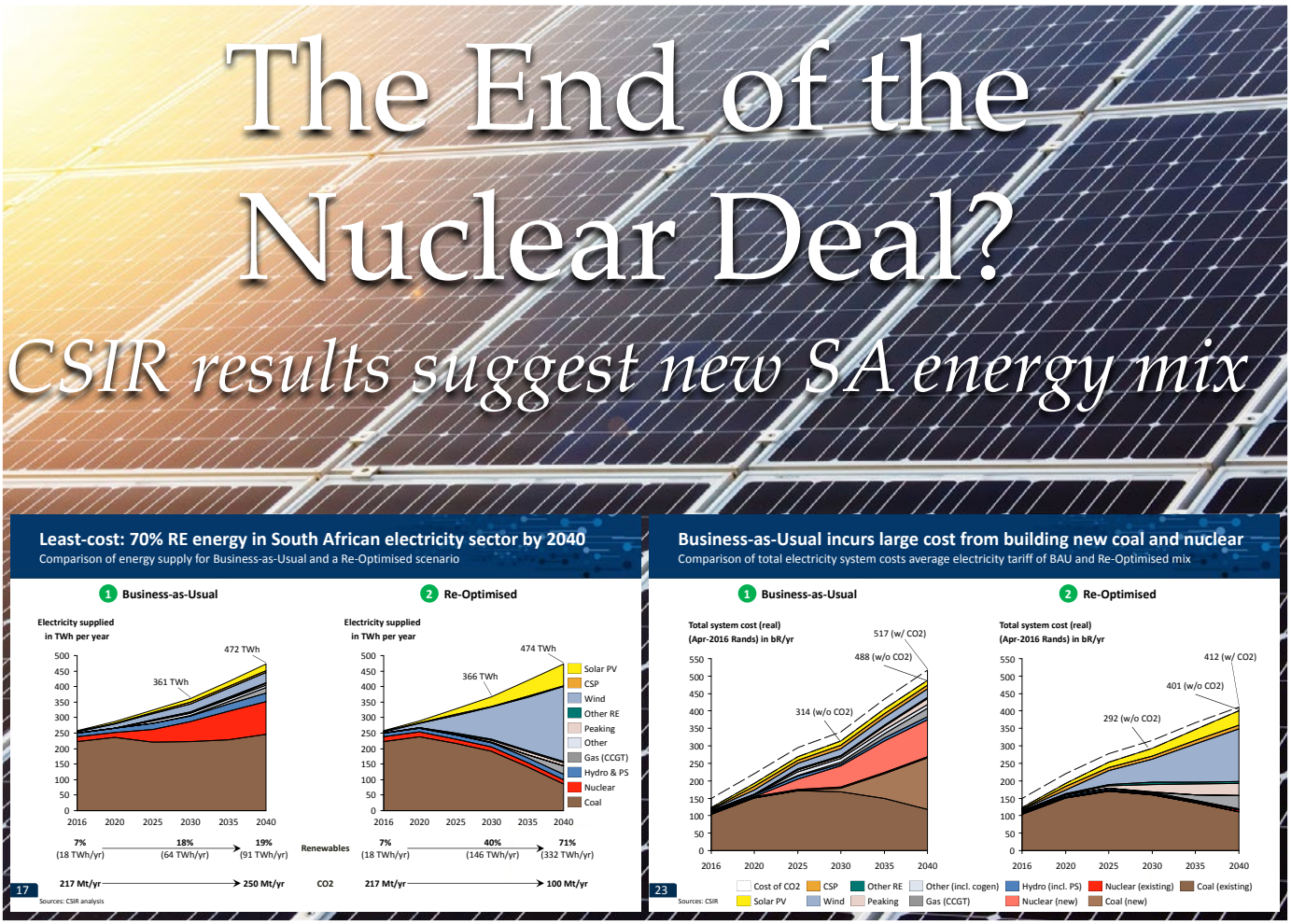
Physics Comment

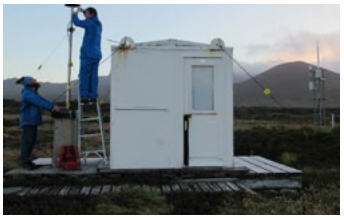
A Southern African Physics Magazine



A Quarterly Newsletter Vol.8 | Issue 2 | December 2016

The end of the University Library

In the fourth part of his analysis, Dave Walker looks at libraries (pg 25)



Space Science at Land's End

A 14 month stay on Marion Island 2000 km southeast of Cape Town is a unique opportunity to do space physics. (pg 29)

Spiral Laser

A new technique developed in South Africa allows to produce spiral light with twisted electric fields directly in a laser. (pg 32)

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Editor's Note

Do we need to create a new approach to science? In a video clip that went virulent in October 2016 we witnessed questioning of the validity of Newton's theory of gravity by a group of UCT students. They see themselves as part of the so-called "fallist" movement, which aims at de-colonising society, i.e. freeing us from prejudiced colonial concepts. While in Physics, Newton's theory has already been questioned and in fact replaced by the theory of General Relativity, the UCT student shown in the video accused Newton's theory of being postulated ad hoc and unjustified and without taking into account an African perspective or knowledge. She concluded that a de-colonialisation of science should discard our entire scientific knowledge and restart science from the beginning. Little did the student know, it seems, that enlightenment had started its scientific programme nearly four-hundred years earlier with a similar radical proposal. Rene Descartes' suggested "tabula rasa", the latin expression for cleaning the board completely, and find out what can really be known. While the fallists might share with Descartes the desire to wipe out prejudices, they might be surprised to know that the aim of the very science, that they are criticizing, was to create universal knowledge that is not specific for, nor belonging to a certain culture but shared by the whole of humanity. Not knowing your history means that you have to (painfully) invent the wheel twice.

This issue of Physics Comment reports about a new CSIR study that identified a way cheaper energy mix to secure the future electric power demands in South Africa. Based mainly on wind, solar power and existing coal power stations, it would save the country 90 billion Rand per year and thereby emit 60 % less carbon dioxide and consume 60% less water. It is thus worth considering before the country embarks on the government's costly Integrated Resource Plan 2016 that was published on 25 November 2016. A public consultation process is inviting written comments (http://www.energy.gov.za/files/irp_frame.html) and I hope physicists make themselves heard.

We also discuss the crisis of university libraries and the way forward in an analysis by Dave Walker.

PC is looking forward to your feedback.

Image on front page:
Diagrams of the CSIR study reprinted with kind permission of Prof T. Bischof-Niemz, the director of the Energy Centre at the CSIR.

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.

News from Africa

The 61st Annual SAIP conference held at UCT

Thomas Konrad (UKZN, Durban) and Brian Masara (SAIP office, Pretoria)

The SAIP 2016 annual conference took place at the University of Cape Town (UCT) from the 4th-9th July, jointly hosted by the physics and astronomy departments of UCT. The conference was officially opened by Dr. Daniel Adams, Chief Director: Basic Sciences and Infrastructure from the Department of Science and Technology (DST).

Prof Gagnon: "Women and Diversity in Physics"

The X-Files of Particle Physics

Plenary talks: A total of eight invited plenary talks were presented, with titles as curious as "Neutrinos- The X-Files of Particle Physics" (by Prof Karl Zuber, TU Dresden in Germany) or "Fire Flares and Fusion: Some Wonderings in Plasmaland" (by Prof Manfred Hellberg, UKZN in Durban). Prof Pauline Gagnon who works at CERN in Geneva, discussed "Women and Diversity in physics" in her humorous style illustrated with anecdotes from her life. In connection with her talk at UCT she visited several universities in South Africa and talked informative and entertainingly about her experience as a female researcher in physics. The variety of topics presented in the plenary talks at the University of Cape Town reflected the attractive diversity of the divisions and for a that meet annually at the SAIP conference.

According to the SAIP customs, de Beer Gold and Silver medalists give plenary talks at the annual conferences. Actually, it would have been the turn of the SAIP Silver Jubilee Medal Winners of 2015, Dr Angela Dudley from the National Laser Centre of the CSIR, and Dr. Shazrene Mohammed of SAAO. However, this time they were joined by Prof Manfred Hellberg from the University of KwaZulu Natal in Durban, who won the SAIP De Beers Gold Medal already in 2014 but had not had the opportunity to give his talk at the 60th Annual Conference in Port Elizabeth in 2015. Both medals are awarded for outstanding achievements in one of the physics branches: research, education, technology and industrial development. While the Silver Medal is reserved for researchers younger than 35 years, the Gold Medal is intended to be the greatest distinction that can be conferred in South Africa for achievement in physics.

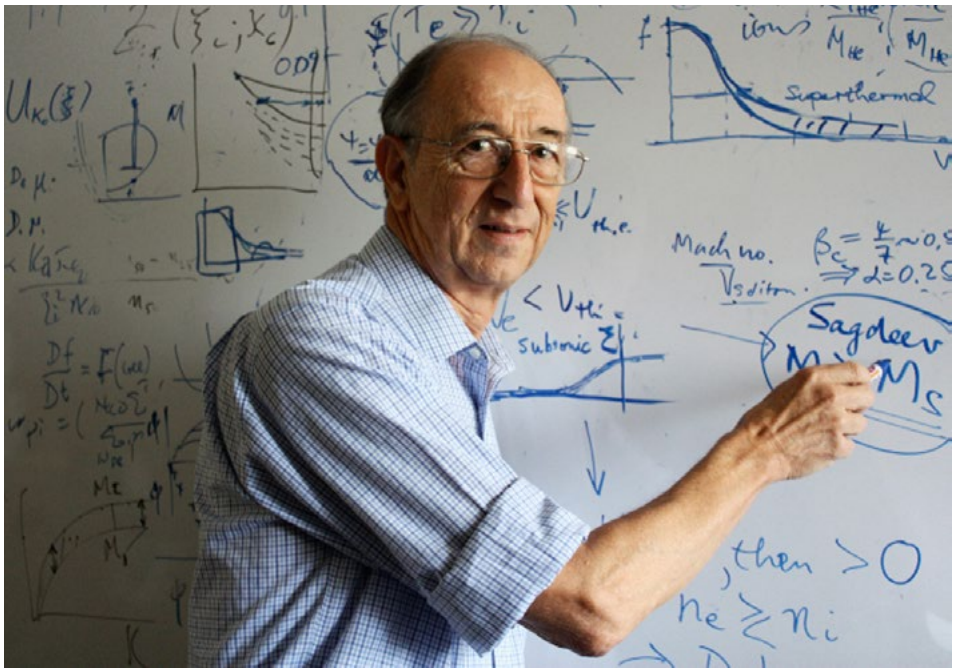
The conference was preceded by two successful Winter Schools.

Winter School 1: From the Smallest to the Largest Scales: Our Evolving Universe

This Winter school addressed fundamental questions in Physics: What do we know about the origins, history, and evolution of our universe? What do we know about the interplay of cosmological evolution and particle physics, the phases of matter and the phase transitions in the early universe? The winter school aimed to discuss nothing less than the main ideas and current issues of elementary particle physics combined with cosmology related to experiments in CERN and with Square Kilometre Array in South Africa and Australia.

Winter School 2: The Biophysics of Cells and Macromolecules

The second winter school studied the biophysics of living systems seen as the ultimate sustainable resource of the planet and the basis of future

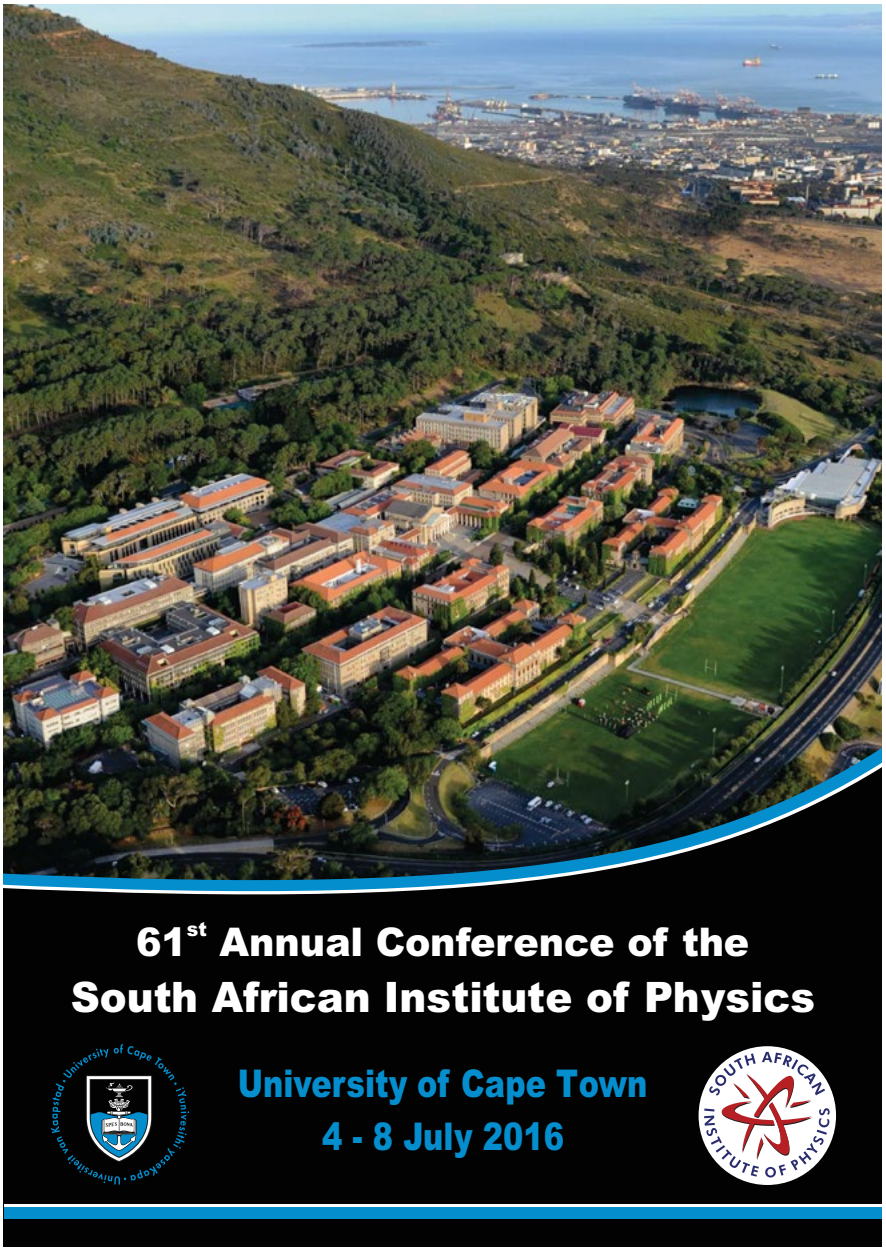


De Beers Gold Medalist Prof Hellberg: "Wonderings in Plasmaland"

technologies. Biophysicists work to define the structures, energetics, mechanics and other physical properties of living cells and the macromolecules from which they are made and in this way obtain insight into the way these complex assemblies work. The insights gained are leading to useful interventions: medical and agricultural products, sustainable energy, industrial enzymes and even cell-like assemblies having useful synthetic properties.

The current strategic focus of SAIP is the improvement of physics education

Teacher and role model Dr Colleen Henning at CERN, where she worked with a group of her High School students that won a student contest for beam time.



Teacher Development Workshop

For the 61st annual conference, SAIP also organised a teacher development workshop that took place during the event. The current SAIP key strategic focus is the improvement of physics education at Schools and Universities. One of the goals underpinning this strategy is the enhancement of the professional competence of physical science teachers. As a recognized professional body, SAIP is faced with the imperative to offer courses for Continuing Professional Development (CPD) of Physicists and Teachers.

In 2014, Dr. Colleen Henning, HOD for Science at St John's College in Johannesburg, and a member of SAIP attended a successful meeting of the American Association of Physics Teachers (AAPT) in the USA which provided the inspiration and verve to host a similar event in South Africa. In the wake of the visit, Dr. Colleen Henning in collaboration with Dr. Horner from Siyavula skilfully organized two workshops in Johannesburg and Cape Town in 2014 with a total attendance of about 140 delegates per workshop.

SAIP aims to adopt the successful methods for professional teacher development of AAPT for South Africa. The first step towards this goal is to invite SA teachers to the annual conference so that they participate in the activities of the SAIP Physics Education group where they will be able to

- Interact with academics working in physics education research, and share their experience
- Learn from the physics education researchers the best practice, latest research trends and concepts in teaching physics.

In turn, the University Physics Education researchers would be able to hear the challenges faced by the physics teachers and then research how to best address the issues. In due course, the 61. conference saw the launch of the SA Physics Teachers Association (SAPTA), which is now located within the SAIP Physics Education Division. In addition, on Monday the 4th July a teacher workshop was held. The positive development is followed by SAIP members and Physics Comment with a lot of interest.

South African National Space Agency (SANSA) hosts International Space Science Community

by Catherine Webster, SANSA

The VERSIM and Radiation Belt symposia were hosted in South Africa at SANSA in Hermanus for the first time from 19 – 24 September 2016 and included 55 international delegates from 16 countries. For a brief history of VERSIM check out this video by Prof Craig Rodger during the VERSIM symposium in Hermanus: https://www.youtube.com/watch?v=27Xf8k7_jZQ

Space science, specifically Extremely Low Frequency (ELF) and Very Low Frequency (VLF) radio waves in the magnetosphere and ionosphere, as well as space plasma and radiation belt phenomena, were topics of dynamic discourse recently between representatives from two international space science working groups at the 7th biennial VLF/ELF Remote Sensing of the Ionosphere and Magnetosphere (VERSIM) and Radiation Belt (RadBelt) Symposia in Hermanus. SANSA was selected to host the event, for the first time in Africa, from 19 - 24 September this year.

The synergy between VERSIM and radiation belt science led the organisers of the symposia to attach several days of radiation belt discussions to the VERSIM meeting in Hermanus.

"The symposium covered a number of important space science topics relevant to both developed and developing nations. The broad international attendance (55 persons from 16 countries) illustrates that the important sci-

entific questions in this field are global and widely interconnected," said Prof Michael Kosch, Chief Scientist at SANSA in Hermanus and the principal investigator on the Sprite1 project.

Co-chair of VERSIM, Prof Jacob Bortnik, highlighted the fact that the exceptionally high-quality magnetosphere and ionosphere data currently being collected by numerous satellites in orbit around the Earth and other planets has given rise to a truly unique time in the history of ELF/VLF science.

Since its establishment in 1975, the group has enjoyed a vast and diverse membership, currently having over 160 scientists from 26 different countries as active participants in the VERSIM group. At present, the focus of the group spans a variety of topics that involve ELF/VLF waves, including the morphology and dynamics of plasma structures and boundaries, wave-particle and wave-wave interactions, wave-induced particle precipitation, wave propagation in the magnetosphere and ionosphere, sprites and the effects of lightning on the ionosphere.

"The importance of these fields of research is that we gain vital insights into the dynamics of our near-earth 1space environment which enables us to forecast radiation levels experienced by satellites during space weather storms," said Prof Kosch.

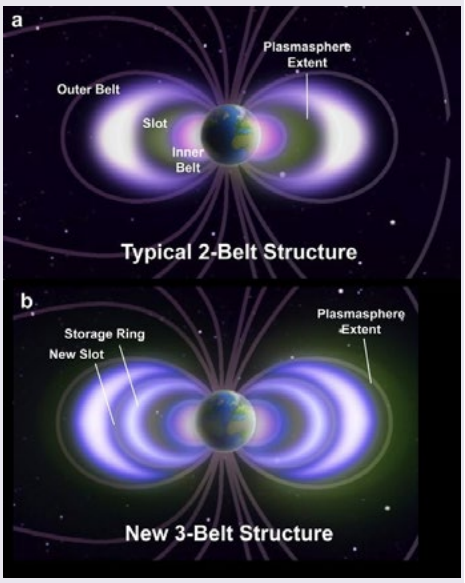
In its discussion sessions during the week-long event, the RadBelt working group looked at the observations, theory and modelling of the Van Allen radiation belts and other plasma populations and processes that influence radiation belt dynamics. All satellites that fly at high altitudes (for example GPS or geosynchronous orbits) must fly in or through the radiation belts, and these belts can even extend to lower altitudes and thus affect manned missions.

Radiation is hazardous to human health and electronics. Understanding radiation belt dynamics helps to ensure that space-flight remains a safe endeavour.

In addition to the science sessions, the delegates participated in outings such as a visit to a penguin colony and a tour of SANSA's Hermanus facility, as well as wine tasting in the picturesque Hemel en Aarde Valley.

"These gatherings are important as they provide a platform to share ideas and showcase the latest research in our field. But even more important is to build a community, foster healthy work relationships and create collaboration between scientists who are separated by large distances and different cultures and disciplines. New ideas often lead to successful partnerships that last well beyond the meeting," said Jacob Bortnik.

1 Sprites (also known as Transient Luminous Events) are optical gas discharges from the top of convective thunderstorm clouds at an altitude of 50-100 km



The first major scientific discovery of the Space Age was that the Earth is enshrouded in "belts" of very high-energy magnetically trapped charged particles. Early observations of these belts, known as the Van Allen radiation belts, showed an inner zone dominated by high-energy protons and an outer zone dominated by high-energy electrons as seen in image a. Subsequent studies showed that electrons in the energy range 100 keV < E< 1 MeV often populated both the inner and outer zones with a pronounced "slot" region relatively devoid of energetic electrons existing between them. The energy distribution, spatial extent and particle species makeup of the Van Allen belts has been subsequently explored by several space missions. However, recent observations by the NASA dual-spacecraft Van Allen Probes mission have revealed unexpected properties of the radiation belts, especially at highly relativistic (E > 2 MeV) and ultra-relativistic (E > 5 MeV) kinetic energies. A study using high spatial and temporal resolution data from the University of Colorado's Relativistic Electron-Proton Telescope (REPT) experiment on board the Van Allen Probes show that multiple belts can exist concurrently and that an exceedingly sharp inner boundary exists for ultra-relativistic electrons as seen in image b. For more info check out this video of a public talk hosted at SANSA by Prof Daniel Baker https://www.youtube.com/watch?v=VJ2Uu9q8NJ8

Brexit: The fallout for African research

This article was originally published by Research Africa on the 30th June 2016 and has been reproduced in Physics Comment with the publisher's permission

The shock vote by the UK to leave the European Union last week has been met with mixed views from Africa-based scientists, with their responses ranging from morose to optimistic. Britain's 'Brexit' vote sent the Sterling plummeting and has caused global economic instability as countries and institutions wonder what the future holds.

While many questions remain unanswered, scientists in Britain fear an exit from the EU and the economic backlashes thereof will impact their work negatively—especially as the UK is one of the biggest recipients of joint European research funding.
However, in Africa, opinions diverge widely on whether Brexit will spell doom or bust for the continent's scientific endeavours.

"The short answer is – we are not worried or specifically concerned," says Daan du Toit, deputy director-general of international cooperation and resources at South Africa's Department for Science and Technology.
Du Toit, who lived and worked in Brussels for many years as South Africa's scientific attaché, says that since Britain's exit from the EU will take time, it is unlikely to affect existing projects under the Horizon 2020 programme. Nor does he believe future projects under the programme, which ends in 2020, will be affected.
With regards to South Africa's bilateral relationship with the UK, he says: "We have firm and long-term commitments in place for cooperation, and are not concerned in any manner this will be affected."
However, he says, the institutional turmoil currently gripping Europe could distract the continent from broader international cooperation. This could in theory affect research collaborations with South Africa, he says, but he says his government's "robust partnerships with the UK and the EU" should safeguard these partnerships.

Others are not so confident. Kevin Marsh, former director of a Kenya-UK medical research partnership and long-term Kenya resident, believes there are several ways in which Brexit can damage African science.
"From a research point of view Africa-UK partnerships are very significant, and there are areas of concern. Firstly, the possibilities of reductions in direct funding from the EU for UK-Africa partnerships," he says. Secondly, he adds, the ability of UK groups to interact positively and equitably with African colleagues depends on UK science itself being in good general health. "Here there is extreme concern because UK science has been such a beneficiary of being in the EU. If this funding stream reduces UK science will potentially contract, and with it its ability to be outward looking."

Nigerian scientists, queried about Brexit, did not believe it would have much immediate effect. "The challenge may come if the UK and the EU economy takes a downturn," says Oladoyin Odubanjo, executive secretary of the Nigerian Academy of Sciences.

There could be some reluctance from the UK to offer as much as before in grants to Nigeria because of economic uncertainty, he says. "However, over time, the UK might actually begin to increase its partnership with commonwealth countries and that includes Nigeria."

Another potential casualty could be large-scale science projects involving UK and EU partners as well as African countries. One such project is the African Light Source project—a nascent initiative to build the first synchrotron facility on African soil.

Simon Connell, who chairs the project's organising committee, says the impacts of Brexit are unclear. While the participation in the project by individual countries has in most cases been on a national basis, he believes Brexit could be damaging on a philosophical level.

"Brexit carries to some extent a connotation of xenophobia and the difficulties of the popular acceptance of a federal unification of diverse cultures. It is this aspect of Brexit that is potentially more damaging," he says.
However others, like Joel Ochieng, secretary-general of the Kenya Universities Biotechnology Consortium, are outright positive about the impact of Brexit on research in their fields. He says it means that the UK could collaborate with Kenya in biotechnology unfettered by the anti-biotech sentiments that pervade the European Union.

"The EU had prepared a bill calling for an end to member states to stop funding to biotechnology research programmes in Africa. Now that Britain has opted out the country can independently decide what science programmes to fund," he says.
As for the younger generation—the future of African science—there are concerns that Brexit and its fallout could limit their ability to travel and study.

"Commonwealth students in the UK could vote in the referendum and along with most in academia, I voted Remain," says Tariq Desai, a South African PhD student studying genome evolution at the University of Cambridge.

"It's hard to say now, but if money is diverted in compensation, there could be fewer scholarships available for African students in the coming years, and students that do come may be part of smaller research communities," he says.

Desai also sees another kind of warning in Brexit for African scientists. "In the run up to the referendum, every vice-chancellor in the UK came out against leaving. Scientists spoke publicly about the consequences to their work if the Remain campaign lost."
But these warnings were not trusted by the public, or mattered less than other concerns, he says. "As in Britain, African research communities depend on the societies in which they are embedded. We need to do more to ensure that our relevance is felt beyond government, the private sector and the socially well-off."

South African Physics Olympiad (SAPhO) 2016

Case Risdjik, Wilderness, Western Cape

Over a hundred learners from 46 schools were selected from nearly 19 000 learners who wrote the SA National Youth Science Olympiad (SANYSO) to write SAPhO 2016 exam.

"South Africa, like every other country in the world, has amongst its youth, a latent talent that needs to be identified, nurtured and monitored, to allow them to reach their full potential", says Case Rijsdijk, SAPhO Convener. "There are talent scouts for potential sportsmen and women, why not for maths and sciences? After all, our future lies in education and a technologically based economy. Identifying future scientists and engineers is essential and SAPhO is one pathway to success."

These results were most satisfactory with an average mark of 46% for SAPhO. The range of marks was 75% and 16%. Learners, who do well in any other recognized science competition or Olympiad, can be invited to take part in SAPhO 2017 which will be held on Monday, 7 August 2017. The organisers hope to increase the SAPhO footprint by attracting closer to 200 learners to participate in the Olympiad next year.

Conrad Strydom, a grade 12 learner from Hermanus High School in the coastal resort of Hermanus, Western Cape, was the top scoring learner in this year's Olympiad with a score of 75%. He will receive a Gold Certificate, R1 500 and the SAIP Medal, which will be presented to him at the Annual SAIP Conference dinner in Stellenbosch in July 2017.

His teacher Charlotte Rabie said that "Conrad has been a focused, dedicated learner with a wide general knowledge, and that the school was proud of his achievement". Conrad added that "To me, physics has been a way to understand the Universe and my place in it. I believe this understanding can be used to push the limits of what is possible, thereby ensuring a better future. I would also like to thank all past educators for the role they have played in shaping my understanding".

In second place was Ahmed Dhansay, a grade 12 learner from Bishops, in Rondebosch, Cape Town, with a score of 73%. He will receive a silver Certificate and cash prize of R1 000. Ahmed commented, "I feel honoured to get this award, and owe thanks to my family for their continued support, my science teacher, Mr. Ledwidge, for sacrificing his free time whenever I needed help, and, of course, to SAPhO for giving me the opportunity to further my physics knowledge".

David Broodryk, a grade 12 learner from Westerford High School in Rondebosch, Cape Town, who with 72% scooped third place, he will receive R500 cash and Bronze Certificate. His reaction to hearing of his result was "As someone who is involved primarily in maths Olympiads, I am very excited about doing well in the physics Olympiad and continuing the long line of individuals lucky enough to excel at both".

SAPhO will also award those who scored between 71% and 61% Merit Certificates for their achievements and those who scored between 59% and 50% will receive Honourable Mention Certificates the remaining learners will receive Participation Certificates to acknowledge their participation in the Olympiad.

The SAPhO Convener, Case Rijsdijk, has said that he is grateful to the Department of Science and Technology and the South African Agency for Science and Technology Advancement for their support and funding. In addition, he also voiced his thanks to the SAIP Executive Officer, Brian Masara, and the Project officer, Ndanganeni Mahani for all their efforts in making SAPhO a success.

SAPhO is hosted by the South African Institute of Physics (SAIP) with the aim of identifying young southern Africans with ability in Physics, in the hope that these students will continue to study Physics at tertiary institutions and Universities within South Africa.

SAIP is the voice for Physics in South Africa. It is a professional body for practising physicists in a variety of disciplines ranging from Cosmology to Medical Physics. It has several goals, one of which is raising the awareness of Physics and its importance to our daily lives; much of which can be achieved through education.

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Case Rijsdijk Admitted as SAIP Honorary Member

by Brian Masara, SAIP office, Pretoria

Case Rijsdijk has made immense contributions towards the advancement of Physics Education in South Africa over many years.

He ably spearheaded the South African Physics Olympiad (SAPhO) through the provision of inspiring leadership that led to the initiative becoming a tremendous success. Through his passion and dedication, he successfully leveraged much-needed funding for the enhanced coordination of the South African Physics Olympiad. SAPhO serves as a crucial vehicle for early identification and nurturing of Physics talent. Case Rijsdijk has trained teachers as part of the Teacher Development Project which essentially forms an integral part of the collaborative partnership involving the South African Institute of Physics, University of Johannesburg and Institute of Physics (UK). His genuine zeal to develop material for the benefit of both teachers and learners has not gone unnoticed. His unremitting commitment to teacher professional development, in particular, is unsurpassed in many ways. In addition, he has always made himself available to serve the South African Institute of Physics in various capacities. He continues to engage with developments in physics education research through sustained interaction with researchers in the field.

More recently, Case Rijsdijk interacted with the broader physics community on various platforms with a view to crafting the Strategic Plan on the Enhancement of Physics Training in South Africa. He made significant inputs during the design and conceptualisation of the strategic plan. The implementation of the strategic plan itself would potentially have profound ramifications for undergraduate physics education within the broader South African context. It gives me great pleasure to officially announce SAIP Honorary Membership of Mr. Case Rijsdijk in recognition of the unparalleled contribution he has made towards the reinvigoration of the overall health of the physics discipline.

CCP2016 held at St George's Hotel 10 – 14 July 2016

by Brian Masara, SAIP office, Pretoria

The International Conference on Computational Physics was held at St Georges Conference Centre from 10 to 14 July 2016. The conference was attended by 100 delegates and was officially opened by the Director-General of the Department of Science and Technology Dr. Phil Mjwara.

The CCP is a series of conferences held annually under the auspices of the International Union of Pure and Applied Physics (IUPAP). The purpose of the conference series is to bring together computational scientists, leading academics, researchers and research scholars to exchange and share their experiences and research results about all aspects of Computational Physics. The conference also provides the premier interdisciplinary and multidisciplinary forum for researchers, practitioners, and educators to present and discuss the most recent innovations, trends, and concerns, practical challenges and solutions adopted in the field of Computational Physics.

For more than 25 years since its establishment, this important conference had not come to Africa. In 2013 the South African Institute of Physics (SAIP), through the leadership of Prof Nithaya Chetty successfully bid for this prestigious conference to be brought to Africa for the first time. Hence the 2016 International Conference on Computational Physics (CCP2016) was held in South Africa.

Highlights of the event included the following

- Plenary Talk by Prof Russ Taylor of SKA and Big Data
- Plenary Talk by Prof Phuti Ngoepe on Nanotechnology and Material Science Modelling at University of Limpopo
- A banquet was hosted at Freedom park by the Tshwane mayor
- An outreach event took place on Tuesday 11 July at UJ Soweto Science Centre
- The Commission on Computational Physics C20 Young Scientist winners for 2015 and 2016 gave plenary talks at the conference.

Address By The Director-General Of Science And Technology, Dr Phil Mjwara At The International Conference On Computational Physics, Pretoria, 11 July 2016

Prof. Hai-Qing Lin, Chair of the International Union of Pure and Applied Physics Commission on Computational Physics;

Prof. Nithaya Chetty, Chair of the Local Organising Committee and Deputy CEO of Astronomy at the National Research Foundation;

Prof. Azwinndini Muronga, President of the South African Institute of Physics;

Officials from various public and private sector institutions;

Ladies and gentlemen:

Opening remarks

Thank you for the invitation to come and address this gathering.

This is the first time in 25 years that the International Conference on Computational Physics is being held in Africa, and I would like to thank Prof. Nithaya Chetty and his team for making this possible.

Hosting the conference is not only an honour for our country, but also an opportunity for us to share some of the advances we have made in a number of key scientific areas, and to learn from our colleagues in the global scientific community.

The strategic importance of computational physics to South Africa

Astronomy as an area that South Africa has designated for the development of our capabilities, and over the years we have made a number of investments in this field. In 2012 we were chosen as the location for a major share of the international Square Kilometre Array which, when completed, will be the largest radio telescope on the planet. Among the many opportunities that involvement with the SKA project offers, it will help us do is enhance our capacity in the area of computational methods associated with astronomy as a science, and the fast transmission of the extremely large data sets at the heart of the SKA.

Big data science is revolutionising the way in which we process, store, access and interact with data, and will irrevocably change the nature of computing the world over. We are proud of our Centre for High-Performance Computing in Cape Town, which is actively involved in making excellent computing resources available for African scientists and students around the continent.

The centre, a Council for Scientific and Industrial Research unit, last month launched a new supercomputer, the fastest on the continent. Lengau (named after the cheetah, well known for its speed), this petascale machine was ranked 121 in the Top 500 List at the 2016 International Supercomputing Conference in Frankfurt.

This success is a demonstration of South Africa's commitment to ensuring world-class services to boost the research and industrial competitiveness of both the country and the continent.

Our vibrant computational physics community includes not only astrophysicists, but also the CSIR unit for Defence, Peace, and Security, the CSIR's Meraka Institute (which works on information and communication technologies), the University of Limpopo's Materials and Modelling Centre, and the National Institute of Theoretical Physics, among others.

Some of the benefits of computational physics

Because physics underpins the development of so many other disciplines and applications in commerce and industry, our investments in computational physics clearly have a significance beyond their immediate value. I must reiterate their enormous educational importance, especially in a country aiming to build skills towards a knowledge economy.

With science being a global endeavour, and knowledge and skills generation enhanced by interaction with peers, our

investment in computational physics and related infrastructure will boost regional and global networks, open new horizons, and improve access to critical data and development opportunities for many of our scientists and students.

This conference will also contribute to our national education and development priorities, and encourage international cooperation across all sectors of computational physics.

It will also provide us with an opportunity to strengthen capabilities in projects and collaborations in synchrotron science, astrophysics, biophysics, fluid dynamics, materials science, strong materials and nuclear research.

Concluding remarks

I am also very pleased that the conference programme includes an outreach event with learners at the Soweto Science Centre. This is a heartening contribution to our efforts to make our youngsters, especially in socially deprived areas, enthusiastic about science, with the view to getting them studying and working in critical areas, like computational physics.

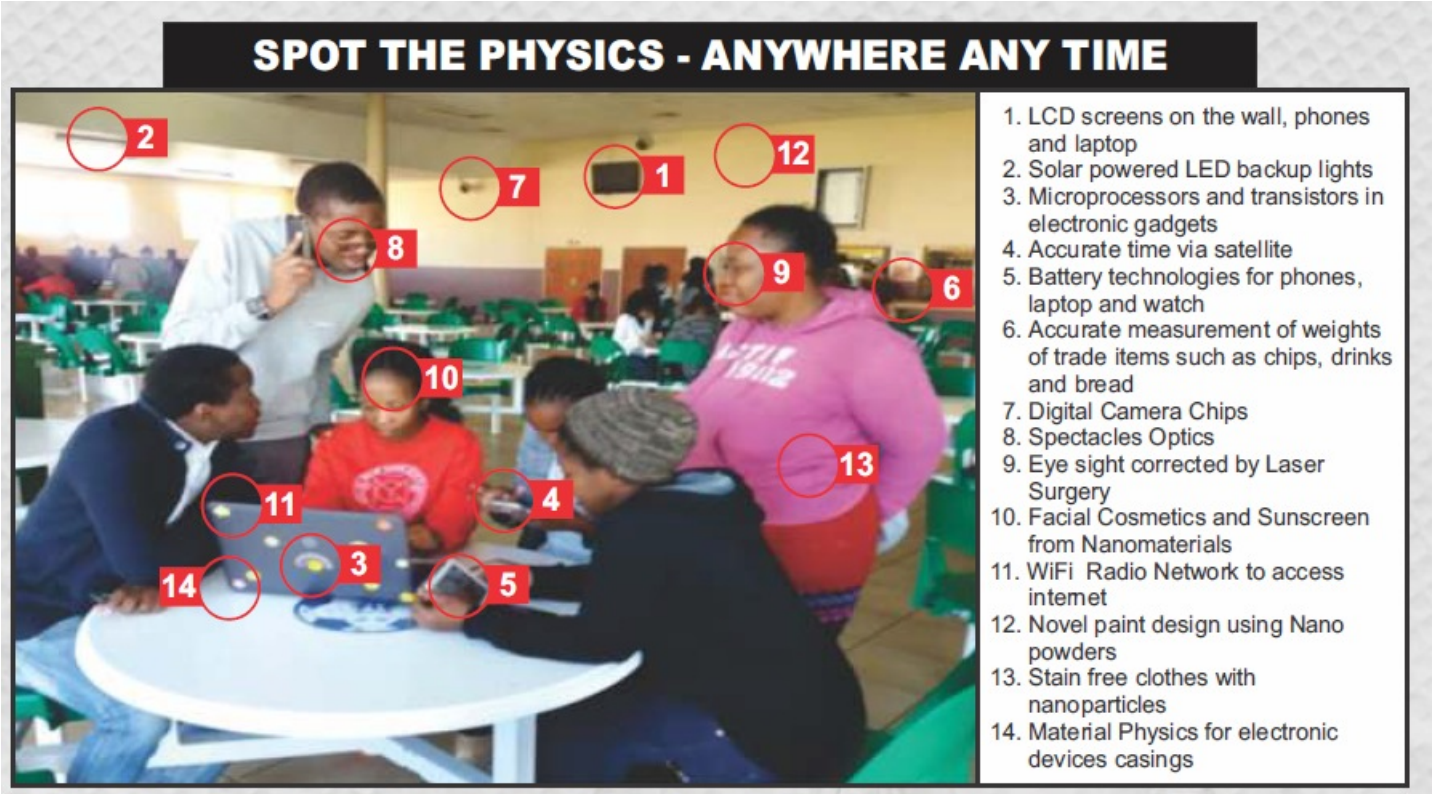
This conference provides researchers, practitioners, and educators with a platform to reflect on the latest innovations, trends, concerns and practical challenges in the field of computational physics. I am sure it will come up with many useful solutions to not only scientific but also, in the long term, social problems.

Thank you.

SAIP Hub & Spoke Model helps Physics Visibility during the National Science Week 2016

Brian Masara

This year the SAIP through its network of SAIP representatives in various parts of South Africa prompted the theme on how Physics improves our quality of life and brings about socio-economic development.



The SAIP Hub & Spoke Model

In order to increase the SAIP footprint, visibility, accessibility, and impact of physics, the SAIP is implementing a HUB and SPOKE model. The model will have departmental/institutional representatives who will work with the SAIP office to implement various physics developmental projects in their region and catchment areas.

The goal of this model is; To Increase SAIP footprint, visibility and impact through appointment of regional/ institutional "SAIP representatives" who work with the SAIP Office in information dissemination and implementing developmental projects

The nomination of departmental representatives is currently in process so far the following institutions have nominated SAIP reps for the HUB & Spoke

Advantages of SAIP HUB & SPOKE

1. It will be more effective than SAIP office travelling to organise events and run projects directly in different regions and institutions. Local "SAIP Reps" will have better knowledge of their respective communities e.g. schools in their catchment area, type of industry in a region, members in their

institution who are not SAIP members but can benefit by joining, links with their science centres and relevant stakeholders such as DoBE and DHET.

2. More publicity will be gained because Institutional "SAIP Reps" have access to their institution's Public Relations Media and Publicity Office to publicise SAIP projects and activities

3. Institutional members who are not on the SAIP mailing list can access information about SAIP through internal communications by the "SAIP Reps" in their institution. This also solves the issue of blocked SAIP Mass emails by institutions. SAIP Information will also be posted on notice boards.

4. Increased impact and visibility because there will be dedicated "SAIP Reps" at major centres across the country hence SAIP can be represented and disseminate information country wide simultaneously e.g.

• During National Science Week and SAIP can have booths / activities across the country

• During the first year orientation week all universities can be distributing careers in physics booklet and enroll first years to SAIP membership as well as make them aware of SAIP as a professional body

5. No more reinventing the wheel on similar projects e.g. every department may be developing outreach materials, career booklets and a model for teacher development. Now the model enables us to share information which is already available at SAIP office

6. Information flows in both directions hence the whole community will be made aware of activities done by all regions no more working in silos.

7. Low cost of materials design since materials are development once and replicated for all regions

8. Institutional Reps can organise institutional specific events, colloquia, and workshops, with the help of SAIP Office e.g. bringing specialist speakers, WiPiSA lunches etc

The Proceedings of the 60th Annual Conference of the South African Institute of Physics (SAIP2015)

The proceedings of SAIP2015 have been published: Please browse to http://events.saip.org.za/internalPage.py?pageId=3&confId=53
ISBN: 978-0-620-70714-5 :
Publication Date: 17 July 2016

The Proceedings of SAIP2015 will only be available electronically. The papers are ordered by SAIP Division and then alphabetically by first author surname. The PDF file of the Proceedings can be navigated from the Table of Contents by clicking on the appropriate paper title. Alt+left arrow navigates back to the previous view. All the content of the PDF file is searchable.

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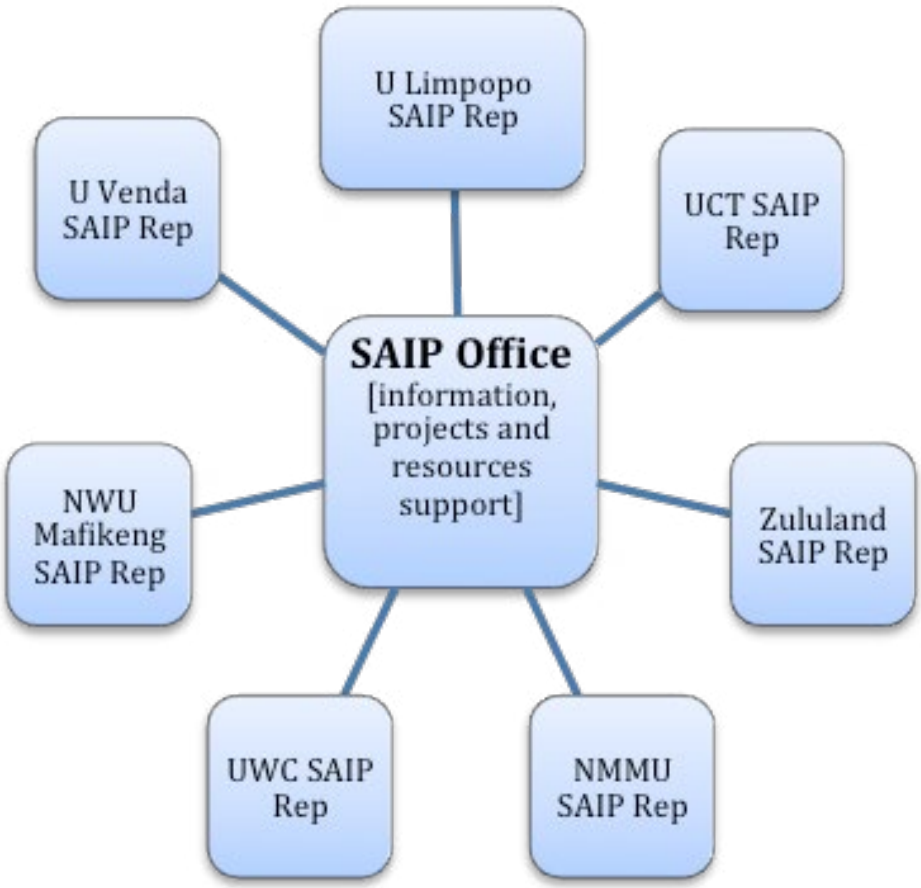
Available online at http://events.saip.org.za

Please visit the SAIP facebook page to see photos, listen to audios and radio interviews of the various activities that took place across the country during 2016 National Science Week https://www.facebook.com/South-African-Institute-of-Physics-1660099704207118/?ref=bookmarks

Complete SAIP2015 Proceedings:
Note: We recommend to first save the file to your machine (with a Right-click --> Save as...) and to then open / view the saved file.
• ***Original Proceedings PDF (68 MB and a total of 565 pages), (Published 17 July 2016)***

Addendum to the SAIP2015 Proceedings

• ***Addendum Proceedings PDF (5.2 MB and a total of 47 pages), (Published 12 August 2016)***



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Like the SAIP Facebook Page

Like the SAIP Face book page to stay in touch with 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 posted please let us know and share those great moments with the community. https://www.facebook.com/South-African-Institute-of-Physics-1660099704207118/

South African Institute of Physics National Science Week Activities

National Science Week (NSW), an initiative of the Department of Science and Technology (DST) is a countrywide celebration of science involving various stakeholders and/or role players conducting science-based activities during the week. It is run in all nine provinces simultaneously at multiple sites per province. SAASTA has been appointed by the DST as the implementing agency and play the role of the National Project Manager for the National Science Week.

Each year a different theme is chosen and activities are offered around the theme to the target audiences. The theme for 2016 was "Science for Sustainable Development and Improved Quality of Life". The 2016 NSW took place from 8 – 13 August. SAIP was part of the exhibitors at the launch which was held at the University of the Western Cape from the 05th to the 6th of August 2016.

For the first time SAIP received a grant from SAASTA after successful bid for National Science Week 2016 under the theme "Physics Improving Our Quality of Life'.

In the proposal we proposed multi activities through our Hub&Spoke reps. Our planned activities were executed successfully. The team started off by designing a NSW flyer "Physics Improving Our Quality of Life". After the flyer we developed a promotional vedio clip on "How Physics Improves the Quality of Life and makes the World Beautiful".

We had 11 teams from 10 universities taking part of SAIP NSW 2016 activities. Each team had planned activities which included:

Outreach to Schools and Distribution of the flyer named "Physics Improving Our Quality of Life". Each team visited the identified schools to distribute flyers and materials to the learners and the educators. Then the team presented an interactive session on importance of physics in improving the quality of life for the benefit of the society.

Each team had a task of organising a 3-hour seminar during the National Science Week under title: "Physics in Our Everyday Life - Promoting Sustainable Development and Improving Our Quality of Life". The target audience were undergraduates, post graduates and open invitation to public.

Fig. 1. Dr Mark Herbert Seminar at UWC for Smart Program.

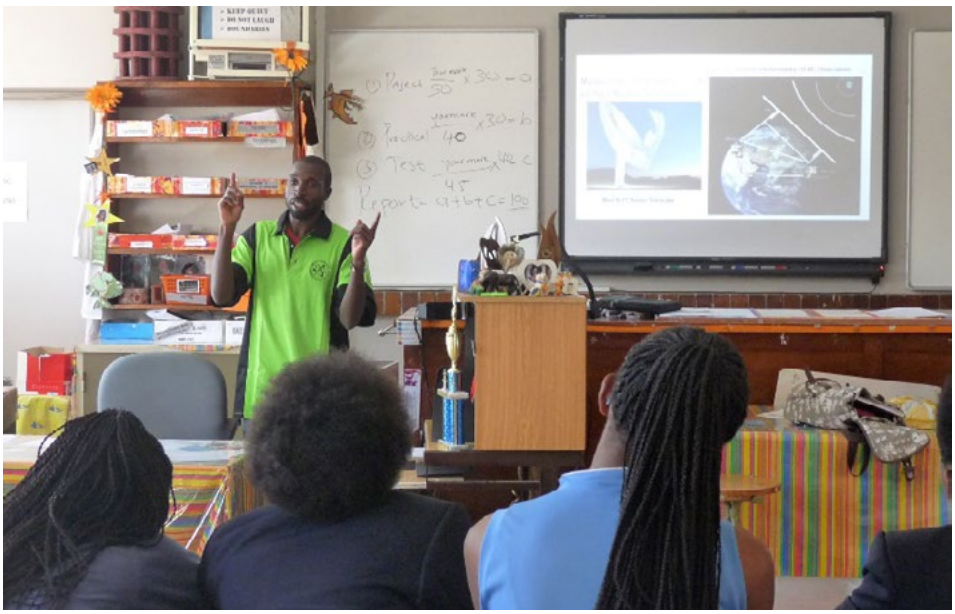

Fig. 2. NW-Potch Team at High School for Girls Potchefstroom.

Target Audience	Total Reached
Schools	**62**
Learners	**4482**
Educators	**171**
University Students	**1058**
Postgraduates	**184**
Researchers and Academics	**941**
General Public	**82585**
Grand Total	**89421**

Overall Statistics

In total our NSW teams reached a total of 62 schools including the 25 schools reached by the UWC Team led by Dr Mark Herbert (Table 1). We achieved a total reach of 82 585 through different media platforms. Most of our activities were posted and advertised on SAIP Facebook Page, SAIP Website and university campus radios. Representatives of NWU (Mafikeng and Potch Campus) did a radio interview at the NWU FM 105.5 Station during the National Science Week. NWU FM has a listener ship of over 50 000 people including surrounding areas. The Univen Team also had an interview at Univen FM Community Radio. For more info visit the following links https://www.facebook.com/South-African-Institute-of-Physics-1660099704207118/ and http://saip.org.za/index.php/news-and-events/other-events

Fig. 3. Mr Dyeyi (WSU) at Umtata High School.

Fig. 4. Wits Team at Limpopo, Venda.

Fig. 5. Univen Team inside Univen FM Community Radio Studio.

SAIP NSW 2016 Reps	
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1. UNISA	Dr Moloi Sabata
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3. US	Dr Pieter Neethling
4. NWU- Potch	Prof Christo Venter
5. WSU	Mr Thembinkosi Dyeyi
6. UWC	Dr Mark Herbert
7. UL	Mr Netsianda Makonde
	Maphanga
8. UNIVEN	Dr Eric Maluta
	Miss Ndanganeni Mahani
9. WITS	Prof Andreas Faltenbacher
10. NMMU	Mr Mpathi Collin
	Mr Nobom Hashe
11. UP	Prof Mmantsae Diale

Fig. 6. Univen Team at Nzhelele Valley Mall.

Fig. 7. UL Team with learners.

Physics and Society

Changing the world 101

The Hawu! Science outreach Initiative was born out of what seemed at first to be a crazy idea that had taken root in the mind of Maria Schuld, a PhD student at the school of Chemistry and Physics, Westville Campus, to start an initiative geared towards encouraging young people to pursue a career in science. I (Sinqobile Mahlaba, MSc Student) remember her telling me about it, and I jumped on board without any hesitation, as I have always wanted to make a positive contribution in my community. And that was the birth of Hawu!, a student led community outreach project aimed at getting young people interested in science.

The South African Delegation (Sinqobile and Maria)

The project was named Hawu!, a word from the isiZulu language used as an expression of surprise, confusion, shock, amazement and disbelief. The name is appropriate as it has been the typical reaction from the children whenever they learn a new and interesting scientific fact.

The initiative is divided into two components, the first, a tutoring project directed at primary school children. The tutoring project involves the creative use of household items to perform scientific experiments, designed and executed by the children. An example of one such experiment was addressing the question of "What is light?", where the pupils had to use everyday items to determine the weight, speed, taste and feel of light. There are a total of five postgraduate students from the School of Chemistry and Physics employed as tutors through UKZN, and tutoring sessions typically involve 40 primary school learners.

The second component involves mentoring Grade 11 pupils on what it means to be a scientist, and what a scientist basically does. The main aim of the mentoring project is to help instil or nurture the confidence

The awards ceremony

of the pupils in their intellectual capabilities. Our belief is that anyone can become a scientist, and that is the message we are trying to bring across to these young people. The total number of learners involved in the mentoring project are 25, with eight mentors from the College of Agriculture, Engineering and Science. We have partnered with the Umkhumbane Schools project, a non-profit organisation that provides maths tuition for the learners from the five schools situated in the Cato Manor Township (Wiggins Secondary, Chesterville Secondary, Mayville Secondary, Umkhumbane Secondary and Bonela Secondary schools). The learners were selected by the organisation based on hard work, promise and enthusiasm for the sciences. The mentoring

sessions take place every alternate weekend for a duration of two hours each. Tanja Reinhardt from STEC@ UKZN provides administrative support, while funding is mainly from the Optical Society of America and RAILREFURB, a private local company.

An event that stands out from my involvement with Hawu! was a mentoring session, where the learners had to answer an open question requiring them to "make something out of nothing". They were given different materials such as fabrics, glue, boxes etc., and the items they came up with were very creative. One group even made a suit of armour from fabrics, leather, paper and pebbles for Thor!

Inadvertently, I also ended up benefiting from the project, as I was given a chance to accompany Maria to Berlin, Germany as she was receiving the "Starke Ideen am Start 2015" award on behalf of Hawu! from the German Academic Scholarship Foundation (Studienstiftung des deutschen Volkes), worth 1000 euros. A day before the awards ceremony, a workshop was held where most of the awards recipients had a chance to converse with people who have different expertise on the establishment and effective management of non -governmental initiatives. For instance, there was a gentleman who was a Non Profit Entrepreneur, whose job entailed determining the success or failure

Project presentation

Poster presentation

Enthusiastic learners from the tutoring programme

The mentoring Super-Team!

of a non-profit venture. There was also a lady whose expertise was in getting people to participate and support these initiatives. Her talk was on overcoming challenges faced when trying to get time to interact with students without infringing upon their learning time, as has been the case in some instances. Overall, I had an opportunity to learn a lot, as I had a chance to hear first-hand accounts of challenges faced when trying to help a community. This is relevant, more especially since most people are sometimes not welcoming of intervention, no matter how much the community as a whole stands to benefit.

The awards ceremony was also an eye opening experience as I had the opportunity to meet distinguished young people who were committed to contributing towards a positive change in their respective communities. The biggest prize went to a fellow named Dominic Ponattu, a student whose project provides disadvantaged women from India an opportunity to study towards a nursing qualification. This not only empowers the recipients of the scholarships, but is a form of economic emancipation due to better job prospects afforded by the qualification. These women can in turn educate their own daughters! What struck me the most was the innovation of the young people receiving awards, and how they were actually active in making the world a better place, no matter how infinitesimally small the change was. It was a big inspiration towards fully committing myself, not only to Hawu!, but to serving the South African community at large, and being an ambassador of science.

The Narrator is Sinqobile Mahlaba, a student from the school of Chemistry and Physics, currently undertaking her MSc in Chemistry. I attended Wiggins Secondary School from grade eight to matric, giving me an insider's insight into the unique challenges faced by the youth from the Cato Manor Area. I am both a tutor and Mentor in the Hawu! Initiative, and I am very much involved.

Maria Schuld has studied political and natural sciences at the Freie Universitaet Berlin and is currently carrying out her Phd studies on quantum machine lerning under the supervision Prof Francesco Petruccione at the University of KwaZulu Natal in Durban.

Editorial

Nuclear Deal not optimal

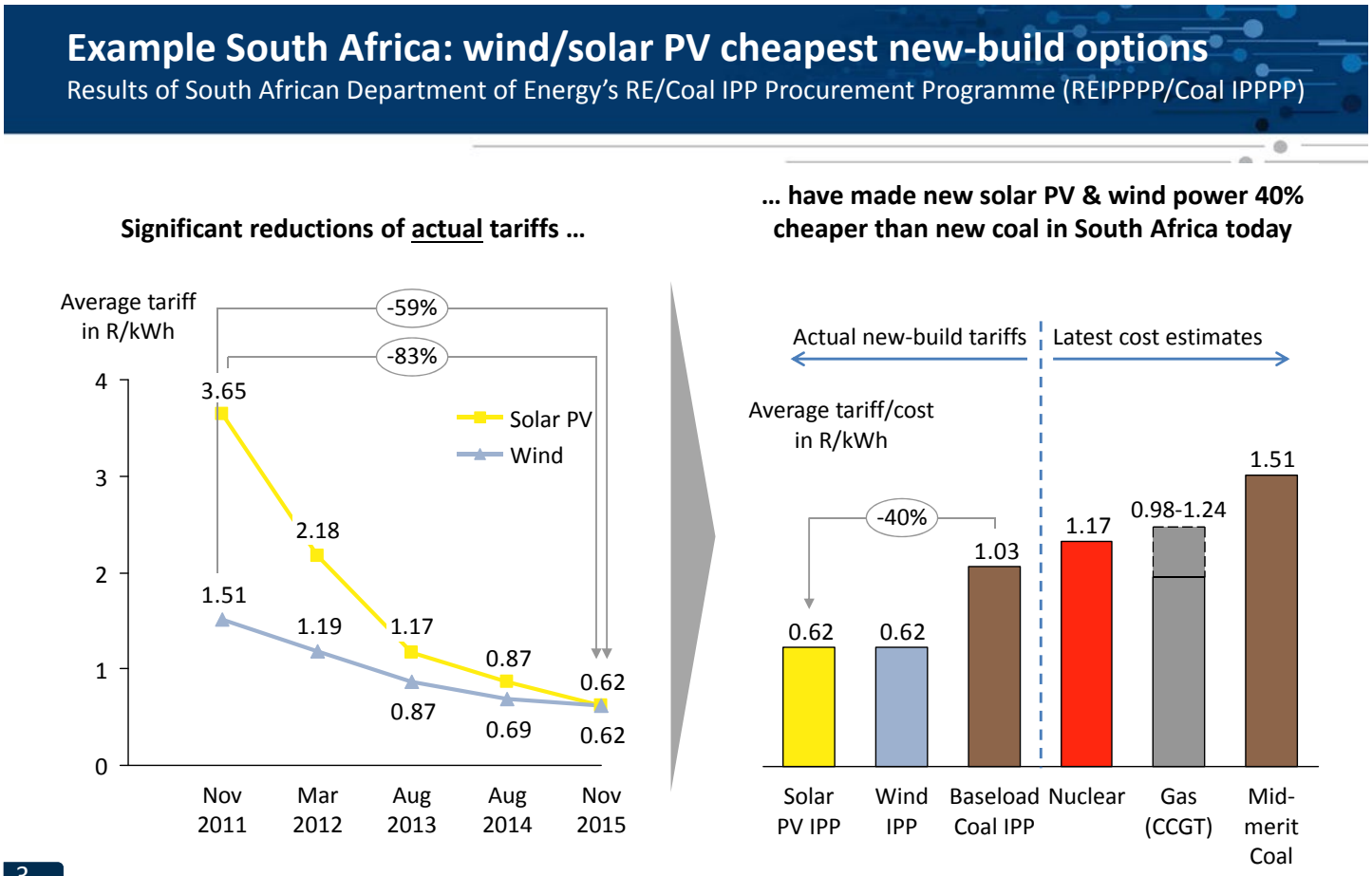
by Thomas Konrad, UKZN, Durban

A CSIR study of the optimal mix of resources to generate electric power for South Africa in the immediate future (2016-2040) identifies a scheme which covers increasing demands by wind and solar power as the most economic solution. The study projects the costs for the current government plans which rely on the purchase of nuclear power stations to be almost 90 billion Rand per annum higher.

The plans of the government to procure nuclear power stations producing 9.5 GW for an estimated cost of 1 trillion Rand from Russian Company Rosatom have been controversially debated among physicists in several issues of *Physics Comment* since they became publicly known in Sept 2014 (cp. PC April 2016, PC Sept&Dec 2015, PC June 2015, PC Dec 2014 and PC Sept 2014). They are based on the Integrated Research Plan 2010-2030 for electricity, which was accepted by the South African Parliament in 2011. An update of the plan commissioned by the Department of Energy, the IRP 2013 never acknowledged by Parliament, already recommended a different future energy mix with less or no nuclear power, depending on the development of power demand and prices for power generating technologies. Recently Minister Tina Joemat-Pettersson presented a new update of the electricity plan, the IRP 2016, to the Ministerial Advisory Council on Energy (MACE) on the 15th September 2016.

IRP 2016 was not endorsed at the meeting in September but instead has been scrutinized by a subcommittee of MACE consisting of Prof Anton Eberhard, Prof Johan van Dyk, Mr Mike Levington and Prof Tobias Bischof-Niemz (see Moneyweb article by Chris Yelland). Meanwhile, the CSIR Energy Centre has produced its own study of the optimal strategy for the SA electricity supply, which was presented by the Director of the Centre, Prof Bischof Niemz, at the Windaba Conference in Cape Town on the 3rd of November. Prof. Bischof Niemz worked as a specialist for Photovoltaics and Renewables at Eskom (2012 -2014) and was involved in the work on the IRP. With a PhD in Automotive Engineering from the Technical University of Darmstadt in Germany, he also is an extraordinary

Figure 1: Actual tariffs for PV and wind power are now below cost assumptions of IRP 2010. They have become the cheapest option.



Associate Professor at the University of Stellenbosch.

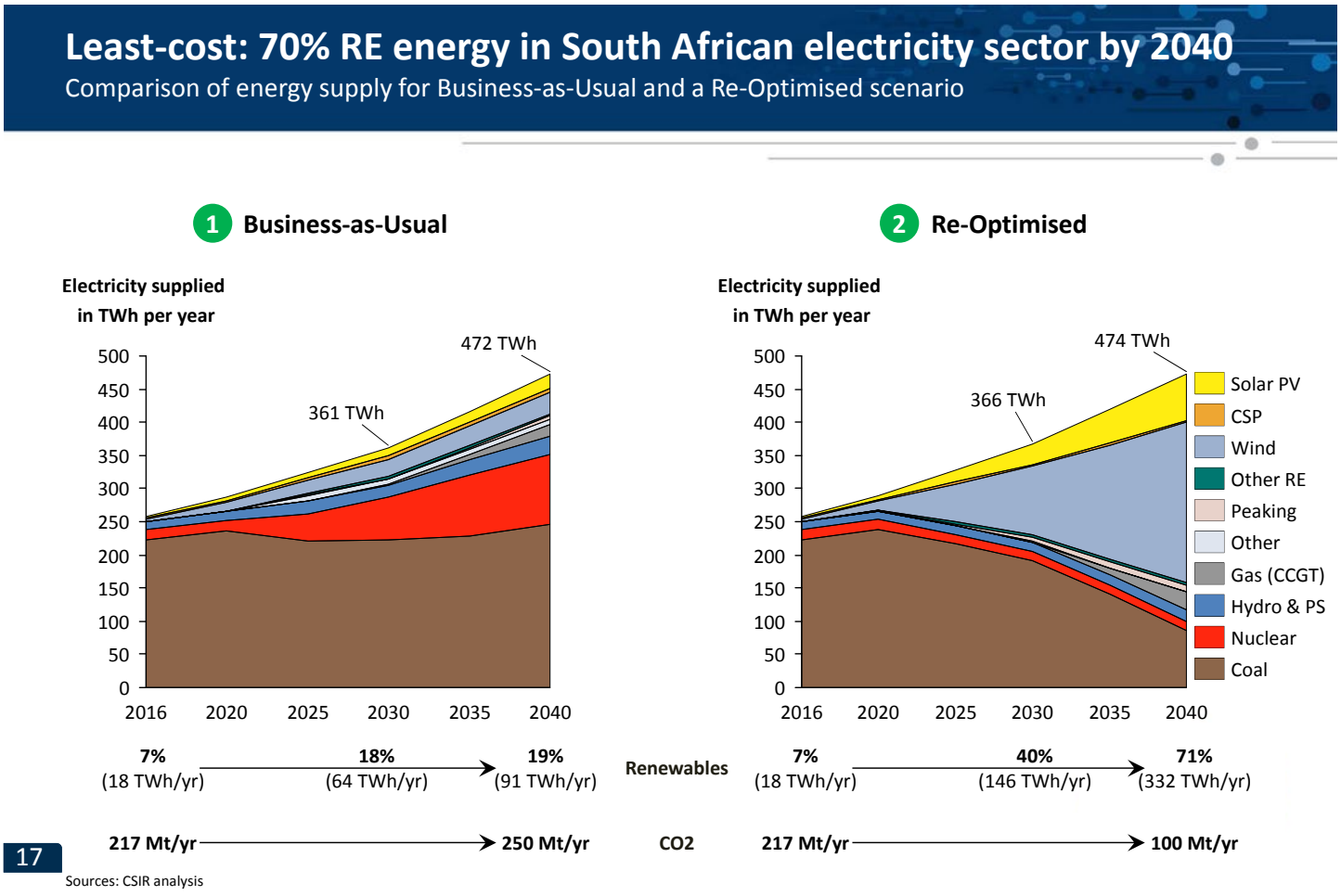
The CSIR study states that two assumptions of the IRP 2010 are not realistic anymore: i) there is now less demand for electrical power than expected, and the predictions for the future have to be adjusted. Moreover, (ii) the prices for power generation by means of solar photovoltaics (PV) and wind in SA have dropped significantly below their predicted values (see Figure 1). The CSIR Energy Centre remodeled the electrical power demand for the period 2016-2040. The power gap resulting from the predicted demand and the phasing out of Eskom's old coal fleet is proposed to be filled in two scenarios. The first one, called "Business-as-usual" (BAU) is based on the recommendations of IRP 2010 taking into account the changed demand but keeping the same energy mix. BAU is in line with the current governmental plans to fill the gap mainly with the help of new coal- and new nuclear power stations. It contains also a small contribution of regenerative energies. The second "Reoptimised" scenario choses the least costly mix from all resources: coal, nuclear, gas, wind, solar photovoltaics (PV) etc. Moreover, Reoptimised ignores the unjustified constraints in IRP 2010 on the building of PV and wind power generation capacities of 1000 MW/year and 1600 MW/ year, respectively [2].

Both scenarios appear to satisfy the projected energy demands (Figure 2).

The CSIR study modeled typical weeks in 2040 in both scenarios. In the Re-optimised scenario there are often weeks where peaks of 40 GW wind power can be harvested at night with a planned 77 GW wind power fleet. In other weeks a lack in wind power has to be compensated using other energy resources (Figure 3). If the minimum values of 7 to 9 GW wind power are always attainable and the grid is big enough to compensate for local variations then there is no need for energy storage for example by water pumping. The wind and solar based solutions are then much more advantageous economically. The Reoptimised scenario is by the year 2040 almost R 90 billion per year cheaper than BAU which includes the building costs for an expensive nuclear and coal fleet (cp Figure 4). Should the saved money be used to decrease the price of electric power, in 2040 one kWh in the second scenario will be 18% cheaper than in the alternative BAU. Since wind and solar PV are essentially "green", the Reoptimised scheme also uses 60% less water and exhausts 60% less carbon-dioxide than the business-as-usual scenario (cp Figure 5). This would lead to a further saving of more than 10 billion Rand/ year for CO2 emission fees.

The Department of Energy published the updated Integrated Research Plan IRP 2016 on the 25th November. It has since been criticized for using outdated exchange rates and technology costs that are inconsistent with other sources.

Figure 2: The projected electricity demand is met in the first scenario (left) with mainly coal and nuclear energy, and in the new scenario (right) relying on Wind, solar PV and coal mainly.



For example, the costs for nuclear energy are significantly lower than estimated by the CSIR report (see article on moneyweb from the 1. Dec.2016). In a presentation on the 22th November, Minister Joemat-Pettersson explained that the new energy plan postpones the introduction of additional nuclear power to the year 2037, but it still propagates an energy mix which in 2050 will be dominated by power from a new nuclear and a new coal fleet. Although recognizing that wind and solar power are cheaper options, it is claimed that grid constraints prevent their use. Meanwhile Eskom has announced the intention to build the new nuclear power stations by 2026. This means the building process, which takes 10 years, has to start soon. A public consultation process is projected before the updated IRP is accepted by parliament with road shows between the 7-15 December or in some provinces in January. Please find the schedule on the website of the Department of Energy. Also written comments on the IRP 2016 are invited. The public and we, the community of physicists, will have the possibility to point out alternative suggestions during this period. So speak then or forever hold your peace!

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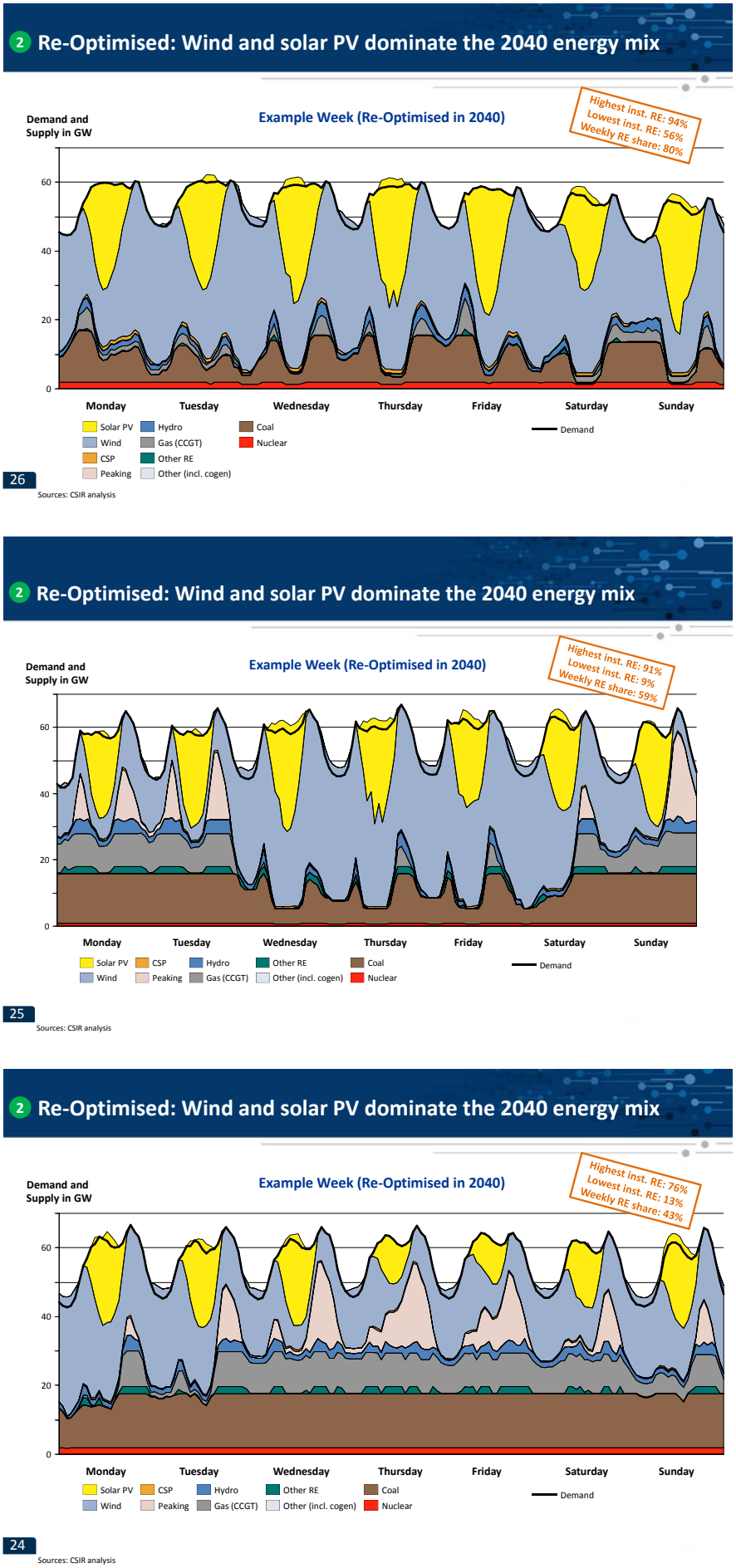
Figure 3: Simulation of the power demand and supply in the Re-optimised scenario for several exemplary weeks in 2040.



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[1] CSIR Energy Centre: Tobias Bischof-Niemz1, Jarrad Wright and Joanne Calitz, Crescent Mushwana, *Least-cost electricity mix for South Africa until 2040*

Presentation at the Windaba 2016 conference. Download of Slides http://www.csir.co.za/Energy_Centre/Energy_papers1.html

[2] Chris Yelland, *CSIR's outlook for South Africa's future electricity mix*, Moneyweb (online) Nov 4th 2016.

Website last accessed on the Nov 20th 2016: http://www.moneyweb.co.za/news/industry/csir-presents-its-outlook-for-south-africas-future-electricity-mix/

Figure 4: Comparison of total electricity system costs in both scenarios. Business-as-Usual incurs large costs from building the nuclear and the coal fleet.

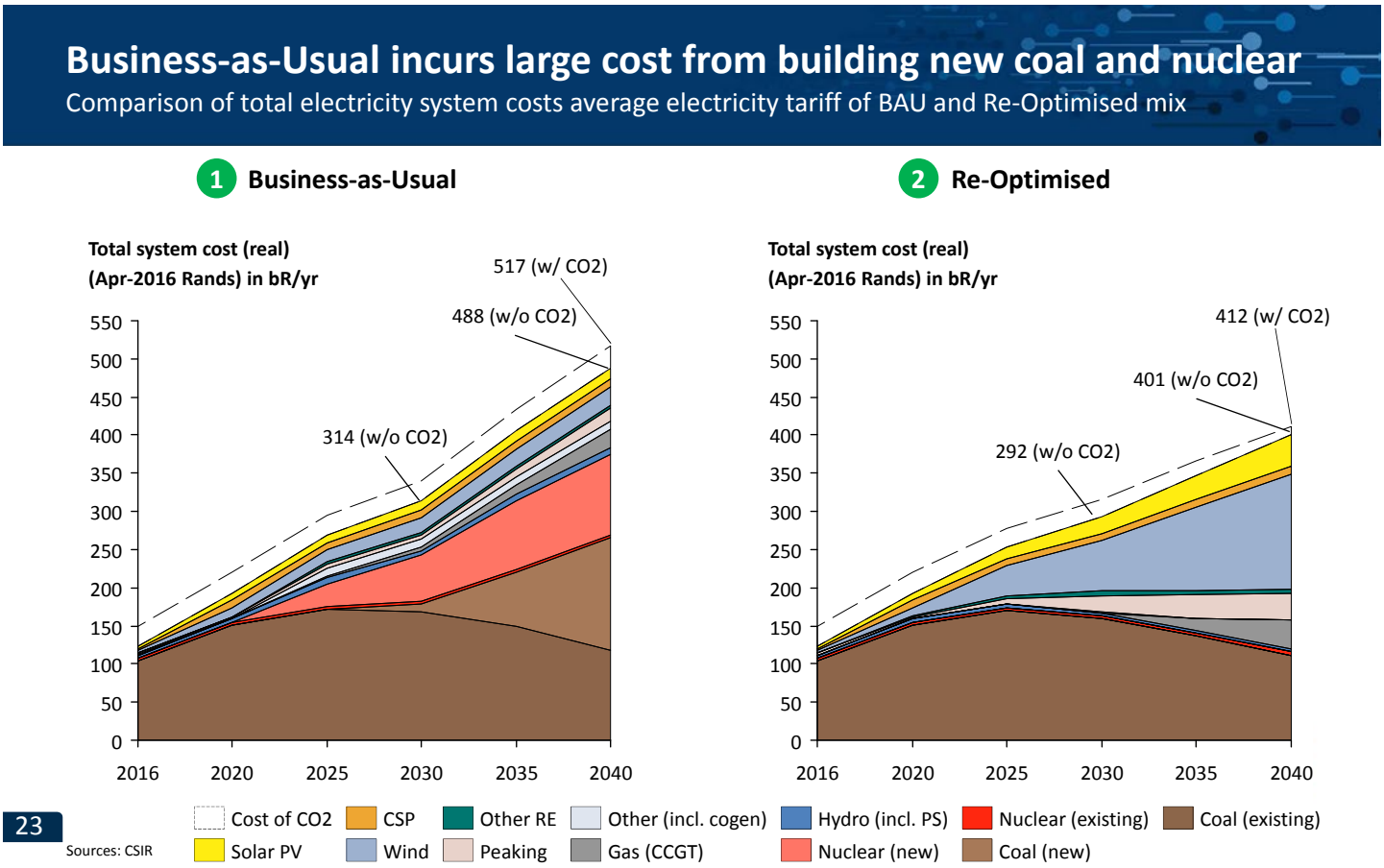
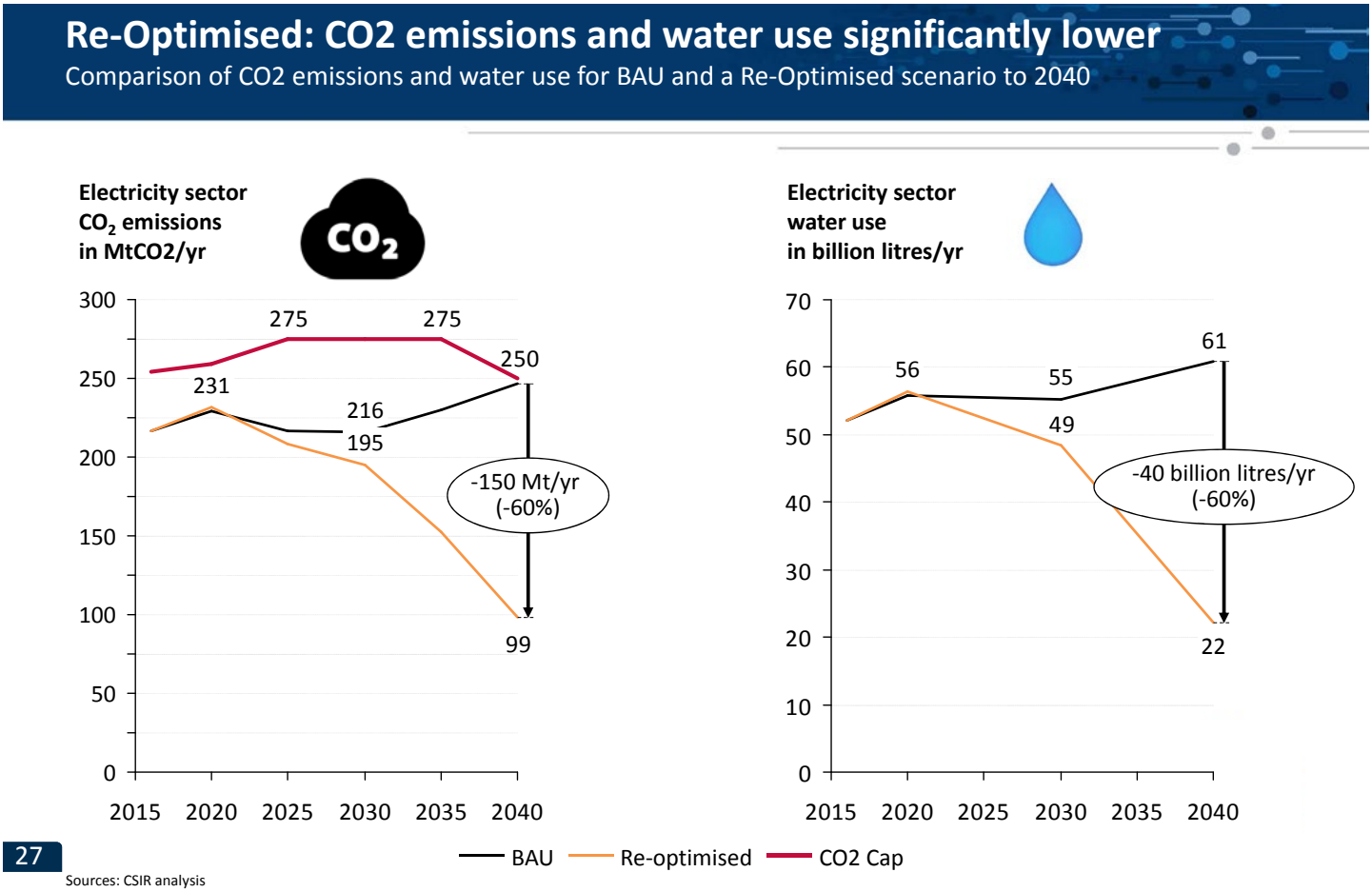
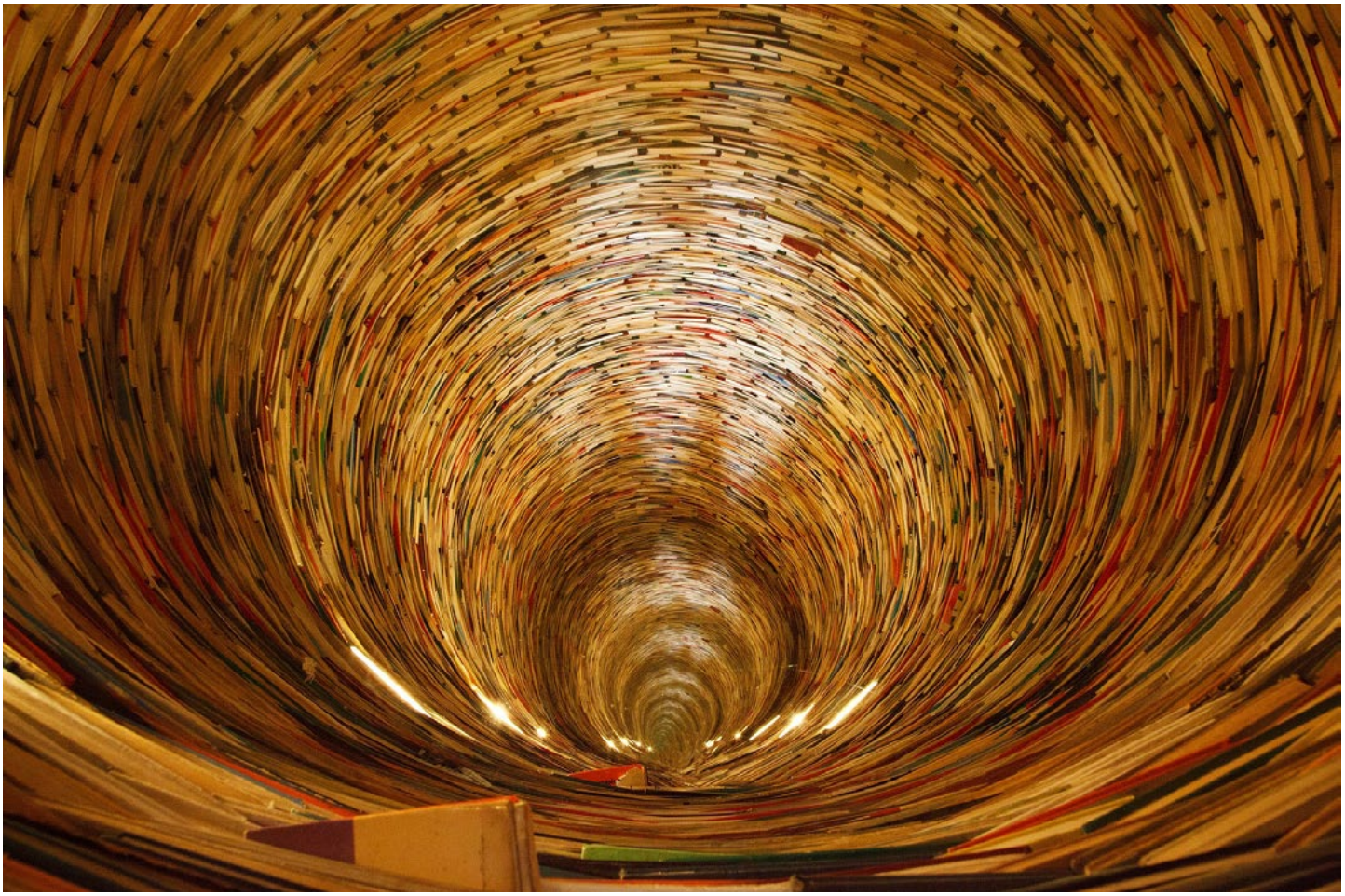


Figure 5: Carbon-dioxide emission (left) and water usage (right) from electrical power generation in both scenarios.



Articles



The End of the University Library

by A. D. M. Walker

***end** n. … 5. thing one seeks to attain, purpose, (to achieve his ends; to what end?) object for which a thing exists.*

The Concise Oxford Dictionary

Das war ein Vorspiel nur; dort wo man Bücher verbrennt, verbrennt man auch am Ende Menschen. (That was only a foretaste; where one burns books, in the end one burns people.)

Heinrich Heine

A university is just a group of buildings gathered around a library.

Shelby Foote

Rather than a single apocalyptic occurrence, the destruction of the great Library of Alexandria was the result of a number of events, taking place over hundreds of years, and ranging from invasion, through Papal decree[1], to budget cuts and bureaucratic incompetence[2]. Nevertheless, the image of a burning Library remains as a symbol of the descent into the Dark Ages.

Over centuries the great University and National libraries have been the repositories of the recorded and collected knowledge of humankind. Furthermore, this knowledge has been recorded in such a way that it is accessible (apart from the decay of age).

Were archaeologists to discover a long lost cache of scrolls that had escaped the destruction of the Library of Alexandria, we could read them. The information on the Rosetta Stone has survived for more than 2000 years.

In the last twenty years this has no longer been so. The digital age swept it all away. Without the right technology to read it, the information is lost. The reel-to-reel magnetic tapes of thirty years ago are junk unless extreme steps are taken to find and resuscitate the appropriate obsolete equipment. Did you ever save data on a WORM storage device? Can you read it now? The CD-ROM is obsolete: the DVD is obsolescent. Terabytes of information

1 Wikipedia, The destruction of the Library of Alexandria, https://en.wikipedia.org/wiki/Destruction_of_the_Library_of_Alexandria, accessed 15 Sep., 2016

2 Newitz, A., The Great Library at Alexandria was destroyed by budget cuts, not fire, http://io9.gizmodo.com/the-great-library-at-alexandria-was-destroyed-by-budget-1442659066, 2013.

can be carried in ones pocket on a hard drive no bigger than a small purse. Ten years ago there was real concern about the maintenance of the scientific archive. The prospect of libraries endlessly and expensively copying their holdings onto new media as the technology advanced was a nightmare.

Fortunately new technology marrying cheap massive storage to the capabilities of the internet has changed this. Cloud storage maintains the integrity of the data with the mechanics of backup, copying, and upgrading concealed from the user. But this does not come free of charge, nor does it come free of risk.

Since the turn of the century the publishing industry has been in turmoil. Many of the difficulties are described by Courant[3] who notes:

> Publishing, academic libraries, and the particulars of peer review were all developed in a world where printing, copying, and distributing were expensive. We no longer live in that world. How then, should we configure the library—and publishing and peer review—to take full advantage of the change?

How is the environment changing? The most obvious change is that our sources are now available on line rather than on paper. Accessibility, however, varies widely. There is a strong drive towards open source publications. In 2013 the United States Government instituted a policy that required all publications arising from government funding must be free to read after 12 months. In May this year the European Union's Science chief, Carlos Moedas, announced the intention that by 2020 all publications arising from Government funded research should be published in open source journals[4]. This is a laudable objective but it does not come without cost.

The first time I became aware that the system of scientific publication was under threat was when I was a graduate student in Grahamstown in about 1960. We had the luxury of a Departmental Library in the Physics Department, and the University Library's collection of Physics journals was shelved there. The shelves were overcrowded and it became necessary to re-arrange them.

In this environment why should we bother with journals? Could we not just use institutional repositories or their equivalents to exchange research results?

Naturally the graduate students were hauled in as a source of cheap labour. Laboriously we removed the journals from the shelves and placed them on the large central table, volume by volume, side by side. At that time *Phys. Rev.* was a monolithic journal covering all fields of physics. It had not yet split into its subsections and the numbering of the volumes was synchronized with the year. The collection displayed on the table stretched back to the early years. On the left of the array was a single slim volume. Next to it was a thicker one, then a thicker, then two separately bound parts, then three until the issues of a single year formed an unstable pile of ten thick tomes. The heights of the piles traced out a perfect exponential curve. The next pile had to be split in two to avoid it collapsing onto the floor. Our system was breaking down in the same way as the system of scientific publication. A few years later *Phys. Rev.* split into its multiple specialist parts.

Where are we now, 56 years later in the twenty-first century? In publication we are in a middle of a crisis. Costs of journal subscriptions have escalated out of control. At the same time an array of alternatives exists. Many journals are open source. Institutional repositories, on-line archives, and frankly pirate sites provide access to many of the articles appearing in journals. Some main line commercial publishers hang grimly onto their copyright rights so that even historical articles have unrealistically high prices, while others have opened their archives. There are attempts by authors to boycott commercial academic publishers[5,6].

Even a University such as Harvard, with an endowment of $25 billion, feels the pinch and is encouraging its faculty members to make their research freely available through open access journals[7]. Most professional societies are moving to open source. Academic libraries still try to maintain their old function as the guardians of the archive.

Fly-by-night predatory on-line journals entice authors to publish un-refereed material at high prices.

In this environment why should we bother with journals? Could we not just use institutional repositories or their equivalents to exchange research results? Of course not. There is an irreplaceable added value supplied by a reputable journal – the system of rigorous peer review, that validates the research being described, as well as the organization into a manageable searchable archive of publications.

Eleven years ago the South African Institute of Physics saw the writing on the wall. In a wide ranging report on the future of Physics[8] they made the following recommendation directed to the Department of Science and Technology (DST) and the National Research Foundation (NRF):

> RECOMMENDATION 4.5 (Exec 7) We recommend the creation of a National Research Digital Library Resource. Such a structure would provide subscription to electronic

3 Courant, P. N., The future of the library in the research university, in *No Brief Candle: Reconceiving research libraries for the 21st century*, Report Pub142 of the Council for Library and Information Sources, https://www.clir.org/pubs/reports/pub142/courant.html, 2008.

4 Khomami, N., in *The Guardian*, London, 28 May 2016, https://www.theguardian.com/science/2016/may/28/eu-ministers-2020-target-free-access-scientific-papers, 2016.

5 The cost of knowledge, 16191 researchers take a stand, http://thecostofknowledge.com/, accessed 20 Sep 2016.

6 *Financial Times*, Elsevier leads the business the internet could not kill, https://www.ft.com/content/93138f3e-87d6-11e5-90de-f44762bf9896, 2016.

7 Sample, I., Harvard University says it can't afford journal publishers' prices, *The Guardian,* London, 24 April 2012, https://www.theguardian.com/science/2012/apr/24/harvard-university-journal-publishers-prices, 2012.

8 South African Institute of Physics, Shaping the future of physics in South Africa, http://www.saip.org.za/index.php/projects/shaping-the-future-of-physics-in-sa, 2005.

> journals that will be accessible over the internet, and hence available to all universities (both staff and students), and selected non-commercial researchers. If the physics programmes of this nation are to be competitive, this is a vital need. It is clear that such a resource will have a transformational nature also, since even remotely located Universities will also be able to access the latest research findings, with the caveat of the necessity of ready internet access. [NRF, DST]

As far as I know the recommendation has sunk without trace. It has, however, already been overtaken by events. It is a good recommendation for the intermediate situation in which we find ourselves, but more drastic measures are necessary. We need to keep up with the trends.

What are the trends? In spite of the commercial dominance of commercial companies such as Elsevier, Springer, Wiley and others, the future probably lies with open source. Indeed, even a company such as Elsevier already publishes over 150 open source journals.

Open source, however, does not come free! Although an on-line journal has no actual print costs, there are still many genuine costs to be covered. These include:

- Editorial costs. Although refereeing and similar activities are traditionally supplied free by researchers there are many technical costs including preparing the final version in the journal style, copy editing etc.
- Maintenance of the on-line data base and all the IT related costs.
- The maintenance of the archive.

South Africa is fortunate in that a number of national open source journals are subsidised by government sources. Few journals have this luxury. The overwhelming model for covering costs is the page charge, initially a quaint American custom that is fast becoming the norm. The logic behind this is that publication is an integral part of any research and its costs should be part of the funding model. A common, but not universal, practice is for a journal to require page charges in order for the article to appear as an open source article on line. Failure to pay the page charge means that for some period (one to two years) the article is only available to subscribers to the journal. This means that, if you want your article to be read, you had better pay the charge!

The result of all this is that researchers currently are faced with a mixed system. Libraries have to pay to get access to the journals and researchers are expected to pay to be published. Does this sound like double dipping on the part of the publishers?

Utopia will not come tomorrow. In the mean time we need to cope with our broken system by more imaginative means

An alarming consequence is the integrity of the archive. We have come to be confident that the results of research are protected by the fact that all over the world there are university libraries maintaining collections of books and journals. The replication of these collections is our guarantee that, even in the event of a catastrophe that is the modern equivalent of the destruction of the Library at Alexandria, the accumulated knowledge base of the world would not be lost. But this is no longer true. A journal subscription no longer buys a tangible asset, but only the right to access a distant data base. How secure are the publisher's backup procedures? Do they have procedures in place to ensure that the archive is maintained into an unforeseen technological future? Suppose that some time in the future, in response to demand, all Elsevier's journals became on-line publications and after a few years of operations the company filed for bankruptcy.

A utopian solution would be that

- All scientific journals become open source, online publications with an income stream that is sufficient to cover the costs of publication and maintenance of the archive, with a reasonable profit for commercial publishers.
- Funding agencies universally include the costs of publication as an integral part of their research grants.
- A scheme be developed to maintain the archive. My dream would be an international agreement that copyright law would restrict copyright on scientific research literature only to a short period – say two to five years from publication date – allowing academic institutions all over the world to set up mirror sites that replicate all such publications after the copyright expires. This would provide far greater security in the long term than reliance on a managed cloud backup system.

Utopia will not come tomorrow. In the mean time we need to cope with our broken system by more imaginative means. We will still need access to journals that require a subscription and these subscriptions will continue to rise. The SAIP recommendation on a National plan needs to be revisited. SAIP needs to lobby DST, the NRF, and the Department of Higher Education (DHE) to champion this. But this is not enough. As the move to open source publication grows we must recognize that page charges will become a fact of life and these organizations must be lobbied to provide a reliable source of funds for this purpose. Otherwise South African science will fail to get the recognition it deserves because it will not be easily available to readers elsewhere. It may well be that this needs a transfer of budget from University libraries to research funding organizations, that is from DHE to DST. This may be beyond the persuasive powers of an organization like SAIP. Our organization should get together with sister organizations and perhaps work through the South African National Academy of Science.

The Four new Elements are Named

Issued by International Union of Pure and Applied Physics (IUPAP)

For further information contact Bruce McKellar, President of IUPAP, at: bhjmckellar@mac.com.

The four newly discovered elements now have proposed names: nihonium (atomic number 113), moscouvium (atomic number 115), tennessine (atomic number 117), and oganesson (atomic number 118). The discovery of these elements was confirmed earlier this year by the IUPAC/IUPAP Joint Working Party [1,2] and now the names have been announced by the International Union of Pure and Applied Chemistry (IUPAC) on 8 June 2016 (http://iupac.org/news/). The groups responsible for the discovery were invited to submit names that follow the recently revised rules for the naming of elements [3]. The proposed names were then reviewed by the IUPAC Inorganic Chemistry Division, which has recommended their acceptance. After a public comment period of five months (see http://iupac.org/recommendations/under-review-by-the-public/) the names will be approved and the results will be published in *Pure and Applied Chemistry.*

Element 113: Nihonium (with the symbol Nh) was named using one of the Japanese names for Japan, *Nihon* (the land of the rising sun). The discovery was made at the RIKEN Nishina Center for Accelerator Science in Japan. The collaboration bombarded a bismuth target with a zinc-70 beam using the RIKEN heavy-ion facility in Japan. The new element, nihonium decayed to known lighter elements by alpha-decay, which allowed it to be identified.

Element 115: Moscovium (with the symbol Mc) was named after the Moscow region, the location of the Joint Institute for Nuclear Research in Dubna, Russia. The JINR used the heavy ion accelerator facilities of the Flerov Laboratory and their gas-filled recoil separator to do experiments in collaboration with researchers from the Lawrence Livermore National Laboratory, Oak Ridge National Laboratory, and Vanderbilt University in the USA. The element moscovium was produced by bombardment of targets of americium by calcium-48 ions.

Element 117: Tennessine (with the symbol Ts) was named after the US state of Tennessee. The name recognizes the contribution of the Oak Ridge National Laboratory and Vanderbilt University in that state to the discovery of the element tennessine, as well as the long-standing contributions to those institutions and the University of Tennessee to the production of new elements. Tennessine was produced by the bombardment targets of berkelium by calicum-48 ions at the JINR. The rare berkelium target was produced at the high-flux reactor at Oak Ridge National Laboratory.

Element 118: Oganesson (with the symbol Og) was named after the nuclear physicist Professor Yuri Oganessian. Professor Oganessian led Dubna research into super heavy nuclei and the search for new elements, including the element oganesson. It is fitting that the collaboration of the Joint Institute for Nuclear Research in Dubna, Russia and the Lawrence Livermore National Laboratory, USA, which produced oganessian by bombardment of a californium target by the calicum-48 beam chose to name the element after him.

The new elements complete the seventh row of the periodic table. Whether or not the periodic table has an end is not known and the chemical and physical properties of these extreme elements and their isotopes are yet to be discovered.

Laboratories are already working on searches for the elements in the 8th row for the periodic table, and they are also working to consolidate the identification of copernicium and heavier elements. To be able to evaluate this work, IUPAC and IUPAP are currently reviewing the selection principle and operations of a future Joint Working Party (JWP) and as soon as these principles have been decided a new group will be formed. This new JWP will review new claims and the consistency of new results with those already evaluated by earlier JWPs.

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1) P.J. Karol et al., Pure & Applied Chemistry, Feb 2016, Vol. 88 Issue 1/2, p139-153, DOI: 10.1515/pac-2015-0502.
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3) W.H. Koppenol et al., Pure & Applied Chemistry, Apr 2016, Vol. 88 Issue 4 p 401-405, DOI: 10.1515/pac-2015-0802.

Island science in the sub-Antarctic Indian Ocean

by Catherine Webster, SANSA, Hermanus

The overwintering exodus to Marion Island this year saw SANSA researcher, Dr Stefan Lotz, accompany Travis Duck, an engineer and member of the 73rd Marion expedition (M73), to assist with the takeover from returning engineer, Pierre Joubert, a member of M72, at the conclusion of his 14-month sojourn on the Island.

Located almost 2 000 km southeast of Cape Town, the meteorological and biological research station on Marion Island, which is run by the South African National Antarctic Programme to carry out vital research throughout the year, houses about 20 scientists and engineers as its only human inhabitants. Otherwise the island is home to birds and mammals, such as the wandering albatross, fur seals and killer whales that are perfectly visible in the clear water.

South Africa proclaimed its sovereignty of the Marion and Prince Edward Islands in 1947 and established a meteorological station on Marion Island

The new Marion Island research base allows for most modern comforts. There is even a glass-enclosed braai room, a true slice of South African culture in the sub-Antarctic, look to the left in the top pictire.

in 1948. Both islands are Special Nature Reserves under the South African Environmental Management: Protected Areas Act, 57 of 2003, and activities are restricted to research and conservation management.

The scarcity of land at the higher latitudes of the southern hemisphere makes Marion Island a prime location for space physics research. As a participant in the worldwide network of magnetic observatories, SANSA has space monitoring instruments on Marion Island, as well as Gough Island, and is responsible for the infrastructure, research and data required for and undertaken there to monitor the near- Earth space environment. The Department of Environmental A airs (DEA) provides support annually for an engineer to overwinter on Marion Island to maintain the equipment and record important space data for use by SANSA and international research networks.

As the principal investigator on some of the instruments on the island, Dr Lotz provided the guidance needed for a successful takeover. "We arrived on the island after a week- long voyage aboard the SA Agulhas II and it was all systems go to carry out important maintenance, undertake scientific eldwork and train the new team to

Image above shows overwintering engineers Pierre (M72) and Travis (M73) replacing the Scintillation GPS antenna at the DORIS hut. The hut is situated 400m away from the base to isolate it from electromagnetic interference. The image to the left shows the Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS) beacon which works with satellite payloads to determine extremely precise orbit and ground locations. The system was designed by the French space agency CNES to determine the precise orbit locations required for observing Earth's oceans. DORIS data has also become valuable in geophysics, helping researchers to estimate electron content in the ionosphere, measure continental drift, monitor geophysical deformations, and determine the rotation and gravity parameters of Earth.

Marion Island, situated at 46°52'34" South 37°51'32" East, lies close to Prince Edward Island in the southern Indian Ocean. The two islands cover a combined area of 316 square km and constitute the Prince Edward Islands Group that politically forms part of South Africa's Western Cape Province. The islands are volcanic in origin. Marion Island, which is 19 km long by 12 km wide and the higher of the two islands, has small lakes and many hillocks (secondary craters), with Mascarin peak as the highest point at 1 230m and permanently covered in snow and ice. The island has little vegetation, mainly mosses and ferns, with some lichen in its centre, and boggy terrain due to the abundant snow and rain. The persistent, strong westerly winds, typically occurring at southern latitudes between 40 and 50 degrees (known as the Roaring Forties), ensure that no trees grow on the Island. *(Page 3 • inner space • volume 1 • edition 13 • June/ July 2016)*

take over for the next year from the departing team."

According to Pierre Joubert, his 14-month stay on Marion Island elicited a range of experiences, from excitement and the stress of preparation to the long hard hours of the takeover.

"At times you miss family, friends and fresh food but the privilege of being on an Island as special as Marion, with its moments of absolute bliss, quickly overrode such feelings," said Joubert.

He remembers special moments during his overwintering period, when he walked over a scoria (basaltic lava fragments ejected from a volcano) hill in the middle of a snowstorm and stood on the rocks looking at killer whales that passed by within three meters, perfectly visible through the clear water. "Going to Marion Island was one of the best decisions I ever made as I learnt so much and grew both professionally and personally. Living in an isolated environment with only a few other people to talk to was tough but great at the same time, as my fellow team members became a second family. Marion Island is a very special place and an opportunity to experience so much. However, like most things in life, you have to be open to the experience and embrace it."

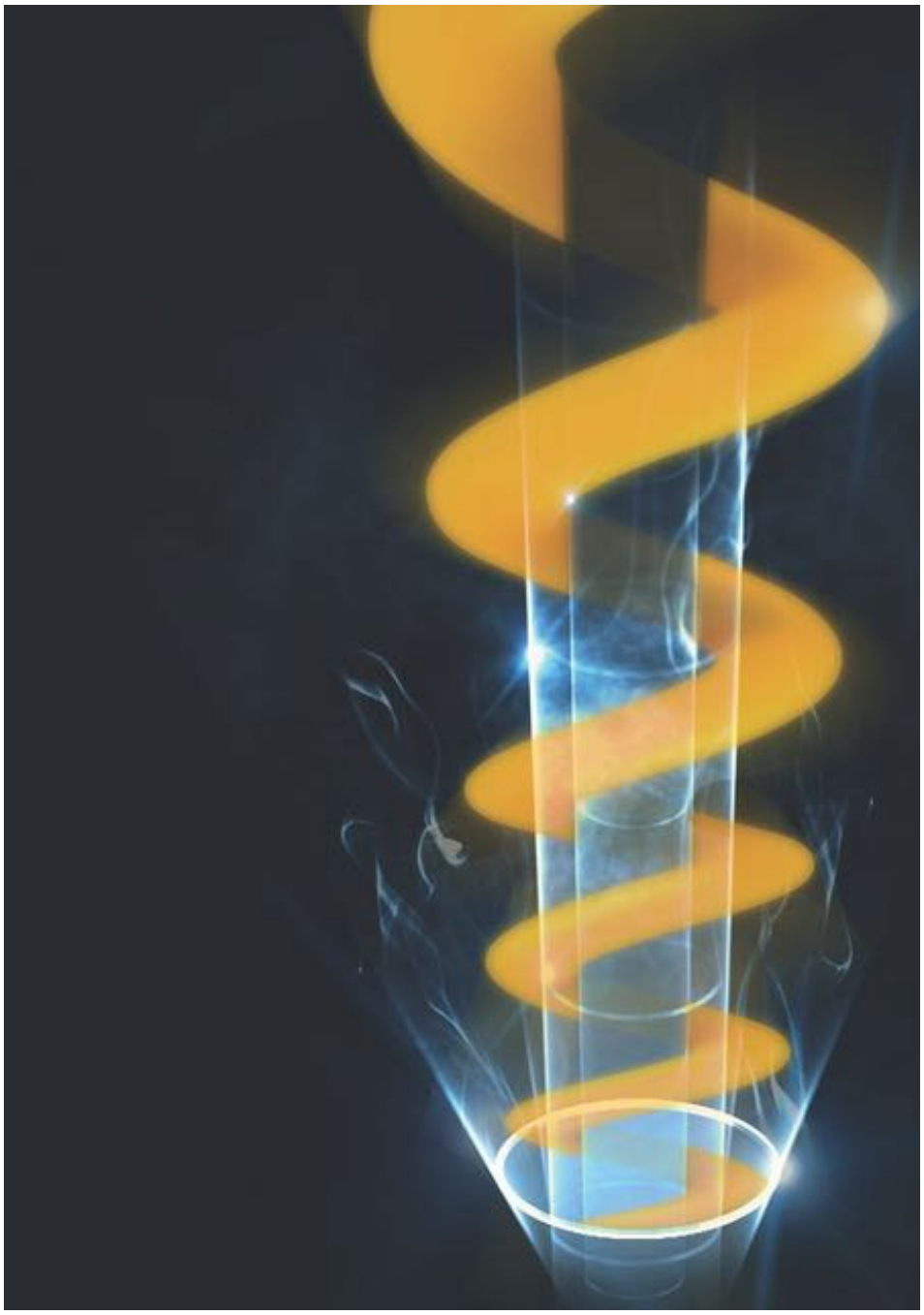
Joubert returned to Cape Town with Dr Lotz aboard the SA Agulhas II on 16 May. The current overwintering engineer, Travis Duck, is doing well with all the instruments up and running. He will return in May 2017.

Being part of a small research team on the Island means everyone needs to help one another out. Occasionally SANSA engineers assist the biologists with some of their work. The top left image shows team members going past kill point, named appropriately as the point from where killer whales are observed. The bottom left image shows one of the team members keeping an elephant seal bull busy while other researchers survey the females. The top right image shows Marion Island engineer, Pierre Joubert, assisting the biologists with eldwork on Macaroni Penguins. No animals are ever harmed during eldwork.

Nature Photonics publishes work by South African-Italian research team demonstrating a new spiral laser for twisted light

by Andrew Forbes, University of the Witwatersrand, Johannesburg.

Nature Photonics this month published research by a team from South Africa and Italy demonstrating a new type of laser that is able to produce laser beams 'with a twist' as its output. – These so-called vector vortex beams are represented on a higher-order Poincare sphere. Using geometric phase inside lasers for the first time, the work opens the way to novel lasers for optical communication, laser machining and medicine.



Light carrying OAM is created by twisting the phase of light into a helical shape, forming a spiral.

Angular momentum is a familiar concept in our everyday lives: the spinning Earth carries spin angular momentum, while the orbiting Earth carries orbital angular momentum (OAM). Light can also carry angular momentum: through its polarization (spin), and through its pattern and phase (OAM). Producing light with a controlled spin in a laser has been known for decades, but producing OAM beams inside a laser is not so simple. Light carrying OAM is created by twisting the phase of light into a helical shape, forming a spiral. Because the twisting of the pattern gets tighter and tighter as you move towards the centre of the beam, the light disappears and such beams are often called donut beams or vortex beams. The problem is that usually lasers cannot tell the difference between light that is twisted clockwise and light that is twisted anti-clockwise, and so the laser simply gives a combination of both in an uncontrolled manner. Moreover, combining spin and orbital components to produce general beams from a single laser that are mixtures of the two momenta have not been demonstrated before.

"Our novelty was to realise that by using custom-geometric phase optics to map polarisation to OAM, the laser could be designed to tell the

difference between the clockwise and anticlockwise light," says Prof. Andrew Forbes, who conceived of the idea and led the project. The control is achieved by simply rotating a single optical element inside the laser, without any need for realignment. Such beams have been used in optical communication, optical trapping of microparticles and metrology, and now a single laser can create them on demand.

The geometric phase of light is a very abstract concept, first appearing in quantum theory

The geometric phase of light is a very abstract concept, first appearing in quantum theory, but here the researchers have used it to created particular types of twisted light. The custom optic, called a q-plate, changes the handedness of the OAM twist according to the handedness of the polarization twist, mapping one to the other. For example, if clockwise polarised light with no twisted phase is passed through the optic, the output is anticlockwise polarised light with a clockwise twist in phase. By placing this element inside the laser the twist in polarisation (spin) controlled the handedness of the twist in OAM, so the output could be controlled in either. "We like to call this a *spiral laser* because both the polarisation and OAM of the beam give rise to light that spins or twists in complicated ways," says Forbes.

Importantly, the same laser can produce any combination of these OAM beams and various polarisations of light. The team was able to show that the outcome was the generation of arbitrary vector vortex beams, known as higher-order Poincare Sphere beams. For example, in addition to the special cases of OAM beams, the same laser also produces radially and azimuthally polarised light, where the polarsation (direction of the electric field) changes in space. For example, radially polarised light has the field always pointing away from the centre of the circle, which is very useful for cutting and drilling metals. Such beams are often called 'vector' beams because the polarisation changes across the beam. When the polarisation pattern stays constant across the beam, it is called a 'scalar' beam. In the reported work, the researchers have shown that either can be created from the same laser.

"You have to understand that vector vortex laser beams have proven immensely useful in machining metals and other materials with lasers, for example, in the automotive industry. But until now we have not been able to produce all of them in one laser," says Dr Darryl Naidoo, who performed the experiments as part of his doctoral studies.

The laser concept is likely to attract interest from both the academic and industrial communities. Vector and scalar vortex beams that exist on the higher-order Poincare Sphere have many applications, such as microscopy, imaging, laser machining, and communication in free space and in fibres. Often one has to decide beforehand which beam is the most desirable and then design a laser for it. Now it is possible to have such beams available on demand from a single laser.

Opportunities

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.

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

·

DOWNLOAD THE Pr.Phys APPLICATION FORM HERE

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. Check the SAIP constitution regarding the criteria here SAIP Constitution

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. P.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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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 be-

coming 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.

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.

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.

Save Money - You'll receive discounted rates for SIAP conferences, and have the benefit of paying affiliate membership fees for IOP membership.

Employment opportunity information -Job advertisements will be displayed on our new website and mailed to members from time to time.

Access to current information on sources of funding grants and scholarships - Exclusive service provided to our members via a direct email system.

Scientific meetings - The annual conferences and workshops provide learning opportunities for different specialisation areas and varying degrees of experience.

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.

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.

Career guidance and resources- Career assistance is provided to all members to find their career path in industry or academia.

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.

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.

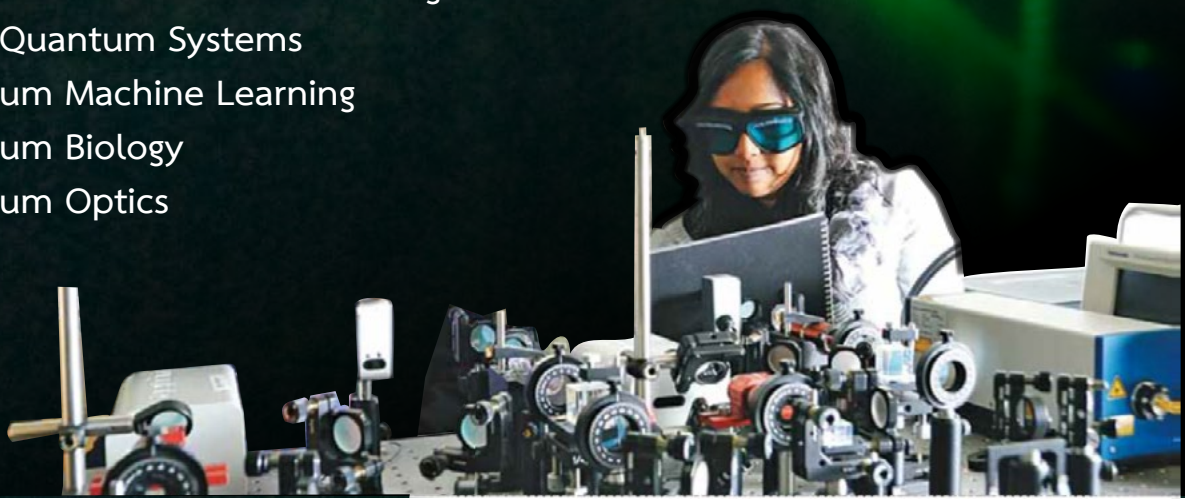
Join SAIP today click the link below for more information on how to apply http://www.saip.org.za/index.php/members/membership-info

Opportunities with the Quantum Research Group

Quantum Information Processing and Communication is a dynamically growing research area in the discipline of physics. The Quantum Research Group at the University of KwaZulu-Natal in Durban is South Africa's largest center for Quantum Information, and is actively involved in both theoretical research and the development of emerging quantum technologies.

We offer Postgraduate scholarships at MSc & PhD level for experimental and theoretical studies in fields such as

- Quantum Information Processing & Communication
- Open Quantum Systems
- Quantum Machine Learning
- Quantum Biology
- Quantum Optics



Prof. Francesco Petruccione heads the Quantum Research Group and holds the position of South African Research Chair for Quantum Information Processing and Communication from the National Research Foundation.

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Physics Comment Editorial Policy

Deadline for submissions for the January 2017 issue of Physics Comment is 30 December 2016

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:

- 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).
- The author allows PC to edit the work for clarity, presentation, including making appropriate hypermedia links within the work.
- 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 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.
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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. 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 by 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/ Physics Comment