NEWS LETTER

Quarter 1 2020/21

TIA-funded initiative to help address rising demand for coronavirus testing

HARNESSING SCIENCE DIPLOMACY IN THE FIGHT AGAINST COVID-19: A South African perspective

Growing Coronavirus: UWC and SU isolate S outh Africa's first Laboratory Culture of SARS-CoV-2

THE PROTECTION OF PERSONAL INFORMATION ACT

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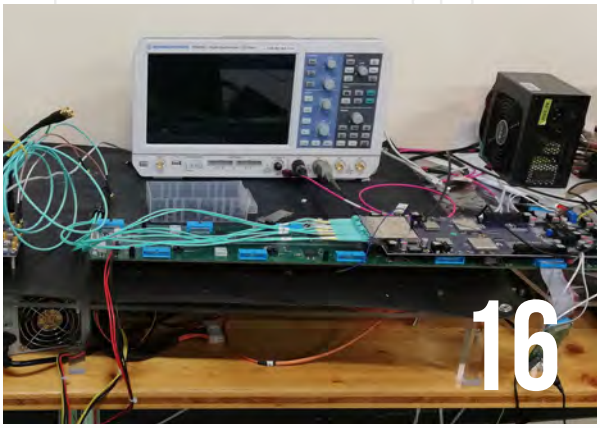


South African students

take second prize at international supercomputing competition

South Africa has once more excelled at the annual International Supercomputing Conference (ISC) 2020 Student Cluster Competition, which took place virtually this year because of the COVID-19 pandemic.

The event, regarded as the world's premier high-performance computing competition for students, is held annually on the sidelines of the ISC in Frankfurt, Germany. The team of six undergraduate students flew the flag high, scooping second prize, it was announced during an online event on 24 June. South Africa has a proud history at the event – it has now participated seven times and made it onto the podium every time.

The country has taken first prize on three occasions, placed second three times and third once. The team fielded by the Centre for High Performance Computing (CHPC) were among 82 university students from 11 countries who spent almost a month working feverishly on a cluster located at the National Supercomputing Centre of Singapore in a bid to win the overall prize. The virtual competition ran from 1 to 24 June.

This year's competition was designed to contribute to the global fight against COVID 19, and included applications addressing education and applied learning towards accelerating bioscience research and discovery. The teams were tasked with testing several applications that are being used by scientists and researchers in their search for a cure for the coronavirus. Team South Africa comprised six undergraduates from Wits University, the University of the Western Cape and the University of KwaZulu-Natal, namely Guy Axelrod, Victoria Bench, Michael Beukman, Sivenathi Madlokazi, Mikhail Vink and Kalreen Govender, with Stephanie Agenbag as the reserve member.

Team South Africa is one of few teams made up solely of undergraduate students, as well as one of few that do not include the same members twice. The team progressed to the international round after winning the national round at the CHPC's National Conference in Johannesburg in December 2019. During the competition, which participants described as incredibly intense, the teams vied to obtain the greatest performance across a series of benchmarks and applications. For the students to spend almost a month on the competition shows the extent of their dedication, and the team, along with their mentors from the CHPC, are to be congratulated.

The efforts put in by the team and the CHPC, and the challenges they faced, reflect the real-life scenario currently being experienced by South Africa's National Integrated Cyberinfrastructure System (NICIS), as it works to ensure the availability of high-performance computing resources in support of the national response to COVID-19, and to address issues of connectivity to enhance online learning.

Since 2011, the ISC has focused on introducing science, technology, engineering and mathematics students to the world of possibilities that is high-performance computing, while helping to develop critical skills that students will use long after completing their studies. Apart from competing in the competition, the students also take part in the world's oldest, and Europe's premier, conference and networking event for the international high-performance computing community. □

"Men love to wonder, and that is the seed of science."

This quote, from 19th century American philosopher and poet Ralph Waldo Emerson, has motivated Soyama Sivatho Nyangwa to be the young scientist he is today, with a passion for using his knowledge to help solve the world's problems – especially as they relate to infectious diseases.

Celebrating Youth Month 2020

Molecular biologist aims to unlock the mystery of immunity to viruses

Nyangwa is a Doctoral Candidate in Molecular Biology at Stellenbosch University, and a recipient of a fellowship from the National Research Foundation (NRF), an entity of the Department of Science and Innovation (DSI). Born the youngest child of a large family and raised in a small town called Keiskammahoek in the Eastern Cape, Nyangwa has wanted to be a doctor or a scientist for as long as he can remember.

"Not to sound clichéd or anything, but growing up was really not so easy, coming from a previously disadvantaged background," he says. "My parents worked hard to make sure they provided us with the best opportunities to pursue our dreams." He traces his inspiration to pursue his childhood dream to his mother, a professional nurse. "Her work and her passion for nursing introduced me to the field of medicine, and I fell in love with it," he said. His ambition was fuelled further by his training as an igqirha (traditional healer), which both shaped him and added to his interest in science.

Nyangwa has travelled a long road to where he is now, starting with a Diploma in Biotechnology at Cape Peninsula University of Technology, where he also completed a BTech in Biomedical Technology. He then enrolled at Stellenbosch University for an MSc in Molecular Biology, which he subsequently upgraded to a PhD.

Nyangwa is driven by a desire to add to the current body of knowledge on tuberculosis and HIV/AIDS, and speaks with passion about his PhD research project. His focus is on the structural and functional variations that occur in a type of cytokine known as interferon gamma. Cytokines, he explains, are small proteins that play an important role in cell signalling in the human body. And among the cytokines, interferon gamma (IFN-γ) is of particular interest to Nyangwa, because it is critical for innate and adaptive immunity against viral and other infections.

While his project will initially look at how the structure of interferon gamma correlates with its function, Nyangwa's ultimate goal is to define the IFN-γ structural profiles in the blood plasma of patients with TB. Doing this, he believes, will help us understand the impact of structural IFN-γ variants on the immune response and possibly on our susceptibility to disease.

At the very least, he hopes his research study will serve as a platform for further research, as no similar study has been conducted in this area. Nyangwa still sees a long road ahead for himself as he works to leave a mark in his chosen field. "I would also like to start a medical research institute in my home province of Eastern Cape, for its children and the children of Mother Africa."

He urges young people to "work hard, play hard, ground yourself in something you love doing, and pray hard if you are religious".

Lastly, describing science as "a passion and a hobby that you sometimes get paid for", he offers the following advice to young people who are considering a career in science: "If you still see being in science as a job, then you aren't where you are destined to be yet." □

Passionate about science

TIA-funded initiative to help address rising demand for coronavirus testing

With an increasing demand for COVID-19 testing by health services and local businesses concerned about the safety of their staff, Artisan Biomed, a biomedical company specialising in precision medicine, is investing heavily in research aimed at reducing the negative impact of the COVID-19 pandemic.

Artisan Biomed is a subsidiary of the Centre for Proteomic and Genomic Research, a non-profit company in Cape Town, which is supported by the Technology Innovation Agency (TIA), an entity of Department of Science and Innovation. Artisan Biomed is using a new laboratory information management system with features that support laboratory operations to provide access to COVID-19 testing as broadly, rapidly and effectively as possible. The system is hosted on the Microsoft Azure cloud computing platform, which enables the building, testing, deployment and management of applications and services through data centres, boosting the scalability of the software-based solution.

It aims to develop precision medicine in South Africa by making molecular applications available to patients to improve health and disease management cost-effectively; enhancing clinical and translational research by creating an integrated environment for sample testing, data use and product development; and developing diagnostic medical services tailored to people of African descent.

As part of a national effort to coordinate COVID-19 testing, Artisan Biomed is in constant communication with the National Health Laboratory Service (NHLS) to determine the need for surge testing capacity and to provide it as and when required, together with a group of third-party academic laboratories. The NHLS is currently struggling to address the demand for testing.

Workflow improvements have given Artisan Biomed the capacity to do 500 COVID-19 tests per day, and there are plans to ramp this up to 2 000 per day. Dr Reinhard Hiller, Managing Director at Artisan Biomed, says: "Overall, we see a surge in the need for testing that exceeds our ramped-up capacity of 2 000 per day at least fivefold. We are in discussion with key stakeholders about additional scale-up scenarios and the long-term need for increased capacity."

At the moment, Artisan Biomed is in discussions with the Western Cape's Department of Health about providing COVID-19 tests direct to state hospitals in the province. The Western Cape is a COVID-19 hotspot, with 47 522 confirmed cases on 18 June 2020 (the national figure for 18 June was 46 951). Artisan Biomed has completed pilots at Mediclinic Constantiaberg and Mediclinic Cape Town in partnership with Lancet laboratories, which sent excess samples to Artisan Biomed for testing.

Highlighting the global need for scaled-up testing, Dr Hiller cited the New York-based Rockefeller Foundation's plans to create mega-scale testing infrastructure to deal with COVID-19 in the United States of America, where the pandemic has claimed over a 100 000 lives so far. The Foundation is aiming for a dramatic expansion of testing, from 1 million tests per week to 3 million and eventually

30 million tests per week. The ambitious plan, which would allow the US to reopen its economy more safely, includes launching a COVID-19 community healthcare corps to allow every American to be tested. To complement the testing, privacy-centric contact tracing, a testing data commons and a digital platform to track COVID-19 statuses, resources and treatment protocols will be rolled out. Artisan Biomed is part of an emerging cluster of private companies collaborating to provide custom-made COVID-19 solutions and boost capacity in the South African health system. Various proposals have been prepared and presented to relevant stakeholders at national and provincial government level. A key focus is on creating and providing an effective data-generation and data-utilisation platform that allows real-time information analysis for effective decision making.

Artisan Biomed has also joined the global COVID-19 Host Genetics Initiative, which brings the human genetics community together to generate, share and analyse data to learn about the genetic elements of COVID-19 susceptibility, severity and outcomes. Artisan Biomed is preparing a custom-made local initiative for genetic research, aimed at strengthening vaccine development for African populations, among other things.

In the immediate future, assuming an extended lock-down scenario, Dr Hiller sees testing being channelled mainly through public and private hospitals, as well as selected partners. Artisan Biomed is working on the assumption that there will also be more mobile stations for sample collection. "Once the immediate crisis is over, we will consider a direct-to-consumer offering, on the premise that (a) the need for ongoing testing will remain high until a vaccine has been found and (b) the demand for testing from individuals is unlikely to decrease," he said. As the pandemic takes hold in South Africa, testing has become critical. By 18 June, 1 228 098 COVID-19 tests had been conducted across the country, with a significant proportion carried out in the public health system. □

Local companies provide testing kits for COVID-19

New app makes

COVID-19 screening and tracing

quick and easy

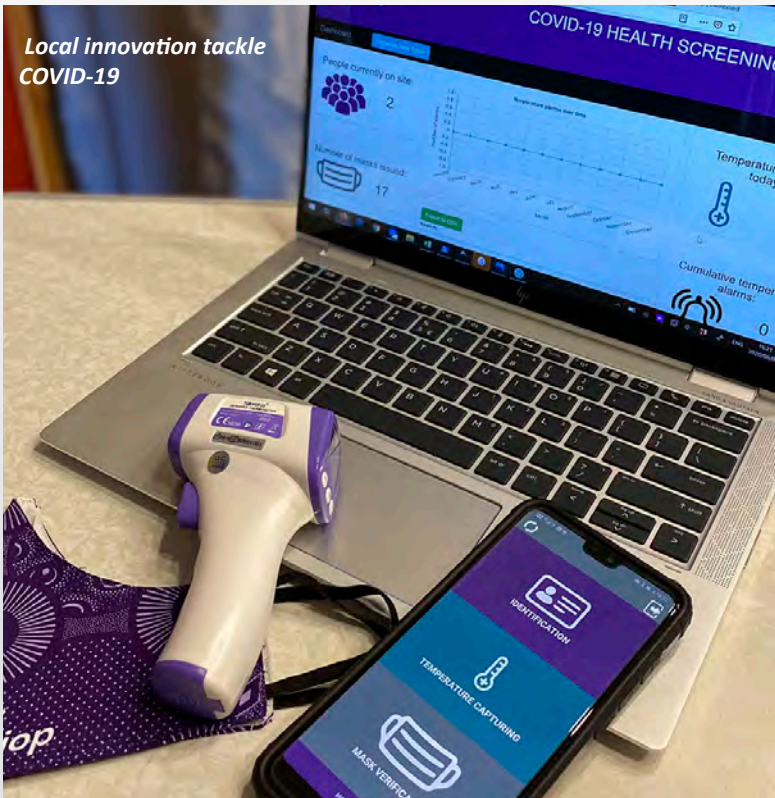
With schools reopening across the country, a team of engineers from North-West University (NWU) have been hard at work to make this process as safe as possible for learners and teachers – while minimising the time and effort required.

Led by Prof. Leenta Grobler and Dr Henri-Jean Marais from NWU's Faculty of Engineering, the team developed a mobile application to assist with quick and effective screening of learners for COVID-19. Named "Tjop Tjop", the app collects and stores the key health information of learners, teachers and support staff without the need for any paperwork. The NWU team were named the winners of the COVID-19 Innovation Challenge that was held alongside the virtual Africa Innovation and Investment Forum 2020, which ran from 15 to 19 June. The Challenge showcased technologies and innovations from across Africa, explored investment and market needs, and identified business opportunities in areas such as affordable rapid testing, enhanced medical devices, and personal protective equipment design and fabrication. The Forum was organised by the Department of Science and Innovation (DSI) in collaboration with the United Nations Economic Commission for Africa.

Health screening measures have been imposed on schools and businesses as they reopen to enable the tracking and tracing of learners, teachers and staff who might have come into contact with people infected with the coronavirus. As Prof. Grobler explains, these measures are time-consuming and laborious, requiring paperwork and causing considerable congestion at entry points to schools and businesses. This is where Tjop Tjop comes in. It works on any Android phone and can scan barcoded IDs. As most learners do not have these, they are issued with quick response (QR) codes. QR codes are machine-scannable images that work in the same way as barcodes at a supermarket, allowing for instant reading by means of a smartphone camera.

Once a learner has been scanned using the app, the information is submitted to a database. This makes reporting and storage of information significantly quicker and easier, and lowers the chances of human error creeping in. All the information that is gathered can be downloaded from a website in comma-separated values (CSV) format. CSV files are delimited text files that use a comma to separate values used for reporting purposes. The app will alert the management of a school or business when a learner or staff member's temperature is above the threshold for COVID-19. Prof. Grobler says the application is now commercially available, having been piloted and rolled out in 13 schools across all nine provinces, as well as one school in Namibia and two businesses. The schools include Alberton High School, Woel en Werskaf Pre-Primary and Laerskool Mooirivier in Potchefstroom, Little Legends Daycare and Aftercare in Port Elizabeth, and Laerskool Walvisbaai in Namibia. The two businesses are BKD Auditors in Potchefstroom and Mugg & Bean Table Bay Mall in Cape Town.

According to Prof. Grobler, the application has been well received. "Teachers are very pleased with how the app enables them to focus on learning instead of screening," she said. The system is ideal for educational institutions, businesses and government departments. "Health authorities will love this. It makes tracking, tracing and monitoring COVID-19 so much easier," Prof. Grobler added. "We are currently in talks with a number of value-added resellers to provide access to this screening and tracing solution to as many people as possible," she said. "Next, we need to formalise a business and establish a back office and sales network, to effectively and quickly market and roll out this offering internationally." □



Local innovation tackle COVID-19

Celebrating STEM scholarship winner in Youth Month – Makgothoma Milton

Makgothoma Milton's participation in the Nka'Thuto EduPropeller programme, which exposes learners from disadvantaged schools to a variety of skills, helped him to win an international BP STEM Academies scholarship.

This will see the grade 11 learner from Bokamoso Senior Secondary School in Polokwane attend a four-week programme in one of four countries (Brazil, Egypt, India or the United States of America) in June 2021. A virtual academy commences in July 2020. Milton's school subjects include Mathematics, Physical Sciences and Life Sciences.

He has been in the Nka'Thuto Edu Propeller programme since his grade 9 year, learning research methodology, how to apply science, technology, engineering, and mathematics (STEM) principles, how to do presentations, and how to be an innovator.

The BP Global STEM Academies are full scholarship programmes that offer young people a chance to enrich their STEM knowledge and skills, while growing competencies in language and problem-solving, and learning to collaborate and build bridges across cultures. The Academies is a partnership between AFS, a non-profit organisation that provides intercultural learning opportunities, and global energy company BP. The collaboration aims to help talented young people from all backgrounds to develop knowledge, critical STEM skills and intercultural understanding, and chooses participants to reflect the diversity of populations around the world.

full scholarship programmes that offer young people a chance to enrich their STEM knowledge and skills, while growing competencies in language and problem-solving

The interactive programme culminates with team projects and presentations that offer potential solutions to real-world challenges, with an emphasis on climate change and the energy transition. Milton is one of 110 young people selected for the scholarship from over 9 000 applications and 91 countries around the world.

For Milton, who has always wanted to study abroad, the programme is an opportunity to gain a perspective on other cultures that will help him adapt to a changing world. With a strong interest in STEM, studying abroad and interacting with peers from different backgrounds, Milton is a perfect fit for the BP Global STEM Academies.

He had to write four essays as part of the application process, and after shortlisting underwent a virtual interview. His experience in the Nka'Thuto EduPropeller programme helped him to tackle each of the questions comfortably. Milton began his journey at Nka'Thuto EduPropeller in 2018, winning third place in the organisation's national Final Innovation Expo that year with an alarm system for mounted flatscreen television sets. This win got him onto the six-day Nka'Thuto EduPropeller TechnoPreneurship bootcamp, which equips learners with the tools to make business cases for their scientific or engineering solutions.

Milton describes STEM as "mind blowing", and is enthusiastic about the impact STEM can make in solving global problems like climate change. □

CSIR study shows reusable shopping bags have lower environmental impact

The Council for Scientific and Industrial Research (CSIR) has released the findings of a life cycle sustainability assessment (LCSA) of grocery carrier bags in South Africa. LCSA is a useful tool that unpacks the environmental, social and economic impacts of a product throughout its life cycle. The study shows that reusable plastic carrier bags are the best option in South Africa, as they have a subtantially lower environmental impact compared to single-use bags – provided that consumers do actually reuse them.

The study, funded by the Department of Science and Innovation (DSI), provides an objective scientific assessment to inform government, producers, retailers and consumers about the environmental and socio-economic impacts of different types of carrier bags. It aims to identify which bag is 'best' in the South African context.

"The results of this research are important in evidencing how we manage single-use plastics in South Africa" notes Dr Henry Roman, Director Environmental Services and Technologies at the DSI. "Although single-use plastics provide many benefits, there are also many avoidable plastic products that negatively impact our environment. Developing capability in LCSA allows us to make informed decisions on the most appropriate material for product design."

The study assessed 16 types of carrier bags made from a range of different materials. It included the standard, single-use plastic shopping bags that most people are accustomed to, which are made from high-density polyethylene (HDPE), with varying levels of recycled content and a thickness of 24 microns. It also included a number of reusable and biodegradable alternatives.

Twenty-one environmental and socio-economic indicators were used to assess each bag. This included 18 indicators that are typically used in environmental life cycle assessment (LCA) studies (such as water use, land use, global warming, etc.). The team also developed a new indicator to account for the impacts of plastic pollution, which is currently missing from most LCA methods.

In addition, two key socio-economic indicators (impacts on employment and affordability for consumers) were added, which are also missing from most LCA studies.

According to the findings, the best performing bag overall is the reusable plastic bag – also made from HDPE – but thicker and stronger (70 microns) than the standard 24 micron single-use bag. This bag is currently sold at one of South Africa's major grocery supermarket groups for R3 per bag, with a 50c discount on grocery shopping each time it is reused.

The other reusable bags – made from other types of plastics, such as polyester (recycled PET) and polypropylene – also perform well. While single-use bags rank lower, the best performing among them is the standard 24 micron HDPE plastic bag with 100% recycled content. Among the 24 micron HDPE bags, the higher the recycled content, the better the overall performance of the bag. In general, biodegradable plastic and paper carrier bags perform poorly overall (except in terms of plastic pollution), due mainly to their land and water use impacts. Biodegradable bags (particularly those made from a combination of imported polybutylene adipate terephthalate (PBAT) and starch) only outperform the conventional 24 micron (single-use) HDPE bags if the latter have a recycled content of 50% or less.

While reusable carrier bags perform better overall, the single-use bags are best from an employment perspective. In particular, single-use paper bags perform well in terms of job creation, followed by 24 micron HDPE bags with 100% recycled content.

"This study shows that 'biodegradable' doesn't necessarily mean better – at least not for carrier bags," says Anton Nahman, principal environmental economist at the CSIR, who led the research team. "Taking into account environmental and socio-economic impacts across the full product life cycle – from resource extraction, through production and use to end of life – the best performing bags are all made from conventional plastics. In particular, the reusable ones are best – but only if they are actually reused, as many times as possible."

The COVID-19 pandemic may delay global action against addressing certain problematic single-use plastics as some retailers suspend the use of reusable bags in stores.

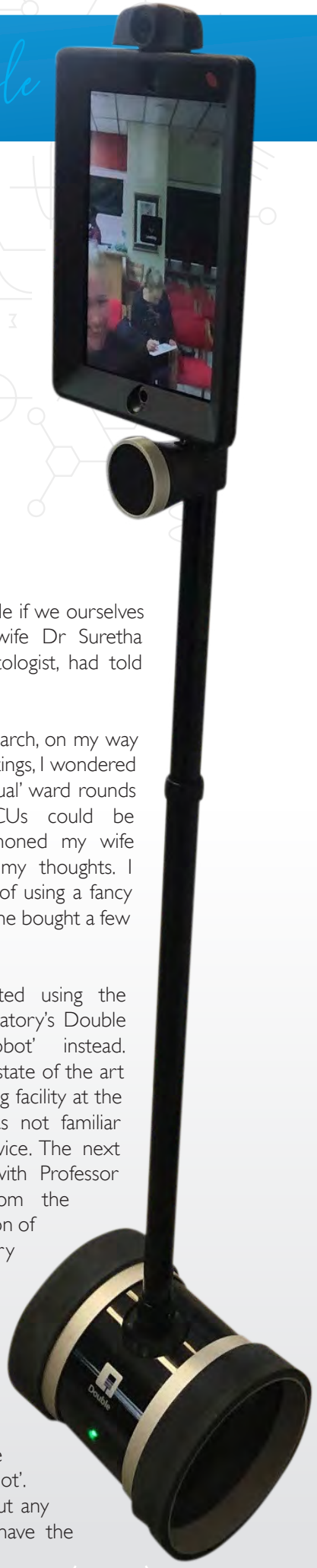
"While this study shows that reusable bags are the best option for South Africa, if retailers and consumers want to use single-use bags now in the interim, then the 100% or 75% recycled content 24 micron HDPE bags are the next best solution. Increasing the recycled content of products will also help to create a demand and a market for waste plastic, typically collected by informal waste reclaimers, helping to improve their livelihoods during a difficult time, further compounded by the very low oil prices," notes Prof. Linda Godfrey, Manager of the CSIR Waste Research Development and Innovation Roadmap Implementation Unit.

This LCSA capability now exists within South Africa and within the CSIR. "We hope that brand owners will use this tool to inform the choice of products that they put into the South African market, to ensure that they have the best overall environmental, social and economic performance," says Dr Douglas Trotter, Manager of the Sustainable Ecosystems Area of business for the CSIR. "Sustainable product design is a critical part of South Africa's transition to a more circular economy." □

"Sustainable product design is a critical part of South Africa's transition to a more circular economy."

More recyling needed.

'Robot' helps Tygerberg specialists on ward rounds during pandemic



"Quintin" – as 'he' is affectionately called – is a Double Robotic 'robot' that has been employed to help specialists do 'virtual' ward rounds – even from home – if they are unable to be physically present.

Coenie Koegelenberg, Professor of Pulmonology at Stellenbosch University's Faculty of Medicine and Health Sciences (FMHS), started experimenting with options to perform virtual ward rounds in the intensive care unit (ICU) of Tygerberg Hospital shortly before South Africa's lockdown, and is assured that ICU specialists can, indeed, run ward rounds remotely, using robots as tireless helpers that can't get infected.

Intensive-care specialists at Tygerberg Hospital have a new infection-resistant 'colleague' helping them do ward rounds on Covid-19 patients.

Tygerberg Hospital has a limited number of specialists in its general medical ICU at present. "Between the specialists, we will share the workload of Covid-19 patients who end up in ICU. The odds of at least one or all of us falling ill are quite high, so we need to realistically plan for what could happen.

"If any of the specialists gets the virus and is unable to physically go to work, we will be able to function remotely using the robot, from a phone or a laptop," said Koegelenberg. "Using this device will enable us to provide a service if our skills sets are in short supply." The idea of using robots came about through "a combination of thoughts of many people," Koegelenberg said. "We started wondering how we could help more people if we ourselves were to fall ill." His wife Dr Suretha Kannenberg, a dermatologist, had told him about this device.

"On Wednesday 18 March, on my way home after many meetings, I wondered whether 'virtual' ward rounds in many ICUs could be feasible. I phoned my wife and shared my thoughts. I had thought of using a fancy 'nanny cam' she bought a few years ago.

"She suggested using the Sunskill laboratory's Double Robotic 'robot' instead. [Sunskill is a state of the art clinical training facility at the FMHS]. I was not familiar with this device. The next day I met with Professor Ian Vlok from the FMHS' Division of Neurosurgery and the Sunskill facilities manager, Bronwyn Stockenstrom who gave me a 'crash course' on how to use the Double Robotic 'robot'. The Sunskill lab without any hesitation agreed to have the

robots be used in the ICU until the pandemic is over. "On Friday Dr Usha Lalla (Tygerberg Hospital's head of ICU) and I tested the device. We performed a full ICU ward round without entering the ICU. It was truly an eye opener and a potential game changer in this and future similar pandemics. It was a remarkable success!

We both concluded (with more than 30 years of combined experience in ICU) that our physical presence was not required, and that the technology has great potential to be rolled out. This is, of course, anecdotal and not 'true evidence', but desperate times calls for desperate measures. Moreover, should one of us be under 'self-quarantine', we would be able to 'work from home'."

The "robot" that looks like an computer tablet and has two wheels, uses gyroscope and accelerometer sensors in its base and can be controlled with a desktop, tablet or smartphone. It enables communication between patient and doctor through a microphone and a zoom function and can relay vital signs of highly infectious patients. Robots have also been used in Italy, where the pandemic has claimed many lives, including those of doctors. The use of the robot at Tygerberg Hospital is yet another example of how the pandemic has brought ingenuity and collaboration to the fore. "This has been a team effort – and such a bonding experience," said Koegelenberg. Vlok, who oversees activity at the Sunskill lab, said: "The Sunskill clinical training facility uses world class technology to further the skills training of our postgraduate students at Stellenbosch University. The robots have given us access to international and national experts in their fields for training with their virtual presence guiding the teaching and training.

Now the same technology can allow us to carefully navigate and manage patients in a high-risk environment and reduce risk to our staff. I sincerely hope this initiative will not only have a positive effect during this pandemic but open the door for further innovation and collaboration." □

Harnessing science diplomacy in the fight against Covid-19:

A South African perspective

The dimensions of "science in diplomacy" and "diplomacy for science" are integral to the world's response to Covid-19, says DDG:ICR, Daan Du Toit.

International cooperation in science and innovation is vital if the Covid-19 pandemic is to be defeated. In recent weeks the South African Department of Science and Innovation has engaged in a series of extensive dialogues with its international partners to explore and develop partnerships.

On 4 April 2020, the Department hosted a conference call with close to 100 participants from the diplomatic community in Pretoria and international partner organisations to discuss cooperation.

The primary objective of this successful engagement was to bolster international networks and encourage the transnational sharing of information, crucial components of the scientific armoury in the fight against Covid-19. The discussion built on the participation of Dr Blade Nzimande, South Africa's Minister of Higher Education, Science and Innovation, in a virtual ministerial meeting on cooperation and #OpenScience in the fight against Covid-19 held by UNESCO on 30 March 2020.

South Africa is also actively contributing to the OECD analysis of the science policy response to Covid-19.

In his statement to the UNESCO conference, Minister Nzimande detailed the extensive contribution that the South African national system of innovation is making to the South African government's response to Covid-19. These efforts include data modelling and analysis, work on the development of diagnostic tools and drugs, and societal behavioural studies. Minister Nzimande also called for reinforced international scientific cooperation, emphasising the critical importance of African regional and continental partnerships.

Global partnerships critical in the fight against COVID-19

Covid-19 knows no borders; neither should science. To deal successfully with the pandemic, it is imperative that the global scientific community collaborates. We need to share resources – experience, expertise, research infrastructure (including cyberinfrastructure) and data. We need to leverage national investments, pooling financial resources, investing in the capacities of developing countries, and aligning and optimising synergies between national research agendas. Perhaps most importantly, we need to reinforce global solidarity, strengthening the coordination and leadership efforts of the United Nations and regional bodies such as the African Union and Southern African Development Community.

If the desired impact is to be achieved, international cooperation in science and innovation should be underpinned by certain principles. The focus should be on the global good, not individual or institutional agendas, and we can see national and global priorities converge in the recognition that Covid-19 will be overcome only through a united response. With national capacities – including the efforts of scientists and experts – stretched beyond what is realistically possible, it is clear that international partnerships must go further than corporate social responsibility projects to add real value. Resources are limited, so any duplication of efforts would be scandalously wasteful.

Above all, the crisis requires urgent action, so there is no time for designing instruments of cooperation from scratch or delaying matters through excessively elaborate planning. We need to improve and build on existing programmes to ensure a rapid response. Under the leadership of Minister Nzimande, the South African Department of Science and Innovation is committed to investing in such partnerships, embracing the holistic vision of open science proposed by UNESCO – i.e. scientific collaboration rooted in open access, open data and a science open to society. We deeply appreciate our collaborations with partners such as the Chinese Ministry of Science and Technology, the European Developing Countries Clinical Trials Partnership and the Regional Office for Africa of the International Science Council, with whom we are already implementing urgent response initiatives.

#ScienceDiplomacy has become a popular theme for academic discussion and analysis, with experts in both science policy and international affairs agreeing that science diplomacy plays a crucial role in addressing global challenges. Covid-19 is, of course, a defining global challenge.

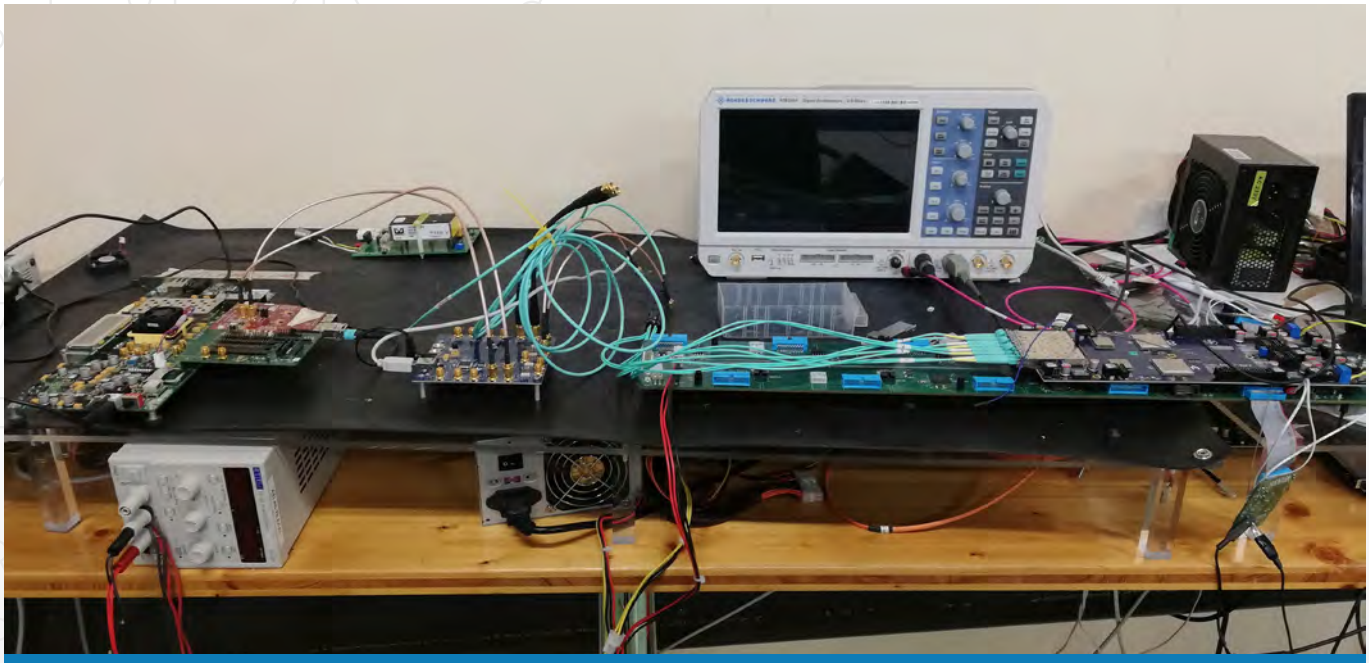
The Royal Society and American Association for the Advancement of Science have identified three dimensions to science diplomacy, namely, "science in diplomacy" (science advice informing and support foreign policy objectives), "diplomacy for science" (facilitating international scientific cooperation and the development of international relations to support the scientific enterprise), and "science for diplomacy" (scientific cooperation improving international relations).

The dimensions of "science in diplomacy" and "diplomacy for science" are integral to the world's response to Covid-19. "Science for diplomacy" is equally important, as solidarity across borders is needed now more than ever to build resilience in troubled times.

#StrongerTogether was the rallying cry for the nation to unite behind South Africa's 2019 Rugby World Cup triumph. It is also the message and invitation from the Department of Science Innovation to our partners across the globe. □

Edward Nkadimeng, showcased SA innovation at its best

Wits students showcase South African electronics research at top international conference



The WITS students presented their work on the reliability testing and upgrade of the low-voltage power supply.

Three students from Wits University's High-throughput Electronics Laboratory within the Institute for Collider Particle Physics recently showcased South African electronics research at the international conference ACES 2020.

ACES (short for ATLAS CMS Electronics) is a state-of-the-art electronics conference focusing on upgrades to the Large Hadron Collider (LHC), the world's most powerful particle accelerator.

The LHC is housed at the European Organization for Nuclear Research (CERN) in Geneva, Switzerland. CERN operates the world's largest particle physics laboratory, where scientists from around the world use the most advanced equipment – including the LHC – to study the fundamental forms of matter and energy. The CERN-South Africa programme is supported by the Department of Science and Innovation (DSI) and is hosted by the iThemba Laboratory for Accelerator Based Sciences (iThemba LABS),

a facility of the National Research Foundation. ACES 2020 was due to take place at CERN from 17 to 19 March, but was postponed to 26 to 28 May – and converted into a virtual event – because of the COVID-19 pandemic and associated lockdowns.

Despite these challenges, the three Wits students – Mpho Gift Doctor Gololo (PhD), Edward Nkadimeng (PhD) and Ryan McKenzie (MSc) – worked through the lockdown period to present their work at the conference.
The trio are conducting research for the upgrade of the Tile Calorimeter (TileCal) of the ATLAS Detector at CERN.

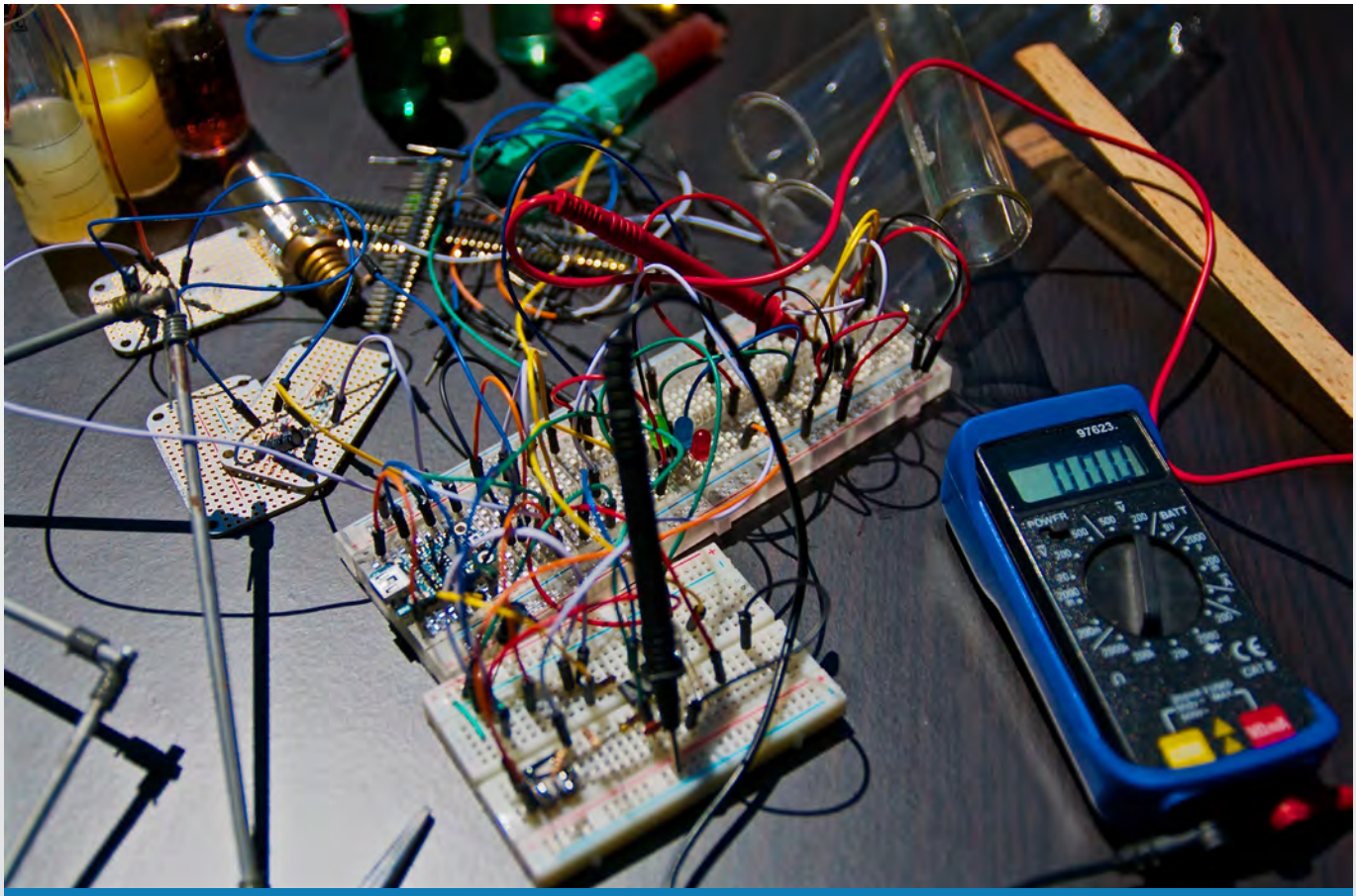
Nkadimeng and McKenzie presented their work on the reliability testing and upgrade of the low-voltage power supply (LVPS), which powers the future on-detector electronics of the Tile Hadronic Calorimeter.

"We presented two test-station designs for testing the latest version of a switch-mode power supply for the front-end electronics of the ATLAS TileCal," said Nkadimeng. "The new test station significantly improves fault detection and reliability. We further discussed the steps taken to test the new Tile-LVPS, using a custom-based software to perform tests and graphically display and record all performance metrics."

Gololo presented his work on the Tile PreProcessor for the upgrade of the readout electronics, which is part of the off-detector electronics of the Tile Hadronic Calorimeter and is used to process data at a mind-boggling throughput of 40 terabytes per second.

"The Tile Computer on Module (TileCoM) mezzanine board is an FPGA board that is used to remotely configure the on and off-detector electronics as well as to interface ATLAS DCS data to the Tile PreProcessor," Gololo explained. "This contribution presents the deployment of an embedded Linux development of firmware and software on the ZYNQ System-on-Chip."

Prof. Bruce Mellado, Director of the university's Institute for Collider Particle Physics, said: "We are proud that our students were able to continue performing at the highest, world-class level during these trying times." □



The test station designs significantly improves fault detection and reliability.

COVID-19 pandemic highlights importance of the circular economy

As countries across the world grapple with the fallout from COVID-19, there is growing acknowledgment that the traditional linear approach to economic growth is no longer sustainable. Many experts believe that the crisis created by the coronavirus pandemic presents an opportunity to embrace a new approach, and many countries are already taking active steps towards growing a circular economy.

"We must start investing in what makes our socio-economic system resilient to crisis, by laying the foundation for a green, circular economy that is anchored in nature-based solutions and geared toward public well-being," says Prof. Phoebe Koundouri, Professor of Natural Resources, Economics and Econometrics at the Athens University of Economics and Business, and Co-Chair of the United Nations (UN) Sustainable Development Solutions Network (SDSN) Greece.

In an article published on the SDSN website on 1 April 2020 *("Never waste a good crisis: For a sustainable recovery from COVID-19"),* Koundouri said now was the time to usher in systemic economic change. The blueprint for doing so, she argued, was already available in the form of a combination of UN Agenda 2030 (comprising the 17 Sustainable Development Goals) and the European Commission's European Green Deal.

"Now is the time for financial institutions and governments … to phase out fossil fuels by deploying existing renewable energy technologies, eliminate fossil fuel subsidies – amounting to US$5,2 trillion per annum – and redirect them to green and smart climate mitigation and adaptation infrastructural projects, invest in circular and low carbon economies, shift from industrial to regenerative agriculture, exploit the limits of the digital revolution, and reduce transportation needs."

Science and the transition to a circular economy

Koundouri added that as science was being used to design measures to restrain the diffusion of COVID-19, science could also be used to design economies that would mitigate the threats of climate change, biodiversity loss, and pandemics.

This is something that South Africa, through its Department of Science and Innovation (DSI), is actively pursuing. The Department's White Paper on Science, Technology and Innovation (STI), which was approved by Cabinet in March 2019, is one of the first South African policy documents to consider the circular economy model in terms of its long-term economic growth potential.

DDG: Socio-economic Innovation Partnerships, Imraan Patel

And in its report on the South Africa Foresight Exercise for STI, the National Advisory Council on Innovation (NACI) – an entity of the DSI – identified the circular economy as one of nine priority STI domains. The Foresight report, released in December, describes the circular economy as focusing on "the generation of products that are restorative and regenerative by design, and which circulate through the economy repeatedly, thereby minimising waste".

The report notes that the circular economy represents a new trajectory for South Africa, and that its implementation will require an innovative, transdisciplinary, STI-based strategy to reduce costs, create jobs and micro-industries, and benefit the economy, the health of people and the environment.

The DSI's Programme: Socio-economic Innovation Partnerships is driving the Department's work on the circular economy. The Programme's Deputy Director-General, Imraan Patel, said the circular economy was "a very important element of a concept that we are taking forward in the innovation policy space, namely innovation for transformative change.

"It is aimed at a deep-seated change that re-orientates societies to a much more sustainable, fairer world," Patel said.

Developing an STI framework on the circular economy

To enable the transition to a circular economy, the DSI has begun developing a STI Framework on the Circular Economy, and has been participating in events focused on the circular economy to gather information. The most recent of these was a two-day symposium held in Pretoria in November last year under the auspices of the South Africa-European Union (SA-EU) Dialogue Facility, a platform for championing the use of STI to derive socio-economic benefits from the circular economy.

Speaking at the symposium, the Deputy Head of the EU delegation in South Africa, Raul de Luzenberger, said the circular economy approach holds numerous benefits that cannot be ignored.

"In the circular economy, almost nothing is wasted. Reuse and remanufacturing become standard practice, and sustainability is built into the system. At the same time, the circular economy is an opportunity to create decent, long-term jobs and boost competitiveness. The job creation potential of the circular economy is not to be underestimated."

Also speaking at the symposium, Cecilia Njenga, Head of the UN Environment Programme (UNEP) office in South Africa, said there was increasing momentum on the circular economy in Africa. UNEP is working with local

More recycling of waste needed.

Climate change and its impact on the circular economy

partners, including governments, the private sector and local communities, to design and apply circular economy systems.

The circular economy in Africa

Njenga said that partnering with global leaders in the circular economy, such as the EU, would help African countries accelerate progress on circularity. "Working together with global value chain partners in the context of the EU Green Deal will foster coordinated efforts in resource-intensive and high-impact sectors such as textiles and construction."

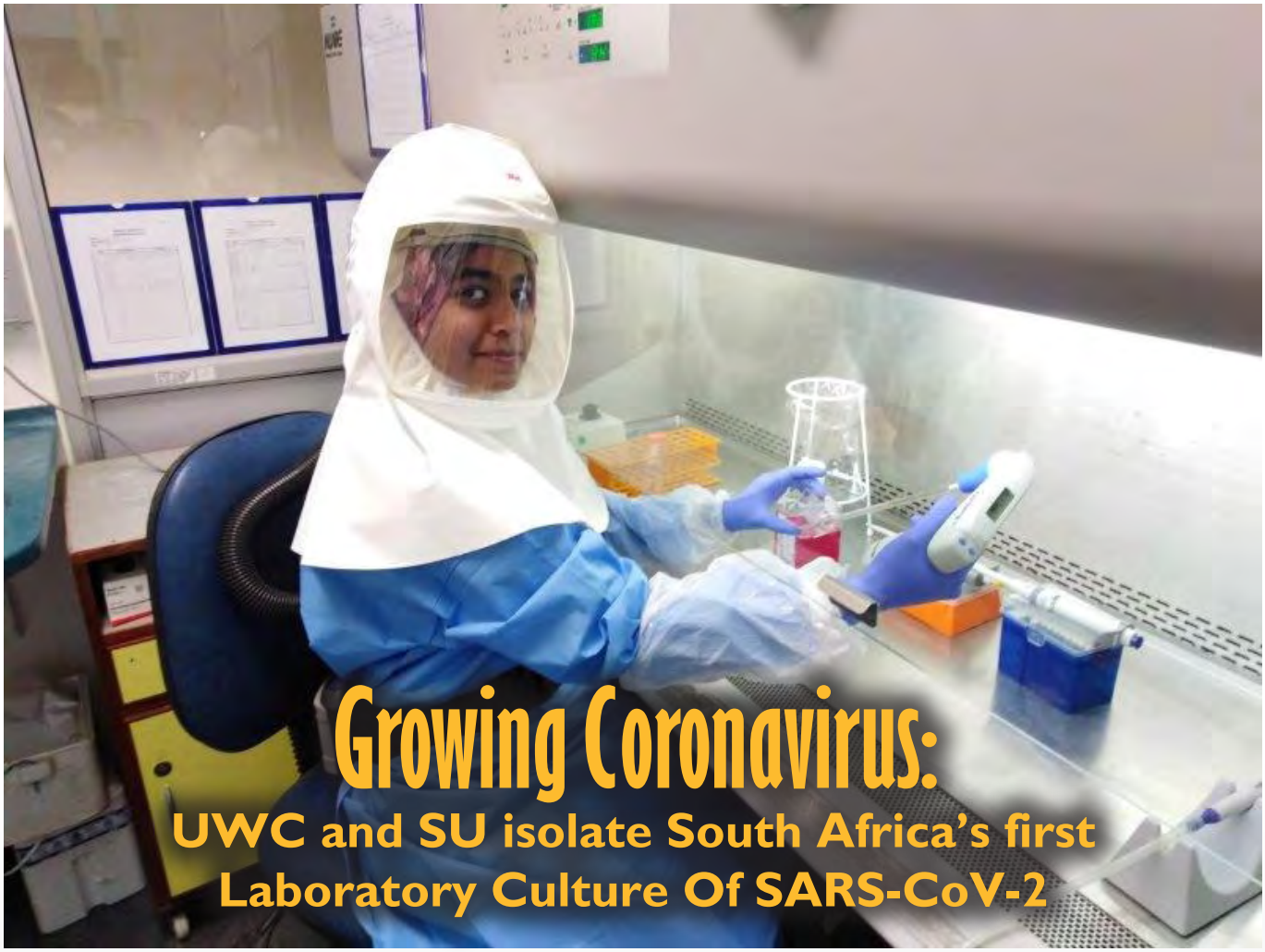
With population growth expected to double in African cities between 2030 and 2050, the future must be designed for circularity, Njenga said, noting that adopting circularity and resource efficiency could reduce greenhouse gas emissions in some sectors by up to 99%.

"Circularity will help African countries prevent pollution, reduce the burden of disease, and improve health and quality of life."

While the political will exists to support the transition to a circular economy, the private sector will be a key player. In South Africa, local and multinational companies have come together in a voluntary coalition, the National Business Initiative (NBI), that is working to shape a sustainable future through responsible business action.

Steve Nicholls, Head of Environmental Sustainability at the NBI, believes that achieving such a future will require doing things "radically differently and together". The most pressing issue facing South Africa is socio-economic transformation, he argued, and in order to address this, the country will need "more than small tweaks".

"Climate change and the circular economy are intimately linked, and simply put, we will not archive carbon neutrality by 2050 without the circular economy," Nicholls said. "This reinforces the findings of the 'Reimagining Africa's Future' report, which states, among others, that there is a conservative annual opportunity of US$350 billion to be unlocked in new, sustainable business models." □



Growing Coronavirus:

UWC and SU isolate South Africa's first Laboratory Culture Of SARS-CoV-2

While much of the scientific and medical community rushes to develop therapeutic agents for COVID-19 based on clinical data, getting a better understanding of the brand new virus remains crucial.

That's why it's so important that South Africa obtained its very first known laboratory isolate of SARS-Coronavirus 2 (SARS-CoV-2) on 1 April 2020, courtesy of the collaborative efforts of the University of the Western Cape (UWC) and Stellenbosch University (SU).

"Having a pure culture of the virus opens doors for research in South Africa," says Dr Tasnim Suliman of UWC. "Currently, much of the data that exists on this novel virus is based on detecting the genetic material, which is still possible after the virus is 'dead', and does not confirm whether the virus is viable and able to cause infection. Now we can experiment on the live virus and observe how it actually behaves in the lab."

Dr Suliman is a post-doctoral research fellow working under Professor Megan Shaw, an influenza expert who recently relocated from the USA to join UWC. Using the biosafety level-3 (BSL-3) laboratory at SU's Division of Medical Virology – with the support of Division Head, Professor Wolfgang Preiser – Suliman was able to inoculate cell cultures with samples from COVID-19 patients and succeeded in growing the virus.

"We didn't *create* the virus, or modify it in any way," Dr Suliman notes. "All we have done is provided the virus with the right conditions to grow, in a space where we are able to harvest a large amount of virus to perform research. And strict safety protocols were followed."

An immediate and indispensable blessing of having an isolate is being able to supply diagnostic labs with large amounts of virus genetic material that is identical in genetic makeup and concentration. This achievement offers numerous valuable opportunities for further research and provides an indispensable reference material for standardising diagnostic tests across multiple platforms between laboratories.

For example, the virus can be used in experiments to test new antiviral compounds in vitro (Latin, "in glass" - meaning in the laboratory) and if they show an effect against the virus without harming the cells, they could become candidates for clinical trials.

"Although South Africa is the leading African country in science and technology, we remain a resource-limited setting by developed world standards," Suliman says. "Therefore, it is a tremendous advantage for us to make this virus available and guide others on how to safely handle the virus locally."
Cultivating Coronavirus: The Art And Science of Virus Culture

Dr Suliman obtained clinical samples from COVID-19 positive patients at Tygerberg Hospital, in Cape Town, and inoculated these samples onto live cells that were cultured in the laboratory.

If the virus is present in the clinical sample, the virus infects the cells and it grows. This provides a pure culture of the virus – an essential resource for all research laboratories, as well as clinical laboratories who can use it as a positive control in their diagnostic tests.

"Virus culture was previously used routinely in diagnostic procedures, which has now been replaced with rapid, sophisticated and high-tech molecular techniques with greater capacity and accuracy, and faster turnaround times,' Prof Shaw says. "Inevitably, virus culture became a dying technique, and the skill is rapidly fading from the scientific community."

Unlike bacteria that can be grown quite simply in nutrient-rich media, viruses require living cells for their proliferation. Viruses need to be able to attach to and enter cells, before redirecting the cells' machinery to produce the proteins and molecules required to assemble new virus particles. The cells themselves have their own growth requirements, and finding a combination of lab-adapted cells that are also compatible with virus growth, is a highly delicate process.

"We have to literally synchronize two naturally-occurring biological systems to work together to yield a desired result," Dr Suliman explains. "Fortunately, the growth requirements of SARS-CoV-2 appear to be very similar to that of SARS-CoV-1, which gave us some sort of a roadmap."

And fortunately also, she was well-equipped to follow that roadmap. There are seven known human coronaviruses, three of which cause severe disease. And as it happens, Dr Suliman has worked with all three to varying extents, as well as one milder disease-causing CoV.

During her PhD (supervised by UWC coronavirus expert, Professor Burtram Fielding) she investigated viral proteins of SARS-CoV-1 from the 2002-2003 outbreak. Cloning and culturing of this potentially dangerous virus made up a large portion of her work, for which she spent four years at the University of Bonn, Germany, with Professor Christian Drosten, a world-renowned coronavirus expert.

She subsequently joined SU's Division of Medical Virology for a post-doctoral research fellowship, hosted by Professor Wolfgang Preiser. There she researched coronaviruses found in bats, and their potential transmission to humans, while also managing the division's BSL-3 lab. As of this year, Dr Suliman had begun to expand her virology experience to the field of influenza viruses in the Shaw Lab, when COVID-19 took everyone by surprise.

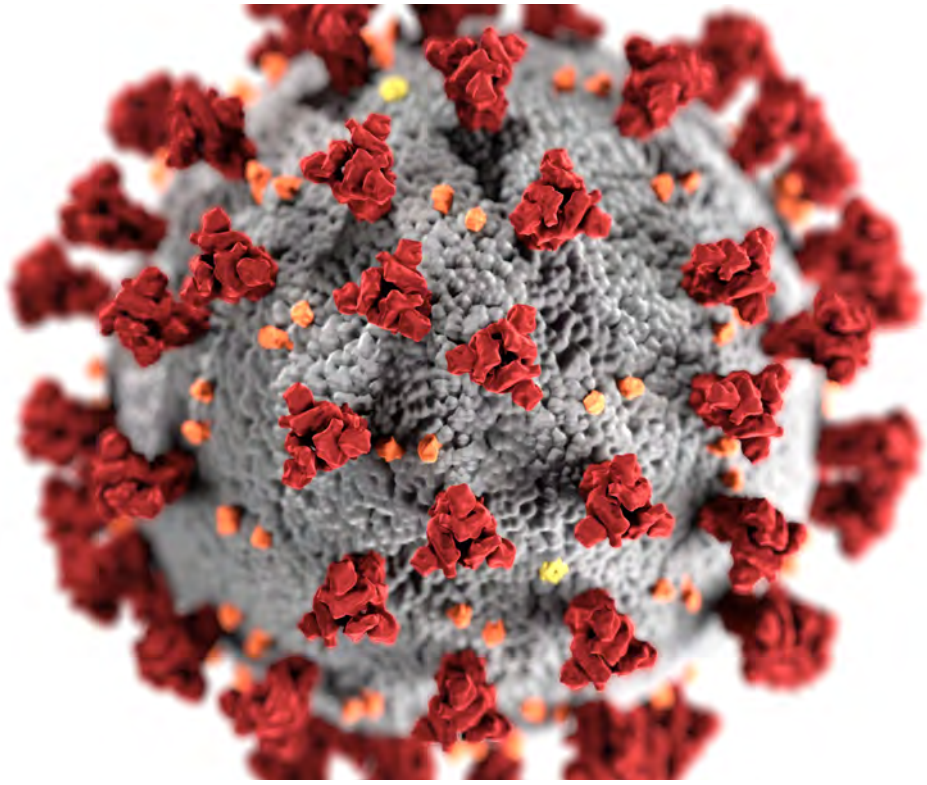
"Since I have worked extensively with SARS-CoV during the 2002/3 outbreak, and given the similarities between SARS-CoV-1 and -2, I was already familiar with what other non-virologists and virologists outside of coronavirology may need time to figure out," Suliman says. "And with a pandemic like this, time is of the essence."

Lockdown in the Lab: Working With a Live Killer

On 11 March 2020 coronavirus disease 2019 (COVID-19) was declared a pandemic by the World Health Organization (WHO), a week after the first infection with SARS-CoV-2 - the virus that causes COVID-19 - had been diagnosed in South Africa. Two weeks later, South Africa entered a national lockdown to attempt to flatten the curve, with stay-at-home orders for all non-essential personnel.

That's when Dr Suliman emailed an inundated Prof Preiser, simply asking her former mentor: "Prof, you know what I can do. Do you need help?"

One of the greatest limitations in growing SARS-CoV-2 is the absolute requirement of a BSL-3 lab, and the scarcity of these labs and trained personnel throughout the country. In South Africa, most BSL-3 labs lack the setup for dealing with respiratory viruses as they are often directed towards tuberculosis, which is caused by bacteria.



Dr Suliman is the only known South African who has ever grown a BSL-3 coronavirus, and is arguably the best-trained person to undertake the isolation of the virus responsible for COVID-19, so it was an obvious decision for her to take on this task. She is now training other scientists from the University of Cape Town.

"It was scary at first," Dr Suliman says. "I was acutely aware that all it would take is a suit malfunction and a badly-timed mishap to become infected. But with training and regularly working in the BSL-3 lab, an automatic sense of hyper-alertness develops. You get used to it."

To gain access to the workspace of the BSL-3, one needs to enter through three doors in succession – each preparing you for the next phase. The multiple doors, together with the outward airflow called negative pressure, prevent any aerosols from escaping into general spaces.

"After the first door closes behind you when entering the BSL3, the door to stage 2 is released - a room where protective gear is worn: two pairs of gloves, boots, a back-closing gown or overalls, sleeve covers, and my personal favourite, the powered respirator that filters the air you inhale," Dr Suliman comments. "The battery pack and filter are worn around the waist and a pipe connects it to the headpiece that fits snugly around the head and face. You are now ready to enter the third door to slay coronaviruses!"

And slay them she did.

"I worked day and night, and struggled with the lack of some essential materials, because by then South Africa had entered lockdown and there were airfreight bottlenecks," Suliman recalls. "Finally, two weeks after I began, I looked through the microscope and saw dead cells – a sign that my virus was growing. I sat smiling in that isolated high-security lab, with only the whirring of the respirator to punctuate the silence, as I considered the potential of what I held in my hands."

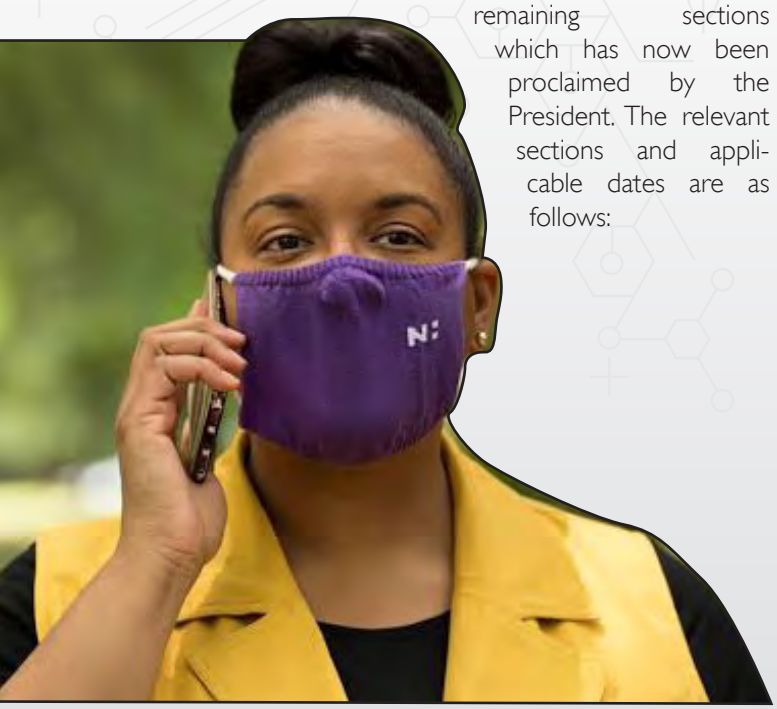
The team has already begun sharing the isolate with multiple researchers and institutions for diagnostic and research purposes. They're also sharing their expertise with TB research groups, who have the infrastructure to study respiratory infections on a molecular and clinical scale, but are not skilled in handling a virus of this nature.

"This disease is very new, and despite amazing progress on many fronts, so much is still unknown. So, new aspects emerge every single day, and that's why it's so important that we conduct as much research as we can," Prof Preiser notes. "Because of the urgency, much of what normally happens 'behind the scenes' is playing out in the open, and it may feel overwhelming. But this is a wonderful example of how we can work together to achieve what any one on their own would not have been able to - and in a time of great need. That's something to be proud of." □

THE PROTECTION OF PERSONAL INFORMATION ACT 4 OF 2013, (POPIA) COMMENCED ON 1 JULY 2020

The Protection of Personal Information Act, 2013 (Act 4 of 2013) gives effect to section 14 of the Constitution which provides that everyone has the right to privacy. The Act promotes the protection of personal information processed by public and private bodies and seeks to balance the right to privacy against other rights, such as access to information. The Act has been put into operation incrementally, with a number of sections of the Act having been implemented in April 2014. Some of these sections include those relating to the establishment of the Information Regulator.

Many of the remaining provisions of the Act could only be put into operation at a later stage as they require a state of operational readiness for the Information Regulator to assume its powers, functions and duties in terms of the Act. Much has since been done in this regard culminating in the commencement of a number of remaining sections which has now been proclaimed by the President. The relevant sections and applicable dates are as follows:



Sections 2 to 38; sections 55 to 109; section 111; and section 114 (1), (2) and (3) shall commenced on 1 July 2020. The sections which commenced on 1 July 2020 are essential parts of the Act and comprise sections which pertain to, amongst others, the conditions for the lawful processing of personal information; the regulation of the processing of special personal information; Codes of Conduct issued by the Information Regulator; procedures for dealing with complaints; provisions regulating direct marketing by means of unsolicited electronic communication, and general enforcement of the Act.

Section 114(1) is of particular importance as it states that all forms of processing of personal information must, within one year after the commencement of the section, be made to conform to the Act. This means that entities (both in the form of private and public bodies) will have to ensure compliance with the Act by 1 July 2021. However, it stands to reason that private and public bodies should attempt to comply with the provisions of the Act as soon as possible in order to give effect to the rights of individuals. Entities which process personal information must ensure that it is done in a lawful way. The Act is fundamental in safeguarding persons' personal information and thus protecting them against data breaches and theft of personal information.

Sections 110 and 114(4) shall commence on 30 June 2021. The reason for the delay in relation to the commencement of sections 110 and 114(4), is that these sections pertain to the amendment of laws and the effective transfer of functions of the Promotion of Access to Information Act, 2000 (PAIA) from the South African Human Rights Commission to the Information Regulator. In this regard, the Commission must finalise or conclude its functions referred to in sections 83 and 84 of PAIA and all mechanisms must be in place for the Regulator to take over these functions. □

South African Population Research Infrastructure Network launches two new urban nodes to expand to a nationwide network and improve response to COVID-19 and other epidemics

With the advent of the Covid-19 pandemic in South Africa, the value of the South African Population Research Infrastructure Network (SAPRIN), has once again been reiterated. SAPRIN, a national research platform funded by the Department of Science and Innovation (DSI) and hosted by the South African Medical Research Council (SAMRC), recently responded rapidly to the Covid-19 emergency by developing a surveillance protocol that was implemented within a month of the first case reported in the country. The research involves ongoing telephonic interviews to screen for COVID symptoms in more than 60 000 rural households in Mpumalanga, Limpopo and KwaZulu-Natal.

According to SAPRIN Director, Dr Kobus Herbst, the Network will continue to monitor the demographic, social, health and socio-economic well-being of the entire study-population. "The impact of Covid-19, and its related 'lockdown' policies, will be carefully observed, while feeding back this vital information to policy makers and planners", said Herbst. He adds that the initiative had already contributed data to the HSRC's assessment of the impact of the pandemic on households (http://www.hsrc.ac.za/en/media-briefs/general/lockdown-survey-results) and in future will provide more insights into the pandemic in South Africa, particularly in reference to its interaction with HIV and TB.

To expand to a national network and to improve its response to COVID-19 and other epidemics, SAPRIN has recently added two new Health and Demographic Surveillance System (HDSS) nodes in Gauteng and Western Cape provinces.

In Gauteng, the new node has been awarded to the Gauteng Research Triangle (GRT), a consortium which is a collaboration of the three research universities: University of Witwatersrand (Wits), University of Pretoria (UP) and the University of Johannesburg (UJ). The planned sites will be in Atteridgeville and Melusi in the north-western part of the Tshwane Metro, and in Hillbrow at the very centre of Johannesburg. In response to being awarded the node, Professor David Everatt from GRT, said they have assembled a remarkable team for the project, and will be building in a multidisciplinary approach from the outset, to ensure that the analysis of vital statistics, migration and other key data generated from multiple angles. "Our approach is not only to ensure the most accurate and quality vital statistics data possible, but to understand it in its specific urban context, including issues such as differing urban forms, inequality and the like", said Everatt.

In the Western Cape, a broad-based consortium, under leadership of Western Cape Government Health, including UCT, SU and UWC, SAMRC, HSRC and CBOs, will oversee the node. The node will span two areas Nomzamo and Bishop Lavis in the City of Cape Town metropole.

Professor Andrew Boulle from the Cape Town Surveillance through Healthcare Action Research Project (C-SHARP), says they are delighted to join SAPRIN and will help pioneer a form of engaged scholarship which contributes to improved service delivery – both directly through the activities in the node, and indirectly through improved understanding of the challenges facing the residents and service providers in impoverished urban communities.

"We plan to embed the node in existing community health worker services as part of the community-oriented primary care approach. This will ensure alignment between surveillance activities conducted as part of service delivery, and those required to contribute to SAPRIN" he added. □

Africa Day delegates call for African solutions to COVID-19

The Minister of Higher Education, Science and Innovation, Dr Blade Nzimande, assured Africa's scientific community that just as the continent had defeated colonial and racial oppression, so too would it overcome the novel coronavirus.

Dr Nzimande was speaking at this year's virtual Africa Day event, which took place on Monday, 25 May under the theme, "COVID-19 and Africa's future development: Opportunities and challenges." The virtual dialogue was organised by the Department of Science and Innovation (DSI) and the Africa Institute of South Africa (AISA), which forms part of the Human Sciences Research Council (HSRC).

The Minister was joined by the science and technology ministers of Zimbabwe and Uganda, Prof. Amon Murwira and Dr Elioda Tumwesigye, and the Commissioner of the African Union Division of Human Resources, Science and Technology, Prof. Sarah Anyang Agbor. Speakers from other institutions also participated, discussing various African initiatives, including the use of indigenous knowledge, to combat the coronavirus.

While Africa has so far not experienced the high infection and mortality rates seen in many other parts of the world, the COVID-19 pandemic remains a major threat to the continent's health systems.

There was general consensus at the event that Africa needs to be instrumental in developing its own solutions to the challenges it faces, including COVID-19.

"COVID-19 stands as a reminder on this Africa Day that Africa's unity is the primary instrument for a continent-wide renaissance through which we will achieve the Africa we want," said Dr Nzimande.

"Even at the height of colonial oppression, we never carried ourselves as helpless victims, but instead we stood up to fight to change our situation. That is the same spirit and determination we need now to confront COVID-19."

The Minister said South Africa was committed to supporting pan-African cooperation on vaccine trials and vaccine manufacturing, and would use its vaccine manufacturing capabilities and efforts to strengthen Africa's capacity to develop and manufacture reagents, test kits, point of care tests, and DNA extraction tools, all of which were

becoming increasingly difficult to import. According to Dr Nzimande, South Africa is also significantly ramping up its multidisciplinary scientific capacity to deal with pandemics.

"There is indeed strong evidence that there is a strong relationship between the destruction of our environment, climate change and the emergence of pandemics. Therefore, as a continent we have the double challenge of intensifying our struggle to protect the environment as we also build our scientific capacity to fight climate change and better handle future pandemics."

The Minister used the platform afforded by the Africa Day celebrations to announce the establishment of the COVID-19 Africa Rapid Grant Fund. The National Research Foundation (NRF), working with the DSI, has leveraged funds from partners in Canada, Sweden and the United Kingdom in support of the fund, which will have a budget of R90 million. The fund will support COVID-19 research cooperation in Africa, capacity-building for science engagement and communication, as well as scientific advice for governments.

South Africa is also co-investing, with the European Developing Countries Clinical Trials Partnership, in supporting African regional health research networks to respond to the pandemic.

"Our fight against COVID-19 must transcend national borders, because this epidemic knows no borders. We therefore need to build solidarity and use each other's strengths by collaborating more and building stronger ties than ever before," Dr Nzimande said.

The African Union's Prof. Sarah Anyang Agbor welcomed South Africa's efforts to look locally to research and develop vaccines to combat the coronavirus.

"The message translates to a need for Africa to look within its context and preempt the future. We need to encourage public-private partnerships and a reconfiguration of our strategies to better respond to man-made and natural crises," said Prof. Agbor, emphasising the need to respond to the pandemic collectively, in the spirit of ubuntu.

Prof. Agbor cited several interventions that the African Union had put together to respond to COVID-19, including the establishment working groups to study the socio-economic impact of the virus, particularly its impact on food and nutritional security, as well as the use of African natural medicines to treat patients with COVID-19.

"Indeed, we need to invest more in science, technology and innovation to realise the Africa we want by 2063," Prof. Agbor said. "We need engagement, inclusivity and collaborative actions more than ever before."

UNECA Innovation Challenge 2020

The event also saw the launch of a call by the United Nations Economic Commission for Africa (UNECA) for researchers, academics, youth and innovators to showcase their innovations at the first Africa Innovation and Investment Forum. The Forum takes place from 15 to 19 June, with a focus on COVID-19.

The Forum's Innovation Challenge 2020 aims to identify and showcase some of the top technologies and innovations from across Africa; to explore investment and market needs; and to identify business opportunities in affordable rapid testing, enhanced devices, and the development and production of drugs and vaccines in Africa.

Dr Victor Konde, UNECA's Scientific Affairs Officer, said the COVID-19 pandemic had given rise to many new opportunities. He said the continent needed to leverage its technology and innovation capabilities, harness its full entrepreneurial talent, deepen national and regional supply chains, and optimise global knowledge partnerships to meet the challenges posed by COVID-19 and beyond. □

Africa's development goals must still be achieved amid COVID-19: UNESCO

The United Nations Educational, Scientific and Cultural Organization (UNESCO) has highlighted the need for Africa to continue working on achieving the Sustainable Development Goals (SDGs) and other development milestones while dealing with the impact of COVID-19 on the continent.

Speaking at the five-day Africa Innovation and Investment Forum 2020, which was due to conclude on 19 June, UNESCO Regional Director and Representative, Prof. Hubert Gijzen, said it was imperative that the SDGs and the African Union's Agenda 2063 remained the compass for Africa's development.

Addressing a high-level panel discussion on investing in science, technology and innovation (STI) in Africa, Prof. Gijzen also emphasised the need for the continent to remain committed to STI as means of realising the SDGs.

"Let us remember the recommendations of the Africa Science, Technology and Innovation Forum we held in February this year, and actively position STI as catalysts for the implementation of the SDGs," he said.

The SDGs, adopted by world leaders in 2015, are a universal call to action to end poverty, protect the planet, and improve the lives and prospects of everyone by 2030. With a decade left in which to achieve the SDGs, plans were put in place to enhance efforts to achieve the goals. However, COVID-19 has hampered these plans and laid bare weaknesses in healthcare systems all over the world, with poorer regions being the most vulnerable.

Solar energy is part of the country's energy mix plan

The virtual Africa Innovation and Investment Forum 2020, organised by South Africa's Department of Science and Innovation (DSI) in collaboration with the UN Economic Commission for Africa, brought innovators, investors, government officials and researchers together online to showcase their innovations and strategies as well as identify innovation gaps, investment needs and industrial opportunities that could contribute to Africa's response to COVID-19.

Daan du Toit, Deputy Director-General at the DSI, said South Africa's participation in the forum was aligned to the country's objectives to maximise its strategic interests in international cooperation in STI.

"The DSI's participation in the forum is aimed at supporting and profiling innovators and innovations in South Africa, particularly those innovations that respond to the COVID-19 pandemic and contribute to strengthening the country's healthcare system," the Deputy Director-General said.

During the panel discussion on investing in STI, it was noted that since the 1980s, African countries had committed to investing at least 1% of their gross domestic product (GDP) in research and development (R&D), so as to build critical base competencies and infrastructure to support innovation in the public and private sectors.

Today, however, it is estimated that Africa invests about 0,5% of its GDP in R&D – 0,43% in the case of sub-Saharan Africa – far below the world average of 1,7% of GDP. In 2019, sub-Saharan Africa only accounted for about 0,8% of the global US$2,3 trillion that was spent on R&D.

This low investment in R&D also means that Africa has fewer doctors, engineers, scientists and economists, whose skills are crucial to meeting challenges such as those posed by COVID-19.

While acknowledging the impact of COVID-19 on the achievement of the SDGs across the world, Prof. Gijzen said the pandemic had also shown what nations could achieve by working together. He cited the global collaboration which has seen trillions of dollars and other financial resources being released in response to the pandemic.

"With the same spirit and commitment, I am sure we can also scale up global efforts to build a better, healthier, safer, more prosperous and sustainable world," Prof. Gijzen said.

He added that COVID-19 was also opening up opportunities, showing that "tele-working" could be effective, and demonstrating the value of scientific cooperation and open science and the need to strengthen education, health and well-being.

The panel considered innovative ways in which Africa could quickly mobilise investments from both the public and the private sector to meet current and future research, development and innovation needs.

More investment needed in off-grid energy solutions.

Prof. Yasser Refaat, Egypt's Deputy Minister for Scientific Research Affairs, urged Africa to improve its education system, ensure that scientific research findings were shared freely, and strengthen cooperation between the public and private sectors, all of which were high on Egypt's development agenda.

South Sudan's Minister of Higher Education, Science and Technology, Denay Jock Chagor, said his country had increased resources to respond to the pandemic and improve communications.

"There are plans to establish a Council for the Development of Scientific Research, Technology and Innovation, and there are also plans to boost R&D funding from the current 0,2% of GDP to 2% of GDP by 2030," said Minister Chagor.

The DSI is also supported the forum's COVID-19 Innovation Challenge. The Challenge was aimed at showcasing some of the top technologies and innovations from across Africa. It also aimed to explore investment and market needs, and identify business opportunities, in areas including affordable rapid testing, enhanced medical devices and personal protection gear design and fabrication, alternative tools for contact tracing and isolation, and the development and production of potential drugs and vaccines in Africa.

The DSI and its entities offered prizes to the winners in the four categories of the Innovation Challenge, in the form of virtual two-week mentorship programmes, as well as two-week visits to South African STI institutions once COVID-19 travel restrictions are lifted. The prizes will cover the accommodation and travel costs of the winners.

DSI entities that supported the challenge included the Technology Innovation Agency (TIA), the National Intellectual Property Management Office (NIPMO), and the Council for Scientific and Industrial Research (CSIR).

The winners in the first COVID-19 Innovation Challenge are as follow:

Category 1

Ready Rapid and Point-of Care Testing Innovations

- Mountaga Keita, Republic of Guinea
  Innovation: *TELEMEDICINE KIOSKS / COVID-19 SYMPTOMS SCANNER*

Category 2

Medical devices

- Shona McDonald, Republic of South Africa,
  Innovation: *OGGIE-AIR RESPIRATOR*
- Yared Yaregal, Ethiopia -
  Innovation: *MULTI PATIENT VENTILATION SYSTEM AND PATIENT MENTORING*

Category 3

Personal Protection Equipment

- Tewodros Tessema, Republics of Ethiopia
  Innovation: *PORTABLE SANITIZER DELIVERY TOOL WITH WRISTBAND*

Category 4

Contact Tracing

- Magdalena Grobler, Republic of South Africa
  Innovation Engineering, IoT Technologies in Healthcare

Category 5

Innovation in Government

- Corrin Varady, Republic of South Africa
  Innovation: *IDEA DIGITAL EDUCATION*

Category 5

Pharmaceutical Production Systems

- Eluemuno Blyden, Sierra Leone,
  Innovation: *AVRIL BIO-PHARMA - EGGS COULD SAVE THE WORLD FROM COVID-19.*

South Africa ratifies SKA Observatory Convention

South Africa, the future home of the SKA's mid-frequency telescope, has ratified the Convention Establishing the SKA Observatory after the South African Parliament approved the Convention and Dr Naledi Pandor, Minister of the Department of International Relations and Cooperation, signed the Instrument of Ratification. It is the third country after the Netherlands and Italy to complete its national process supporting the establishment of the SKA Observatory; the intergovernmental organisation responsible for building and operating the SKA telescopes, and the first of the SKA's three host countries to do so.

South Africa was among the seven countries that signed the Convention in Rome on 12 March 2019, alongside Australia, China, Italy, the Netherlands, Portugal and the United Kingdom. The Convention will enter into force once five countries, including the three hosts Australia, South Africa and the UK, ratify the text.

"This is a significant moment not only because South Africa is the first of our hosts to ratify the Convention, but with multiple countries having done so, we are now closer to the SKA Observatory formally existing," said SKA Director-General Prof. Philip Diamond.

The South African Radio Astronomy Observatory (SARAO) has been leading the country's participation in the SKA on behalf of the Department of Science and Innovation. South Africa is already home to two precursor telescopes: the 64-dish MeerKAT array which will ultimately form part of the SKA's mid-frequency telescope, and the Hydrogen Epoch of Reionisation Array (HERA), which is under construction. As well as conducting world-class research, MeerKAT is also providing vital input for SKA design work and science planning.

"Ratification is a critical milestone for the SKA project. I would like to thank both Houses of Parliament as well as the Department of Science and Innovation for supporting our country's participation in this iconic global science infrastructure project," said Rob Adam, Managing Director of SARAO.

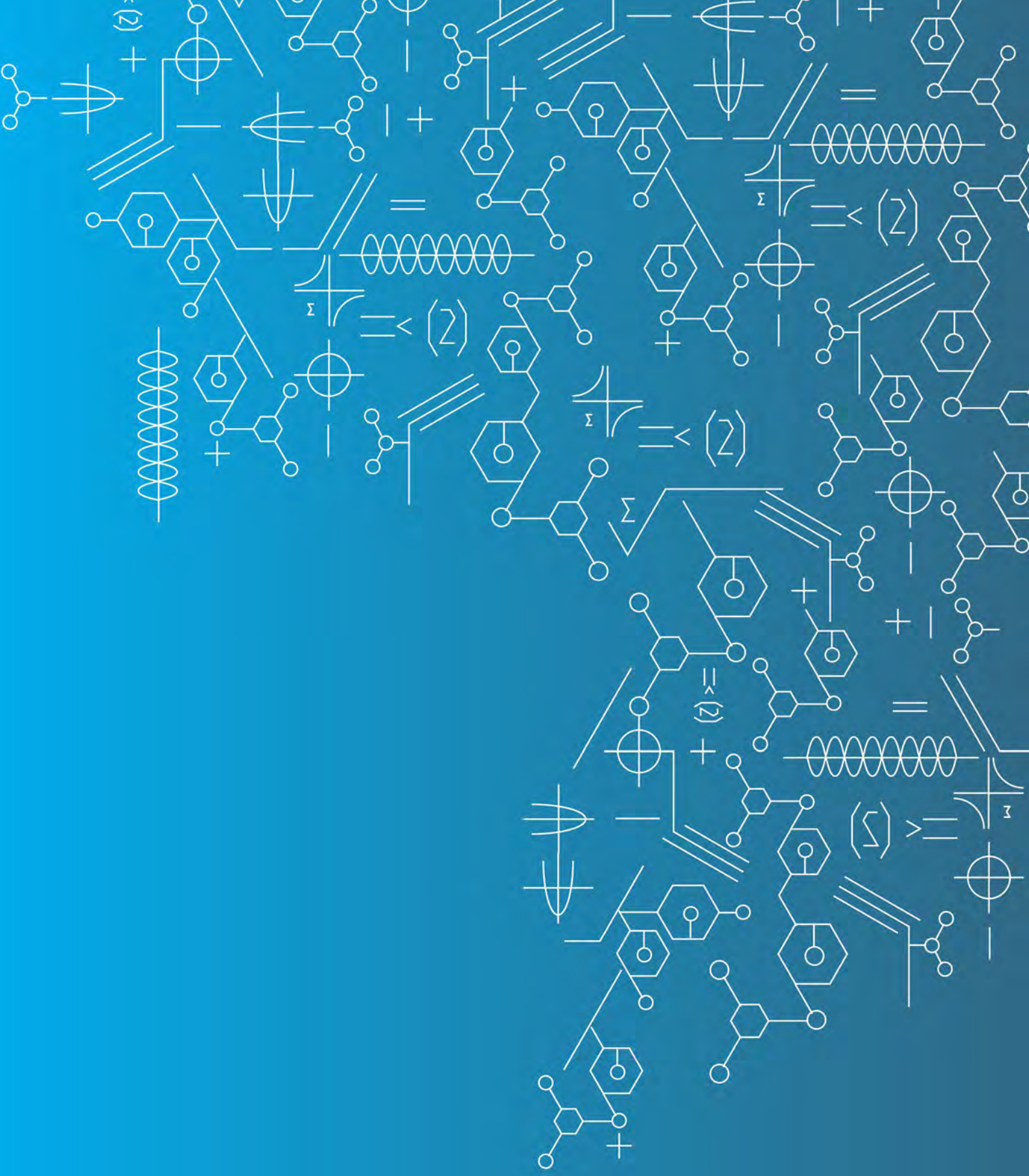
South Africa's radio astronomy and related engineering expertise has evolved rapidly in the past two decades, and the contribution of South African institutes and industry in the detailed design work of the SKA has been invaluable. Recently, stunning early images from MeerKAT – currently the world's most powerful radio telescope in its category – have cemented the country's position in the premier league of radio astronomy. Scientists at South African institutions are also active in 10 of the SKA's Science Working Groups and Focus Groups.

"South Africa's ratification of the Convention confirms South Africa's strong commitment to the global SKA partnership. We are determined to ensure the success of what will be the first ever large global research infrastructure hosted in Africa," said Dr Blade Nzimande, South Africa's Minister of Higher Education, Science and Innovation. "South Africa's participation in the SKA project has significantly strengthened South Africa's data science capabilities, precious resource in the fight against Covid-19. More than ever our world needs international cooperation and solidarity in science such as enabled by projects such as the SKA."

"Even with the terrible toll of this novel coronavirus around the world, countries have shown remarkable commitment to the SKA and continue to push forward. It is testimony to the strength of our global collaboration and the impact the project will have," added Prof. Diamond. "Momentum is strong, and we expect Australia, China, Portugal and the UK to ratify in the coming months, with other countries joining the Observatory in due course. Once the SKA Observatory is up and running, construction of the largest science facility on the planet will begin in earnest."

The Square Kilometre Array (SKA) project is an international effort to build the world's largest radio telescope. The SKA is not a single telescope, but a collection of telescopes, called an array, to be spread over long distances. It will be constructed in Australia and South Africa with a later expansion in both countries and into other African countries.

The design has been led by the SKA Organisation based near Manchester, UK and supported by more than 1,000 engineers and scientists in 20 countries. The SKA Organisation is transitioning to the SKA Observatory, an intergovernmental organisation established by treaty, to undertake the construction and operation of the telescope. The SKA will conduct transformational science and help to address fundamental gaps in our understanding of the Universe including the formation and evolution of galaxies, fundamental physics in extreme environments and the origins of life in the Universe. □



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