

News

Faculty of Science

Opinion by the Dean

It is vital to build capacity in the basic sciences in Africa

Opinion piece published in Mail & Guardian

This year is the centenary of the International Union of Pure and Applied Physics of which South Africa is one of the 13 founding members, and which has 60 member countries. It is also the International Year of Basic Sciences for Sustainable Development.

These celebrations come at a critical time, as the UN Educational, Scientific and Cultural Organisation has highlighted the basic sciences are being neglected worldwide. This has led to a state of serious vulnerability in disciplines such as physics, maths and statistics. These are key to innovation, development and the world of work in the 4IR (Fourth Industrial Revolution) and Society 5.0. Nurturing the basic sciences has become a priority and we have made this part of Nelson Mandela University's national and continental strategy.

The basic sciences (also known as the fundamental sciences) include physics, biological sciences, chemistry, maths, statistics, computer science and the geological sciences. Research in the basic sciences is curiosity driven and it is critical to the understanding of natural phenomena and the processes by which natural resources are transformed. By extension, this research plays a huge role in sustainable development, in making radical shifts to the way we live now by finding solutions to address the real-world problems expressed in the UN Sustainable Goals.

Physics is the cornerstone of other basic sciences, as well as of the applied sciences, which include space science; information and communication technology and energy. Strong collaboration between the sciences is a prerequisite for the generation of new knowledge and its application.

Over the past 150 years, basic scientists have achieved fundamental advances, such as quantum mechanics; genomics; antibiotics;



Prof Azwindinni Muronga

plate tectonics; nuclear fission and fusion; the x-ray; the theory of evolution and the internet/world wide web — which is effectively a by-product of particle physics research at CERN, originally with the aim of addressing the information-sharing needs of academics. In reading this document, most of you will be using a high-speed wireless device that has its origins in technology developed by radio astronomers interested in processing confused, faint signals from the depths of space. Looking to the future, we have an incredible opportunity on our doorstep with the Square

Kilometre Array (SKA), one of the world's largest big science projects, which South Africa is hosting with other African countries and Australia. The majority of the SKA dishes are positioned across Africa, and we need to make sure that we have a strong and growing pipeline of young basic scientists contributing to projects like the SKA and applying themselves to future discoveries.

In the same vein, South Africa and Morocco participate in international research collaborations such as the Large Hadron Collider (the world's largest and most powerful particle

accelerator) at CERN in Switzerland and at other accelerators around the world. It is all about advancing the boundaries of human knowledge to understand our universe and push the frontiers of technology and understanding for the benefit of society.

iThemba LABS — the African hub of expertise in accelerator-based sciences promotes collaborations with international partners and brings together scientists in the physical, medical and biological sciences who are tackling some of the most fundamental scientific questions of our age.

International facilities like the SKA and CERN are gateways for students from Africa who can also take their knowledge back to their home institutions. It's an example of the continent working without borders to build capacity in the basic sciences.

To advance and shape the future of physics on the continent, the process of having an African Strategy on Fundamental and Applied Physics was established in 2020 by a steering committee. I serve on the body's international advisory committee, and we are increasing the number of physics programmes and learning initiatives throughout Africa. South Africa is playing a leading role as the South African Institute of Physics is one of the most established on the continent, dating back to 1955.

As part of the 100-year celebrations, the Faculty of Science at Nelson Mandela University hosted the South African Institute of Physics conference in July this

year and we are hosting the 2022 edition of the African School of Fundamental Physics and Applications in November. The continental school started in 2010 and is held in a different African country every two years.

This year, about 80 postgraduate students from all over Africa, including South Africa, will converge at Nelson Mandela University. The students have been selected from hundreds of applications and they will spend two weeks with us doing intensive hands-on training and participating in lectures by a range of international experts.

As an engaged faculty of science, with an emphasis on science for society, one of our focus areas is on growing our partnerships with universities and schools, particularly in the township and rural areas, to enlarge the basic sciences graduate pipeline.

What is very important for us is to see physics in Africa working for communities and societies, and this includes considerably escalating the participation of girls pursuing physical science in high school, and young women taking physics at universities, continent-wide.

Also at year-end, the annual internship of the National Institute for Theoretical and Computational Sciences will take place at Nelson Mandela University. Twenty to 30 South African students, many from rural universities, come to the university for four weeks of intensive training on nuclear physics, particle physics, astrophysics and cosmology.

Nelson Mandela University will also be hosting the African Conference on Physics and Applications in 2023 where physicists from throughout the continent will gather to discuss cutting-edge physics and physics for development in Africa. This aligns with the Africa-focused agenda of the International Union of Pure and Applied Physics and hence some of the activities we are hosting will be supported by the union.

Participants from African countries who cannot physically attend can collaborate virtually, with digitalisation as the enabler. We have already had several successful pan-African virtual collaborations, such as during the pandemic when postgraduate physics students from all over the continent came together virtually to model the Covid-19 virus in different African countries, as well as the impact of lockdowns in their countries. They published two papers from this and are busy with a third, looking at the impact of Covid-19 vaccination in African countries.

Digitalisation can be a significant enabler in Africa, providing all countries with equal access and opportunity to participate in international science but, as we know, connectivity and affordable data are still considerable inhibiting issues in many African countries.

Resolving this is a priority because the continent-wide development of the sciences can contribute to the growth of economies, such as through the transformation of resources into products, services and processes.

International Year of Basic Sciences for Sustainable Development (IYBSSD 2022/2023) and 100 Years of Physics



Sustainable Development Goals— Why are they important?

The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - in a global partnership. They recognize that ending poverty and other deprivations must go together with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests.

IYBSSD

This year in science, we are celebrating the International Year of Basic Sciences for Sustainable Development 2022/2023 (IYBSSD). To celebrate this event, the Faculty of Science hosted a webinar aligned with the opening ceremony of IYBSSD on 8 July 2022.

The IYBSSD – Celebrating 100 Years of Physics webinar started with a live streaming of the opening ceremony hosted in Paris, France. It was important to live stream the first 35 minutes of this opening ceremony to create context around the importance of the event in the science sphere and beyond.

“This opening ceremony is an important step in

the journey that scientists, citizens and policy makers will take together throughout this International Year to ensure that basic science plays a full role in efforts to achieve more sustainable development around the world.” - UNESCO

“The International Year of Basic Sciences for Sustainable Development, that we organize in 2022, focuses on these links between basic sciences and the Sustainable Development Goals. This is a unique opportunity to convince all stakeholders that through a basic understanding of nature, actions taken will be more effective, for the common good” - Michel Spiro, President of IUPAP

Webinar

The aim of the webinar was to bring the IYBSSD themes and Sustainable Development Goals closer to home.

Therefore, we asked the following speakers, Prof Tim Gibbon and Dr Sharlene Govender to talk about the following topics.

The role of basic science in decision-making

The first speaker, Prof Tim Gibbon, Director of the Centre for Broadband Communication discussed the topic of basic science in decision-making.

Prof Gibbon spoke on the scientific methods used in decision-making, data driven decisions, decisions and game science, quantum

behaviour, the dual nature of decisions, expectation value of decisions and much more on decision-making from the framework of a physicist.

Basic Science and Covid-19

Dr Sharlene Govender, senior lecturer for Biochemistry and Microbiology department and spoke from this framework when discussing Basic Sciences and Covid-19.

Dr Govender started off her talk with some background on the flu pandemic and thereafter focused on Covid-19 (SARS-CoV-2). Herewith she spoke on the diagnostic testing for the virus and wastewater epidemiology for SARS-CoV-2 surveillance, wastewater surveillance in Nelson Mandela Bay and its limitations and the wastewater-based tracker also used in testing for the SARS-CoV-2 virus at Nelson Mandela University residences.

“Basic science research laid the foundation for the innovative tools for virus detection. Researchers can now sequence viruses and study their genomes,” said Dr Govender.

United Nations General Assembly stressed that “the applications of basic sciences are vital for advances in medicine, industry, agriculture, water resources, energy planning, environment, communications and culture, and that basic sciences rupture technologies respond to the needs of humankind by providing access to information and increasing societal well-being, and promoting peace through improved collaboration toward Sustainable Development Goals (SDGs)”.

Botany students in Spain for Palaeoecology Workshop

Originally published by Communication and Marketing

A group of postgraduate students from the Botany Department travelled to Spain to participate in a Palaeoecology Workshop at the University of León.

The workshop is embedded within a larger research initiative led by Dr Lynne Quick of the African Centre for Coastal Palaeoscience and head of the Palaeolab in the Botany Department along with Dr Saul Manzano from the University of León. The workshop is funded by the National Research Foundation of South Africa (NRF).

The workshop will integrate both lecture and practical components with several palaeoecology themed guest seminars on offer by international experts in their fields, together with intensive palynology (the study of pollen) training sessions. Paper discussions and student presentations will also form part of the workshop.

The goals of this workshop were to:

- 1) provide the students with key background knowledge on the various elements of Palaeoecology and its relevance to modern ecology and conservation management,
- 2) train students in the art of identifying South African pollen types in fossil records,
- 3) initiate an international mobility partnership between Nelson Mandela University and the University of León to build capacity and generate new collaborative scientific outputs and to
- 4) promote diversity, accessibility and inclusivity within the field of palaeoecology in South Africa, leveraging international collaborations.

This workshop provides a valuable opportunity for Mandela students to participate in an international, scientific initiative and to develop and strengthen their research careers.



(Left to right) Asithandile Ntsondwa, Erin Hilmer (senior laboratory technician in the Palaeoecology lab at Mandela Uni), Dr Lynne Quick, Boitumelo Langa, Dr Saul Manzano (Head of the Palaeoecology Quaternary Laboratory, University of Leon), Marishka Govender and Luke Nel.

International Organising Committee of Africa School of Physics 2022 visits Gqeberha

South Africa was awarded the bid to host the 7th edition of the biennial African School of Fundamental Physics and Applications from 28 November - 09 December 2022. The school will be organised and hosted by Nelson Mandela University.

The Faculty of Science hosted the Africa School of Physics' International Organising Committee (IOC) for a site visit around Nelson Mandela University and Nelson Mandela Bay.

The objective of the site visit to Gqeberha was for the IOC to review logistics and discuss improvements to be implemented for a successful event. The IOC consisted of Dr. Kétévie Adiklé Assamagan and Mr. Noel Blackburn from Brookhaven National Laboratory, Dr. Christine Darve from European Spallation Source (ESS), and Dr. Horst Severini from the University of Oklahoma.

The African School of Fundamental Physics and Applications (ASP) is based on the close interplay between theoretical, experimental, and applied physics and computing. It covers a wide range of topics: particle physics, particle detectors and accelerator technologies, space physics, astro-particle physics and cosmology, nuclear physics, scientific computing, medical physics, condensed matter physics, light sources, and their applications.

Approximately 100 postgraduate students are selected from all over Africa, from an average of five hundred applications in each edition of ASP. Scientists from Africa, Europe, Asia, and the USA are invited to prepare and deliver lectures according to the proposed topics and considering the diverse levels and backgrounds of the students. The duration of the school allows for extensive networking among students and lecturers.

In addition to the university students' program, the scientific agenda at ASP includes a workshop for high school teachers, physics outreach for learners and a forum for engagement with the public and science policymakers.

Site Visit

The purpose of this site visit was for the IOC to meet the Local Organising Committee (LOC) and together review the logistics and establish a framework in preparation for the event.

The first day of the site visit by the IOC started with a welcoming and briefing session facilitated by the Executive Dean of the Faculty of Science, Prof Azwinndini Muronga, and a welcoming message from Acting Vice-Chancellor Prof. Cheryl Foxcroft.

This was followed by the viewing of the Science building and the Physics department. Prof Andre Venter, Head of Department of Physics, led the tour of the computer labs, and the delegation



The international delegates and staff from the Faculty of Science, after a tour of the first of its kind Ocean Sciences Campus

was allowed to test the performance of the computers in terms of speed and software. The LOC also took the delegation on a tour of



Dr. Horst Severini testing the computers in the computer labs at Building 13

the newly built residences at the Sanlam Student Village. This followed a viewing of hotels in Summerstrand where they would be staying for the duration of the ASP.

One of the highlights of the second day of the site visit was the visit to The Centre for High Resolution Transmission Electron Microscopy (CHRTEM) a facility for advanced electron microscopy. Here the delegates got to see the

facility that houses the four state-of-the-art electron microscopes - including the only double aberration corrected transmission electron microscope on the African continent - as well as the enabling infrastructure for sample preparation, data processing and image simulation.

The delegation also got a tour of the North Campus Health Centre and was granted the opportunity to ask relevant questions about the health and emergency services they offer.

Another highlight was the visit to InnoVenton, which incorporates the Downstream Chemicals Technology Station, a Technology Innovation Agency programme, funded through the Department of Science and Innovation, to make available high-level research and development, technological services and training, to technology based Small and Medium Enterprises, and the South African industry as a whole.

The delegates also visited the first-of-its-kind campus in South Africa - the dedicated Ocean Science Campus. At the end of day two, the delegates were met by Prof. Werner Olivier, the Director of the Govan Mbeki Mathematics Development Centre (GMMDC) at the historic Bird Street Campus to learn more about the

centre and its engagement projects.

The last day of the site visit was slightly different. The LOC organised a drive through the townships of New Brighton, KwaZakhele and Zwide for the IOC to view the high schools and possible venues for their outreach projects during the duration of the ASP.

The road from the townships led to the 10th medical school built in South Africa - Nelson Mandela University's Medical School - which is based at the Missionvale Campus in the heart of the Bay's townships and close to Dora Nginza and Livingstone State hospitals. This special medical school serves as a beacon of hope for the communities it aims to serve, as well as the Eastern Cape and South Africa at large. The tour was led by Dr. Zithulele Tshabalala, senior lecturer of human anatomy and the delegation was shown around the Biochemistry lab, Physiology lab, Anatomy wing and the Clinical Skills lab with all its impressive medical

mannequins.

The last site visit for the day was the Nelson Mandela Bay Science and Technology Centre in Uitenhage. The delegates viewed the massive exhibition room at the centre and learned more about the programs at the centre that were designed to build enthusiasm and an affinity for science, technology and mathematics in learners through fun and interactive engagements. After an exciting three days of a successful and informative site visit to Gqeberha and its surroundings, the IOC departed.

The IOC also visited the University of Witwatersrand and the University of Johannesburg, the NRF, DSI and the South African Institute of Physics (SAIP) to draw national support for the upcoming event.

The central long-term objective of the ASP



School is to help improve higher education in Africa across national borders and in doing so, to contribute in a significant way to the development of science and technology on this continent.

This site visit marked the beginning of concerted efforts between the IOC and the LOC to prepare a successful event.

National Science Week 2022

CELEBRATING THE ROLE OF BASIC SCIENCES IN THE MODERN WORLD

The Faculty of Science hosted the National Science Week 2022 (NSW 2022) under the theme: The Role of Basic Sciences in the Modern World. This year Nelson Mandela University's Faculty of Science celebrated NSW 2022 by hosting events in Gqeberha and Graaff-Reinet (Eastern Cape), as well as in George (Southern Cape).

Science Marketing Team (SMT) kickstarted the NSW 2022 pre-launch activities on Monday, 25 July. During the pre-launch week, we invited high schools in Gqeberha to participate in our activities. These activities included chemistry lab tours on North Campus, South Campus and Ocean Sciences Campus, chemistry demonstrations, experimental physics, the chemistry of batteries and a viewing of the electric vehicles at the uYilo eMobility Programme based at North Campus.

This was followed by the focus week of activities from Monday, 1 August – 5 August. During the focus week, the Science Marketing Team (SMT) invited primary schools and high schools to participate in activities such as chemistry demonstrations on flocculation chemistry, interactive demonstrations from the human physiology department, a guided walk from the Botany department through the nature reserve, and more chemistry demonstrations at Ocean Sciences Campus.

The highlight of the NSW 2022 focus week was the Science Expo hosted in Graaff-Reinet, in collaboration with the Sarah Baartman Education District. The purpose of taking a science expo to this region was to rekindle the love of science in learners and to exhibit and communicate awareness of science, and to exhibit the role and value of science and technology in people's daily lives.

The Science Expo was hosted by Spandau Secondary School. The SMT, along with departments from the Faculty of Science including chemistry, computing science, physics, agriculture, and exhibitors from the rest of the Mandela University such as marketing,

Emthonjeni: Student Wellness, Student Access and Enrolment, ICT, the Faculty of Education brought their science students and lecturers to demonstrate a variety of science experiments. In addition, we invited exhibitors from Graaff-Reinet these included SAN Parks and Eastcape Midlands College.

In total, we reached 28 schools, 627 learners,



and 38 educators across all our NSW 2022 activities on our Mandela University campuses and in Graaff-Reinet.

Prof Azwinndini Muronga delivered a public lecture to the people of Graaff-Reinet during National Science Week. The public lecture was titled: Unlocking the deep secrets of the

Universe.

The lecture was centred around the various discoveries in the solar system from Voyager 1, the planets and their moons in the solar system, telescopes and observing stations based in South Africa. Overall, the NSW 2022 activities were a success and impacted learners from all walks of life.

“After this public lecture, the people of Graaff-Reinet will look to the sky with new understanding” – Prof Azwinndini Muronga.

It also created an opportunity for the Faculty of Science to network with schools, educators, students and lecturers and strengthen the relationships with all these stakeholders and encourage them to Change the World by studying science at Nelson Mandela University.

Young African Women in Computing (YAWiC) Initiative by Computing Sciences Department to Inspire School Learners

Written by: Carmen Bekker from Department of Computing Science

In the information economy and the era of the Fifth Industrial Revolution (5IR), skills in the vast field of Computing Skills are in short supply. Companies like S4 Integration have had at least 30 vacancies in their software development department that they cannot fill.

To address this need, the Young African Women in Computing (YAWiC) initiative in collaboration with S4 Integration hosted a workshop to educate and inspire Grade 10 and 11 girls on what careers are available in Computing Sciences.

The YAWiC initiative was launched over five years ago by Professor Brenda Scholtz. She attended the workshop with Dr. Anthea van der Hoogen and a few of the department's Honours ladies. The university

team shared some of their personal experiences in the Computing Sciences field. The team from S4 consisting of Nomsa Tsoetsi, Kylie van der Merwe, and Meggan Naude, showcased some leading-edge technologies used by S4, such as their collaborative robot (cobot), which are vastly different from large-scale industrial robots, and their Virtual Reality (VR) technology.

With the VR system, learners could interact with a virtual factor floor to design automotive parts. It was also a great opportunity for the school girls to see S4's offices and their assembly workshop.

The feedback from the learners was that they were excited about exploring their unique skills and were inspired and motivated to pursue a career in the field of Computing Sciences at Nelson Mandela University.



YAWiC presenters with the grade 10 and 11 girls



YAWiC presenters with the grade 10 and 11 girls

Women in Science

According to the UNESCO Science Report 2021 towards 2030, women still just represent 33,3% of researchers globally and sadly, their work does not always receive the recognition it deserves. Furthermore, less than 4% of Nobel Prizes for science have been awarded to women. Whilst being mindful of these statistics the Faculty of Science, in celebration of National Women's Day, hosted a Women in Science event on Tuesday, 9 August 2022. The event was facilitated by Acting Dean of School, Dr. Buyiswa Hlangothi.

The first speaker was Dr. Lungelwa Mahanjana (PhD Natural Product Chemistry). She spoke about her journey into the world of research, from studying Analytical Chemistry whilst highlighting the advantages and challenges she faced as a woman in the science sphere.

With her research she ventured into Natural products, studying medicinal plants in the Eastern Cape to cure diseases. "See what is around you, see what you can do in the Eastern Cape" was Dr Mahanjana's advise to the audience.

Miss Marishka (Minx) Govender (BSc Honours in Botany) was the second speaker and during her talk she spoke on her highlights on her academic journey, when she headed to University of León in Spain and Frankfurt, Germany.

"Make it known that you can be just as good as the other women and men in the room" were one of the key messages from Marishka Govender's talk.

Our Faculty of Science has committed to actively promote women scientists in our structures to address systemic gender equity issues. However, this should be a daily practice so that we can work towards eliminating the element of surprise when hearing the words women scientists, we must work towards recognising all scientists based on the merit of their discoveries and research in science.



Miss Marishka Minx Govender alongside Dr Buyiswa Hlangothi and Dr Lungelwa Mahanjana.

The Road to Mvezo

The Faculty of Science joined the Nelson Mandela University's Communication and Marketing Department to exhibit at the Future World of Work career expo at the Mandela School of Science and Technology in Mvezo, more commonly known as the birthplace of our namesake Nelson Mandela.

The purpose driving the Future World of Work career expo was to showcase careers that are cutting edge and future oriented and to introduce a focused approach towards a career driven strategy that allows

for the development of a meaningful emphasis on careers that are in line with the changing working world.

The event was endorsed by the Royal House of Mandela served as an opportunity for learners of the Mandela School of Science and Technology, and other surrounding schools in the region, to obtain information about the Faculty of Science and other important information about our university and for learners to apply to Nelson Mandela University.



Chemistry PostDoctoral fellow reaches final of FameLab

Originally published by Mandela Uni—Reasons to be proud #R2bp

Postdoctoral fellow from the Department of Chemistry, Dr Nehemiah Latolla, has been selected as a finalist in the South African leg of the international science competition, FameLab.

FameLab is designed to engage and entertain by challenging young scientists (aged 21 to 35 currently registered, studying or working in science, technology, engineering or mathematics in South Africa) to communicate their science to a public audience in under three minutes. Talks are fun and engaging, making science relevant to everyone, without using jargon or formal presentations. Talks are judged on content, clarity and charisma.

As an advocate of science, Nehemiah seeks to discover novel chemical compounds from plants to use as medicine. He believes that listening to indigenous stories about plant use could hold the key to resolving our fight against illness and disease. He aims to share some of the science behind medicinal plants through social media.

Apart from being a phytochemist, Nehemiah is also a poet and fashion designer, where he uses these multidisciplinary mediums to make meaning through art and science.

Nehemiah was awarded his PhD in Chemistry in April this year. His thesis - Phytochemical Investigation and Antidiabetic Activity of *Cissampelos Capensis* and *Strychnos Henningsii* the Eastern Cape Medicinal Plants - investigated the phytochemistry of two Eastern Cape Medicinal plants used to treat diabetes by locals. His study contributed new knowledge in drug discovery.

The FameLab final will be broadcasted on 17 October at 18:00 on the NRF SAASTA YouTube channel.



South African indigenous knowledge systems could bring us less toxic, cost-effective drug solutions for the future.

Nehemiah Latolla
Nelson Mandela University
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Produced and created by
CHELTENHAM Festivals

Fame Lab
TALKING SCIENCE

NRF SAASTA
National Research Foundation
South African Academy of Science and Technology

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Wildlife Excellence Award for Prof Graham Kerley



The Southern African Wildlife Management Association recently awarded its prestigious “Wildlife Excellence Award” to Nelson Mandela University’s Prof Graham Kerley of the Zoology Department and Director of the Centre for African Conservation Ecology.

This award is recognition of his outstanding contribution to wildlife research, capacity building and practice in southern Africa. Highlighted in the award citation was his conceptualization of the Greater Addo Elephant National Park, which led to the growth of the park from 12 000 ha to over 200 000 ha.

Consequently, the income from ecotourism, employment and biodiversity conservation increased. Prof Kerley was also honoured for his service advising government and on the boards of South African National Parks and Eastern Cape Parks, and internationally as an invited member of three IUCN Species Survival Commission Specialist Groups.

In accepting the award, Prof Kerley highlighted the contribution of the over 100 MSc and PhD students and postdocs he has worked with.

Physiology PhD student goes to Brazil

Olaulo Samuel Olushola, a PhD student in the Human Physiology Department in the Faculty of Science is one of the few candidates from Africa that was accepted to attend a competitive TrypsSchool- São Paulo School of Advanced Science on pathogenic trypanosomatids: from basic biology to pathogenesis and new therapies in Ribeirão, Brazil.

Olaulo managed to join the school from 19 September to 30 September 2022, taking place at Universidade de São Paulo and presented part of his PhD work entitled “Behavioural and molecular characterization of cognitive responses to *Trypanosoma brucei* infection”.



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