



Physics Comment

**FIND OUT MORE
ABOUT ABOUT OUR 100
YEARS OF PHYSICS IN
AFRICA PROJECT**

PG 10

**OBITUARY OF PROFESSOR
ROGER RAAB
PG 5**

SPRING EDITION

**IN THIS ISSUE WE DISCUSS SOME OF THE SAIP PROJECTS
THAT HAVE OCCURED IN THE FIRST HALF OF THE YEAR**

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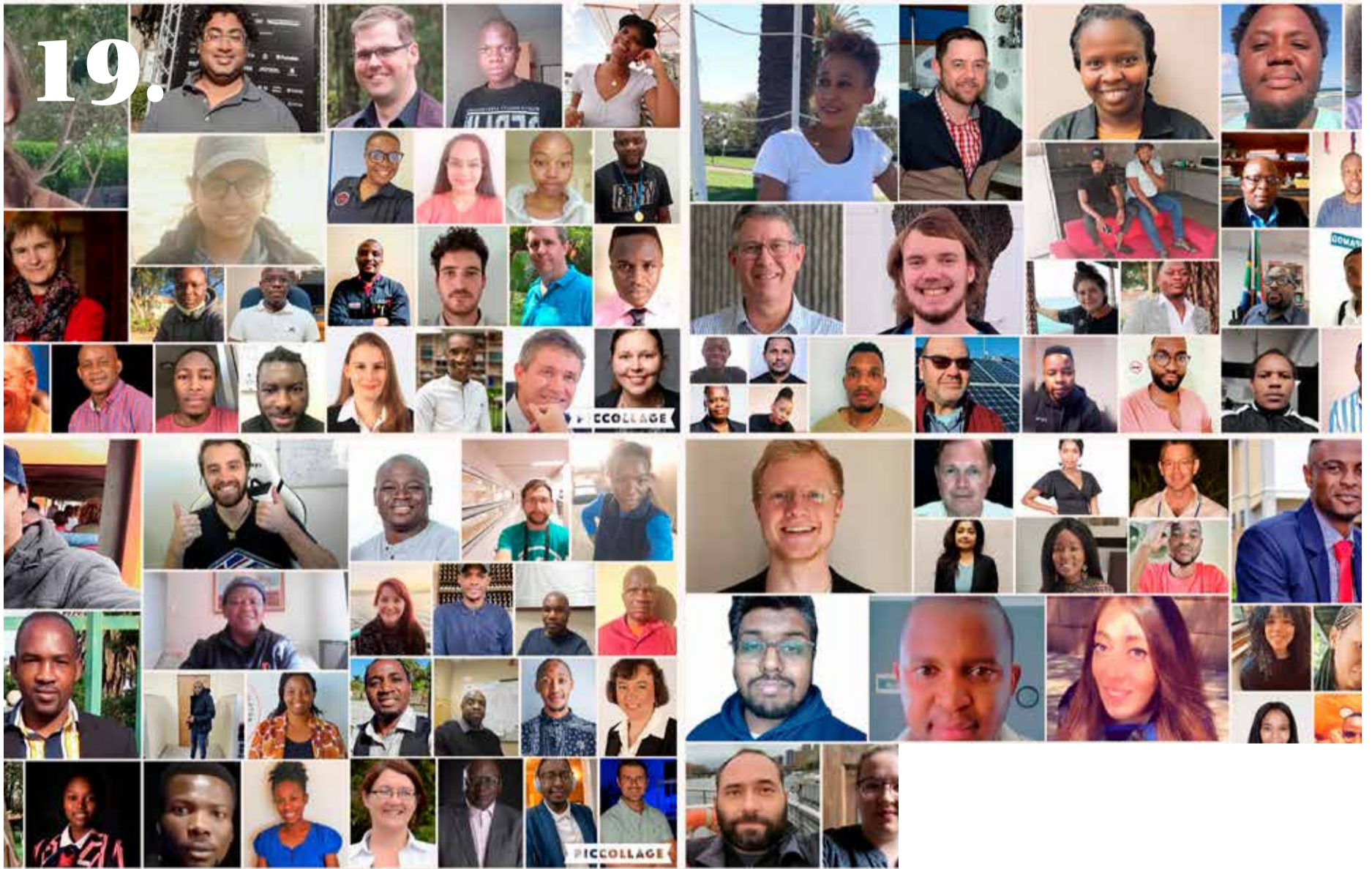
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If you would like to submit articles, news, achievements, calls or adverts to be featured in the magazine please email physicscomment@saip.org.za

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Professor Roger Raab passed away on Friday evening 17 June 2022, aged 88. Roger was one of the outstanding scholars of the University of Kwa-Zulu Natal, and always the epitome of an academic and a gentleman.

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"What is the role of Physics in society?" This is the question that was tabled at this year's annual conference of the South African Institute of Physics (SAIP 2022). A synopsis of the conference is given.

10. 100 YEARS OF PHYSICS IN AFRICA.

Have you heard about our "100 years of Physics in Africa: Past, Present and Future", project ?



MESSAGE FROM THE PRESIDENT

The second semester of academic year 2022 is in full swing and it is good to see campuses alive with large groups of students. This is how a campus functions best – with all its people present in person.

The SAIP community was saddened to hear of the passing of Prof Roger Raab on 17 June 2022. He was a pioneer in many ways and his varied contributions and the influence he had on his peers and his students are featured in the detailed obituary in this issue.

SAIP 2022 took place from 4 – 8 July 2022, making use of the Zoom platform as the primary means of communication, and very ably organised by Dr Lindsay Westraadt and her team from Nelson Mandela University. There were almost 400 registered delegates and a full programme with excellent Plenary Speakers was presented by all the Divisions. The poster session using the Gather Town site was again very successful. Please read the synopsis of the conference in this issue for more detailed information.

SAIP 2023 is being hosted by the University of Zululand and planning is already underway by the LOC to host this conference in person. I very much hope that the SAIP community will support this conference and the return to the face-to-face format.

WiPiSA organised a very successful month of activities to coincide with Women's Month in August. More details on this will be given in a future edition of this magazine.

After two years of hosting Scifest Africa virtually, South Africa's national science festival returned to its live format, taking place in Makhanda from 7 – 13 September 2022. The SAIP worked jointly with the Departments of Physics, Mathematics and Statistics at Rhodes University to participate and by all accounts Scifest was a huge success.

I hope you enjoy the other articles featured in this issue of the magazine.

The concluding semester of this academic year is being affected particularly badly by loadshedding. I wish everyone, staff and students, all the best with the final stretch ahead of us.

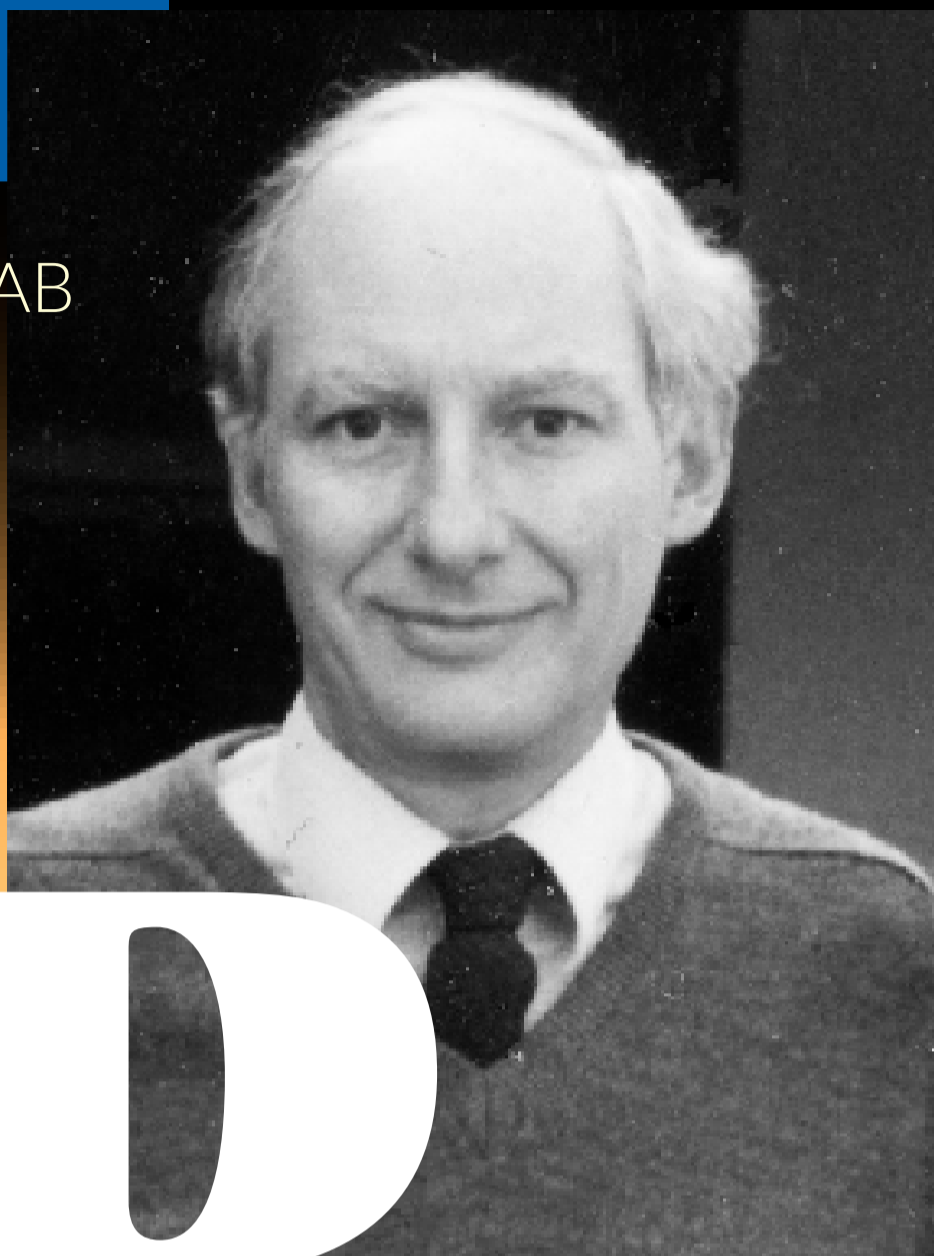
Prof Rudolph Erasmus

President-Elect



21 JANUARY
1934 - 17 JUNE
2022

Obituary issued by the
University of KwaZulu-
Natal
School of Chemistry
and Physics



OBITUARY:
PROFESSOR RAAB
ROGER

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Professor Roger Raab passed away on Friday evening 17 June 2022, aged 88. Roger was one of the outstanding scholars of the University, and always the epitome of an academic and a gentleman. His colleagues in the School of Chemistry and Physics are profoundly saddened by his passing.

Roger was born in Durban on 21 January 1934. He was educated at Clifton Preparatory School in Durban followed by Hilton College, where he was Dux in 1950 and Head Boy in 1951, obtaining a brilliant academic and sports record. He studied physics at the Pietermaritzburg Physics Department of the then University of Natal, graduating with a BSc in 1954 and a BSc (Hons) in 1955.

In 1955, Roger won the Natal Rhodes Scholarship, and embarked on his doctoral studies in Oxford, where he had the good fortune to come under the supervision of AD (David) Buckingham (FRS, 1975; CBE, 1997). Roger was David's first graduate student,

and he obtained his D. Phil. from Oxford in 1959, with three joint papers on the dielectric properties of liquids. David and Roger's deep friendship and highly creative academic collaboration would prove to last a lifetime.

Roger continued research in molecular physics in Oxford as a post-doctoral fellow, and was then appointed Lecturer in the Pietermaritzburg Physics Department of the University of Natal in 1960. He was rapidly promoted to Senior Lecturer in 1961, Professor in 1968, and Head of Department in 1974. He subsequently served two three-year terms as Dean of the Faculty of Science on the Pietermaritzburg Campus, and as Pro-Vice Principal of the Medical School in Durban from 1992 to 1996.

After retirement in 1999, Roger continued as a prolific researcher until the end, serving as an Honorary Research Fellow, and as Professor Emeritus of the now University of KwaZulu-Natal. He published a total of 89 peer-reviewed research articles and 2 books. Roger also graduated 8 MSc and 11 PhD stu-



dents. He was also an NRF grantholder, for many years enjoying a B-rating (internationally acclaimed scientist).

Roger worked together with Professor Clive Graham for many years on theoretical and experimental studies of electromagnetic properties of molecules in optical effects. Later, collaborating with his former student, Dr Elizabeth Graham, he worked on experimental and theoretical studies of optical and electromagnetic effects in crystals, both non-magnetic and magnetic. More recently in collaboration with Professor Owen de Lange, Roger was able to complete the development of multipole theory, elucidating many major problems and enigmas in macroscopic electromagnetism arising from multipole theory. This work was published in the widely-acclaimed book "Multipole Theory in Electromagnetism" (Oxford, Clarendon Press, 2004).

His earlier book, "Operator Methods in Quantum Mechanics" (Oxford, Clarendon Press, 1991), also co-authored with Owen de Lange, received accolades for its excellence, winning the University of Natal Book Prize in 1993, and the Bill Venter Book Prize in 1994. It has become an internationally respected text.

Roger's research has led to international and local recognition. In 2001, he was invited by the Council of the Royal Society of London to join the editorial board of the prestigious journal Proceedings of the Royal Society of London A. He was one of very few South African scientists to be recognized in this way. He declined in order to concentrate on his research. Locally, he was elected a Fellow of the Royal Society of South Africa in 1993, and was awarded the De Beers-SAIP Gold Medal in 2004, this being the highest award of the South African Institute of Physics, for his outstanding research in "the theory of electromagnetism, and optical properties of molecules and crystals".

What is remarkable about Roger is that he was able to maintain this international research profile whilst also providing excellence in teaching and serving on many university committees. Past students have spoken of the inspirational experience it was to be taught by Roger Raab. He enkindled a deep respect and affection for physics in generations of undergraduate students, and established a keen appreciation of creativity and commitment to excellence in his research students.

Over and above this, Roger contributed substantially to the Physics and wider Community. He was Chairman of the National Measuring Standards Committee from 1976 to 1980, and in recognition of his services there

was awarded the South African medal for services towards Measuring and Standards. He served on the National Physics Research Grants Committee (1970 – 82), and the National Liaison Committee of IUPAP (1985 – 1988), and was advisor to the NPRL, CSIR (1974 – 1983). He also served on the Natal Rhodes Scholarship Selection Committee from 1964 to 1970.

Roger was highly principled and extremely generous with his time and attention. He was a Life-Line Counsellor from 1973 to 1990, and served as the Vice-Chairman of the Life-Line Executive Committee from 1978 to 1983. He served on the School Board of St John's Diocesan School for Girls, and was Chairman of the Board from 1993 to 1998. Roger played a significant mentoring role to many of our students who come from disadvantaged backgrounds, several of whom have gone on to succeed in Physics and in fields beyond academia. In addition, he donated countless pints of blood over many years. He was adept at hiding his selflessness behind his wit and humour.

Roger and Lorraine, a painter and art historian, married in 1963, parenting three children, Elizabeth, Caroline and Conrad, who have made them grandparents nine times over. Roger shared Lorraine's love of indigenous plants, particularly those of the Drakensberg. He loved family trips to the 'Berg, occasionally bringing his telescope for viewing the spectacular night sky. Roger and Lorraine shared their appreciation of classical music with their children and grandchildren. Roger was very supportive and encouraging of Lorraine's dedication to her painting.

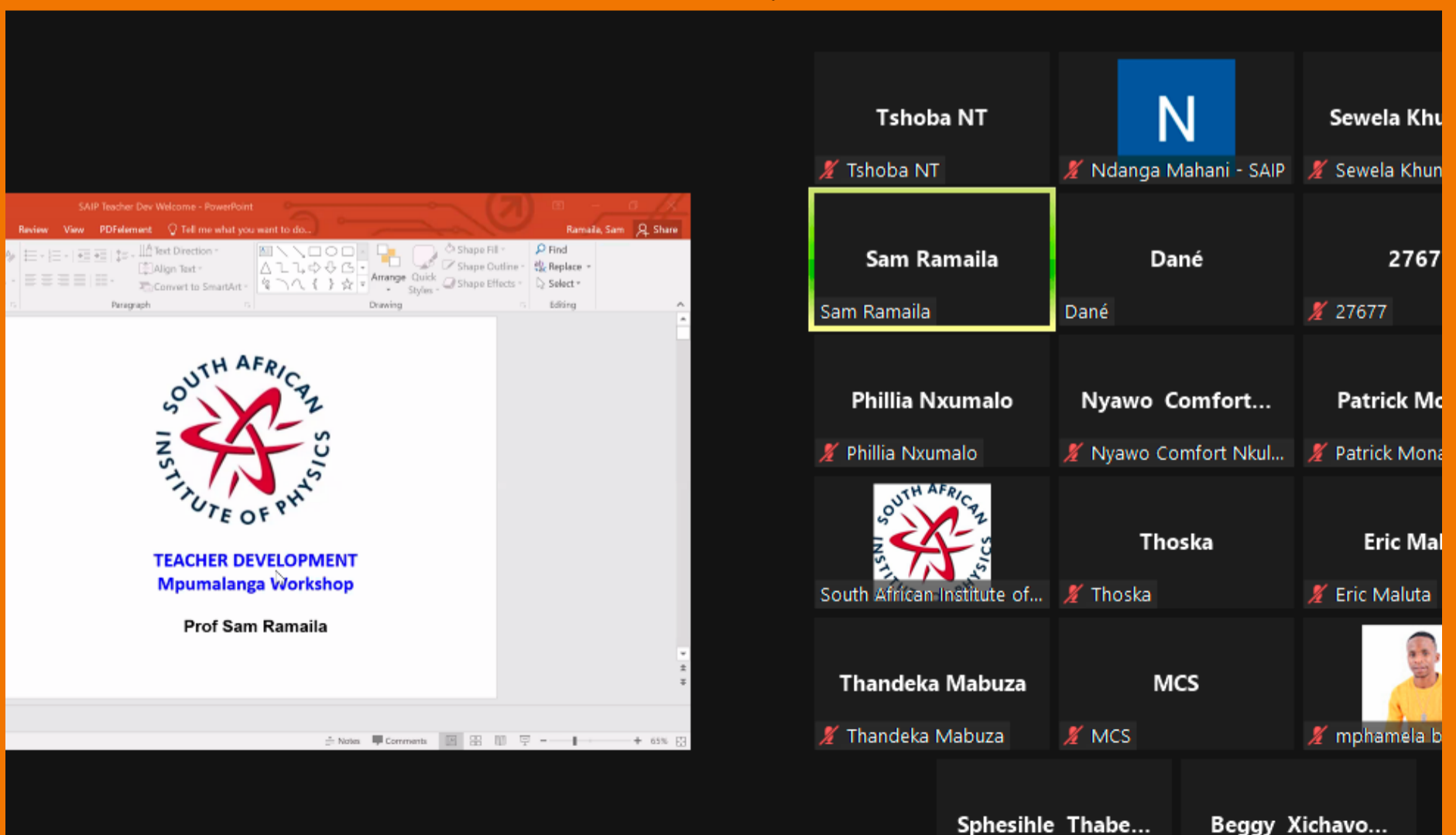
Roger had a warm and hospitable personality, and was a person of deep integrity. He and Lorraine were welcoming hosts to many lunch and dinner parties in their home for colleagues and students. Roger was always willing to lend an ear or offer his wisdom when necessary. He will be remembered with great fondness for the many ways in which he enriched the lives of his colleagues and former students in the School of Chemistry and Physics. We convey our deepest condolences to Roger's wife Lorraine, and to their children Elizabeth, Caroline and Conrad, as well as to his extended family.

The Memorial for Roger took place at the Cathedral of the Holy Nativity, 166 Langalibalele Street, on Friday 24 June at 2:00 p.m.

TEACHER DEVELOPMENT WORKSHOP 2022

Article by Mphamela Baloyi

The South African Institute of Physics (SAIP), in partnership with the Department of Science and Innovation (DSI), hosted the teacher development training sessions in Physical Science for the Mpumalanga Province from the 25th of June to the 30th of June 2022. It was a five-day workshop focused on Physics and Chemistry topics; Chemical Equilibrium, Acids and Bases, Stoichiometry (Limiting reactants, Percentage Yield Percentage Purity), Electrostatics, and Electric Circuits. Over 35 teachers were registered for the workshop. The workshop's mission was to equip Physical Sciences Teachers with skills and boost their confidence in teaching specific Physical science topics. The pre and post-evaluation surveys were used to monitor the workshop's impact. The educators were asked how confident they were in preparing each of the five topics, and they were 71.95 % confident. The workshop significantly impacted the teachers since their confidence in teaching improved by 19.14 % (91.09 % Confident). Some educators recommended that the physical workshop can be much more effective in avoiding load shedding and connectivity problems. "I think workshops of this nature must be done regularly so that we as educators can also gain more understanding, as well as tactics others were using when teaching," one teacher stated. In the chemistry part, most teachers were interested in or enjoyed Chemical equilibrium, and in the physics part, it was Electrostatics



Eastern Cape Face to Face workshop

IMAGES OF THE PARTICIPANTS FROM THE EASTERN CAPE WORKSHOP

IMAGE 1: PRESENTATION

IMAGE 2: PRACTICAL SESSION (A TITRATION J).

The South African Institute of Physics (SAIP), in partnership with the Department of Science and Innovation (DSI), hosted the teacher development training sessions in Physical Science for the Eastern Cape Province in Mthatha and Cofimvaba from 11-15 July 2022 and 4-8 July 2022, respectively. Over 60 teachers were registered for the workshops, of which 32 teachers were from Mthatha and 28 from Cofimvaba. For both Mthatha and Cofimvaba, the workshops focused on 10 Physical Science topics and six experiments. A pre-evaluation survey was used to check the teachers' confidence in teaching the ten selected topics, and their responses ranged from 54.62 % to 90 %. Most teachers were confident in teaching Newton's

law, Electrostatics, and Organic Chemistry to both Mthatha and Cofimvaba. There was a clear improvement in the teachers' confidence in teaching the ten selected topics after completion of the workshops. The workshops were successful, and the teachers thank the SAIP for organizing such training. "The workshop was interesting. The facilitators presented well, helping us to solve problems and giving us skills to tackle some questions", one educator stated.



100 YEARS OF PHYSICS IN AFRICA

Past
Present
Future



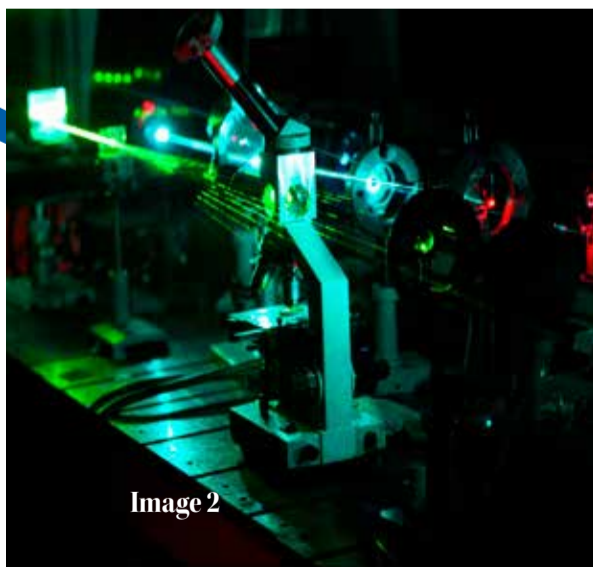
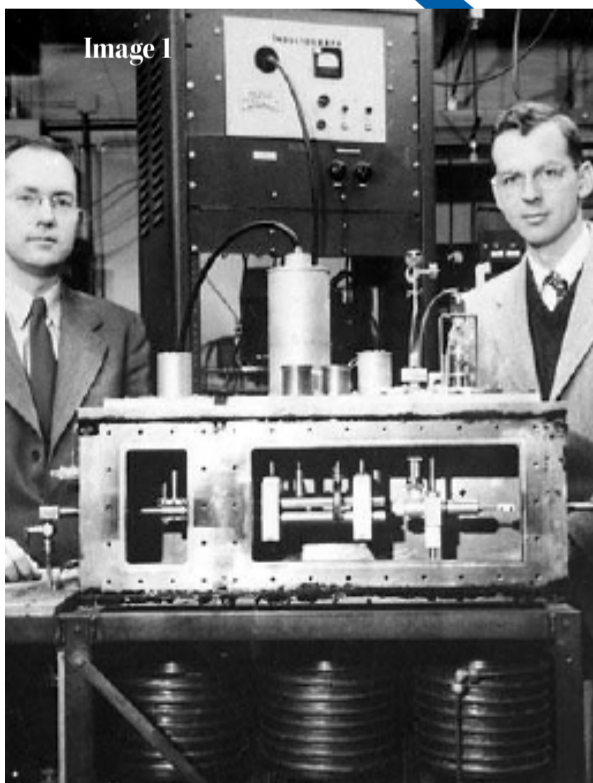
This initiative is prompted by the 100th anniversary year of the International Union of Pure and Applied Physics (IUPAP). The first agreement was signed in 1922; the first General Assembly was held in 1923. This time last century, Modern Physics in Africa was in its infancy. Now, it is time to flex our muscles and take hold, change lives and unfold understanding. The elders and the youth of Physics are stretching their minds together.

Whether your country is a member of IUPAP or not, this is an excellent time to look back and look forward.

One hundred years from now, perhaps Physicists will understand the vision we had for Physics contribution to the Sustainable Development of Africa. For example, how can Physics contribute to the 4th Industrial Revolution, gender and equity, food security, science education, health, energy, clean water, among other sustainable development challenges facing Africa.

Invitation to tell your story and desired future for Physics in Africa

There are many beautiful and inspiring stories on how Physics is thriving, changing lives, bringing development and impacting different parts of Africa, even producing world-class research and Physicists with bare minimum resources, but the World never gets to hear of these incredible success stories from Africa. An African proverb says, "Unless the lion tells the story, Tales of the hunt will always favour the hunter." This is your chance to tell your story, as the, SAIP, looks forward to the next 100 years. This a story about a story: about Physics and Physicists and Africa.



Images 1 & 2 show the evolution of the laser from the first laser to a modern day set up. The third image represents the role lasers may play in the future of Augmented reality.



Where will your story go ?

The collection of stories will be used to build a history of Physics in Africa and share the desired future for Physics in Africa. The stories may be used as follows :

- Published on the 100 Years of Physics in Africa website as short stories.
- Published with different newspapers, magazines, online platforms as a series of African stories on Physics.
- Can be selected for inputs into the IU-PAP centenary celebrations .
- Combined and edited into a book on Physics in Africa.
- Authors may be approached for Radio and TV interviews on their stories.

100 YEARS OF PHYSICS IN AFRICA – PAST, PRESENT AND FUTURE: THE CENTRE FOR SPACE RESEARCH

**THE IMAGE SHOWS PROFESSOR
PIETER STOKER WHO IS PART
OF THE NORH WEST UNIVERSITY
(NWU) ALUMNI.**

Cosmic-ray Research

Pieter Stoker was appointed in 1952 as the head of the Department Physics at the Potchefstroom University for Christian Education (1953 – 1990). Under his leadership, the undergraduate and postgraduate courses and experimental work were developed, with important contributions by MA Meyer. Stoker (together with Meyer) initiated cosmic ray research at this university. Stoker was Director of the PU Research Unit for Cosmic Rays, 1960 - 1991. He led the construction of neutron monitors for the International Geophysical Year (IGY) of 1957. Until today, there are four neutron monitor stations under the authority of the former Unit for Space Physics, now the Centre for Space Research (CSR), at the North-West University in Potchefstroom, located at Sanae (Antarctica), Hermanus, Potchefstroom, and Tsumeb (Namibia). Stoker managed them and was responsible for the data quality and dissemination until 2017 at an age of 90 years. It was his lifelong dedication.

In 1959 the Potchefstroom group became part of research in Antarctica. Since 1964 they were formally involved in research in the South African National Antarctic Programme

100 years of Physics in Africa



To participate please scan the QR code or click the link below

<https://www.saip.org.za/100YearsOfPhysics/>

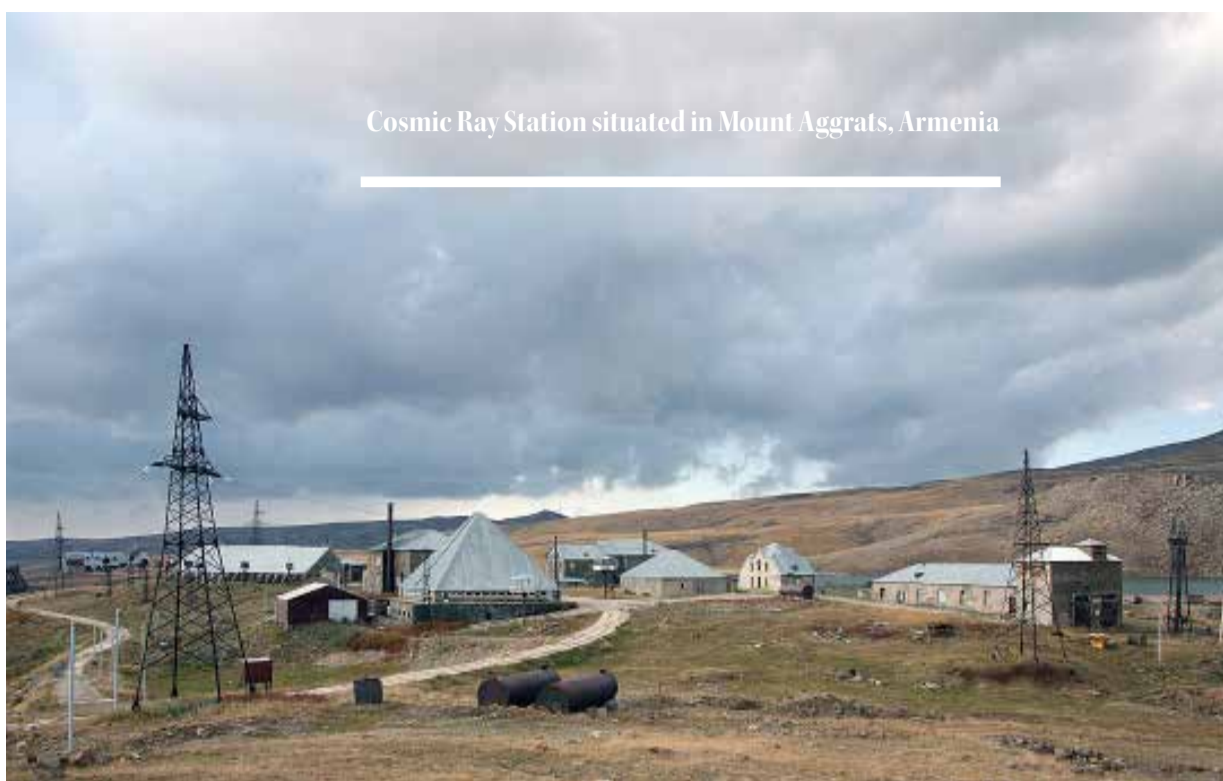


(SANAP). Stoker was program director of the Antarctic research program on cosmic rays 1963 – 1996. In 1994 he received the BP medal for Antarctic research. In 2009 an Antarctic meeting decided to rename the departure hall of the SA Agulhas to Pieter Stoker.

With the establishment of the SA Institute of Physics (SAIP) in 1955, PH Stoker was one of the Founding Members who signed the attendance register. He was on the council of the SAIP from 1969 to 1997, as vice-president 1973-1975, and as president 1975-1979. Persons were elected for two-year terms. Stoker also received various prestigious awards, including the De Beers Gold Medal in 1992 by the SAIP for outstanding research and the S2A3 Gold Medal in 1997 for his outstanding scientific contribution, both locally and internationally.

Gamma-ray Astronomy

Profs Christo Raubenheimer and Okkie de Jager were instrumental in establishing Gamma-ray Astronomy in South



Cosmic Ray Station situated in Mount Aggrats, Armenia

Africa. Following the experiments of the Department of Physics at the Potchefstroom University for Christian Higher Education involving Extensive Air Showers in the 1960s, Raubenheimer led the construction of the MK 1 telescope that became operational in 1985 – the first in the Southern Hemisphere – on Farm Nooitgedacht, 35 km from Potchefstroom in the Vredefort Dome. It consisted of 4 mini-telescopes and was in operation for 9 years. The MK 2 Telescope was next constructed and continued operations until the late 1990s.

Okkie de Jager, a PhD student of Raubenheimer, contributed significantly to theoretical results, including a Kernel Density Estimator (KDE) method to obtain smooth light curves plus errors, overcoming the problem of binning (De Jager et al. 1986) and

developing the H-test to search for periodicity with an unknown light curve shape (De Jager et al. 1989). Okkie later occupied a SARCHi Research Chair in Astrophysics and Space Science. Their work led to the involvement of the North-West University in the High-Energy Stereoscopic System (H.E.S.S.) in the late 1990s, and helped persuade the Collaboration to construct H.E.S.S. in Namibia.

The Centre for Space Research is a member of the next-generation Cherenkov Telescope Array (CTA) under the leadership of prof. Markus Boettcher, current SARCHi Research Chair, who also leads the South African Gamma-ray Astronomy Programme (SA-GAMMA) Consortium.

Following the untimely passing of Okkie de Jager in 2010 at age 49, an international conference was held in his honour at the Kruger National Park in 2012. Prof. Raubenheimer has since retired. Due to the tireless efforts of these pioneers, Gamma-ray Astronomy has a legacy that is being taken forward by their students and colleagues.

THE SOUTH AFRICAN GAMMA-RAY ASTRONOMY PROGRAMME (SA-GAMMA) IS A CONSORTIUM OF SOUTH AFRICAN UNIVERSITIES AND RESEARCH INSTITUTIONS WHICH ENGAGE IN RESEARCH IN THE FIELDS OF GAMMA-RAY ASTRONOMY AND HIGH-ENERGY ASTROPHYSICS.

[HTTPS://SAGAMMA.ORG/](https://sagamma.org/)



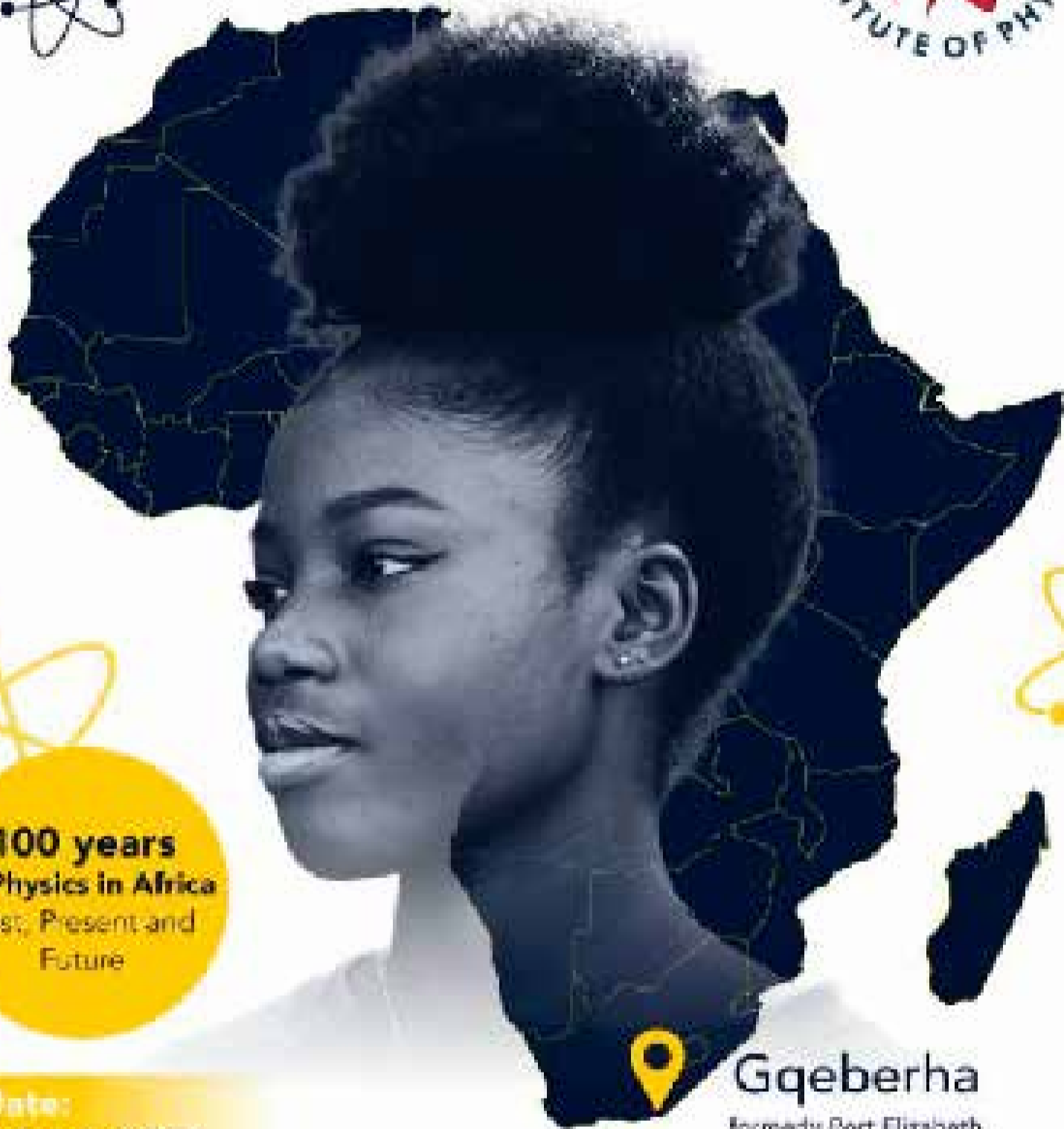
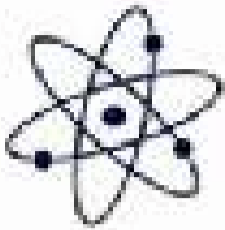
AGAINST GRAVITY

This year Women's Month has been celebrated with an original theme - "Against Gravity."

Gravity is the force by which a planet or other body draws objects toward its center. When we look back to the beginning of space exploration, scientists probably asked the question. "How do we overcome gravity?" How do we get past this enormous barrier preventing us from reaching new frontiers?

Gravity represents the obstacles we face as women and the social prejudice that can sometimes shackle us. To go against gravity in this regard would mean to break these chains and overcome the obstacles that prevent us from entering and succeeding in the field of Physics.

Happy Women's Month !!



100 years
of Physics in Africa
Past, Present and
Future

Date:
4-8 July 2022

Gqeberha
formerly Port Elizabeth

**ANNUAL CONFERENCE OF THE SOUTH
AFRICAN INSTITUTE OF PHYSICS (SAIP 2022)**
Virtual Conference

**THANK YOU TO THE ORGANISERS AND PARTICIPANTS
FOR MAKING THE SAIP CONFERENCE A SUCCESS**



SAIP 2022 CONFERENCE SYNOPSIS

**THE FOCAL POINTS OF THE
CONFERENCE ARE DISCUSSED AND
SUMMARIZED BY THE CONFERENCE
CHAIR DR. LINDSAY WESTRAADT**





What is the role of Physics in society?" This is the question that was tabled at this year's annual conference of the South African Institute of Physics (SAIP 2022), which was hosted virtually by the Nelson Mandela University Department of Physics in July (1-8 July 2022). This year's conference was dedicated to the two-fold observance of the International Union of Pure and Applied Physics centenary celebrations (IUPAP 100) and the International Year of Basic Sciences for Sustainable Development (IYBSSD 2022).

The basic sciences and society are interdependent. As the basic sciences fuel the development of new technologies necessary to tackle current challenges and take society into the future, society, in turn, guides the direction of research endeavors through technology-directed funding streams. The one supports the other, and vice versa. A better understanding of these linkages, focusing on establishing win-win partnerships, could lead to more efficient use of time and resources. Based on this premise, the conference programme included a range of activities with the dual focus of exploring the role of Physics in addressing the sustainability challenges facing Africa (including innovation, good health, quality education, gender equality, clean energy, etc.). At the same time, exploring the role of industry in shaping and sustaining research programmes. To this end, the highlights of the conference included:



- Two one-day winter schools: one focusing on Bridging the Gap Between Academia and Industry and the other focusing on the role of Biophysics in Confronting Health Challenges;
- A Physics in Industry Day: showcasing the work of Physics alums in industry. Delegates attending the Industry Day also discussed the development of an Industry Connection Roadmap aimed at strengthening the physics community's ties with industry;
- SAIP Day celebrations: where we journeyed from the past into the future, reflecting on the establishment of the SAIP over the past decades while keeping an eye on the current and future role of the SAIP in ensuring a thriving Physics community in South Africa;
- A teachers' programme run in partnership with the DSI: aimed at addressing the skills gap identified in the Matric Diagnostics Report and general misconceptions in physical

Image 1:
The image above shows some of the participants in this year's conference.

To view the conference programme please scan the QR code below



science; and

- A complete programme of world-class plenary and non-specialists talks

In addition to the activities mentioned above, an overview of the 300+ conference contributions made by the South African physics community (academics and students) (see pie chart) shows that Physics in South Africa has long been contributing to the achievement of the global Sustainable Development Goals, with established focus areas in innovation, clean energy, health, and education.

have the necessary skills to thrive in these environments. It also aims to strengthen ties with industry to leverage the mutually beneficial opportunities between academia and industry.

The entire conference programme can be downloaded here: https://saip.org.za/SAIP2022/SAIP%20Programme%20Book%20Final%202022_final.pdf. Please get in touch with lindsayw@mandela.ac.za should you wish to contribute to the development of the Industry Connection Roadmap or to request a conference recording.

WHAT IS THE ROLE OF PHYSICS IN SOCIETY?

In the future, the Applied Physics Division of the SAIP will continue to develop and implement an Industry Connection Roadmap for South Africa. The roadmap aims to tackle student retention, graduate employability, funding, and entrepreneurship issues. It aims to do this by exploring future technological trends and the physics-related employment landscape; and ensuring that our graduates

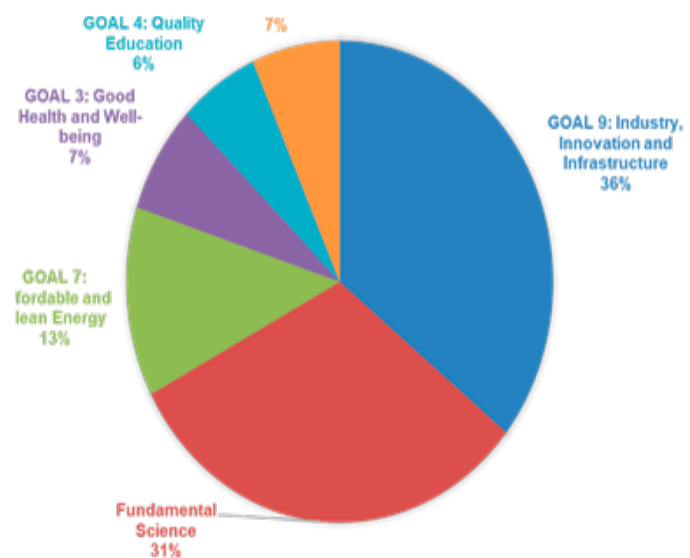


Figure: Distribution of conference abstracts grouped according to the global Sustainable Development Goals. <https://focus2030.org/What-are-the-Sustainable-Development-Goals>



STUDENT PRIZES AT THE SAIP 2022



*Best Honours Oral
Presentation*



Space Science

Jaclyn Stevens (North
West University)

Applied Physics

Nalesi Segale (UCT)

Physics Development, Education & Outreach

Busisiwe Mbuyisa (University of Venda)





Best MSc Oral Presentation



Theoretical & Computational
Physics

Mr Akshay Durgapersadh (UKZN)

Semiconductor Science and/or
Technology

Nicholas Hoy (UNISA)

Applied Physics

Cade Ribeiro Peters (Wits)

Nuclear, Particle & Radiation Physics

Josiah De Klerk (UCT)

Happy Vilakazi (UNISA)

Anza Mulaudzi (Wits)

Orcel Thys (CPUT)

Photonics

Cade Peter (WITS)

Eugene Fouche (Stellenbosch)

Astrophysics

Sriram Shankar (SAAO)

Condensed Matter Physics and/or
Materials Science

Eugene Sibanda (UJ)

Space Science

Mbali Dlamini (UKZN)





Best Phd Oral Presentation



Theoretical & Computational Physics
Mr Blessed Arthur Ngwenya (UCT)

Applied Physics
Bereneice Sephton (Wits)

Nuclear, Particle & Radiation Physics
Cebo Ngwetsheni (UWC)
Xola Mapekula (UJ)
Ryan McKenzie (Wits)
Sukanya Sinha (Wits)

Photonics
Berenice Sephton (Wits)
Keshaan Singh (Wits)

Astrophysics
Michael Sarkis (Wits)

Physics Development, Education
& Outreach
Chané Simone Moodley (Wits)

Space Science
Jabus van den Berg (NWU)



Special Categories



MSc Applied
Photonics:

Pedro Ornelas
(Wits)

PhD Applied
Photonics:

Chané Moodley
(Wits)

Photonics in
biology

Zaria Malindi
(UJ)

Photonics technology prize

Technology prize:
Irma Rabe (NMISA)

Condensed Matter Physics/
Material Science

PhD Publication Award: G.
Mwendwa (Wits)

MSc Publication Award: B.C. Tladi
(UFS) and E.T. Sibanda (UJ)

Semiconductor Science
and/or Technology

R.I. Maphoto (UL)

Condensed Matter Physics/ Material
Science

The Frank Nabarro Oral PhD
Presentation Award: Leonato T
Nchinda (UP)

Congratulations to all!

Thanks for reading!



Email: physicscomment@saip.org.za

Date: August 2022