquiries about artificial intelligence and research.

Nkateko Baloyi gave a keynote address about Big Data and Data Science. Nkateko is enrolled in the DST-funded E-Science program, where she chose to solve problems in Particle Physics using Machine Learning techniques, which are used for the development of artificial intelligence. Nkateko emphasized the importance of Data Science and Machine learning for artificial intelligence and how the latter is so vital for the future of the country. Nkateko gave a rundown of the different aspects of Machine Learning and what can one achieve if one master these techniques.

8 Women in Physics in South Africa

The SAIP runs the Women in Physics Programme that helps to improve the number of women working in physics. The main objectives of WiPiSA are to:

- Encourage and stimulate an interest in girls and women to study physics
- Support girls and women to work in physics-related careers and

- Assist in removing/overcoming obstacles and barriers for girls and women in their studies and at the workplace.

For more information, please visit: http://wipisa.saip.org.za/

WIPISA is involved in various activities summarised below:

8.1 Stellenbosch University WiPiSA Meeting 2019

The Women in Physics meetings at Stellenbosch University aim to build and nurture a sense of community and support for female students within the Physics department. These meetings provide an opportunity for women to come together in a friendly and welcoming environment to share their personal experiences, provide possible role models for both undergraduate and postgraduate students, and to encourage and inspire women to pursue further work in physics.

The meeting took place on 20 September and received overwhelmingly positive feedback. A key aim of the event was to identify issues that students may face and how the department can improve the climate for female physics students. This was addressed through an activity where students anonymously wrote down their “dreams” and “challenges” they have encountered, which were then collected and formed the basis of a group discussion. Common “challenges” included confidence and self-doubt, time management, emotional and mental health, family expectations and pressure, and lack of funding. Under “dreams” were written, for example, fulfilment regarding their research and career, making a modern contribution in society, impacting women in science, inspiring others, collaborating internationally, having a challenging and stimulating career, and living a healthy balanced life. The many repeating themes did an excellent job of helping build the community feel and stimulated discussions that took many themes much further, with nearly all students contributing with their own experiences. Several sections of the evening were designated for one-on-one informal chatting and discussions were received very well.

Additionally, the event featured an engaging motivational talk from Dr Gillian Arendse, (the Deputy Director at the Division for Student Access at Stellenbosch University and physicist by training), followed by several female staff members and postgraduate students sharing their personal journeys in physics. These talks aimed to provide motivation and to make the world of physics feel more accessible to students who are struggling with issues such as lack of confidence and societal pressure, as well as offer a chance for students to ask questions about specific pathways in academia and research.

We are grateful to WiPiSA and the Physics department of Stellenbosch University for their support in organizing the Women in Physics meeting. Overall, the response to the event was overwhelmingly positive, and we look forward to planning other similar events in the future.

The participants in the Stellenbosch University Physics Department's 2018 Women in Physics meeting.

Students wrote down their "dreams" and "challenges" they have faced as a woman in physics while engaging in one-on-one discussions.

8.2 WiPiSA Outreach programme in the Eastern Cape

Submission by: Onesimo Mtintsilana, (2018-2020 WiPiSA Student Rep)

On behalf of the WiPiSA forum I would like to thank the SAIP for the opportunity to allow me to host an outreach programme in the town, Egcuwa located in the rural outskirts of the Eastern Cape. The programme ran from the 5th Aug until the 8th Aug 2019. It was a beautiful with success with some challenges as well. I visited a total of 7 schools, where 99% of the schools were quintile 2. I was received well, all the students (including educators) enjoyed the talks and experiments I demonstrated as most

of them had never had external visitors coming to the schools to talk about science. In the primary schools, I conducted “fun” physics experiments were students engaged whereas in high schools, it was a formal presentation and handed out informative pamphlets. Engagement was received from both learners and educators, as most of the information was new to them.

However, there were some challenges that I faced such as; the roads were not suitable for a small car and there was also no water (which made it difficult to conduct the experiments). Due to limitations on budget, the experimental equipment I used was from my own money (more funding opportunities re needed for WiPiSA. Despite all the challenges the outreach was a success and it indeed helped the learners to learn about opportunities available in physics.

This was not only a learning opportunity for the schools but for me as well. I hope in the near future, there will be more outreach programmes focused on.

9 SAIP Conferences

One of the key roles of the SAIP is to organise conferences. A summary of conferences hosted recently is as follows:

9.1 Conference Proceedings

The following conference hosted by SAIP produced conference proceedings, the recently published proceedings are listed below:

Conference	Link To Proceedings
SAIP2018	http://events.saip.org.za/getFile.py/access?resId=53&materialId=3&confId=100
ICPE2018	https://iopscience.iop.org/issue/1742-6596/1512/1

9.2 SAIP2019

Monday, 08 July 2019 marked the official opening of the 64th South African Institute of Physics (SAIP) Conference. The 64th SAIP Conference was hosted by the University of Venda at The Ranch Hotel, a few kilometres outside Polokwane, from 8 to 12 July 2019.

The Conference consisted of 360 presentations, 68 posters, seven exhibitors and sponsors. All South African universities including two Universities of Technologies (TUT and CPUT) participated in the conference. African universities from Tanzania and Botswana were among participating universities. Internationally, universities from United Kingdom and USA also participated.

Participating research institutions included CSIR, iThemba LABS, Square Kilometer Array (SKA) and South African National Space Agency (SANSA). Government institutions included National Research Foundation (NRF), Department of Science and Technology (DST) and Limpopo Tourism Agency (LTA).

9.2.1 Prof Whitelock Received the SAIP 2018 Gold Medal

Prof Whitelock was awarded the 2018 Gold Medal during the SAIP2019 conference.

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.

Prof Patricia Ann Whitelock holding the Medal.

The 2018 SAIP Gold Medal is 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. Prof 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. Prof 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, as president-elect from 1999 to 2001, 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 Prof 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.

Prof Whitelock's contribution to the development of the astronomical community in South Africa are 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 Prof Whitelock, the SAIP bestows onto her the greatest distinction that is conferred in South Africa for achievements in Physics.

9.2.2 Physics Bowl at SAIP2019

The 4th Physics Bowl took place yesterday; the theme of this year was Avengers Endgame. We had 9 teams from 6 universities (NWU, UCT, UL, University of Venda, UNIZULU and Wits). Moving with 4IR (4th Industrial Revolution), instead of traditional buzzers Kahoot software was used instead. It was pre-downloaded on participants smartphones, tablets and laptops.

Congratulations to the winners, 1st place was UCT, with University of Venda2 coming 2nd and NWU1 on third place. There was also a prize for best dressed participant. Many thanks to all the participants and the sponsor for prizes, Blue Stallion Wolfram Mathematica.


Overall winner, UCT and 2nd prize winner (University of Venda)


3rd place winners, NWU1 and the UL team participants.

9.2.3 Physics in Industry Day at SAIP2019

Following up on the successful launch of the Physics in Industry Day that was launched on Thursday 27th of June 2018 during the SAIP2018 Conference that was held at the University of Free State Bloemfontein, The SAIP organised the 2019 one that was held at Protea Ranch Hotel Polokwane on 12 July 2019. It was allocated as a parallel session on the Applied Physics track which was graced with many enthusiastic researchers and postgraduate students.

The goals of the Physics in Industry Day are:

1. To inculcate an entrepreneurship culture among physicists
2. To develop skills in innovation and commercialization of research among physicists - as you are aware most of the physics of today is the technology of tomorrow
3. To bridge the innovation Chasm - most research ideas are sitting on shelves and not getting to the market
4. To share experiences with those who have done it and created successful businesses from their research
5. To create links between industry and physics as you are aware South African industry does not fully understand the role of physics in technology development unlike chemistry
6. To provide a platform where industry can possibly present research related problems they have, and physicists can identify opportunities to work with industry to solve those issue
7. To present a platform where physics community can present their research that's ready for commercialization or can solve various problems and see if the industry can take it

Key areas suggested by planning committee

The Programme

Time	Suggested Topic / Area	Presenter
10:00 – 10:40	Intellectual Property, Innovation Management and the Role of NIMPO in Innovation Support in South Africa	NIMPO Rep Ms Lungelwa Kula
10:40 – 11:20	PV Insight	Prof Ernest van Dyk
11:20 – 12:00	Experiences and Lessons Learned on Careers in Industry, Innovation and Commercialisation of Physics Research	Mikhail Sakharov
12:00 – 12:40	Industry-Academia Collaborations – Case Study of Diamond Sorting	Prof Simon Connell
12:40 – 13:00	Discussion of Improving the Physics in Industry Day	All


Ms Lungelwa Kula and Prof Ernest van Dyk presenting.

9.2.4 Monitoring Evaluation and Impact Assessment Workshop at SAIP2019

The IOP UK facilitated a 2-day workshop on Monitoring Evaluation and Impact Assessment for SAIP during SAIP2019 on 10 and 11 July at The Ranch Hotel in Polokwane. Delegates who attended SAIP2019 and also involved with either the teacher development project or the SAIP Hub and Spoke projects, were invited to participate in the IOP facilitated workshop.

In efforts to raise funds for SAIP projects, including the Teacher Development Project, one of the key weaknesses of the SAIP fundraising is impact assessment reporting. Funders want to know what impact the SAIP projects are making. The SAIP approached the IOP UK who agreed to facilitate a 2-day workshop. The workshop included:

1) Introduction to M&E in Project Management
2) Linking M&E to Impact Assessment
3) Models and tools for M&E and Impact assessment
4) Reporting Impact
5) Linking Impact to Marketing, public relations, and Fundraising
6) Case Studies and Example - e.g., M&E and Impact in Education Related Projects since this is one of our main focus areas

The was interactive component where the attendees were divided into 2 groups and had to present projects case studies. The attendees included the Tanzanian Physical Society Representatives.

Workshop Group Photo.

9.3 SA-ESRF Light Source Conference 2019

The SA-ESRF Light Source Conference will took place from 11-13th November 2019 at the Johannesburg Business School. The conference focused on the scientific Association of South Africa with the European Synchrotron Radiation Facility (ESRF), Grenoble, France- especially in light of the currently ongoing upgrades. A key aim is to grow the South African synchrotron user community by highlighting the versatility and cutting-edge nature of the ESRF infrastructure.

Delegates attending the SA-ESRF-2019 Conference.

The conference was successfully held the report is

https://docs.google.com/document/d/1LUfSEIdg93ZrFwdcUHaC2Ptr1tmZklo9EJG2oCDZ1Yk

9.4 COSFLOW Conference 2020

International Conference in Cosmic Flows, Large-Scale Structure and Visualisation (Cosmic Flow 2020)

International Conference in Cosmic Flows, Large-Scale Structure and Visualisation (Cosmic Flow 2020), a conference in celebration of Prof. Renée Kraan-Korteweg was co-hosted by the South African Institute of Physics (SAIP) and the School of Department of Astronomy, University of Cape Town (UCT) jointly with the Inter-university Institute for Data Intensive Astronomy (IDiA). It was held at Wallenberg Research Centre (STIAS, Stellenbosch), during the period 17 – 21 February 2020.

This international conference was part of a series of conferences that have been dedicated to the topic of Cosmic Flows over the last two decades: most recently 2012 in Queensland, Australia, 2013 in Marseille, France and 2016 in Quy Nhon, Vietnam.

The aims were to discuss and review the following main topics, with a vision to future goals:

- Distance determinations, redshift and peculiar velocity surveys
- Cosmic flow fields
- Visualisation and Modelling (took place at the Iziko Planetarium and Digital Dome in Cape Town)

The scientific program comprised of a diverse range of international level plenary sessions, with in-depth review talks and contributed talks on specific specialised topics, as well as posters, including selected panel discussions. There were 60 plenary and single oral talks and 3 posters. The conference was attended by 72 delegates.

Conference Highlights

- **Welcome Reception** was held on Sunday, 16 Feb with a welcome reception (17:30 - 19:30pm). This will be at the conference venue itself, and the registration was open. Delegates were entertained by a live marimba band
- **Wednesday morning program scheduled at the Iziko Planetarium**, to make use of the Digital Dome where the 360 degrees group photo was projected (taken by Dr. Arman Khalatyan, AIP). Transport was provided from the STIAS Conference Venue to the Iziko Planetarium (and back) for both attendees and partners. A guided tour was offered for partners during the scientific session. After lunch at the planetarium, we continue with an excursion (for both participants and partners).
- **Excursion**, after lunch, they continued on the excursion around part of the Cape Peninsula with interesting stops, last one being at Cape Point Vineyards including snack, with time to walk around and enjoy the spectacular view over Noordhoek.
- **Partner program:** there were some options for partner programs such the Khayelitsha Experience (18 February) and the Cape Town City Centre tour (during the Iziko Planetarium scientific session).
- **Conference Dinner:** The conference dinner was be held on Thursday (20 February) at the Vredenheim wine farm. Delegates firstly enjoyed a stroll in the beautiful gardens and a guided walk through the Cat Park. MC of the night was Prof. Patrick Woudt (SAIP/UCT Astronomy) with the guest speaker being Dr. Clifford Nxomani (NRF, Deputy CEO- NRIP) also present was Prof. Russ Taylor (UCT-UWC-SKA South Africa Chair in Radio Astronomy, Director: IDIA). Wonderful remarks about Renée were made by Dr. Omar López-Cruz (INAOE) and Dr Win van Driel (Paris Observatory). The group was entertained by the Khayelitsha Choir for Change.
- **Sutherland Trip:** there was a weekend trip to SAAO/SALT after the conference, to those who indicated their interest.

This is one of the most amazing conferences where most of the delegates know each other through previous collaborations and through research supervision, although they are based in different institutions around the world. The delegates interacted, shared ideas and networked which leads to future collaborations. They enjoyed the conference venue breath-taking atmosphere and what South Africa as a country has to offer especially the Western Cape Province, from the culture, the food, scientific programme and the social events that were scheduled away from the conference venue.

Through the generous sponsorship support from the National Research Foundation (NRF) Grants for conferences and the South Africa National Convention Bureau (SANCB), the conference was a success.

Conference group photo (left) and right is Dr. Arman Khalatyan (AIP) taking the 360 degrees photo.

Presentation at the at Iziko Planetarium.

Delegates are having a tour at the SALT.

10 SAIP on Social Media

10.1 Facebook

SAIP Facebook Page has 1533 followers, and you can visit it on the following link: https://www.facebook.com/South-African-Institute-of-Physics-1660099704207118/