Vol 7, Issue 2, August 2015 Webpage Email

# Physics Comment

## A Southern African Physics Magazine

# Accelerating Africa: South African High School Team wins beam time at CERN

A Quarterly Newsletter Issue No 2

### SA-Russian Collaboration at JNIR Dubna

SA high-energy physicists collaborate in Russian flagship project to study quark-hadron phase. (**p.4**)

### The 60th annual conference in PE

What did you miss if you were not at the SAIP conference? Background reports on p.5.

### Performance Management in SA

After Dave Walker's article PC received letters to the editor. (p 15)

### It's 5 minutes to 12 for the nuclear deal

The purchase of eight nuclear power plants has been debated controversely. Now time is running out if you want to still influence it. (p.16)

*Editorial board: T. Konrad and A.D.M. Walker*

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# Editor‘s Note

“Physics Comment has become a forum for debate”, as the past president of the South African Institute of Physics, Dr Igle Gledhill, said in her report at the annual general meeting, which is republished in the present issue of PC (page 24). I would like to pass the compliment on to our authors who take care of critical issues and spark debates. For example, take the difficulties caused by performance management in academia as reported by my colleague Prof Dave Walker in the last issue of PC. The resulting letters to the editor sent to PC state that this kind of bureaucracy can seriously obstruct our business of extending the boundaries of knowledge. Please find the letters together with an update on the case of Dr Sahal Yacoob at UKZN on page 15. Another debate is lead in PC (on page 16) about the intended purchase of eight nuclear power stations by South Africa for an estimated total cost of R 1 trillion. If the analysis of a government commissioned report (and the article of Prof Hans Eggers in PC) is correct maximal two nuclear power stations would suffice. However, while our debate is still busy establishing the facts the political decision makers already prepare to cross the finish line and sign the deal by the end of the year. Thereafter corrections will be difficult to implement. So please have a look, and let us benefit from your advice in these matters with a letter to the editor. Thanks in advance.

On the sunny side of things, there was a successful 60th annual SAIP conference which took place in Port Elizabeth. We report on the statistics of participation and on the highlights on page 5. By the way, you can download photos of the conference here using the password *SAIP12345MS*. Moreover, it gives me a lot of pleasure to announce an article on the scientific efforts of high school students from Johannesburg to generate coherent gamma beams with the help of CERN on page 20. I was told recently, that a gamma ray laser might even help to transform nuclear waste into non-radioactive material by removing nucleons. All’s well that ends well!

With best wishes
Prof Thomas Konrad

.

*Caption of picture on frontpage: Team of learners from St John’s College and Barnato Park High School in Johannesburg together with Prof Simon Connell and their teacher Dr Colleen Henning, that won beam time at CERN in an international competition with 119 teams.*

***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

## Plans for South African -Russian Scientific Cooperation: The NICA project

*by Jean Cleymans, UCT, Capetown*

*Above: delegates to the NICA round-table*

### Background and History

On October 5th 2005 a Memorandum of Understanding (MoU) was signed between the Republic of South Africa (RSA) and the Joint Institute for Nuclear Research (JINR) in Moscow. The aim of the MoU was the development of collaboration between the Department of Science and Technology of South Africa (DST) and the JINR in the sphere of scientific and technological areas.
The project NICA (the Nuclotron-based Ion Collision f(A)cility) was approved by the Committee of Plenipotentiaries at a meeting in Dubna on 14-15 March 2009. It is the flag-ship high energy physics project in the JINR 7-year plan (2010 - 2017). It is one of only two mega-science projects approved by the Russian government and has international support from seven countries Germany, Egypt, Kazakhstan, Belarus, Bulgaria, Russia, Ukraine. Once it is fully operational it will be one the largest projects to study nuclear matter at high densities in the world.
South Africa has been involved in this project since the beginning and has contributed expertise. Cryostats used by the NICA project have been built in South Africa.

### International round-table discussions in Dubna

A round-table discussion took place at the Joint Institute for Nuclear Research (JINR) in Dubna on Sunday 5. July 2015. Several aspects of the new flagship project, NICA, at the JINR were discussed. The meeting had 12 participants from South Africa and a large number of international and Russian experts.

The participants concluded that the NICA project is impressive and provides a unique chance of observing new states of superdense nuclear matter, South African participation in the construction of NICA is welcomed by JINR and will in turn be beneficial for South Africa. The participants come to the conclusion that it should be properly discussed at the Governmental level and become an international treaty with participation from all other BRICS countries, Brazil, Russia, India, China and South Africa.

### Scientific Topics

The participants have concluded that the NICA project possesses potential for truly outstanding discoveries. If funded properly and completed in a timely manner, the NICA project would allow JINR and participating institutions to assume a leading position of international prominence in the crucially important field of high density nuclear physics. This project would enable discoveries of great value that would improve the current knowledge about properties of super-dense nuclear matter. The realization of the NICA project in Dubna brings JINR and participating countries to the forefront of the current effort in high density nuclear physics. The understanding of the properties of matter under extreme conditions of high density and temperature is absolutely necessary and has great value not only for nuclear physics, but also for astrophysics, cosmology, condensed matter physics and the development of new technologies.

The main goal of the NICA project is the search for a possible manifestation of the mixed phase formation and critical endpoint in heavy ion collisions. These investigations are relevant to the understanding of the evolution of the Early Universe after the Big Bang, the formation of neutron stars, and the physics of heavy ion collisions. The new facility makes it possible to reach a new level in studying polarization phenomena in few-body nucleon systems. The beam energy of the NICA is particularly interesting; it is considerably lower than the region covered by the Large Hadron Collider (LHC) in Geneva but it sits right on top of the region where the baryon density at the freeze-out is expected to be the highest. In this energy range the system occupies a maximal space-time volume in the mixed quark-hadron phase (the phase of coexistence of hadron and quark-qluon matter similar to the water-vapor coexistence-phase). The net baryon density at LHC energies (ALICE experiment) will be lower because of a phenomenon called nuclear transparency: at very high energies nuclei fly "through" each other, produce a very large number of mesons and, therefore, reach very high energy densities but due to a large number of mesons achieve fairly low baryon densities. The energy region of NICA will allow analyzing the highest baryonic density under laboratory conditions.

### Realization period

The project is the flagship project of the JINR and is presently under construction. The first stage will see experiments being done using the beam on a fixed target using the BM@N (Baryonic Matter at Nuclotron) detector. This is scheduled to be operational in 2017. In the second phase the collider mode will be used with two beams making head-on collisions within the MPD (Multi-Purpose Detector). This is scheduled to start in 2019.

### Theoretical and Experimental outcome

Expected results include:

- Theoretical investigations, development of the models for description of the properties of excited nuclear media un-

der high temperatures and compression, dynamics of nuclear interactions at extreme dense baryon matter. Possible signals of phase transitions and identification of observables that are sensitive to various aspects of the quark-hadron phase transition in the NICA region.

- Specification of necessary parameters of the accelerator complex and multipurpose detector for investigation of the mixed phase and other topical problems of the physics of relativistic hadrons, heavy ions and polarized particle interactions.
- Development of a highly charged state heavy ion source KRION and Research and Development work on the Nuclotron heavy ion pre-accelerator.
- Development of a beam diagnostic system at the accelerator complex.
- Design,construction and tests of the new model and prototype super conducting magnets for the NICA project.
- Preparation of the project of heavy ion collider NICA (Nuclotron-based Ion Collider fAcility) based on the Nuclotron and new technology of pulsed superconducting magnets with the maximum field up to 6 Tesla.
- Preparation of the project of multipurpose detector MPD (Mixed Phase Detector) for investigation of relativistic heavy ion collisions. Analysis of the setup conceptual schemes, modeling of the collision processes in the energy range of 11 GeV. Experiments at the Nuclotron beams on the first priority tasks of the accelerator development, physics and methodical experiments.

#### The way forward

The first step in this collaboration has been the round-table Discussion "Physics at NICA" which took place in Dubna on July 5th 2015. Institutes interested in promoting and working for the NICA project participated in the discussion meeting together with many international experts.
A second event will take place during the 15th Session of the Joint Coordination Com- mittee on RSA-JINR cooperation, September 2015 in Dubna which provides an ex- cellent opportunity to focus on the funding possibilities for different research fields including the NICA project.

Another step will be taken in September 2015 when about 30 South African students and academics will be invited to Dubna for three weeks to attend the International RSA-student practice 6th -27th September 2015 which will focus on introducing students and academics to Dubna. In addition to lectures and working hands-on on different projects, the participants will visit the NICA site. They will be encouraged to work on projects when they return to South Africa which are directly related to the NICA project.

Also, the 4th RSA-JINR Workshop "Few to many Body Systems: Models, Methods and Applications" will take place in Dubna in September 2015 and will provide another opportunity for South African scientists to discuss common projects related to NICA.

## Science Teacher Development Workshop

*Brian Masara, SAIP office, Pretoria*

A Science teacher development workshop, was organized as a collaborative initiative between the South African Institute of Physics (SAIP) and the Institute of Physics (IOP, UK), and hosted by the University of Johannesburg, Soweto Campus, during the period 6th July – 9th July 2015. "Meaningful human capital development within the broader South African context remains a key strategic priority for the fulfillment of societal and economic needs," said Dr Sam Ramaila, SAIP Education Portfolio Chairperson. The importance of such an initiative has been emphasized at the SAIP Council meeting during the 60th Annual conference of SAIP at Port Elizabeth.

*Above: Teachers at workshop in June 2014*

## NMMU & Rhodes Host a Successful 60th Annual SAIP Conference

*by Brian Masara (SAIP Office) and Thomas Konrad (UKZN)*

The SAIP 2015 Annual Conference was hosted by Physics Departments at NMMU and Rhodes University. Held in Port Elizabeth from 29 June to 3 July 2015, a total of 465 delegates from 8 countries ( SA, Austria, Bostwana, Namibia, Swaziland, Sweden, USA and Tanzania) attended the conference. According to the statistics, 97% of the delegates were from South Africa. The specializations of the participants was also broadly distributed over the SAIP Divisions and Fora but clearly peaked in condensed matter physics and materials (see table below):

*Divisions: ( % rough estimate)*

| |
|---|
| Applied Physics Forum 9% |
| Astrophysics & Space Science 9% |
| Biophysics 1% |
| Nuclear, Particle & Radiation Physics 18% |
| Photonics 9% |
| Physics Education 2% |
| Physics of Condensed Matter & Materials 30% |
| Space Science 3% |
| Theoretical & Computational Physics 9% |
| None Selected 10% |

Several other meetings were held in conjunction with the SAIP annual conference. The number of related and associated meetings is rising steadily, and in 2015 included the following;

- The NASSP Consortium Inaugural Meeting
- The National Laser Centre Rental Pool Programme Meeting
- The Winter School: Photonics
- The WiPiSA lunch and the Student lunch
- Council meeting with Heads of Physics Department and National Research Facilities. A function of this meeting is to identify issues of common concern in the physics community, and if possible, to formulate projects to address them. The Review of Undergraduate Physics and its implementation arose from this meeting. This year a project on introducing Astronomy at undergraduate physics was presented by Prof Thebe Medupe (NWU) in Collaboration with Dr Mathoto Thaoge from DST.
- Council meeting with Division and Forum Chairs

- The Astronomy Town Hall (independent, in the week before the SAIP Annual conference).

Among the highlights were the plenary talks by high-calibre invited speakers and a novum: three public talks, which let a broad local audience profit from the high quality of this year's invited speakers. Among them was South African born Japie van Zeyl who is NASA chief engineer at Jet Propulsion Labs in California/USA with a talk entitled *Exploring the Universe: Signs of Life.* The talk (to watch click: youtube), that captured the audience from the first to the last sentence, showed a breath-taking landing of a 1t rover on Mars and recent pictures from missions to several planets in our solar system.

*Jacob van Zeyl leading the audience on an exploration tour through the universe*

The bread and butter of the annual conference are the talks and discussions in the specialist sessions. Here is what happenend from specialists' points of view.

## Biophysics

*Tjaart Krueger (Chair: SAIP Biophysics Initiative), UP*

A record of 15 Biophysics oral presentations were given during the 2015 SAIP conference: 11 in the Photonics Track, 2 in the Theoretical Physics Track, and 2 in the Condensed Matter and Materials Physics Track. A broad range of subjects were presented, which included photosynthetic light harvesting, molecular motors, biofilms (i.e., slime), and diseases such as diabetes and cancer. The range of experimental techniques ranged from atomic-resolution imaging, single-molecule and ultrafast spectroscopy on the one extreme and remote atmospheric insect sensing on the macroscopic scale. Monetary prizes were awarded for the best presentation on a Biophysics topic by an MSc and a PhD student.

## Photonics

*Erich Roehwer, Head of Division, University of Stellenbosch*

The Photonics division held a successful Photonics winter school attended by 50 students and scientists. Topics ranged from Trapping of ions, manipulation of light, photosynthesis to Ultrafast and THz spectroscopy and luminescent materials.

At the SAIP the highlight was the plenary by Prof Andrew Forbes on quantum entanglement with patterns of light. The Lectures and posters in the program were very well attended. The main topics that were covered were ultrafast spectroscopy, digital light manipulation, quantum optics and laser development as well as medical- and bio photonics. Prof Andrew Forbes also presented a very popular non-specialist lecture: "Accelerating light" which was very well attended.

Students were awarded prizes for their excellent presentations:

- CSIR MSc poster prize Bienvenu Ndagano
- Airbus optronics MSc oral presentation prize Xavier von Stein
- Aerosud PhD Poster prize Benjamin Perez Garcia
- SAIP PhD oral presentation prize Alem Gebru
- Concillium Technologies Technology prize Andre de Bruyn

## Space Science

*John Bosco Habarulema, Head of Subdivision, SANSA*

From the Space Science sub division of the Astrophysics and Space Science, one of the most interesting events was the plenary about Space Weather and why we should care. This plenary given by Prof Michael Kosch was an informative and engaging presentation to the extent that time was not enough to take all questions. Prof Kosch has told me that after the talk, he got two invitations from SAIP members to their respective universities.

Another exciting and informative plenary was from the Women in Physics Forum given by Prof Liesl Folks about the "Status of Women in STEM in the US". I think the issues she talked about and articulated are also relevant to our own situation. In general, all plenary talks were excellent and this should be highlighted.

About the presentations in Space Science: We had excellent talks from MSc and PhD students which led to the sharing of PhD prizes. This year, we had 5 MSc and 9 PhD talks respectively. We were fortunate to get generous sponsors from the Center for Space Science Research NWU, Hartbeesthoek Radio Astronomy Observatory, South African Astronomy Observatory,

*Interested audience in a talk*

South African National Space Agency, French South Africa Institute of Technology CPUT and SAIP.

**Organisation of SAIP:**

I feel that SAIP was very well organised and the usage of sending smses for different functions/gatherings was very helpful which should continue for the next SAIP conferences.

## Theoretical and Computational Physics

*Thomas Konrad, UKZN*

This year we saw interesting theoretical work on string theory, quantum and particle physics, condensed matter systems and materials, solar cells, chaos theory and relativistic fluids as well as other subjects. I personally like this large variety of research fields that, as I suspect, can only be found under the roof of the division of theoretical and computational physics. The theory session of the annual conference never fails to teach me something new.

For example, this time I learned about an interesting new non-relativistic field-theory approach to the description of exotic metals that might help to fill the gap left by Fermi liquid theory. The latter somehow collapsed in front of the task to describe high-temperature super conductors as nicely explained in an article by Nobel laureate P.W. Anderson. While Fermi liquid theory applied the concepts of quantum electro dynamics (QED) to represent the propagation of electron-hole pairs in metals in the Fermi Sea of non-interacting electrons (similar to the vacuum in QED), the new approach uses renormalisation techniques to describe the propagation in the presence

of strong interacting electrons as present in high-T superconductors. I asked Robert de Melo Koch from Wits, who explained:

"The recent work extends the program of Wilson's renormalization group to problems involving quantum field theory at finite density. The existence of the Fermi surface implies (i) the existence of a new scale besides the cut off, (ii) a mixing between ultraviolet and infrared modes (so that the infrared modes do not strictly decouple) and (iii) new possibilities for marginal couplings since momenta tangential to the Fermi surface do not scale under the renormalization group flow."

Despite the interesting subjects there were not as many participants in the Theoretical and Computational Physics sessions as in previous years. The problem was recognised and discussed in the Division Meeting. The participants agreed that there is no alternative for meeting the South African physics community, which is important for both theoretical and computational South African physicists.

*Robert de Melo Koch with students*

## Physics Education Division

*Sam Ramaila, Head of Division, UJ*

It was indeed with a sense of immense pride for the Physics Education Division to present a Non-Specialist Lecture titled "South Africa and the International Measurement System: Billion or Trillion?" delivered by Dr Wynand Louw of the National Metrology Institute of South Africa (NMISA) during the 60th Annual Conference of the South African Institute of Physics. The lecture itself has profound ramifications for Physics as a fundamental discipline as the International System of Units (SI) is set to undergo a major change in 2018 when four of the base units, the kilogram, Ampere, Kelvin and mole will be redefined.

## SAIP Elects New Council

*Brian Masara, SAIP Office, Pretoria*

The SAIP held elections for a new council that will serve for the next 2 years. The new SAIP council is composed of the following

| Name | Portfolio/ Committee Chair |
|---|---|
| Prof. Azwinndini Muronga (UJ) | President |
| Prof. Patrick Woudt (UCT) | President – Elect |
| Prof. Andre Ventre (NMMU) | Treasurer |
| Prof. Makaiko Chithambo ( RU) | Secretary |
| Prof. Igle Gledhill (CSIR) | Past-President & International liaison |
| Prof Jean Cleymans (UCT) | Awards |
| Prof. Regina Maphanga(UL) | Outreach & Marketing |
| Prof. Deena Naidoo (WITS) | Conferences |
| Dr. Sam Ramaila (UJ) | Education |
| Dr. Mmantsae Diale (UP) | Fundraising |
| Dr. Malebo Tibane (UNISA) | Industrial Liaison |
| Dr. John Bosco Habarulema (SANSA) | Divisional Representative |
| Mr. Brian Masara (SAIP) | Executive Officer |

## SAIP Awards 2 Silver Medals at SAIP2015

*by K. Mueller Nedebeck, Stellenbosch*

One of the main goals of the SAIP is to promote and recognise excellence in Physics in all its forms through bestowing medals and awards in recognition of excellence in Physics. The main medals awarded by SAIP are the Gold Medal for Life Time Achievement and The Silver Jubilee Medal for early career achievement.

This year the SAIP was awarding the Silver Jubilee Medal. The Silver Medal is awarded for the outstanding achievements by a young physicist in any of the following facets of any branch of Physics: research, education, technology and industrial development. This award is made to persons who are less than 35 years old on the closing date for the receipt of nominations.

We are extremely pleased to announce that the Silver Jubilee Medals for 2015 were awarded to Dr Angela Dudley, of the CSIR National Laser Centre, and to Dr Shazrene Mohamed, of the South African Astronomical Observatory, for their achievements in their respective fields of physics in their young careers so far.

## 2015 Silver Medallist - Dr Angela Dudley, CSIR National Laser Centre

Dr Angela Dudley received her doctorate from the University of KwaZulu-Natal in 2012 working on the experimental techniques associated with the generation and measurement of optical fields that carry orbital angular momentum.

Dr Dudley has performed pioneering work on Bessel beams, demonstrating that they can be created with digital holograms, made to spin as they propagate, and combined to form non-diffracting speckle. A key innovation of her scientific activity has been the development of new techniques for the modal decomposition of light with only a spatial light modulator, allowing a very simple way to extract all the key properties of a laser beam. This new technology is presently being applied by Dr Dudley in the analysis of laser resonators, and is a cornerstone of a spin-out company from the CSIR, with Dr Dudley as the chief technical expert.


*Past President Igle Gledhill with Dr Dudley and the silver medal*

Dr Dudley's PhD already produced 9 papers in high-impact publications of the field, and she is continuing to publish her work in leading physics journals. Dr Dudley has won 13 national and international awards for her research, and her work has been on the front cover of journals and been listed in the top 10 most downloaded papers of a journal of the Optical Society of America. It has been selected as "hot" in the Editor's Choice in the New Journal of Physics. She has been invited to spend time in top overseas laboratories and has been a driving force in the collaboration network of the National Laser Centre. She has spent time and formed collaborations with groups in the USA, Canada, Scotland and Belarus.

Dr Dudley has also been involved in numerous outreach and community service projects, ranging from being the face of the CSIR's Young Scientist, working as a lead conference organiser and through in-

volvement in various ways with the Optical Society of America.

Dr Angela Dudley is awarded the Silver Jubilee Medal of the South African Institute of Physics for excellent achievements in her early scientific career.

## 2015 Silver Medallist Dr Shazrene Mohamed, South African Astronomical Observatory

Dr Shazrene Mohamed completed a double bachelor's degree in Astronomy and Astrophysics and Mathematics at Harvard University, before pursuing a PhD in astrophysics at the University of Oxford in 2010. She is currently a research career advancement fellow at the South African Astronomical Observatory, followings stints as post-doctoral research at the African Institute for Mathematical Sciences in South Africa and the Agelander Institute for Astronomy in Germany.

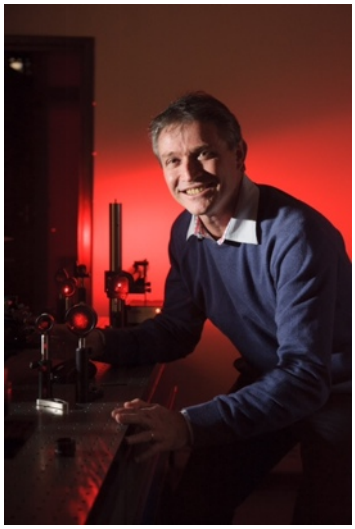
Dr Mohamed is internationally acknowledged as the authority in three-dimensional modelling of the complex interactions between the extended atmospheres of highly evolved stars and a variety of companion stars. Her computations have included complex and computationally intensive physical processes that were previously neglected. Her work has provided solutions to long-standing problems, which include the interactions in symbiotic binaries that cause nova outbursts. Her work has also provided a detailed understanding of shells and shocks close to stars, and provides and explanation for the behaviour of superluminous supernovae, where the shock wave of the exploding star interacts with other material.

Dr Mohamed has published numerous papers, two of which have appeared in Nature, and she already has 315 citations. Her simulations have appeared on the cover of Astronomy & Astrophysics. She has been invited to give reviews at several international meetings.

Dr Mohamed engages with non-specialists, young and old, and encourages and supports young scientists from disadvantaged backgrounds. She has been a keynote speaker at the astronomy and telescope expo "ScoPex" and the Annual Maths and Science Conference. In addition she serves on the National Committee for Astronomy. Dr Shazrene Mohamed is also awarded the Silver Jubilee Medal of the South African Institute of Physics for excellent achievements in her early scientific career.

## NSTF Award for Andrew Forbes

Prof. Andrew Forbes was recently awarded the Photonics award of the National Science and Technology Forum (NSTF). In the citation the NSTF mentioned Andrew's



contribution to photonics in South Africa over the past decade. Over the past 10 years Andrew has put South African photonics on the map, covering topics from classical to quantum optics, lasers to materials. His ~250 technical papers have appeared in the top optics journals, including the Nature journals, featured in more than 100 news stories, and won over 50 awards. Transcending pure research, the resulting innovations include the digital laser, high brightness lasers, and novel laser detection methods, all of which are being commercialised or have been licensed. He has made a telling impact on future generations of scientists by graduating 24 post graduate students (80% black or female), hence contributing to the role models of tomorrow, and has established new photonics programmes at previously disadvantaged South African and Africa HEIs.

Andrew has made major (international) advances in each of the three main fields he has worked in (classical optics, quantum optics and lasers):

**Classical:**

* major contributions to the creation of structured light: non-diffracting light, rotating light fields, and their self-healing;

* first demonstration of modal decomposition of laser beams with digital holograms – a new detection method for light.

**Quantum:**

Andrew produced the first quantum correlations ever seen in Africa and has demonstrated high-dimensional entanglement in 25 dimensions. He has used this to make several world firsts:

* highest (at the time) dimensionality in a quantum key distribution experiment using orbital angular momentum;

* first demonstration of mutually unbiased bases for quantum state tomography;

* first entanglement of Bessel photons, and demonstration of entanglement self-healing.

**Lasers:**

World-leading intra-cavity beam control:

* first explanation of the mode structure from Porro-prism lasers;

* seminal work on the understanding of orbital angular momentum generation from lasers

* first demonstration of on-demand lasers with a digital laser;

* 20 times improvement in laser performance using diffractive optics inside a laser, which has been licensed by a company;

* 10 times laser brightness improvement using a novel approach that is patented, and the first demonstration of how to optimally extract a high-energy Gaussian beam from a laser by phase-only control.

## SAIP now a SAQA Recognised Professional Body

*Brian Masara, SAIP Office, Pretoria*

The SAQA Board approved the recognition of the South African Institute of Physics (SAIP) as a Professional Body for the purposes of the National Qualifications Framework (NQF) Act, Act 67 of 2008. It also approved the registration of the Professional Physicists Designation on the NQF.

For a recap of the history and long road to registering SAIP as a recognised professional body please read the article by SAIP Past President Prof. Simon Connell that appeared in Physics Comment of March 2012 ***Embracing a new and enhanced role for the "Physicist" Profession***

**http://www.saip.org.za/images/stories/documents/PC/PhysicsComment_March_2012.pdf**

In the process the SAIP also had to change its constitution to enable establishment and development of the Professional Physicists designation.

## Critical Skills Visa Letter

*Brian Masara, SAIP Office, Pretoria*

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;

- 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.
- 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.
- 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

*Brian Masara, SAIP Office, Pretoria*

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**

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 is eligible to apply.

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:

**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 that 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 physicists

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

Supporting the recruitment process, many recruiters these days want to know if one has a professional designation

The designation can be used as a criterion for promotion, skills and salary benchmarking. It demonstrates that someone who possesses this designation believes in professionalism, continuous skills development, belongs to a professional body and accepts ethical standards.

## Purchase the book Physics in South Africa

*Order from SAIP Office!*

The book is currently available from the SAIP Office in Pretoria in hard copy and currently priced as

a) Hard covered Copy R500 per copy

b) Soft covered Copy R250 per copy

Courier and postage fees is for the customer's account To order your copy please Email or Phone +27 12 841 2655/2627

## WiPiSA Departmental Lunches Funding Opportunity

*Aletta Prinsloo, University of Johannesburg*

Two of the main objectives of WiPiSA are to

- encourage and stimulate an interest in girls and women to study physics.
- support girls and women to work in physics-related careers and assist in removing/overcoming obstacles and barriers for girls and women in their studies and at the workplace.

To meet this objectives we initiated an idea to have departmental lunches across Universities within South Africa. The lunch activity is expected to bring women in physics together; academics, those in leadership roles and students (both undergraduates and postgraduates), to enjoy a meal together while encouraging and stimulating interests to study physics, networking and to talk about some challenges they are facing as women in physics.

WiPiSA will provide a funding of R3000 only for your institution to organize the lunch. We therefore request you to help us accomplish this goal, or forward the name and contact information of the representative from your department to facilitate this activity. We would appreciate if the lunch event can be held before the end of November 2014 as this will help us to compile a report. WIPiSA expects you to send us:

- A short report about the event (venue, number of attendees, activities, etc).
- The outcomes of the event (students were motivated, links established, etc).
- Few event pictures.

Please do not hesitate to contact me at alettap@uj.ac.za for further enquiries.

## Rhodes University and SAIP2015

Makaiko Chithambo ( RU), Co-chair SAIP 2015

The Department of Physics & Electronics jointly organised the 2015 South African Institute of Physics (SAIP) Conference with the physics department at Nelson Mandela Metropolitan University (NMMU) from 29th of June to the 3rd of July 2015. This was the 60th in an annual series and drew participants from physics departments and related institutions all over the country. The meeting was held at the Boardwalk Convention Centre in Port Elizabeth.

The meeting, which attended by some 450 participants, was officially opened by the Deputy Vice Chancellors for Research at Rhodes and NMMU, Dr Clayton and Prof Leitch. In his opening remarks, Dr Clayton presented and discussed statistics of research publications in the country and noted that physics was making an important impact given the size of the discipline. The remarks from Dr Clayton were particularly opportune given the research culture at Rhodes University.

Rhodes is the smallest university in South Africa but with a strong research identity that also emphasizes excellence in undergraduate teaching. The university achieved a new university record of 75 PhDs at its graduation ceremony in April 2015. The significance of this achievement comes into light if once considers that a sister university with an enrolment of 30000 or so, that is almost six times the size of Rhodes, graduated 71 PhDs in 2014. Another significant statistic is that 61% of the graduates in 2015 were women. Despite its size, Rhodes University has one of the highest research output per academic staff member.

Located in the Rhodes Science Faculty, the Department of Physics and Electronics houses a SARChI Chair in Radio Astronomy and has a vibrant research group involved with the SKA project. It is the only University Department in South Africa which offers research opportunities that combine Fundamental Physics and Modern Electronics. This hybrid offering gives students the distinct advantage to apply cutting-edge technologies to the frontiers of scientific research in a way that can enable them to contribute uniquely to big scientific projects such as the SKA. Apart from the flagship SKA programme, the department has research groups in Experimental Solid State Physics, Theoretical High Energy Physics, Experimental Nuclear Physics, Electronics and, Pedagogy of Physics. Research in space science is carried in collaboration with the South African National Space Agency.

The last time Rhodes University organised a SAIP annual conference was in 1988. Organising SAIP2015 was involving but good fun and made easy because of the support of Joint Chair Andre Venter and colleagues at NMMU. There was stress and doubt in the months leading up to the conference but all the while we wanted to host a memorable and professionally managed conference. The conference week flew past and by the time it was over, one wondered what had just happened. Of particular note is that three students from Rhodes University, Mr Mbou Sob, Mr Philip Liju and Ms Lerato Sebokolodi, won awards for excellent presentations in astrophysics. We at Rhodes will always have fond memories of SAIP2015.

## A bit on the Department of Physics – NMMU

André Venter (NMMU), Co-chair SAIP 2015

The Department of Physics has been in existence since 1965, and has nationally and internationally acknowledged expertise in the fields of Solid State Physics, Materials and Nanoscience, and Renewable Energy. Currently the department has four main areas of research, namely Electron Microscopy, Semiconductor Physics, Renewable Energy and Optical Communication. All these fields are currently of great importance and relevance in South Africa

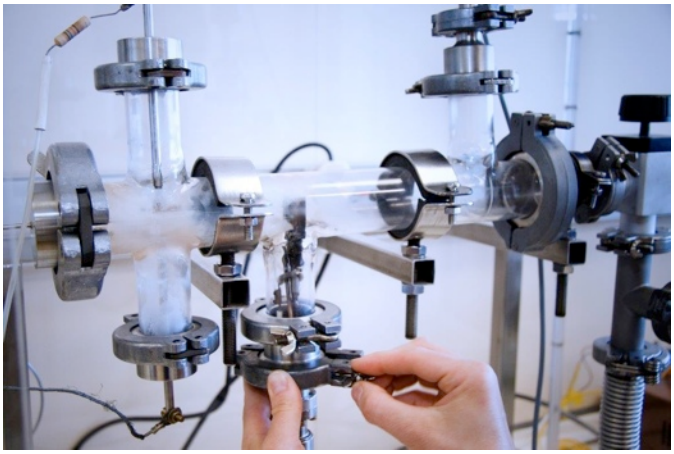
and the world, in particular the novel area of Nanoscience.

*Electron Microscopy unit at NMMU*

Our undergraduate programme deals with the basic principles of Mechanics, Optics, Electricity, Magnetism, Nuclear Physics, Thermodynamics, Quantum Mechanics and Solid State Physics. All our qualifications are internationally recognised. The department has many links with overseas universities and research institutions, and our postgraduate students are afforded the opportunity to do research at these institutions through collaborative projects and present their research results at national and international conferences.

Electron Microscopy is one of the niche areas offered at NMMU, and the department has state-of-the-art equipment in this field. The department specialises in all aspects of electron microscopy, from sample preparation to analysing samples by scanning (SEM) or transmission electron microscopes (TEM). The department has the only Atomic Resolution Electron Microscope in Africa, complemented by a highly skilled team in the Centre for High Resolution TEM. The department hosts one of the South African Research Chairs in Nanoscience and has the capacity to produce

and characterise a range of novel semiconducting materials. Moreover, The department it hosts the only two Metalorganic Vapour Phase Epitaxial (MOVPE) reactors in South Africa, which allow the controlled (almost atom-by-atom) growth of structures for light emitters and detectors.



Today the internet requires extremely high data rates, with optical fibres replacing slower copper links. The Physics Department has one of the leading laboratories in South Africa for optical fibre telecommunication research, assisting South African Industry and collaborating with universities worldwide. The laboratory is well-equipped with the latest equipment. The laboratory is also playing a key role in designing and implementing the data transport network for the Square Kilometer Array (SKA) Telescope project.

The department is affiliated with NMMU's Centre for Energy Research (CER), where the focus is on various renewable energy research activities. The department has state-of-art-the-art equipment in the laboratories and at the outdoor research facility where students get involved in exciting research projects on solar and wind energy technologies.

*Rack with multicrystalline silicon modules and heat box*

## My experience in Organizing SAIP 2015

**André Venter (NMMU), Co-chair SAIP 2015**

Organizing a conference on behalf of the South African Physics Community is a great responsibility. Being mindful of this, one realises the importance of a well-constructed management plan and the importance of selecting a team able to execute the plan. As you know, the 60th SAIP Conference was co-hosted by Rhodes University and us (NMMU). The sharing of responsibility of this magnitude relies on trust and commitment from both parties. My co-organiser Prof Makaiko Chithambo and I, together with the LOC worked together very well and developed into a formidable team. Reflecting on the conference, I would like to highlight a few points:

The best decision we made was to bring a professional conference organizing team on board. Tania Schmidt and her team from Eastern Sun Events were absolutely remarkable. The level of competence and professionalism has been a revelation. The chairpersons and the LOC could actually enjoy the conference and attend lectures, something that seldom happened in the past.

The perception that this is a more expensive route (than the conventional way of organising SAIP conferences) has been proven wrong.

The public lecture series introduced by the 2015 LOC was a great success and should be considered for future conferences as well. The idea with this was to introduce the general public and in particular school learners to the wonder of science and the myriad of possibilities that it presents us with. The feedback and appreciation from the public were overwhelming.

The choice of venue has played a major part in the success of the conference. I suppose it is normal for organisers to be anxious about the arrangements and continuously question whether one could not have done more. Despite this, I believe the conference was a success and my thanks go to all involved.

*Prof André Venter at the conference banquet*

*From left to right: Prof André Venter, Prof Makaiko Chithambo with Prof Simon Connell*

# Obituary Darragh O'Donoghue 1957-2015

**by Patricia Whitelock, South African Astronomical Observatory (SAAO) and UCT**

**and Lisa Krause, SAAO**

Darragh O'Donoghue was a truly remarkable man and an extremely talented scientist. He contributed enormously to astronomy, South Africa and, most profoundly, to the lives of his many colleagues and friends around the world.

In 1977 he came to Cape Town, from Durban where he had studied physics as an undergraduate, to do a PhD at UCT. His close friend and colleague, Mark Cropper, who was a student there at the same time, fondly remembers his arrival in a VW Beetle, with a guitar. He was quite the hippy at that stage and probably slept in that car until he got himself settled...

He joined the SAAO in 1997, after more than a decade as a postdoc at UCT. Scientifically, he made seminal contributions to studies of white dwarfs, cataclysmic variables, hot stars and pulsating variables. He was a leader of the Edinburgh-Cape Blue Object Survey and as such was one of the co-discoverers of an entirely new class of pulsating subdwarf B stars. These he went on to investigate and characterise in detail, with over 30 papers co-authored on the subject between 1995 and 2015. The referee's report for the group's latest EC Survey paper was, in fact, received the day after he died.

High speed photometry has been a critical tool for investigating a range of variable stars. Darragh designed one of the first high-speed photometers ever used and many years later he ensured that this type of work would be one of the unique capabilities of the Southern African Large Telescope (SALT). As a result, both of the telescope's first-light instruments - SALTICAM and the Robert Stobie Spectrograph (RSS) - possess high-speed capability.

Darragh was also a founding member of the Whole Earth Telescope (WET), a collaboration of over 50 international astronomers who did pioneering work on astreroseismology. He was a co-director of WET for some while and was influential in their choice of instrumentation.

His contributions to SALT have been immense, starting with a complete redesign of the secondary optics used on the Hobby-Eberly Telescope (HET), SALT's older twin. This optical assembly, known as the spherical aberration corrector (SAC), was to yield sharper images and a larger field of view for SALT. It is a wonderful tribute to Darragh's optical design capability that the HET's long-awaited Wide Field Upgrade centres on replacing the original HET SAC with a scaled up version of Darragh's SALT corrector. It seems a bitter-sweet coincidence that, after extensive delays in that project, the Wide Field Corrector is currently due to be installed on the day of his funeral.

Darragh also designed SALT's first-light acquisition/imaging camera; SALTICAM. As the head of the SAAO Instrumentation group at the time, he then oversaw the instrument's construction in the SAAO workshops.

Following Bob Stobie's death in 2002, Darragh took over as one of the two South African representatives on the SALT Board and rapidly gained the respect and deference of the other Board members. He was determined that SALT would be the very best telescope it could possibly be and worked tirelessly at all levels to that end.

When it became clear that SALT was not functioning properly, Darragh took up the challenge and meticulously tested all aspects of the system and later established that the issue lay with the mechanical design of the SAC/payload interface. He then led the campaign that included the repair, re-alignment and comprehensive optical testing of the SAC, and afterwards delighted in the telescope finally producing the sharp images that his design allowed.

Whatever Darragh chose to do, he did it with 100% of his effort; there were never any half measures. This applied to science, technology and all of his many other pursuits. This was vividly demonstrated when he took on the task of defending a former director of SAAO against unwarranted charges. He applied his characteristic dedication to understanding the National Research Foundation conditions of service and the King III report on Corporate Governance. This he did to great effect and ultimately achieved an excellent outcome, not just for that specific case – but for the sake of academic freedom in South Africa.

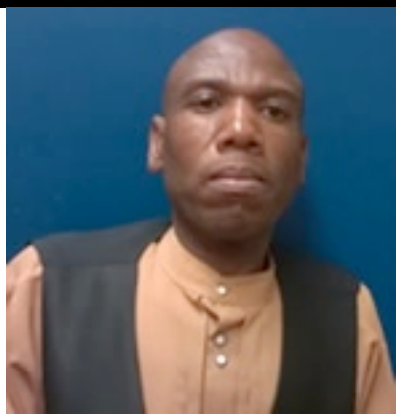
Following the successful conclusion of the SAC repair work, and his extraordinary foray into the legal world, Darragh received the Gill Medal from the Astronomical Society of South Africa for exceptional services to South African astronomy in 2011.

During the sabbatical year granted by the SALT Board in appreciation for his Image Quality effort, Darragh spent time working with Chris Clemens at the University of North Carolina in 2012. Work done during that time led to them designing and patenting a compact, revolutionary type of spectrograph based on the critical enabling technology of curved volume phase holographic gratings. A spectrograph incorporating such a grating was to be tested on the 1.9m at Sutherland during the coming year. If this new instrument works as anticipated, it will revolutionise spectroscopy, not just in the field of astronomy. We anticipate that curved grating spectrographs will be one of Darragh's many great legacies.

We have lost a treasured friend and a delightful colleague who was kind, thoughtful, tenacious, playful and incredibly smart; the world is a vastly emptier place without him. He is survived by his wife Liz and two daughters, Andrea and Alex, who were his pride and joy and who were with him at the end.

# Obituary Erasmus Rammutla

**by Raphela Maphanga and Petros Ntoahae,**
**University of Limpopo**



It is with great sadness to inform the SAIP community about the untimely death of Prof Koena Erasmus Rammutla of University of Limpopo. He passed away on Saturday the 1st August 2015. Prof Rammutla was an Associate Professor and Head of Department of Physics at the University of Limpopo since 2010. After completing his matric at Kgoke High School in 1990, Rammutla joined the then University of the North (now University of Limpopo). He completed his Bachelor of Science in Physics and Chemistry in 1994 and Bachelor of Science Honours in Physics in 1996. He then registered for his Master of Science in Physics at the University of the Witwatersrand under the supervision of Prof JD Comins. His MSc was upgraded to a Doctor of Philosophy in Physics, which he completed in 2001. His thesis was titled "Light Scattering and Computational Studies of Superionic Compounds." After completing his PhD, he joined the University of Kent in the UK as a Postdoctoral Research Fellow. He then returned to SA in 2004 to join the University of Limpopo as a Senior Lecturer in Physics and he immediately became the Interim and Acting Head of Department.

Many of SAIP Members will remember Prof Rammutla as he made significant contributions in Physics, particularly at SAIP where he served as the Council Member from 2009 to 2013. During his term in the council he served as the Chairperson of SAIP Conference Portfolio Committee. Also, he was the Chairperson for Local Organising Committee for 53rd Annual SAIP conference held at the University of Limpopo in 2008, for the first time in the history of SAIP conferences. He participated in various activities in the division of Condensed Matter Physics and Materials Science. In addition, he served on many Scientific Committees in South Africa, including being Executive Committee Member South African Nanotechnology Initiative (SANI), Member of Department of Science and Technology Steering Committee on India-Brazil-South Africa (IBSA) Projects, Executive Committee Member of the South African Solar Energy Initiative, etc.

Those who know Prof Rammutla closely hold him in high regard as a very humble and prominent Physicist. For example Prof Darell Comins of Wits Schools of Physics had to say this about Erasmus "I am deeply saddened by the death of Prof. Erasmus Rammutla. I remember the days when he was a postgraduate student at Wits University with his enthusiasm for physics, dedicated work, imaginative and original ideas, kindness and a wonderful sense of humour. These attributes have led his subsequent research career to blossom in new and important directions. Erasmus was a dear friend and colleague and I have much appreciated our collaborations. His passing is a great loss to Physics in South Africa and to his Department and University. My colleagues join me in expressing our condolences and deepest sympathy to his wife and family."
He was a colleague, mentor, supervisor, collaborator and friend to many. The SA Physics Community and the country at large have been robbed of a giant Physicist. He had a lot to offer as a Physicist by contributing to the well-being of young and future Physicist

May his soul rest in eternal peace.

# Letters to the editor

**Performance Management (PM) at universities**

*Editorial note:*

The correspondence below has been received as a response to the article "Bureaucrats, bean counters, and bungles" in the last issue of Physics Comment. Since that issue the following events have taken place:

Dr Sahal Yacoob, feeling that he would be unable to pursue his field of research at UKZN in the future, resigned from the University and has accepted a position at the University of Cape Town. He was dissatisfied with the UKZN disciplinary findings against him and continued to pursue the matter with the CCMA. The outcome of the case was that the matter was settled between Dr Yacoob and the University of KwaZulu-Natal. The terms of settlement were

"1. The respondent (i.e. UKZN) agrees that the final written warning issued to Dr Yacoob, the applicant, whilst he was employed at the respondent, will be expunged from his personal record."

"2. The respondent undertakes that, for reference purposes, it will officially confirm that there is no record of any disciplinary action taken against the applicant as same has been expunged by mutual agreement."

***Dear Editor:***

South Africa is now firmly in the era of big science, with the SKA project being only one such experiment that will result in very large multi-authored papers. DHET needs to find a more effective way toincentivise research outputs in this changing environment of big science, and universities should stop using simplistic (read daft) methods to administer performance management. The problem is, of course, that some universities are seeing the DHET subsidy system as a means of additional income, and so academics are being flogged to produce more.

These bureaucrats have no clue on how to assess quality because this does not fit nicely into their check boxes. As the editor correctly points out, not every contribution made by academics is simply quantifiable. The dreaded Excel spreadsheet has empowered bureaucrats dangerously.

At the 2014 annual general meeting of the Academy of Science of South Africa, this matter was discussed at length and a number of senior academics representing a very wide range of different disciplines spoke to this. ASSAf is ideally placed to lead this discourse across disciplinary boundaries and SAIP should actively collaborate with the Academy to resolve these issues, and to find intelligent answers. I am truly sorry to hear that Dr Sahal Yacoob could be leaving his university because of this dreadful experience. He has been treated shabbily by those who are entrusted to lead and to inspire. During apartheid times, we often had convictions which at face value, was for breaking the law. Desecrating a park bench, for instance, earned a group of youngsters a sjamboking in the 70's in Pietermaritzburg where I grew up, as this amounted to damaging public property. But those who cared about social justice would have looked into this a little more deeply: those kids were not allowed to sit on the bench because of their race.

Passing this off as a legal, technical matter and overlooking the fundamental question that was being raised was convenient. We haven't come too far it seems.

**Nithaya Chetty**

***Dear Editor:***

PM in academic science is a way to control institutions or their members in order to further technological, economic, social or cultural progress. In this sense science as a social activity is the instrument to meet economic or social purposes. Historical evidence shows that this limitation of science by state, clerical or economic purposes always has blocked the innovation potential of science. So the answer of whether science can prosper under such conditions is simply: No, it can't.

But in my view it is even worse.

Science may be seen as a corporate enterprise in striving for knowledge. So to get the job well done science should be based on a non-strategic and authority-free process of communication which include:

a) the scientist says what he sincerely thinks is right (principle of honesty),

b) the scientist has strong confidence that his colleages also act according to the principle of honesty,

c) the scientist points out frankly, which of his statements are well-justified and which of them are of mere hypothetical character.

There are strong indications that PM undermines these fundamental values and destroys the basis of rational communication that is so important in the academic field.

**Werner Pabst, Physicist, Frankfurt (Germany)**

***Dear Editor:***

This letter represents the views of a group of concerned postgraduate students at UKZN in response to the article entitled Bureaucrats, Bean Counters and Bungles by Prof AD Walker in Vol 7, Issue 1 of Physics Comment.

In the article, Prof Walker gave details on how staff performance is evaluated at UKZN and highlighted the fact that the "one size fits all" approach employed by the University can not be applied to all cases. What concerns us is that this approach is applied in the first place, but even more concerning is the fact that it is applied with great persistence and determination, even when it is clearly not applicable.

Performance within different spheres of academic endeavour cannot be compared in exactly the same way. In some fields, working alone or in small partnerships is the norm. In science, big budgets are required to fund big projects with expensive equipment. As a result, big teams and collaborations are required to make these projects feasible. In fact, having many collaborators is encouraged by most universities, including UKZN, as a sign of involvement in major scientific projects.

A person working within a large collaboration does no less work than someone working alone. If they did, the collaboration would not be working effectively and the under-performing person would be asked to leave. It would thus be advisable for a university to place more of a premium on a staff member's activity within a collaboration, rather than simply counting how many papers the group have published and dividing by the size of the group.

As students, we work within the Astrophysics and Cosmology Research Unit and many of us are only able to study because of scholarships supplied by large research organisations such as the SKA. Most of us are involved in collaborations and hope to continue to work on exciting, relevant scientific projects. To do this, we need to continue to be involved in big collaborations. But apparently, being involved in big col-

laborations is a sure way to run into trouble with your employer, if that employer happens to be UKZN. Thus it is clear that if we wish to continue with a career in research, we would be well advised to seek employment elsewhere.

The case of Dr Sahal Yacoob, highlighted by Prof Walker, has shown UKZN's management to be short sighted in the blind application of the rules, without any attempt to consider mitigating circumstances. This can only be detrimental to the University as a whole. First of all, they have lost the services of an excellent lecturer and top class physicist. They have also lost their only connection to CERN, one of the largest and most important research groups on the planet. And finally, they have demoralised their current staff and set a precedent that cannot be ignored by prospective staff members.

It is our sincere hope that the powers that be will evaluate what has happened and come to realise that a little more thought and deliberation is required in devising a method of performance evaluation. A decision needs to be made; does the University want to be involved in cutting-edge, high quality research that will attract the world's best researchers? Or is it more important to produce a large volume of mediocre papers? One would hope, that "Africa's premier research University" would aim for the former.

Yours Sincerely, Concerned ACRU students:

Heiko Heilgendorff, PhD student Kenda Knowles, PhD student
Susan Wilson, PhD student
Tamirat Gogo, PhD student Mthokozisi Mdlalose, MSc student Heather Prince, MSc student
Johannes Adotey Allotey, MSc student.
Onkabetse Sengate, MSc student Ayanda Romanis Zungu, MSc student Kwazi Mthembu, MSc student

# Physics and Society

## Discussion on planned Nuclear Power Plants

*Thomas Konrad, Durban*

When the news broke in September 2014 about plans of the South African government to purchase eight nuclear power stations from Russia a debate arose whether this is a suitable way to secure electrical power for South Africa. An article in PC by Hans Eggers from the University of Stellenbosch analysed the needs based on an updated integrated resource plan commissioned by the SA government. The article echoed the conclusion of the resource plan that, because of revised projections of future economical growth, not 8 but at most two nuclear power stations are required. Since there is an estimated cost of 1 trillion Rand involved the purchase will have a major economical impact. Moreover, fueled by recent speculations about possible locations of the new nuclear plants such as the Old Durban airport, a large public debate on nuclear energy and possible health hazards can be expected.

A discussion among members of the previous SAIP council started with the prospect to find a common view among physicists and thus to be able to give recommendations. Although the sub-discipline of nuclear physics might profit and grow with the nuclear programme, there is the expectation that physicists have a practical and rational approach to the subject and could bring the voice of reason to the political debate, uncorrupted neither by financial interests, nor baseless fears. The Department of Energy stated that government is to start the procurement process in July and complete it by the end of the 2015 financial year. Therefore the time for recommendations is limited.

Here we publish part of the SAIP discussions in order to spark a public debate among physicists first in Physics Comment and at a later stage in a dedicated internet forum. Please send your comments as letters to the editor .

### Correspondence:

**Email by Hans Eggers on the 26 June:**

Dear Thomas and all,
I'm not sure whether this has progressed since Thomas's last email from a month ago. Apologies for my late reply. My own feelings about this are mixed.

R134,000 per taxpayer

1. On the one hand, I am under high time pressure almost permanently, and taking on another issue seems beyond the limits of the possible. I would not be surprised to hear that you feel the same.
2. On the other hand, the problem at hand is not a minor one; the procurement or not of eight power stations at an estimated cost of a trillion Rand (not counting cost overruns) can literally break this country financially. The findings of the Integrated Resource Plan revision of 2013 are not some obscure technicality but a vital piece of information pertinent to the question: Do we really need eight nuclear power stations or not? Here is a quick back-of-the-envelope calculation: Say there are five million taxpayers in SA. About 36 percent of tax revenue is income tax, another 26 percent VAT, another 5 percent fuel levies. So let's assume that 5 million taxpayers have to pay (36+26+5) = 67 percent of R1 trillion. That's an average of R134,000 per taxpayer on top of existing tax liabilities. (Of course high income earners, such as we are, will pay much more than that, but everyone will suffer.) It does not end there. Sibanye this week threatened shaft closures if Eskom threatens to hike tariffs by 25 percent. Eskom threatened more load-shedding if the hike is not approved. That may be grandstanding, but the fact is that the inevitable much larger future electricity tariff rises resulting from expenditure of R1trillion would badly influence industry and consumer alike. Not to mention nonlinear feedback loops like decreased electricity use, rising competitiveness of renewables in such scenario etc.. Of course all of government expenditure will suffer, including research spending. Add that to the personal cost as taxpayer. And so on. So can we afford *NOT* to think about it, debate it, and eventually to make public statements on it?
3. That, however, is the third issue here: that of end result. If we launch a discussion forum, will this result in some concrete action or statement at the end, or will we just post information, agree that people disagree, and leave it at that? Is there a willingness by SAIP to engage seriously with this threat?

Only SAIP could bring a physics angle to this public discussion.

I do think that SAIP is the only public body that could bring a physics angle to this public discussion. We should think carefully about what we are trying to achieve, set realistic goals, and then concentrate on those goals. It may be that we should simply become informed advisors to those people and bodies that do influence the process.
Kind regards
Hans

**Email by Simon Connell on the 28th June 2015**

Dear Folks
I am pro nuclear because

1. There is about $10^7$ - $10^8$ times more energy per mass in nuclear compared to coal. This is such a big number, it should

make people look seriously at this option. For Thorium reactor technologies, the extent of the natural resources is immense, lots of other advantages too.

## About $10^7$ - $10^8$ times more energy per mass in nuclear compared to coal

2. Other modes are very diffuse in energy density, some to the extent you can hardly transport them efficiently. For others you need vast farms to harvest them, again, if we need 10 x more, that's simply not viable.
3. There is the load following capacity for the base load, which cannot be done by all. Wind and solar have their supply out of phase with demand - orthogonal.
4. I am against storing energy of the amounts required to run cities and large industries (multiply 2GW by 24 hours !!!!)
5. Together with the previous point, I would say renewables are fine only for a fraction of the mix, and for remote or domestic use.
6. Wind will need more then the world supply of rare-earth materials. The technologies without enormous permanent magnets are failing.
7. The nuclear waste when processed is not large compared to the other modalities or hospital waste. Just think for a moment, that if you must have some kind of waste, which type would you rather have to deal with. There are likely to be technologies to reduce the nuclear waste further or harvest it for important materials. I really don't think waste is a large or insolvable issue, to be against nuclear. Most of the waste of Koeberg is still on site, in a pool, amazing, as its unprocessed to reduce volume. The same was true for Fukushima, and the waste storage on site in a pool not designed to survive the quake was the major radioactive release. Fossil fuels for example release many tons of U and Th into the air, as these are at ppm levels in the coal, and you need so many tons of coal per hour.
8. Nuclear is green, so the power at the plug will be green, and that will green up manufacturing etc..
9. Most people who understand Fukushima maintain that when the dust settles, it will be a massive argument for the safety of nuclear.
10. Basically, nuclear can be *physiced* and engineered to be safe.You need to discuss safety in terms of scientifically treated risk analysis, not perception. For example, it should definitely be 1000000 times safer than a car trip in SA! Assuming that the people who vote will insist on good regulation (not necessarily a valid assumption), it means the argument eventually comes down to economics.

Nuclear's price is not easily affordable because [of]

- High capital start-up cost with low running cost, you have to amortise it over 50 years.
- Safety, return to greenfield, full fuel cycle cost.

Other modalities aren't yet subject to the same cost structuring or time scales, so the comparisons are difficult to make. It's basically a waste of time to compare numbers that aren't assembled by one source of objective experts.

Pro nuclear lobbies will maintain nuclear is cheaper, greener, safer, less waste, scalable, can supply the base load, etc..

## How long will we do nuclear? I think another 100 years.

How long will we do nuclear? I think another 100 years. I expect there will be other solutions at some stage ... so … we are only taking about a rather brief time window.

Is R 1 trillion a lot of money ? No … thats what one family (Gadaffi) squirrelled away in a Swiss bank account that is now not accessible. Its 20 Gautrains … What happens if [we] spend this R 1 trillion? The economy can restart, there can be investment, employment, less crime … finally another profession for some physicists. We can re-industrialise.

We have 38GW capacity now, we had 42GW 20 years ago, we should probably be at 50GW by now, we are missing a lot of energy, and this is a major disaster.

Best regards
Simon

**Email by Hans Eggers on the 9th July 2015**

Dear SAIP Council et al,
while there is much to say I will concentrate on four points.

@Alan: I agree. My perception is that we as physicists can contribute significantly by utilising our skills of problem solving and ability to make quantitative estimates for complicated systems under conditions of insufficient information.
@Simon: I'll not discuss the first part regarding "I am pro nuclear" since we probably agree in broad strokes; differences can be relegated to later discussions. As far as I am concerned, nuclear energy will be part of our future mix while coal needs to be phased out as soon as possible.

In my view, in zeroth approximation the problem lies not in the merits or demerits of nuclear energy per se but in the economics, the risk profile and in capacity.

**1. Zeroth-order economics**
To use an analogy: Mr X is well versed on cars, and he loves Subarus based on their demonstrable merits: they are good cars! So Mr X signs a contract borrowing R3 million to buy not one but eight Subarus. Unfortunately, the resulting annual repayments leave no more room to pay for education or other family necessities. Are the eight good Subarus in the garage good for the family? Will the family love the Subaru brand?

## Mr X signs a contract borrowing R3 million to buy not one but eight Subarus

The basis for the above argument is that loans must be repaid, and that overextension of credit is bad for the country: witness Europe, Greece, Argentina. Eventually the financial chickens come home to roost. In zeroth order, money that is spent on credit repayment is not available for competing budget items: that is the dominant term in a financial perturbation expansion. Nonlinear economic growth and economic decline processes are first- and second-order effects. And there are many possible cause-and-effect loops, so arguing a case on one only is risky.
For a more comprehensive 1st order analysis, read the 2010 Integrated Resource Plan 2013 Update and note the conclusions: www.doe-irp.co.za/content/IRP2010_updatea.pdf

## Nuclear power stations need years, perhaps decades, to build.

**2. Risk economics**
The second major issue is the large risk associated with the high degree of inflexibility of nuclear energy:
2a: Nuclear power stations need years, perhaps decades, to build. You cannot stop mid-way should conditions change.
2b: A contract is binding. Once SA has signed an international agreement, that agreement is enforceable (unless you go the Greek route, of course).

The ongoing aluminium smelter debacle demonstrates what happens if you sign a contract binding over decades while conditions keep changing. A contract is enforceable.
http://www.financialmail.co.za/coverstory/2014/09/11/bhp-billitons-eskom-contracts-tied-to-the-smelters
http://www.bdlive.co.za/business/energy/2014/11/11/nersa-to-finalise-investigation-into-eskom-billiton-deal-by-january

**3. Who benefits?**
While we are talking orders of magnitude, let's also recognise that in terms of finances, academic research and physics, and nuclear physics in particular, are just small perturbations on the estimated cost of R $10^{12}$. The primary beneficiaries of R 1 Trillion will not be research or SA engineering firms (see below) but first and foremost the banks (R400 Billion goes to interest), and secondly foreign engineering and construction firms, and possibly some well-connected local firms and individuals who will get rich on the crumbs.

## The primary beneficiaries of R 1 Trillion will not be research or SA engineering firms

South Africans will not benefit much because of our lack of human capacity. The state of SA education amply demonstrates that building such capacity is not quick and not limited primarily by lack of funds but by wrong policy and, well, lack of capacity. We cannot pull hundreds or thousands of physicists, engineers, technicians out of a hat even over ten years: are we not all exasperated by the low student numbers? So presumably the necessary capacity on which R 1 trillion would be spent would have to come from the foreign nuclear vendor. And the money that goes overseas will not be available to the SA economy, including deserving low-tech sectors like sustainable agriculture, water and capacity building itself (schools, student bursaries, research).

4. **Rand for Rand**
I see no rational reason why a government should spend R 1 trillion on nuclear energy and neglect renewables. Let's build one nuclear power station (at a cost of say R 125 billion) and then spend another R 125 billion on other modes of energy creation, including relevant wider capacity building.

**Bottom line**: Given current economic data, one nuclear power station is great, eight is not. Building capacity in nuclear physics and all high-tech disciplines and branches is great.
I would suggest that we as physicists and as SAIP in particular have a responsibility to contribute our skills of rationality and quantitative analysis towards a rational approach to energy and finance.

Regards

Hans Eggers

**Email by Alan Matthews (UKZN) on the 9th July 2015**

## It is now possible to provide solar electricity round the clock

Dear Hans and Colleagues
I am no longer on Council, but this is an interesting discussion. Thanks for the information and reports. I am no expert, but my stance is to maximise renewables (solar and wind). The cost of PV is falling all the time (now at around R6/W for a panel, and going down) and roughly R20/W for a power plant (also going down?) Using molten salt it is now possible to provide solar electricity round the clock (and in Ireland there is flywheel storage).

PV plants in SA are built with no financial input from government, and go up quickly (two years). Solar is cheaper than nuclear and externally-financed, with zero cost of fuel, no waste (other than decommissioning, I suppose) and low water use. SA has high insolation (N. Cape) in areas relatively close to major population and industrial centres. Solar PV is scalable and can be placed on roofs, unlike nuclear and coal generation. Germany has 40 GW of PV, and SA could have the same.

## Germany has 40 GW of PV, and SA could have the same.

What can go wrong in a solar plant? Much less than in a nuclear plant. SA does not have a good track record in maintenance, so a nuclear accident would be a danger. (Wind turbines disintegrating due to poor maintenance could also be dangerous.)

## SA would be the leader in Africa of renewable technology

Technology is advancing, and SA may find itself behind the game when it could be ahead. The physical principles of solar and wind are innately simple, e.g. shine sunlight on a pipe. How hard can that be? One economic advantage for SA would be to be the leader in Africa of renewable technology, rather than leave that place to other countries.

But, I am quite aware that there are different points of view, many better-informed than mine.

Regards, Alan.

**Email by Simon Connell on the 10th July 2015**

Dear Folks
Germany buys nuclear power from France. It has a large installed capacity for solar, but it doesn't get to use it all, by a long way. They are complaining about increasing costs there, due to their "green" policies. For renewables …. installed is not equal to available.

## Don't try to store GWs for hours

Please don't try to store GWs for hours … if you do, it won't be consistent to ever use safety as an argument for or against other modalities. I won't live near an energy storage plant, but I will live near a nuclear power plant.
I am not against renewables, but they can't be 100%. They are OK in certain conditions, as part of the mix (say 15%) and more for some domestic and remote areas. You will still need a reliable base load, safe, green, with load following capacity. In anyway, nuclear technology is a bridging technology to the next technology. When used on a large scale, Solar PV and Solar Concentration with Storage are not low tech … they are very high tech. Its fine to be a leader in solar or wind, but we should also aim to be a significant user of nuclear.

## The only argument against Nuclear (given a good regulator) is economic

In the previous mail, Hans had four points, and I see that these were all essentially economics related, not technology related. These apply in some sense to all modalities, but most to Nuclear. They are also connected to the complex social inequalities.
I agree the only argument against Nuclear (given a good regulator) is economic (in the sense of the structuring of the deal and the social inequalities). This is not a sufficiently good argument against nuclear to not seek economic and social solutions.
Best regards
Simon

**Email by Hans Eggers on the 5th August 2015**

Hello all,

[...] Let me not try to respond to each and every thought raised by Simon below [before], but again try to approach it "perturbatively", addressing what to my mind are perturbations last, not first. So let me try:

I note that the zero-th order assertions of the 9 July email remain unchallenged. These are as follows:

**0.1 AFFORDABILITY**

## The economic growth rate of South Africa has fallen below even the worst forecast of the 2010 IRP

South Africa does not need eight nuclear power stations in the foreseeable future, and South Africa cannot afford eight nuclear power stations.

The main reason: The economic growth rate of South Africa has fallen below even the worst forecast of the 2010 IRP and has decelerated further since the 2013 Update was published. Future demand depends strongly on GDP growth rate. Extrapolation is a dangerous game at the best of times, and ignoring crucial real data would be unscientific or worse.

The affordability calculation I will not repeat here; see the 2013 Update or my little Physics Comment December 2014 summary and other sources.

**0.2 FLEXIBILITY AND RISK**

Flexibility implies low risk; inflexibility implies high risk. South Africa should be taking a flexible approach in energy planning, adapting to ever-changing economic and technological conditions. Nuclear energy is very inflexible, due both to the size and cost of each unit, and more importantly because of the very long construction phase.

## Flexibility implies low risk; inflexibility implies high risk

And as a result: If South Africa has the choice between signing a binding contract for ONE nuclear power station, why should the country sign up for EIGHT immediately? It would be wiser to sign up for a second unit as and when GDP growth rate picks up, continuing to adapt to changing conditions.

To quote the 2013 Update again: "Flexibility in decisions should be the priority to favour decisions of least regret. This would suggest that commitments to long range large-scale investment decisions should be avoided" and "building for the higher demand may result in over-capacity and stranded investment but building for the low could constraint the development path. The dynamics of the decision should be to allow maximum flexibility to build for the low as a minimum, but provide options for faster, more flexible development to meet the aspirations of the country." Or, in plain English, what would the nuclear operator do with excess power should the country's power consumption not live up to the over-optimistic 2010 projections? He would have to sell it at a discount, making the operation even less affordable. Therefore, let's wait and see as long as we can and commit only incrementally to nuclear units.

## Let's commit only incrementally to nuclear units.

Note for example that the USD/ZAR exchange rate has changed from 11 to 13 in the last six months, so all Rand prices must be revised upwards by 18 percent based on that alone. Loans must be repaid.

To get (very briefly) to some 1st order issues:

My point 4 regarding parity between renewables versus nuclear power: I was referring to parity in government spending, not parity in installed capacity. Why should renewables not receive government subsidies, technical and education support if nuclear energy generation is fully funded by the government?

The major issue with renewables is indeed storage. I agree that nuclear power is more suited for base load than current renewable options. That was and is taken into account in all the planning documents. So this does not change the 0th order conclusions.

Technology changes quickly, however. Storage capacity is improving rapidly.

Then there is Alan's simple argument that decentralised power generation is more robust and flexible than centralised generation.

If the price of centralised electricity trebles or worse in real terms in the next decade to pay for the nuclear operator's costs, many non-nuclear generation technologies become competitive.

And so on.

Kind regards

Hans

# Articles

## SA high school students win beam time at CERN working towards a gamma ray laser

Dr Colleen Henning and Prof Simon Connell


A team of 10 students from St John's College and Barnato Park High School in Johannesburg formed a team "Accelerating Africa" and proposed an experiment, to the CERN Beamline For Schools Competition (BL4S). Only two winners were selected from a field of 119 candidate teams, and the SA team is one of these. Accelerating Africa is led by Dr Collleen Henning, the Head of the Department of Science at St John's College. Prof Simon Connell from the University of Johannesburg has provided support in the proposal development and student training. Their prize: An all expenses paid trip to CERN from the 10th to the 20th September 2015, to conduct their experiment at the T9 Beamline of the CERN Proton Synchrotron. Their experiment will use a diamond crystal super-lattice and a GeV positron beam to generate a gamma ray beam using the undulator principle. Ultimately, it is expected a gamma ray laser beam can be created using the Free Electron Laser (FEL) principle.

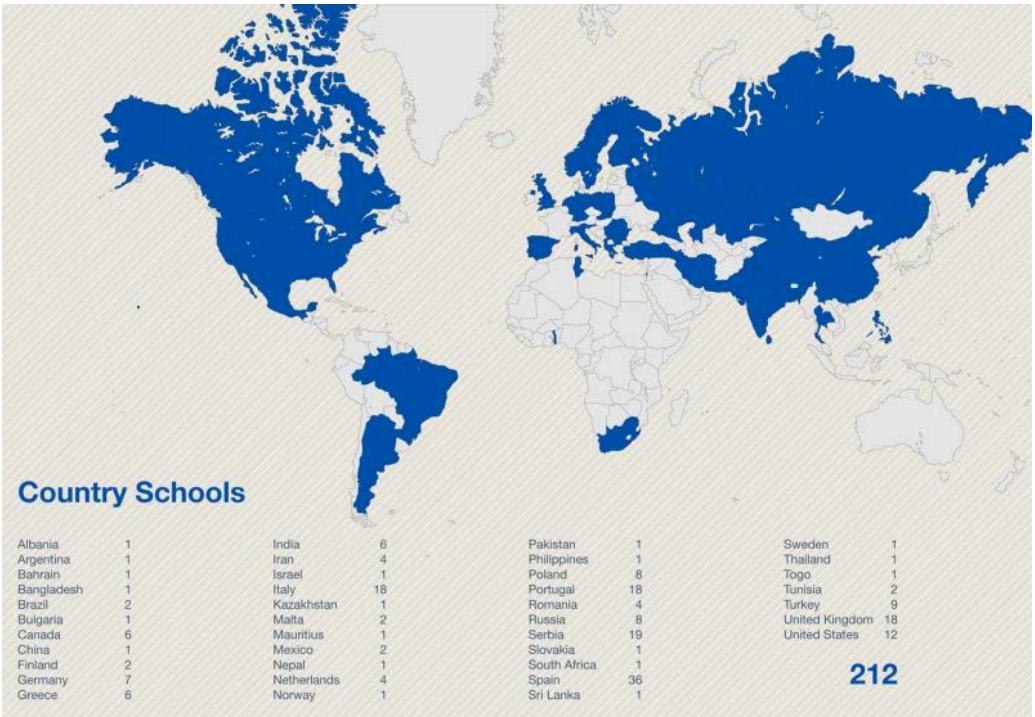



*image: http://home.web.cern.ch/students-educators/updates/2015/02/beamline-schools-teams-40-countries-running*

Fig 1. This map shows (in blue) the 40 originating countries for the 212 teams who had registered for the CERN Beamline for Schools competition by the end of January 2015. Ultimately 119 of these teams submitted proposals by the 31 March 2015 deadline. The SA team was selected as one of the two winning teams.

The name “Accelerating Africa” was chosen as the team wanted to demonstrate that students from different backgrounds, working together, with a passion for Science, could be an example of what Science education in South Africa can achieve. Their project is inspired by 2015 being named the International Year of Light by the United Nations, and involves producing high-energy gamma rays using a crystalline undulator.

In the experiment a positron beam ($E_p$=1-9 GeV) will be directed onto a diamond superlattice in such a way that the positrons will be captured into channelled trajectories in a (110) crystallographic direction. The C*(B) diamond superlattice is constructed by the introduction of the substitutional boron impurity during synthesis. This is done with a periodically varying concentration engineered to cause a periodically varying coherent tetragonal lattice dilation (Poisson effect). The transmitted positron beam will then exhibit an undulator motion, which modulates the channelling motion, so that undulator radiation is emitted. This is similar in principle to the undulator radiation emitted using a lattice of alternating magnetic dipoles in more conventional Light Sources. The very important difference here is that the much shorter period and larger equivalent magnetic fields lead to production of undulator radiation with energy in the MeV or even GeV regime. This effectively extends the concept of a light source from the infrared, optical and X-ray regimes, right up to the hard gamma ray regime. Crystal undulator radiation is reviewed in a book by Korol, Solov'yov and Greiner [1], and further described in the papers cited therein. The version of the crystal undulator to be studied is the Small Amplitude Short Period undulator [2,3]. A recent experiment [4] indicated evidence for an observation of crystal undulator radiation for the case of 600 and 855 MeV electrons in a Si(Ge) undulator. The current experiment (Accelerating Africa) uses higher energy positrons (longer dechanneling length) and also for the first time a diamond superlattice. Diamonds can now be synthesised with exceptional lattice quality [5,6] (approaching that achievable for Si). Incoherent effects due to thermal lattice vibrations are much less than in other materials. The combined effect of using positrons and diamond mean a stronger signal and lower background. Diamond is also exceptionally radiation hard, and the diamond crystal undulator is considered the most viable material for the ultimate realisation of a lasing source of gamma rays [7-9]. In this case, the principle of lasing is similar to that of a Free Electron Laser (FEL). An indication of the theoretically expected performance of the new (lasing) crystal undulator radiation is shown in Figure 2 below.

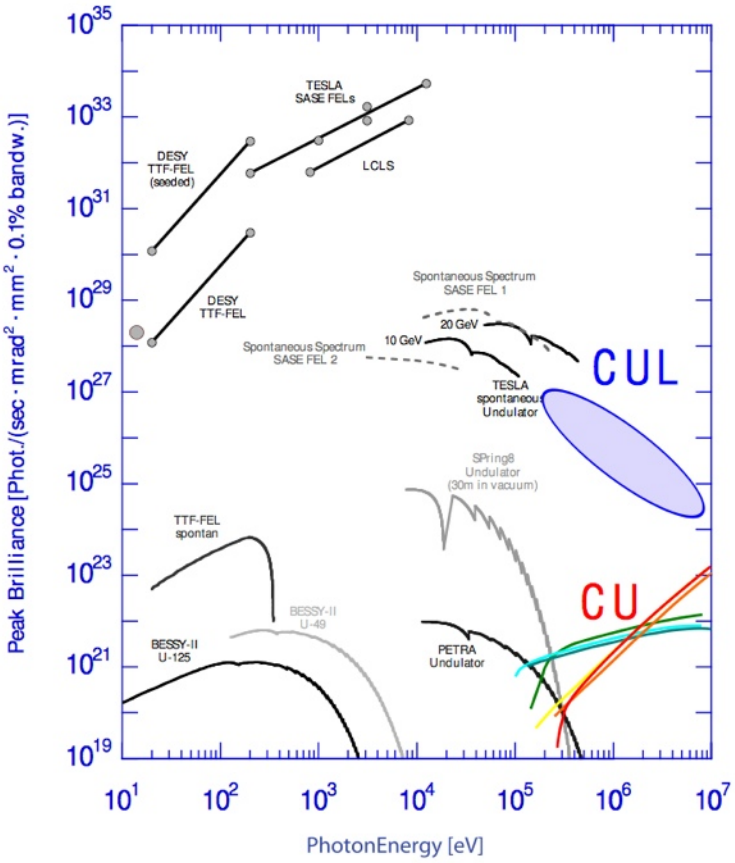



Fig 2. Comparison of the peak brilliance for several modern undulators and FELs and for the crystal undulator radiation based on different crystals (the coloured curves). The dashed area marks the estimation of the lasing crystal undulator radiation brilliance carried out with the parameters of the electron beam from the FLASH FEL [7-9].

The proposal submitted by the students may be found here:
http://physics.uj.ac.za/wiki/CBL4S/Main/HomePage?action=download&upname=CERN%20proposal%20-%20Accelerating%20Africa.pdf
The 1 minute video submitted with the proposal is here:
https://www.youtube.com/watch?v=_1bRnuciYZU&feature=youtu.be

The web-page for the CERN BL4S competition as well as the press release with the announcement of the winners is here:
http://beamline-for-schools.web.cern.ch

The experiment will be carried out at the T9 beamline and experimental station of the CERN proton Synchrotron (PS) as indicated in figure 3. The crystal undulator will be mounted in the chamber, as indicated. The students are currently undergoing training in the physics, the detection systems, and the ROOT based data analysis system. The students will arrive at CERN on the 10 of September, for safety training and orientation. Several CERN scientists are already working on the preparation and set-up, and will assist with the mentoring of the students, and in the operation of the experiment. The students will however be ultimately responsible for the experiment. The experiment will run until 20 September 2015.

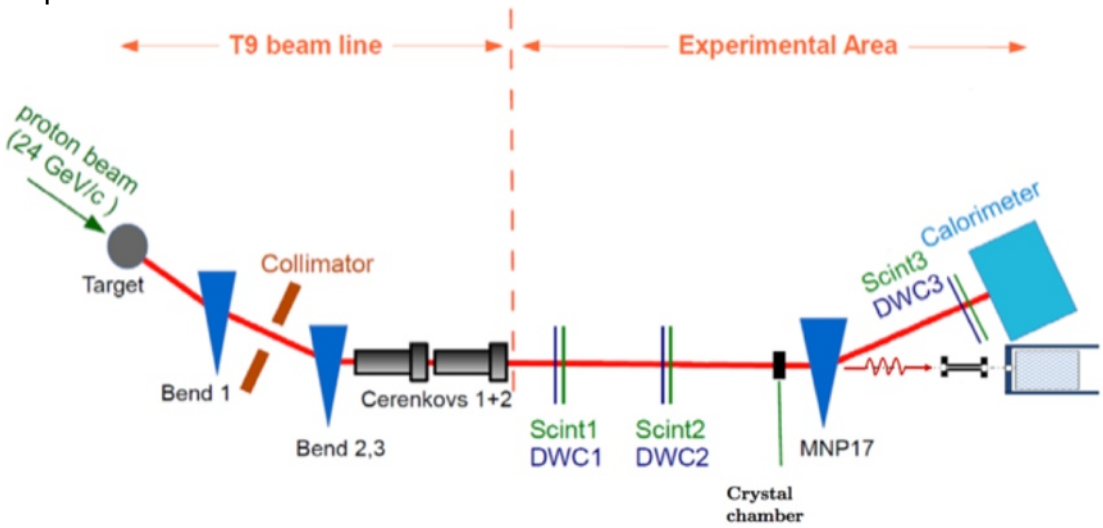



Fig 3. The secondary beam available at the T9 beamline of the PS will be optimized to direct positrons into the experimental area with an energy that can be selected in the range of $E_p$=1-9 GeV. The positrons are then directed into the detector system capable of tagging the kinematical history of each positron and detecting the radiation from the crystal.

Should the experiment be successful, it will pave the way for the realisation of a tuneable, monochromatic and intense source of gamma radiation, as in figure 4. The ultimate goal is to work towards a gamma ray laser system. The possible applications in basic science, technology and medicine are quite fantastic. In particular, there is the potential of disposing of nuclear waste, developing new areas of nuclear medicine, providing isotopes for imaging techniques (positron tomography, gamma-ray assisted nuclear imaging), visualising of electron dynamics in atoms, molecules and nanodevices, a variety of new photo-induced nuclear reactions, which can also be applied in molecular systems for medical applications (personalised medicine). As the technology progresses, one envisages non-destructive imaging of complex molecular systems (proteins, viruses, nanodevices).

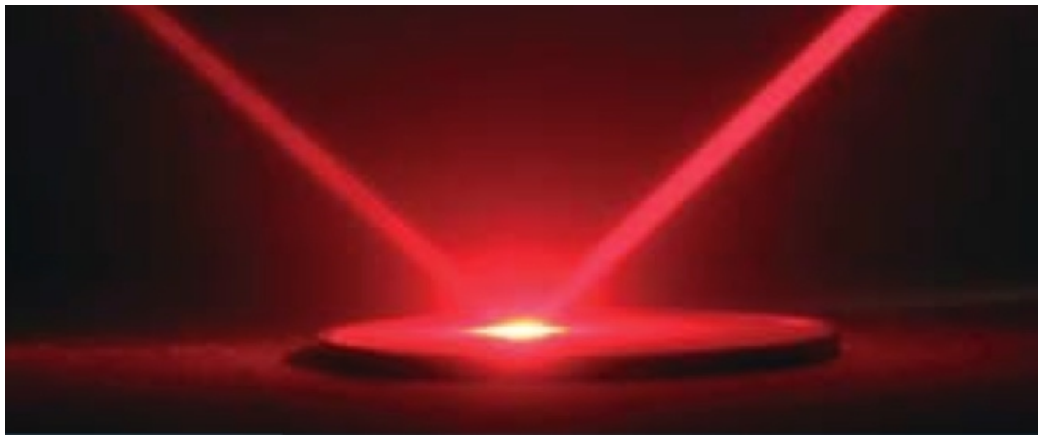


Fig 4. Accelerating Africa: Working towards a lasing gamma ray source.

Winning the opportunity to perform their proposed experiment is an incredible achievement for South Africa, St John's College, Barnato Park High School and the students involved.

A few quotes from some of the South African team members capture their thoughts:

*"Science was the catalyst for this endeavour, co-operation inspired the feasibility, and the two together will lead us along this journey." - Brandon MacKenzie, St John's College*

*"When I first heard the good news I was ecstatic, my hands where shaking and my heart was beating faster than usual. I could not believe that such an amazing opportunity has been blessed to me. I've always wanted to pursue a career in Physics or Engineering and winning this amazing competition has brought me closer to my dreams. I've always wanted to travel abroad as I have never been overseas nor have I been in an airplane. I'm truly thankful for this opportunity given to me and I know that I will take it with my two bare hands and not let go of it. Thank you." - Malaika Elliot Motsoai, Barnato Park High School*

*"This opportunity that we have been presented with, will not only allow us to enjoy a once in a lifetime experience, but has also given us the chance to show the world and our fellow South African students that with hard work and determination almost anything is possible." - Fayadh Haffejee, St John's College*

The Diamond Crystal Undulator, a key feature of the experiment, has previously been produced by Element Six and its structure has been studied at the ESRF in Grenoble. Element Six is now producing an undulator specifically for the experiment optimised for the parameters of the positron beam in the T9 beamline of the PS.

Dr Henning may be contacted at henning@stjohnscollege.co.za for further information.

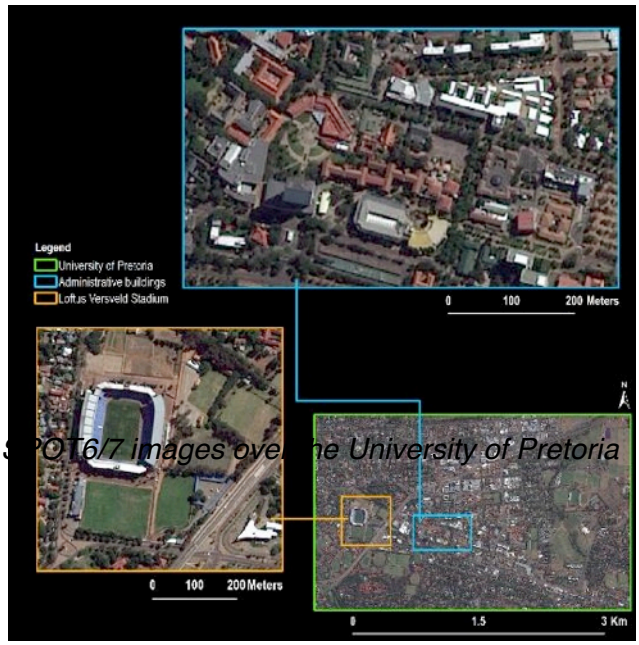
*The support of many colleagues as indicated in the references is acknowledged.*

[1] Korol AV, Solov'yov AV, Greiner, W, Channeling and radiation in periodically bent crystals; 2nd ed. Springer Series on Atomic Optical and Plasma Physics ; 69 (2014) ISBN 9783642549335, 9783642549328
[2] A Kostyuk, Phys. Rev. Lett. 110, 115503 (2013).
[3] VG Bezchastnov, AV Korol and A V Solov'yov, J. Phys. B: At. Mol. Opt. Phys. 47 (2014) 195401
[4] T. N. Wistisen, K. K. Andersen, S. Yilmaz, R. Mikkelsen, J. Lundsgaard Hansen, and U. I. Uggerhøj, W. Lauth and H. Backe, PRL 112, 254801 (2014)
[5] R Burns et al, J. Phys.: Condens. Matter **21** (2009) 364224
[6] P M Martineau et al, J. Phys.: Condens. Matter **21** (2009) 364205
[7] A.V. Korol, A.V. Solov'yov, W. Greiner. Int. J. Mod. Phys. E 13 (2004) 867
[8]A.V. Korol, A.V. Solov'yov, W. Greiner. Proc. SPIE 5974 (2005) 597405
[9] A. Kostyuk, A.V. Korol, A.V. Solov'yov, W. Greiner. Estimation of the Peak Brilliance of a CU. http://ec.europa.eu/research/fp6/nest/pdf/whats_next/pecu.pdf

# SANSA launches SPOT 6 and SPOT 7 National Mosaics

Catherine Webster, Communications Officer SANSA Space Science

The South African National Space Agency (SANSA) reached another milestone with the recent launch of its high-resolution SPOT 6 and 7 National Mosaics and ortho-bundle data. With a resolution of 1.5 m, the SPOT 6 and 7 earth observation satellites are sure to enter the SPOT series into a new era. These two satellites, deployed into the same orbit on 9 September 2012 (SPOT 6) and 20 June 2014 (SPOT 7), form a small constellation and replace a single satellite, SPOT 5, which was decommissioned at the end of March 2015.




SPOT6/7 images over the University of Pretoria

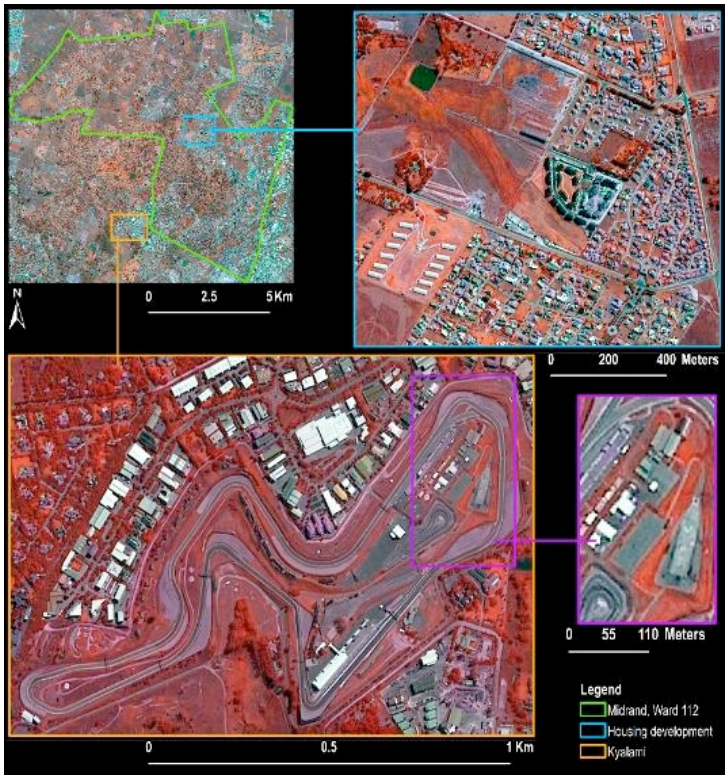
"We are very excited to harness the potential benefits of the SPOT 6 and SPOT 7 satellite imagery products to further address national issues, including tackling food security, agricultural issues, energy, rural development and urban planning, especially at local government level," said SANSA CEO, Dr Sandile Malinga.

Dr Malinga also noted "SPOT 6 and SPOT 7 are crucial decision-supporting tools for South Africa. Defence, Intelligence and Police departments will benefit greatly from their highly responsive sensors that increase acquisition capacity and simplify data access."

SPOT 6 and SPOT 7 cover wide areas in record time and their agility capability makes them useful for disaster monitoring. Both products can accommodate last-minute urgent task requests with high levels of data detail.

"Using satellite data provides repetitive, reliable and consistent information about the planet on a global scale. When combined with 'in-situ' observations, it's an extremely powerful tool for monitoring our environment, including low-cost housing mapping, which helps government with future planning and development," said SANSA Earth Observation Managing Director, Dr Jane Olwoch. More importantly, with the two satellites we are in a position to provide two seasonal mosaics per year.

SPOT 6 will aid agriculture by making available information about vegetation and providing water quality analysis. Among other wide-ranging data, these products are strategically in line with the SANSA goal to collect, assimilate and disseminate earth observation data to support South Africa's policy making, decision making, economic growth and sustainable development initiatives.




SPOT6/7 images over Midrand

# President's Report 2014-2015

I Gledhill, SAIP AGM, 3 July 2015

This is the Diamond Jubilee of the South African Institute of Physics, and the 60th Annual Conference of the South African Institute of Physics. On behalf of the present Council, may I congratulate the physics community on its remarkable achievements over the last six decades? The events of sixty years are perhaps outside the scope of an Annual Report, but fortunately there is a supporting reference for at least the first 50 years in "Physics in South Africa"[1]. There has been both continuity of engagement, and considerable growth and innovation.

I would like to thank our hosts, NMMU and Rhodes University, represented by Prof. André Venter and Prof. Makaiko Chitambo, the Local Organising Committee members, and Eastern Sun, for letting us invade both the Eastern Cape and their lives. The hosts very rarely have time to see the impact made by the action of scientific hospitality, but I can assure you all that immeasurable impact results. This has been a productive and enjoyable conference. Thank you!

It gives me great pleasure to summarise the events and initiatives of the last year.

## 1. Education

*"The function of education is to teach one to think intensively and to think critically. Intelligence plus character - that is the goal of true education."* Dr Martin Luther King, Jr.

The Heads of Departments have tasked SAIP to assist in the struggle to produce more physics graduates who are critical thinkers. SAIP strategy is to tackle this at two levels: in undergraduate teaching and learning, and with School Teachers.

### Review of Undergraduate Teaching and Learning[2]

At present, enrolment rates are higher, attrition is higher, and graduation rates are lower. 27% of students (across faculties) graduate in the regulation time. 55% of students (across faculties) never graduate at all. There is widening access, but not improved success. A shift in emphasis from numbers to quality is necessary. A shift from a rigid curriculum to a different rigid curriculum is not what is needed. The physics community in universities is aware of all these things: it is leading in its ability to do something about them.

The implementation of the Recommendations of the Undergraduate Review3 is moving forward, both formally, and due to the efforts of individuals who can make changes based on the Recommendations straight away.

The Heads of Departments and Schools met in the National Strategic Planning Meeting on the 26 – 27 March 2015 at St. Georges Hotel near Pretoria. There is, to everyone's delight and astonishment, significant agreement on how to exchange and implement best practice within the present curricula, or

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[1] Physics in South Africa, ed. P.R. de Kok and H. Moraal, SAIP, 2013

[2] Council on higher Education & SAIP, Report on Review of Undergraduate Physics Education in Public Higher Education Institutions, 2013

[3] Council on Higher Education & SAIP, Report on Review of Undergraduate Physics Education in Public Higher Education Institutions, 2013

within reformed curricula4. Implementation of the 11 Recommendations of the Review of Undergrad is well under way. The Heads of Schools and Departments have always been committed to better teaching and learning, and are remarkably committed to sharing best practice and improving at all levels. The report of this meeting has been started. Some projects that the Executive Office is pursuing right away include

- Ratification of the Benchmark Statement and the Review Recommendations,
- Development of a physics teaching and learning materials sharing platform, and
- Actions towards improving the Teacher Development Programme and including more stakeholders.

SAIP President Igle Gledhill with symbol of power.

SAIP is grateful for funding of £5000 from UK FCO[5] Prosperity Fund in 2014.

Igle Gledhill, Brian Masara, and David Wolfe have visited 14 Physics Departments across the country so far, to engage in listening and discussing the Review implementation.

### Teacher Training 1

*Underpreparedness* of learners was identified as a major problem by the Review. The decision was made to focus on intervention to help teachers to understand physics concepts better, by in-service training, and in university training.

- Between July 2015 and July 2015, approximately 1100 teachers will have participated within the SAIP-IOP[6]-UJ Soweto Science Centre Pilot Project. The Science Centre has become a lab, in which conclusions can be drawn about learners and teachers in action.
- Prof. David Wolfe, IOP Volunteer Co-ordinator for South Africa, has been driving fund raising. In April, the UK Prosperity Fund announced a grant of £ 22 996 for the project.
- Prof. David Wolfe, Case Rijsdijk, Dr. Sam Ramaila, Prof. Azwinndini Muronga, and Brian Masara are thanked for the enormous contribution of their team.

*"However beautiful the strategy, you should occasionally look at the results."* Winston Churchill

- Does this intervention work? Physics Education researcher Dr Kathleen Foote will be taking up a Post-Doc position at UJ with the aim of evaluating the results.

### Teacher Training 2

New teachers are trained at universities, but there are only a few cases in which physics departments or physics education researchers are involved. With the help of Prof Wolfe, engagement between university physics and education departments/schools has begun.

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[4] Council on Higher Education, A proposal for undergraduate curriculum reform in South Africa: the case for a flexible curriculum structure, 2013

[5] United Kingdom Foreign and Commonwealth Office

[6] Institute of Physics, London

11 Review Recommendations for Undergrad Teaching and Learning

1. SAIP: coordinate implementation.
2. Adopt a 4 year Physics undergrad programme.
3. Research ways of teaching under-prepared students.
4. Use more appropriate, more rigorous, ways of monitoring and evaluating Teaching.
5. Guard against adjusting the standard of degrees to cope with student lack of preparedness.
6. Intervene to improve student work ethic.
7. Play an active role as a Department in Teacher Training.
8. Encourage and support women in the field.
9. Form Physics communities of practice at the regional and national level.
10. Track graduate experience.
11. SAIP: form an action plan.

**Additional actions**

Prof Bill Phillips, NL, has been invited to visit South Africa, and has accepted.

**2. SAIP is a Registered Professional Body, Pr.Phys**

The SAIP application under the authority of DHET[7] and SAQA[8] was published in the government gazette. Errors in the publication were corrected. Registration has been completed and SAIP is authorized to provide a professional registration service. To date, 57 Pr.Phys applications have been approved by the Standards Committee, chaired by Prof Johan Malherbe.

**Continuous Professional Development**

Professional CPD[9] Monitoring systems and joint marketing are under discussion with Dr. Rolf Becker, the Executive Director of SACNASP[10].

**Critical Skills visa applications**

With its Professional Body status, SAIP's Standards Committee has supported 18 Critical Skills Visa applications.

**3. DHET Publication Unit Incentive Scheme task team**

SAIP Council Task Team has developed position papers on the issue that papers with over 100 authors are not recognized by the Incentive Scheme, to the detriment of universities and especially individuals.

- Members met with DHET University Policy and Development Support Unit on the 12 Nov 2014. In this meeting, DHET members stated that the scheme was never intended for use in evaluating individuals.
- Letters have been sent to the Vice Chancellors of UKZN concerning an individual case in 2014 and 2015. SAIP is In contact with both NRF[11] and ASSAf[12].

[7] Department of Higher Education and Training

[8] South African Qualification Authority

[9] Continuous Professional Development

[10] South African Council for Natural Scientific Professions

[11] National Research Foundation

[12] Academy of Science of South Africa

- The matter will be raised with the Deputy Vice-Chancellors' Forum in 2015.
- An update on the draft SAIP Position Paper and a communiqué from the Task Tea on their findings is expected.

**4. International**

- The IOP-SAIP partnership has been of real benefit in education and science. A new Memorandum of Understanding is under consideration.
- The IUPAP National Committee includes Council and IUPAP representatives. It has met, as scheduled, once this year.
- NSBP[13] arranged an extraordinary set of meetings for SAIP's President in Washington DC in 2015. The potential for collaboration and assistance is somewhat overwhelming. Specific initiatives already in action are
    - International Pulsar Timing Array collaboration
    - National Institute of Science and Technology Neutron Facility collaboration
    - Strong links catalyzed between the National Cancer Institute NCI and the South African Association of Physicists in Medicine and Biology SAAPMB, and the South African Medical Physicists Society SAMPS
    - Collaboration between the SAIP Biophysics Group and The Biophysical Society.
- SAIP continues to be represented at the SA-ICSU[14] President's Forum, where issues across science can be raised. South Africans are well represented in ICSU structures.
- A statement condemning Xenophobia is on our website.
- SAIP was invited to celebrate Nobel Night for Physics at the Swedish Ambassador's House in 2015, where I had the honour of giving an after-dinner speech.

Prof. Simon Connell and Prof. Azwinndini Muronga are thanked for their work in science diplomacy and in real contributions to South Africa.

**5. IUPAP Representation**

The IUPAP[15] General Assembly in Singapore was attended by Azwinnndini Muronga and Igle Gledhill. An impromptu meeting of African representatives was held. South Africa has a high representation for its membership status at IUPAP, as follows.

| | Associate Secretary-General | Rudzani Nemutudi |
|---|---|---|
| C4 Astroparticle Physics | Secretary | Prof Adri Burger |
| C6 Biophysics | Member | Prof Trevor Sewell |
| C13 Development | Member | Dr Mmantsae Diale |
| C14 Education | Member | Prof Deena Naidoo |
| C19 Astrophysics | Secretary | Prof Patrick Woudt |
| Working Group on Energy | Member | Wikus van Niekerk |
| Working Group on Women in Physics | Chair | Igle Gledhill |

[13] The National Society of Black Physicists, USA

[14] International Council for Science

[15] The International Union for Pure and Applied Physics

## 6. International Conferences

- The first meeting of the African Light Source community will be held at ESRF[16] in early 2015, with the guidance of Prof Simon Connell.
- SAIP will be hosting the IUPAP Conference on Computational Physics in Pretoria in 2016 with the leadership of Prof. Nithaya Chetty.
- The 15th International Conference on Luminescence and Electron Spin Resonance Dating will be held in Grahamstown in 2017 under the leadership of Prof. Makaiko Chitambo.
- A bid is being submitted through the Astro Community, guided by Prof. Patrick Woudt, to host the IAU General Assembly in 2021.
- The African School of Fundamental Physics and its Applications will be held in August 2016 in Rwanda, and several members of the SA-CERN team are participating in the organization. The NRF Liaison Section has already committed partial financial support. A new feature is that the NRF will be working in a closer partnership with the organisers going forward, to develop the suite of deliverables.

## 7. Conference Organisation

- The SAIP Executive Office now provides a Scientific Conference Organisation capability, with full provision for delegate registration and correspondence, conference papers and proceedings (including abstract submission and review tracking, paper submission and review tracking and correspondence and publication), and scientific programme printing. The INDICO system provides meeting and agenda facilities on the web with document upload and archiving.

## 8. SAIP Annual conferences

### Proceedings

The emphasis is on the quality of science within the South African community. The status of the conference proceedings of the various years as on 10 June 2015 is as follows.

| Year | Total number of papers received | Papers rejected or withdrawn | Papers for which no reviews were completed | Papers published |
|---|---|---|---|---|
| 2011 | 185 | 40 | 0 | 145 (78%) |
| 2012 | 183 | 51 | 27 | 105 (57%) |
| 2013 | 116 | 25 | 0 | 91 (78%) |
| 2014 | 159 | 51 | 0 | 108 (68%) |
| 2015 | 120 anticipated | | | |

Heads of Departments and Schools have been alerted to changes under consideration by DHET to approval and accreditation of conference papers. Prof. Ilsa Basson is thanked especially for her signal contribution to the success of the Proceedings and the Conferences. Without her experienced and determined guidance, and the dedication of Brian Masara, Roelf Botha and Juan Grey in the SAIP Office, it is unlikely that the publication of Proceedings would have succeeded.

### National Conferences

While many national conferences in various areas of physics have taken place, the success of the 6th South African Conference on Photonic Materials in May 2015 is notable. This conference brings together many Divisions and Forums of SAIP.

### Associated Meetings and Events

The number of related and associated meetings is rising steadily, and in 2015 included the following.

[16] The European Synchrotron Radiation Facility

- The NASSP Consortium Inaugural Meeting
- The National Laser Centre Rental Pool Programme Meeting
- The Winter School: Photonics
- The WiPiSA lunch and the Student lunch
- Council meeting with Heads of Department
    - A function of this meeting is to identify issues of common concern in the physics community, and if possible, to formulate projects to address them. The Undergrad Review and implementation arose from this meeting.
- Council meeting with Division and Forum Chairs
- Public Lectures
    - It is notable that Teachers have been invited to public lectures. The intention is to increase the involvement of school Teachers in SAIP events.
- The Astronomy Town Hall (independent, in the week before the SAIP Annual conference).

**9. Stakeholders**

- DST has continued to support SAIP, both in providing a grant to assist the vital Executive Office, and in involvement within the scientific community and the flow of information and advice in both directions. The SAIP expresses great gratitude for this support, since without the Executive Office, the level of contribution made by SAIP to the community and to scientific infrastructure would drop dramatically. DST has formed a Basic Sciences Platform which includes SAIP.

**10. Registration as a Non-Profit Organisation**

The SAIP annual report and audited financial statements were submitted to the Department of Social Development in December 2014. The Registration Number is 130-172 NPO.

**11. Membership**

Membership is approximately 600. In the last year, 54 new members have been ratified.

**12. Divisions and Forums**

| **Group** | **Chairperson** |
|---|---|
| Nuclear, Particle and Radiation Physics Division | Dr. Simon Mullins |
| Division for Physics of Condensed Matter and Materials | Prof. Japie Engelbrecht |
| Division for Physics Education | Mr. Sam Ramaila |
| Applied Physics Forum | Prof. Ernest van Dyk |
| Division for Astrophysics and Space Science | Prof. Chris Engelbrecht (UJ) : Co-chair Astrophysics |
| | Prof. John Bosco Habarulema:<br>Co-chair Space Science |
| Division for Theoretical and Computational Physics | Prof. Kristian Müller-Nedebock |
| Photonics Division | Prof. Erich Rohwer |
| Forum for Women in Physics | Prof. Aletta Prinsloo |
| Biophysics Working Group within the Applied Physics Forum | Dr. Tjaart Kruger |

- WiPiSA[17] has gone from strength to strength with Prof. Aletta Prinsloo as Chair. A call for Projects resulted in funding of 7 projects. Many excellent proposals were received which could not be accommodated within the budget. An article was published by Dr. Iyabo Usman in Optics and Photonics News. Hosting of Departmental Lunches continues. Prof. Liesl Folks spoke at SAIP 2015.

  The Forum focusses on

  - Attracting girls and women into physics
  - Retaining and promoting women in physics by improving institutional and leadership structures.

**13. Portfolios, Committees and Task Teams of Council: highlights**

- Risk and Audit Committee: Prof. Frikkie Scholtz is thanked for his careful and experienced eye.
- Awards Committee and Electoral College: the Silver Medal award process has been conclude. Results will be announced at the 2015 Banquet. Prof David Wolfe has been elected an Honorary Member. Prof. Kristian Müller-Nedebock is thanked for his sterling service.
- Industrial Liaison: Dr. Mmantsae Diale is thanked for her work, which is particularly through the Applied Physics Forum.
- Fundraising: Dr. Mmantase Diale, and Brian Masara, as Executive Officer are thanked. In particular, Brian is thanked for his outstanding success in collaboration with Prof David Wolfe during 2014/2015.
- International Liaison: is summarized above.
- Market and Outreach Portfolio, and Physics Comment Editorial Board: material raising the Image of Physics is under development. A new Careers Brochure made its debut at SAIP2015. Physics Comment has become an outstanding newsletter and forum for debate under Prof Thomas Konrad and Prof Dave Walker. Words cannot express Council's gratitude adequately.
- Conference Portfolio: Prof. Ilsa Basson is thanked for outstanding work in the 2013. 2014, 2015, 2016, and 2017 Annual Conferences. The standard of both conferences and proceedings continues to rise under her guidance.
- Education Portfolio: is summarized above.
- Astronomy and Astrophysics Liaison: Prof. Patrick Woudt ensures that the communities are in close contact, and that the physics community provides good support to Astro projects and initiatives and *vice versa.* Particular attention will be given to support of the SA Gamma-Ray Astronomy Programme, SA-GAMMA.
- Conference Portfolio, WiPiSA and Division and Forum Portfolio: are summarized above.
- The Standards Committee is chaired by Prof. Johan Malherbe, and works hard, and often, to make sure Pr.Phys and Critical Skills visa applications are processed as fast as possible.
- The Disciplinary Committee, fortunately, has had no work at all. This is good.
- The Policy and Advisory Committee has been called in for advice on certain occasions.

**Council 2015 under President Igle Gledhill**

[17] Women in Physics in South Africa

- The Undergraduate Review Working Group has delivered as above. Many, many thanks to Dr. Sam Ramaila.
- The DHET Task Team work is described above.
- The Executive members, Prof. Frikkie Scholtz, Prof. Simon Connell, Dr. Malebo Tibane and Prof. Alan Matthews, have prompted, and taken, action throughout the year. Each has taken considerable responsibility. They cannot be thanked enough.

**14. Executive Office**

**Staff**

The Executive Office continues to grow in its achievements and responsibilities, and as agreed with DST, has been increased by 3 new staff members:

- Accounting Officer: Siphiwe Hlongwane
- Projects Officer: Nadanganeni Mahani
- Secretary: Lizzy Sathekge

In addition,

- Webmaster and IT: Roelf Botha and Juan Grey continue to provide effort above and beyond expectations, in particular in the INDICO systems multiple capabilities, in Conference capabilities, and in the publication of Proceedings.

There is considerable training, through courses and on the job, taking place in the Office.

**Financial Sustainability**

Co-funding for the DST support of the Executive Office is being vigorously pursued through conference services, membership services and project management. A 10-year strategic plan has been formulated.

**Projects**

Responsibility for Scarce Skills liaison is ably handled by Brian Masara. SAIP is registered under the Department of Labour.

The Executive Office has the following plans:

- on-line membership and Pr. Phys. application system
- updating of the Graduate Database
- review of the server systems
- continuation of the Physics Entrepreneurship Workshops with IOP
- development of Memoranda of Understanding with the SA Chemical Institute and the SA Crystallographic Society.

**Governance**

- VAT returns are up to date,
- The Financial Audit by Mazars has been completed, and
- Our new Accounting Officer has a working knowledge of the Public Finance Management Act and Treasury rules, under which the SAIP-DST contract falls.

**Executive Officer**

Brian Masara continues to carry strategy onward and upward, at the same time as achieving a great deal of proposal writing, project delivery, and management of the expanding Executive Office. He keeps the organizational memory of SAIP in both tacit and explicit form, and provides continuity as the Council members change. He is in continual touch with stakeholders, keeping them informed of SAIP developments, and bringing back valuable assessment of the scientific infrastructure environment. *Inqwele* – he is a wise and seasoned warrior. On behalf of Council, I extend my humblest and warmest thanks to him.

**15. A note on the excellence of young South Africans**

A week before the Conference, the CERN Beamline for Schools Competition 2015, in which 205 teams originally entered, is won by the team Accelerating Africa from St. John's College and Barnato Park High School. SAIP has sent letters of congratulation to the team.

**16. Council Elections**

Elections of Council members were held in 2015 and results will be announced at the AGM for the 2015-2017 term. Many thanks for Brian Masara, Dr. Malebo Tibane, and Roelf Botha. The Student Representative will be elected in 2015 under the guidance of the present representative, Zipho Ngcobo, and the Hon. Secretary.

**To the Outgoing Council**

I am gratefully astonished at how much has been accomplished by Council and the Office working together. I attribute much of this to the affectionate tolerance with which the Council members have treated each other, and the burning love of the subject which drives each of them.

SAIP is a professional, respected institute with immense reach, and immense outreach. Thank you.

Irvy (Igle) Gledhill

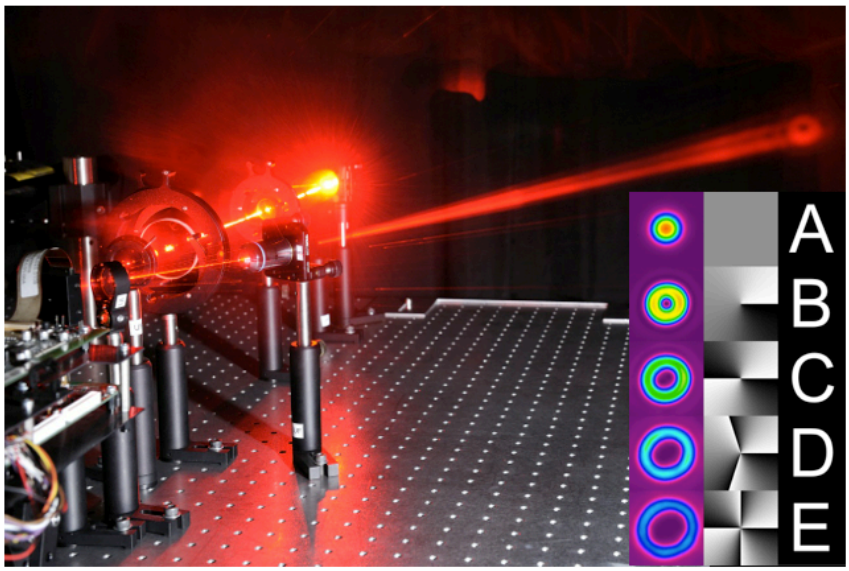
President, SAIP

3 July in The International Year of Light, 2015

# Opportunities

## Post-graduate positions available: Quantum communication flagship project

A new quantum communication flagship programme has just been launched by the Photonics Initiative of South Africa (PISA). A consortium of three institutes comprising the University of the Witwatersrand (Wits), University of KwaZulu-Natal (UKZN) and the Council for Scientific and Industrial Research (CSIR) will attempt to demonstrate a quantum communication link using high-dimensional quantum states in both free space and in fibre. The project will be led by Prof. Andrew Forbes (Wits) with core team members of Prof. Thomas Konrad (UKZN), Prof. Francesco Petruccione (UKZN) and Dr Stef Roux (CSIR).




We have opportunities at MSc, PhD and Post-Doctoral Fellow levels for suitable candidates with an interest in:

- Quantum entanglement;
- Quantum information processing and quantum communication;
- Free space communication;
- Structured light;
- Fibre optics.

We welcome applicants with an interest in theoretical and/or experimental studies, with options to be based at one of the three centres: UKZN (Durban), CSIR (Pretoria) or Wits (Johannesburg). We promote joint supervision and mobility between centres, project dependent. We are seeking motivated applicants with a good academic track record in physics or related disciplines.

To apply, please send a CV and a link to a self-created YouTube video where you motivate why you want to join the project. You may address it to one or more of the project leaders:

Prof. Thomas Konrad: konradt@ukzn.ac.za
Prof. Francesco Petruccione:petruccione@ukzn.ac.za
Dr Stef Roux: fsroux@csir.co.za
Prof. Andrew Forbes: andrew.forbes2@wits.ac.za or aforbes1@csir.co.za

# Upcoming Conferences & Workshops

### Bring International Physics Conferences to South Africa

The SAIP Office would like to help South African physics community to bring international conferences and workshops to South Africa. The SAIP can help with hosting these conferences as well as preparing bidding documents, budgeting and fundraising.

The SAIP office has helped in hosting very successful international physics conferences and workshops.

Please email the conferences you want us to help bring to South Africa to info@saip.org.za

## SAAPMB 2015 Cancer Imaging

The 53rd National Congress of the South African Association of Physicists in Medicine and Biology (SAAPMB) will be held from 23 – 27 September 2015 under the theme Cancer Imaging in the friendly city of Bloemfontein, South Africa.

Do not miss out on this outstanding Spring event with a hands-on training workshop, congress contributions from local and international speakers and an overseas expert panel on the topics of Medical Physics, Radiotherapy and Diagnostic Imaging. With our common goal of fighting cancer in a rapidly developing information and technology driven era, we would be delighted to have you present at the congress. Use this opportunity to be inspired, motivated and to network with your peers and other experts in your profession. As always in the centre of the hearty Free State province, the social programme will be especially enjoyable.

For more information and registration visit http://www.saapmb2015.co.za/

## IUPAP CCP2016 from 11 to 14 July 2016 St George Hotel Gauteng South Africa

We are glad to inform you that SAIP will be hosting the IUAP International Conference on Computational Physics in 2016 (IUPAP CCP2016) from 10-14 July 2016 at the St George Hotel in Pretoria. This immediately follows SAIP2016 which will take place at UCT, and is the first time that this prestigious conference will take place on African soil. This is considered to be the premier international conference on computational physics that occurs on an annual basis. The SAIP proposal to bid to host CCP2016 emphasised several important aspects: the need for computational physics education, the strength of South Africa's astronomical interests in computations, the need for participation of African scientists, the interest in encouraging the development of new fields such as computational biology, etc. The conference format will include plenary lectures (1 hours each), and parallel sessions comprising invited talks (30 min each) and contributed talks (20 min each) as well as poster presentations. This will be an excellent opportunity for South African scientists to showcase their own work in computational physics, but also to learn from international experts about new trends in this rapidly growing field.

**Proposed key dates are**

- First Announcement and Call for Abstracts – 30 November 2015
- Abstract Submission Opening – 2 Jan 2016
- Registration Opening – 2 Jan 2016
- Abstract Submission Closes – 30 April 2016
- Abstract Acceptance Notification – 06 May 2016
- Registration Closes – 10 June 2016
- Payment Deadline, - 17 June 2016

**More Details to Follow Soon**

SYNCHRONISED WITH THE INTERNATIONAL YEAR OF LIGHT

# THE AFRICAN LIGHT SOURCE CONFERENCE AND WORKSHOP

## 16 - 20 NOVEMBER 2015, ESRF GRENOBLE FRANCE

THE AFRICAN LIGHT SOURCE CONFERENCE AND WORKSHOP IS OPEN TO AFRICAN SCIENTISTS, COLLEAGUES, STUDENTS WHO HAVE UTILISED LIGHT SOURCES, AND FRIENDS OF AFRICA WHO SUPPORT THE VISION FOR AN AFRICAN LIGHT SOURCE.

### Conference: African Synchrotron Science

The Workshop will review the status of the African User Base at international light sources.

- Presentations of African research at Light Sources.
- Presentations of highlights and status globally.

### Workshop: Strategy and Policy

- Discussions on a Light Source Roadmap for Africa.
- Visit and insights to an operational international light source.
- Election of the new, fully mandated Steering Commitee for the African Light Source.
- Dissolution of the Interim Committee.

**Conference Secretariat:**

- Conference Web Page: www.saip.org.za/AfLS2015/
- SAIP Conference Organisation: afls2015@saip.org.za
- ESRF Conference Liaison: afls2015@esrf.fr

**Web Page of the Interim Steering Commitee of the African Light Source:**
www.africanlightsource.org

### ORGANISING COMMITTEE:

| | |
|---|---|
| Simon Connell (Chair) | University of Johannesburg, SA |
| Tabbetha Dobbins | Rowan University, USA |
| Brian Masara | SA Institute of Physics, SA (Zimbabwean) |
| Sekazi Mtingwa | TriSEED Consultants, USA |
| Romain Murenzi | Exec Dir of TWAS, Rwanda |
| Tshepo Ntsoane | Necsa, SA |
| Francesco Sette | ESRF, Europe |
| Ahmadou Wagué | Université Cheikh Anta Diop, Senegal |
| Herman Winick | SSRL, SLAC National Accelerator Laboratory, USA |
| Mohammad S. Yousef | Cairo University, Egypt |

### MEMBERS:

The Interim Steering Committee of the African Light Source

| | |
|---|---|
| Simon Connell (Chair) | University of Johannesburg, SA |
| Tabbetha Dobbins | Rowan University, USA |
| Jonathan Dorfan | OIST, Japan |
| Ken Evans-Lutterodt | BNL, USA (Ghanaian) |
| Tarek Hussein | Cairo University, Egypt |
| Brian Masara (Exec) | SA Institute of Physics, SA (Zimbabwean) |
| Fetene Masresha | Ethiopian Academy of Sciences, Ethiopia |
| Krystle J. McLaughlin | Lehigh University, USA |
| Sekazi Mtingwa (Exec) | TriSEED Consultants, USA |
| Romain Murenzi | Exec Dir of TWAS, Rwanda |
| Lawrence Norris | NSBP, USA |
| Tshepo Ntsoane (Exec) | Necsa, SA |
| Philip Oladijo | Int. U. of Sci. and Tech., Botswana (Nigerian) |
| Esna du Plessis | SASOL, SA |
| Kennedy Reed | LLNL, USA |
| Francesco Sette (Exec) | ESRF, Europe |
| Ahmadou Wagué (Exec) | Université Cheikh Anta Diop, Senegal |
| Sverker Werin | MAX IV, Sweden |
| Herman Winick | SSRL, SLAC National Accelerator Laboratory, USA |
| Mohammad S. Yousef (Exec) | Cairo University, Egypt |

# Physics Comment Editorial Policy

## Deadline for submissions for the September 2015 issue of Physics Comment is 31. August 2015

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