RE.SEARCH

ISSUE 10

MAKE TODAY MATTER

THE FOUNDATIONS OF THE FUTURE

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Make today matter

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Cover Image: We believe that in every day lies the potential to have a positive impact on the future and, in so doing, change the world for the better.

Image Credit: Subodh Agnihotri, Maksym Dehil and Jackie Niam on iStock
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Editorial

WELCOME

Professor Francis Petersen

Welcome to the 10th issue of *RE.SEARCH magazine, a hybrid publication housed on the University of Pretoria's (UP) dedicated science communication portal, Research Matters**.**

This is my first edition of this magazine as Vice-Chancellor and Principal. The publication provides an impactful snapshot of research and innovation across UP's faculties, institutes, units and centres. The articles in this edition feature work from all nine of our faculties, and underscore our University's slogan, 'Make Today Matter'.

UP is known for its array of research that solves real-world issues from an African perspective. Our studies seek to address various grand challenges that are linked to the United Nations' Sustainable Development Goals (SDGs). The strength of our work in this area has positioned us in 42nd place in the Times Higher Education Impact rankings, which identify universities from around the world that are excelling across multiple SDGs.

This would not be possible without our world-class researchers and the cutting-edge facilities that enable their success. But more than this, we would not be able to live up to our brand promise to make today matter without the passion of our people who are working towards building a more sustainable future. At UP, we believe in taking decisive action today to build the future we want to realise. We do so by collaborating across disciplines to solve challenges – which rarely occur in silos – and by striving for excellence in everything we do and celebrating diversity in all its forms in order to enrich our world from different perspectives. In all aspects, our research aims to make a positive impact on society by changing lives and the future for the better.

You can explore some of the impact that we have made as you peruse this edition, which includes studies on hope and empathy that demonstrate the increasing importance of human qualities in an ever-digitalised world.

SA Publication Forum
WINNER
2024
Corporate Publication Competition

Re.Search has been named South Africa's top corporate publication.

We cover research that seeks justice by protecting whistleblowers in anti-corruption efforts and by safeguarding athletes from abusive coaches. We also feature researchers who are monitoring African cities for a more equitable distribution of services, and those who are trying to correct the imbalance in partnerships between the Global North and Global South. The question of how to make machine learning cleaner and greener for a more sustainable future is addressed, as are potential solutions to malaria and rabies. We highlight our efforts in the fight against rhino poaching, showcase our cutting-edge nuclear medicine facility and feature experts who are looking to the skies to better understand supermassive black holes. Additionally, this issue features research that is homing in on less invasive treatments for brain tumours, and a study that is looking to revolutionise wound care by bio-printing skin.

I'm so proud of the work that UP is doing to provide the world with a more optimistic future. I trust that as you read through this magazine, you will understand the scope and impact of what we're doing to address critical global challenges, and that it will become clearer how we are making today matter through our research.

Happy reading!

Professor Francis Petersen

Vice-Chancellor and Principal
University of Pretoria

***RE.SEARCH** magazine is available at www.up.ac.za/research-matters/magazine
**Research Matters is available at www.up.ac.za/research-matters

ATOMIC HEALTH

ACCELERATING EQUITABLE HEALTHCARE DELIVERY

A new nuclear medicine facility represents a future-focused paradigm shift in how we screen, diagnose and treat life-threatening illnesses. In addition to addressing critical health challenges, it will also champion bio-innovation for South Africa to become a significant player in nuclear medicine.

Researcher:
Professor Mike Sathekge, CEO and President of the Nuclear Medicine Research Infrastructure

With more than 19 million new cases and 10 million deaths in 2020 alone, the global annual cancer burden is expected to grow.[1] Over the next two decades, it is estimated that there will be 30 million new cases and 16 million deaths as a result of cancer. The disease places its heaviest burden on low- and middle-income countries, where over 70% of cancer deaths are expected to occur, yet these countries receive only 5% of global spending in this area.

Appropriate cancer management – diagnosis and treatment – can extend the lives of many, particularly if diagnosed early.[1] The lack of access to imaging technologies, and the wide disparities that exist between low- and high-income countries when it comes to accessing them, are iniquitous. The Nuclear Medicine Research Infrastructure (NuMeRI) at the Steve Biko Academic Hospital wants to change this.

The University of Pretoria (UP) and its partners* launched NuMeRI in May 2024 as a flagship of how nuclear can be used for good. This state-of-the-art facility is set to accelerate the diagnosis and treatment of diseases such as cancer and tuberculosis through advanced medical imaging and targeted therapies.

Professor Mike Sathekge, the CEO and President of NuMeRI, and the facility's medicine team have the most sophisticated medical imaging equipment available for novel drug development and clinical research. Nuclear medicine uses small amounts of radioactive material combined with a carrier molecule in the body to see how organs or tissue are functioning, and can thus detect diseases very early. It then selectively targets and treats the diseased area in the body with molecular precision, sparing healthy adjacent cells.

"Accurate imaging and assessment play a vital role in curbing cases of misdiagnoses and cancer-related fatalities," Prof Sathekge says. "If you have such high numbers of people in low-income countries who can't access this technology, you'll forever misdiagnose patients and you won't be able to potentially save millions of lives."

One-stop shop for medical imaging

NuMeRI is one of a few in the world one-stop-shop medical imaging facilities dedicated to drug development and imaging-based clinical research. Equipped with two cyclotrons – one for a commercial partner and one for research – that are seamlessly connected to two separate radiopharmacies, the facility will provide a holistic service, from radiolabelling to preclinical testing and clinical trials. This will allow treatments and drugs for cancer and tuberculosis (TB) to reach the market sooner.

TB is the leading cause of death from a single infectious agent, with over 25% of these deaths occurring in the African region.[2] South Africa is among the top 30 countries with the highest prevalence of TB globally, with an estimated 301 000 new cases reported in 2022, according to the World Health Organization.

Enormous strain is placed on public health facilities and strategies due to multidrug resistance and the fact that no test is available to accurately determine the number of viable tubercle bacilli (the bacteria that is the major cause of tuberculosis) in a human host.

With an investment of R700 million from the national Department of Science and Innovation, NuMeRI stands as a testament to South Africa's dedication to precision medicine and personalised therapies, significantly contributing to the country's bio-economy strategy. This significant investment will provide a long-term enabling environment for South African researchers – as well as pharmaceutical and biotechnology companies – to remain significant global players in nuclear medicine.

FAST FACT

NuMeRI is an anchor centre of the International Atomic Energy Agency's Rays of Hope for Cancer Care. The Rays of Hope initiative is working to bring access to cancer care where it is needed most as too many preventable cancer deaths are occurring in low- and middle-income countries.

Why this research matters

The Nuclear Medicine Research Infrastructure (NuMeRI) is the first of its kind in Africa. Through innovation and technology, it addresses the disease burden of life-threatening diseases like cancer and tuberculosis, and the need to provide quality healthcare to all South Africans. The facility will enable South African researchers as well as commercially driven healthcare companies (pharmaceutical and biotechnology) to remain significant global players in nuclear medicine.

SDG 3: Good health and well-being

Take a virtual tour of the facility

*The Nuclear Medicine Research Infrastructure (NuMeRI) is a national asset that supports all universities across the country. The University of Pretoria is a core partner, along with the Steve Biko Academic Hospital, the South African Nuclear Energy Corporation and iThemba Labs.

Sources:

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CATCHING THE EYE OF BRAIN TUMOURS

UP researchers are making today matter by developing non-invasive techniques to detect brain tumours and make earlier diagnoses, which often lead to better outcomes.

Researcher:
Professor Llewellyn Padayachy, Director: Brain Tumour and Translational Neuroscience Centre (BTC@UP)

Brain tumours are one of the most formidable challenges in modern medicine: they are difficult to diagnose and expensive to treat, with the best predictor of outcome still being early diagnosis. But what if the eye could be used as the "window to the brain" to extract critical information about pressure on the brain to make an earlier diagnosis and improve the outcomes of this life-threatening condition?

Such a "thermometer of the brain" would be inexpensive, minimally invasive and could provide vital early diagnosis. The Brain Tumour and Translational Neuroscience Centre at the University of Pretoria (BTC@UP), the first of its kind in the country, has developed a state-of-the art Neuro-Ophthalmology Laboratory for assessing the accuracy of various diagnostic methods. These include ultrasound, infra-red pupillometry and optical coherence tomography to view the brain through the eye, and determine pressure and other conditions within the brain.

"Convenient point-of-care diagnosis (literally at the bedside, or in rural clinics) will address the issue of late diagnosis, and brings high-end care to underserved communities," says Professor Llewellyn Padayachy, Head of the Department of Neurosurgery. "The focus of our research at the Neuro-Ophthalmology Laboratory is to develop and refine these non-invasive diagnostic techniques. Brain tumours present numerous challenges, including late diagnosis, limited access to advanced imaging and molecular testing, and a shortage of trained neurosurgeons, particularly in low- and middle-income countries. These obstacles often result in suboptimal patient management and poor outcomes."[1]

This research into exploring the role of the eye and optic pathway as a mechanism for non-invasively assessing brain pressure is one of many projects at the centre to improve outcomes for people living with brain tumours.

The burden of brain tumours

In Africa, the overall incidence of central nervous system tumours, both benign and malignant, was estimated at about 227 per 100 000 between 1960 to 2017[2]. About one neurosurgeon per 4 million people is available on the African continent to address this burden[3], falling far short of the World Health Organization's recommended ratio of one per 200 000 people.

Given the large population of Africa, the total number of reported cases may be underestimated when compared with other continents due to the lack of a central brain tumour registry in Africa.

To address these challenges, the centre conducts research in three groups:

1. **The Early Detection and Epidemiology group** aims to build a comprehensive database of brain tumour patients to validate local and regional data, and to develop screening and point-of-care tools, such as ultrasound and optical coherence tomography, to enhance early brain tumour detection.
2. **The Surgical, Adjunctive and Neurorehabilitation group** focuses on safe, effective brain tumour resection using advanced techniques, and emphasises the positive impact of neurorehabilitation.
3. **The Translational Neuroscience group** studies chemical, molecular and anatomical pathology markers as well as imaging and mathematical modelling-based biomarkers.

"Our transdisciplinary research approach addresses a major global health challenge by enhancing the early detection and treatment of brain tumours to reduce mortality and improve patients' quality of life, especially in developing countries," Prof Padayachy says. "We aim to overcome barriers to effective management, including shortages of trained professionals, inadequate diagnostic and treatment capabilities, and the lack of coordinated care. Our work also advances global knowledge, informing practices and shaping future research with scalable, sustainable interventions for worldwide implementation."

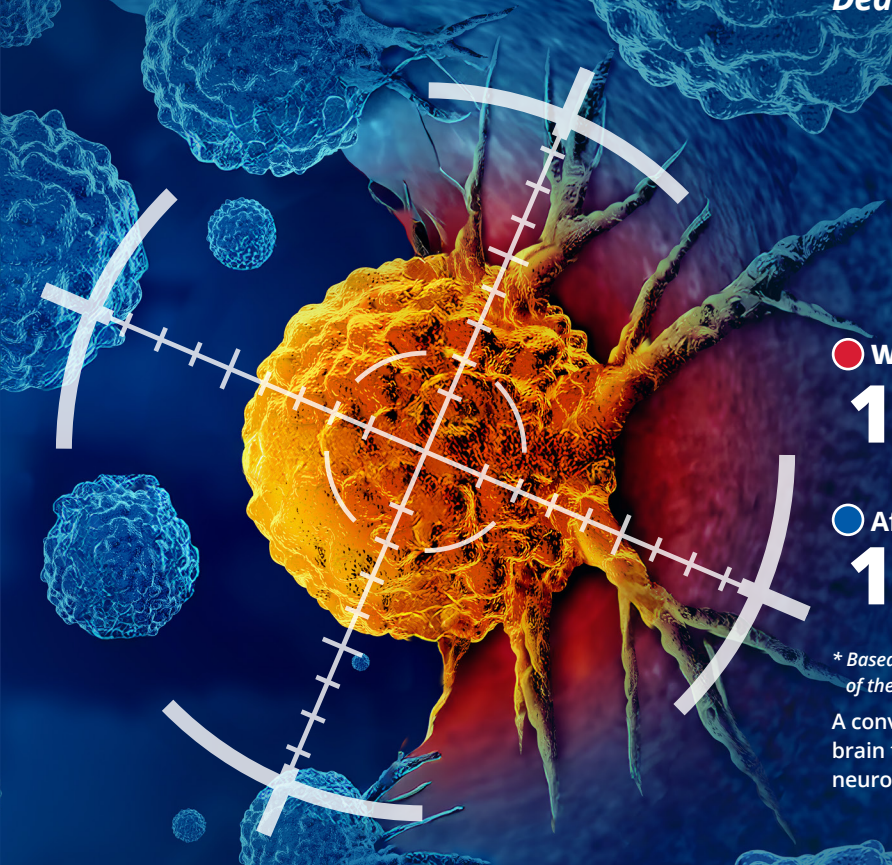
While other projects may focus on isolated aspects of brain tumour care, the centre's work integrates multiple disciplines to address the full spectrum of challenges associated with this condition.

"Our holistic approach sets our work apart, holding great promise for the future," Prof Padayachy says.

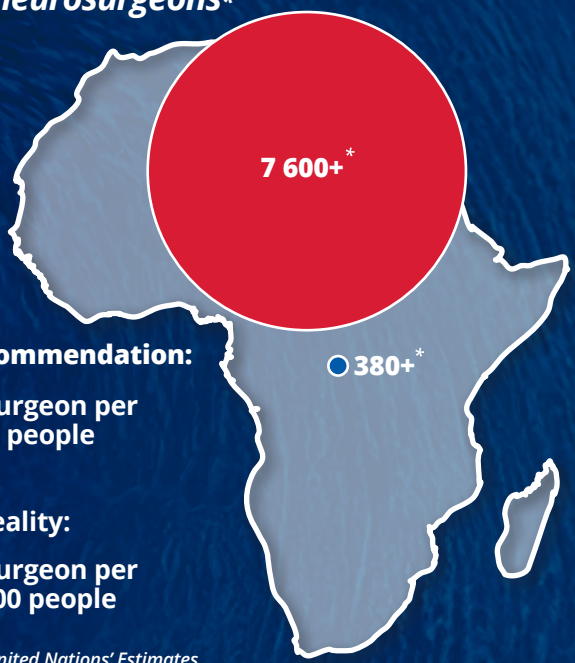
Why this research matters

The Brain Tumour and Translational Neuroscience Centre is unique in its comprehensive, transdisciplinary approach to brain tumour management and its role in translating clinical research into results that directly benefit people, particularly those in underserved areas. Transdisciplinary collaboration sees neurosurgeons work with a diverse range of experts, including engineers, ophthalmologists, mathematical modellers and computational analysts, to assess convenient point-of-care diagnostic techniques and maximise the impact of early detection.

SDG 3: Good health and well-being



*Dearth of neurosurgeons**



WHO recommendation:
1 neurosurgeon per 200 000 people

Africa's reality:
1 neurosurgeon per 4 000 000 people

** Based on latest United Nations' Estimates of the population of Africa (1 525 800 000+)*

A convenient, point-of-care technique to diagnose brain tumours will relieve the burden on a small pool of neurosurgeons without neglecting those in need of care.

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COMFORTABLE IN (BIO)PRINTED SKIN

New research helps address the limitations of traditional skin grafting and explores customised solutions for patients with chronic or secondary wounds.

Researchers:
Dr Alison Fany Ridel, Department of Anatomy
Hafiza Parkar, Department of Pharmacology

Wound healing has been termed "an overlooked burden and a silent epidemic" due to the significant financial strain that it places on healthcare systems, let alone the unquantifiable human cost. The gold standard for treating secondary intent wounds – those left open to heal by themselves rather than being stitched together, such as burns – is skin grafting, but this is limited by patient conditions, the availability of viable skin and potential immune rejection.

What if we could 'print' new skin?

Researchers from the Department of Anatomy and the Department of Pharmacology at the University of Pretoria (UP) have addressed the limitations of traditional skin grafting by merging biological sciences with engineering and computational methods to create a solution.

"Decellularised acellular dermal scaffolds (ADS) are an alternative to skin grafts and are developed by removing cells from the skin of a donor or an animal; this reduces the potential for rejection," explains Dr Alison Ridel of the Department of Anatomy. "Traditional decellularisation processes have various limitations and may produce ADS with altered three-dimensional (3D) structure, damaged proteins and decreased tensile strength."

Emerging technologies like 3D bioprinting can overcome the challenges posed by traditional methods.

"Our research aimed to provide a digital protocol to generate a 3D acellular dermal scaffold for 3D bioprinting," Dr Ridel says.

This required collaboration between researchers who understood the biological need and processes required for effective wound healing and those who could develop and optimise the technological processes to create viable dermal scaffolds. The research team integrated the 3D bioprinting technology of ADS with advanced technologies like micro-x-ray computed tomography scanning and Amira-Avizo software. This interdisciplinary approach bridges the gap between biological sciences and cutting-edge 3D imaging and bioprinting technologies.

Significant impact

This research on developing artificial dermal substitutes through 3D bioprinting is significant for several reasons. Firstly, by creating advanced dermal substitutes that replicate human skin, the research offers a promising solution for treating secondary intent wounds.

"This improves the healing process for patients with chronic and complex wounds, addressing a critical need in reconstructive medical engineering," Hafiza Parkar from the Department of Pharmacology says. "Secondly, 3D bioprinting enables us to create customisable acellular dermal scaffolds that can be tailored to the specific size, depth and nature of each patient's wound. This personalised approach enhances the efficacy of the treatment and ensures a better fit, potentially leading to faster and more efficient healing, relieving the strain on both the healthcare system and the patient."

Furthermore, the precision of 3D bioprinting minimises material waste, making the process more sustainable and cost-effective compared to traditional methods. This level of efficiency has the potential to make advanced wound care solutions more accessible to a broader range of patients.

"Effective wound healing not only affects physical recovery but also has psychological benefits," Parkar says. "By accelerating healing, this reduces the risk of non-healing wounds forming; these are susceptible to infection and can take months or years to heal. As a result, patients may experience less anxiety and improved overall well-being, leading to a better quality of life during recovery."

The integration of 3D bioprinting in wound care represents a significant advancement in medical technology. It provides a more consistent, feasible and accessible solution, addressing some of the limitations of current methods and paving the way for future innovations in reconstructive medicine.

Why this research matters

The research merges biological sciences with engineering and computational methods to overcome the limitations of skin grafting, such as tissue rejection and the availability of donor skin. By using cutting-edge technology to create acellular dermal scaffolds without the process of decellularisation, which has its own limitations, the research advances the field of wound care, improves patient outcomes and contributes to more effective and personalised medical treatments. Besides its inherent innovation, the project also addresses Sustainable Development Goal (SDG) 3: Good Health and Well-Being; SDG 10: Reduced Inequalities; and SDG 12: Responsible Consumption and Production.

SDG 9: Industry, Innovation & Infrastructure

The image shows an acellular dermal scaffold, which is essentially a piece of skin without cells.

WHAT'S ON THE MENU FOR SUPERMASSIVE BLACK HOLES?

How do supermassive black holes co-evolve? New research may offer clues about recurrent activity patterns in radio galaxies and why they restart, suggesting that neutral hydrogen absorption could be an indicator.

Researcher:
Leon Mtshweni (PhD candidate), Astronomy Group in the Department of Physics, and national and international collaborators

In 1933, Karl Jansky accidentally discovered radio waves coming from the direction of the supermassive black hole sitting at the heart of the Milky Way, our galaxy, and kick-started the field of radio astronomy. Radio astronomy allows us a view of the workings of the universe, which are invisible to our eyes.

Much has changed since then, but the fascination that radio astronomers have for these wonderful objects has remained the same. Many investigations of supermassive black holes (it is thought that there is one in every large galaxy!) and how they interact with their surroundings have been carried out by radio astronomers.

Leon Mtshweni, a PhD candidate in the Astronomy Group in the Department of Physics at the University of Pretoria (UP), is one of them. He carried out an in-depth astronomical study using the South African-built MeerKAT radio telescope, which promises to improve astronomers' understanding of how supermassive black holes co-evolve with the cosmic structures surrounding them.

This work has unveiled crucial insights into the restarted activity of the radio galaxy called PKS 2014-55. Radio galaxies emit large amounts of radio waves that appear extremely brightly in the radio part of the electromagnetic spectrum. With radio telescopes, such as the MeerKAT, we can view planets, comets, giant clouds of gas, stars and galaxies.

"The astronomers associated with the project have recently detected the motion of gas by tracking Doppler-shifted atomic spectral lines emitted by gas," Mtshweni says. "They could thereby identify redshifted neutral hydrogen (HI) against the core galaxy from where the jets in PKS 2014-55 emanate, and detected a further seven HI sources of emissions from neighbouring galaxies."

Redshifting is a key concept for astronomers. The wavelength of the light that the astronomer is observing is stretched so that the light appears to have shifted towards the red part of the colour spectrum. The redshift of a galaxy shows that the galaxy is moving further away from Earth. It also tells us how quickly it is moving.

The UP study focuses on understanding the mechanisms and potential cause of the restarted activity – a phenomenon that has intrigued astronomers for years. The findings will be significant as they offer clues about recurrent activity patterns in other radio galaxies.

FAST FACT

SKA, the world's biggest radio telescope array, will be composed of two instruments, SKA-Mid in South Africa and SKA-Low in Australia, covering different but complementary radio frequency bands. MeerKAT will be integrated into the mid-frequency component of the SKA. The first telescope dish for its SKA-Mid array was assembled on site, in the Karoo region in the Northern Cape province, in July 2024.

Why study the galaxies?

There are more than 200 billion galaxies, the size and scale of which we cannot comprehend. Observations of these galaxies have allowed us to understand the origin, structure and evolution of our cosmos. Radio galaxies, powered by supermassive black holes, are key players in determining how galaxies grow and evolve. They can variously encourage or discourage the formation of new stars, which are essential to intelligent life in the universe.

"This study has advanced our understanding of PKS 2014-55 and recurrent astral activities, and has contributed to the broader knowledge of galaxy behaviour," Mtshweni says. "This newly acquired knowledge will contribute to insights into various related fields, including cosmology and space exploration."

The study group hopes to soon have access to Very Long Baseline Interferometry – an Earth-sized telescope that combines several telescopes planted across various continents. Such a telescope will no doubt bring new facts to light, which could further solidify the UP research group's theories.

Why this research matters

Galaxies are the largest organised structures known to us. They provide insight into the formation, origin, evolution and large-scale structure of our entire universe. By studying them, we have also developed an understanding of dark matter, dark energy and cosmic expansion. This research provides clues about recurring activity patterns in other radio galaxies, which will enhance our insight into space exploration, among others.

SDG 4: Quality education

Did you know?

Galaxies recycle material from one generation to the next. Without this recycling, human beings would not exist as we are all composed of astral material from light years ago.

GREEN, DEEP LEARNING

Finding ways today to distil the knowledge that makes artificial intelligence so valuable will ensure we have a tomorrow where it is available to those who need it most – and at less cost to the environment.

Researchers:
Dr Anna Bosman and Heinrich van Deventer, Department of Computer Science

A single query to ChatGPT uses as much electricity as burning a light bulb for about 20 minutes.[1] Multiply that by the millions of requests that this artificial intelligence (AI) chatbot receives each day, and the environmental impact is ominous.

The Computational Intelligence Research Group (CIRG), led by Dr Anna Bosman of the University of Pretoria's (UP) Department of Computer Science, is searching for ways to reduce the energy consumption of artificial neural networks without sacrificing their performance.

"If we want AI to be sustainable, we must make it compressible," she says.

Artificial neural networks (ANNs) can automatically extract patterns from data through a process called training or machine learning (ML). While 'artificial', ANNs were inspired by the human brain's ability to process information. ML allowed computers to perform tasks such as image recognition, natural language processing and decision-making without being explicitly programmed. However, the size and complexity of the ANNs have grown exponentially over the past decade, and that's not always good news.

"State-of-the-art ANNs often have billions of parameters, demanding massive computational power for training and deployment," Dr Bosman explains. "This rapid increase in model size has raised significant concerns about their accessibility and environmental impact. The data centres built in Ireland, which are crucial for the modern ML infrastructure, are projected to consume 27% of the country's electricity by 2029. An average data centre is estimated to use as much water as three average-sized hospitals.[2] Using large ANNs is costly and has a significant environmental footprint."[3]

Another downside of large ANNs is that they cannot be deployed in resource-constrained environments. Not everybody has access to a Google data centre. As such, impressive progress in AI remains inaccessible to those who may need it most: doctors in rural areas, small-scale farmers and nature conservationists.

"Energy efficiency can be achieved in two ways: by compressing large models to reduce their size or by designing more expressive ANN architectures requiring fewer parameters to achieve comparable results to standard ANNs," Dr Bosman says.

Compact ANN models

A promising avenue for green ML is knowledge distillation (KD), a method of transferring knowledge from a large 'teacher' ANN to a smaller 'student' ANN to preserve performance in a more compact form; this is done by mimicking the information representation of the teacher. Using this technique, Dr Anna Bosman and collaborators achieved a tenfold reduction in the size of a pest detection model for a farming project in Rwanda. Another research project is underway where KD methods are applied directly to the ANN parameters rather than the outputs they produce.

Heinrich van Deventer, a PhD student at CIRG and recipient of a Google PhD Fellowship, is using his background in theoretical physics to develop radically new compact ANN architectures (or neural operators) from the ground up. The trick is to treat inputs as continuous functions similar to analogue computing, rather than discrete or independent variables.

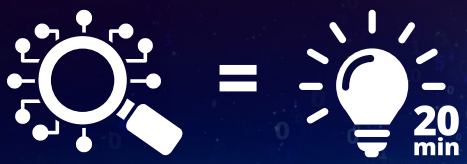
"Such compact ANN models may become the building blocks for the next generation of AI that is accessible to all, and mindful of the world," he says.

Powerful footprint of AI

Water usage:

One data centre uses as much water as **three** hospitals

Energy usage:



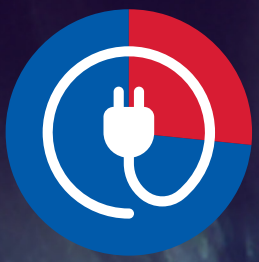
One ChatGPT query uses as much energy as it takes to burn **one** light bulb for **20** minutes

Why this research matters

Machine-learning models are larger than ever, and yield results that have an impact on every aspect of our lives. However, creating and using such bloated models comes at a price: they are inaccessible for most organisations and people, and the associated energy demands and environmental impact are significant concerns. Finding ways to distil the knowledge of these artificial neural networks by developing new compact neural operators from the ground up is the seedbed of future AI innovation.

SDG 9: Industry, Innovation & Infrastructure

Ireland's data centres:



Ireland's data centres will use as much as **27%** of the country's electricity (by 2029)

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BUILDING A HOME-GROWN AFRICAN CITY TRACKER

By creating a tracker that captures the unique realities of cities across Africa, a more pragmatic approach can be developed to shape the urban health and sustainability of African cities.

Researchers:
Dr Taiwo Afinowi and Professor Nara Monkam, Public Policy Hub and Chair in Municipal Finance, Department of Economics

As the 2030 deadline for the United Nations' Sustainable Development Goals (SDGs) approaches, it is clear that most of the ambitious objectives of the 17 SDGs to address global challenges will remain unmet. Moreover, any progress made by Africa before 2020 has been significantly hampered by COVID-19, the Russia-Ukraine war and the devastating effects of climate change. This slow progress highlights the need for immediate and decisive action.

SDG 11 is focused on cities, and aims to make them inclusive, sustainable, resilient, safe, healthy and affordable in order "to promote prosperity and quality of life for all". A research project led by the transdisciplinary Public Policy Hub and Professor Nara Monkam, the Chair in Municipal Finance at the University of Pretoria (UP), seeks to amplify the African perspective – a voice often under-represented in global discussions.

"There is a clear need to develop relevant, context-specific indicators for African cities as a framework to measure progress," Prof Monkam says. "It is not realistic to compare Africa's progress to that of advanced cities, which have benefitted from long-standing political and financial stability, not to mention advanced social welfare systems."

"A context-specific tracking tool, which takes into account the unique challenges and opportunities inherent in our urban environments, is required," Dr Taiwo Afinowi adds. "An initiative of this nature could ensure that Africa leads the conversation and stands at the forefront of solutions being developed."

Tailored to Africa

The research seeks to proactively define a framework tailored to Africa, rather than waiting for the next global framework to adapt to.

"We must develop our own tools to assess whether our cities are progressing or regressing," Prof Monkam says. "The question then becomes, 'How can we align global developmental policies with local priorities on critical issues such as cleanliness, efficient transport, affordable housing, safety, employment, service delivery, public health and infrastructure?'"

A set of evidence-based policy recommendations and key indicators can help municipalities across the continent to self-assess, learn from each other, share best practices and improve governance. It will also empower citizens to engage in the process, fostering transparency and accountability in local government.

Various indices are used globally to evaluate cities, with multiple indicators to assess levels of compliance, and identify challenges faced by different cities. While a uniform set of indicators is valuable for global comparisons, how can we balance the need for consistency with the flexibility to reflect diverse local contexts? For example, some SDG indicators call for the evaluation of efficient water use, yet many African cities struggle to provide water altogether. Similarly, how does one assess renewable energy when there is no energy supply at all?

This research will start with data collection from existing literature on urban performance indicators. The gathered data will be vetted through five regional consultative workshops across Eastern, Western, Central, Northern and Southern Africa, bringing together experts and city stakeholders.

"These workshops will ensure that the indicators are context-specific and relevant to Africa," Dr Afinowi says. "The revised indicators will then be tested in pilot cities, leading to the creation of an African city tracker dashboard, which will present the urban health and performance of these cities."

The tracker will be rolled out to other cities, allowing for broader adoption and comparison.

"The sooner we start tracking, the sooner we can agree on realistic objectives – and start shaping the African cities of tomorrow," Prof Monkam says.

Why this research matters

It is unrealistic to expect African cities, many of which face significant challenges, to achieve the United Nations' SDGs at the same pace as more developed cities in wealthier nations. African countries have endured a long history of challenges, including wars, drought, famine, colonisation and underinvestment. Given these realities, it is crucial to adopt context-specific indicators that empower local governments, urban planners and communities to shape their own development pathways.

SDG 17: Partnerships for the goals

FAST FACT

The **Public Policy Hub** at UP drives the adoption of sustainable, evidence-based public sector reforms across Africa by fostering collaboration between academic research and the government. By co-creating transdisciplinary, reform-relevant research, the hub strives to offer practical solutions and better development outcomes to address Africa's most pressing public sector challenges.

Click HERE to visit the hub.

ACEING GN-GS PARTNERSHIPS

Correcting assumptions today will ensure that tomorrow's partnerships between the Global North and Global South are based on the understanding that all partners, irrespective of their geographic origins and location, have something valuable to contribute.

Researchers:
Professor Chika Sehoole, Dean of the Faculty of Education
Dr James Jowi, Executive Director: African Network for Internationalization of Education
Karen Stran and Melanie McVeety, EduCulture (a division of Strang Intercultural Solutions, Canada)

The divide between North and South is more than geographical. Collaborations between institutions and researchers in the Global North and Global South are characterised by challenges of inequities, unequal power relations and biases, which often result in unequal benefits for the partners.

Researchers Professor Chika Sehoole, Dean of the Faculty of Education at the University of Pretoria (UP), Dr James Jowi of the African Network for Internationalization of Education, and Karen Stran and Melanie McVeety of EduCulture propose adopting more responsive, mutually beneficial options through the ACE principles to overcome these challenges.

"A": Be AWARE of assumptions

Being 'aware' is important when addressing the knowledge asymmetries and imbalances between the Global North (GN) and Global South (GS).

"Awareness refers to being conscious of the lenses through which we operate, and identifying assumptions that we bring into these collaborations," Prof Sehoole says. "To have meaningful partnerships between institutions from the GN and the GS, we need to lay our cards on the table, be honest and deal with these stereotypes."

These include assumptions that scholars from the GN know better than those from the GS; that speaking better English means they are more intelligent; that scholars from the GS need to listen and learn from scholars from the GN; and that GS universities need to partner with top GN universities to have visibility to boost their global rankings.

In terms of research, the GS should not be viewed merely as a site for data collection.

"This is akin to the way minerals are extracted from the GS, processed in the GN, then returned to the GS as finished products for consumption," Prof Sehoole says. "The GS must participate in the processing of research data, research findings and dissemination."

"C": How do we CONNECT with others?

"This refers to the need to 'connect' with our collaborators on an equitable basis," Prof Sehoole explains. "To achieve that goal, it is necessary to deal with biases that are related to attitudes, values and traditions that are informed and influenced by the paradigms in which we operate, and which are reflected in our behaviours, actions and words."

Viewing others through our own cultural lens may not be equitable, fair and just.

"The principles of mutuality, co-partnership, respect and an understanding that we all have contributions to make will go a long way in laying a foundation for connections that are necessary for successful collaboration."

"E": EMPOWER in collaboration

Empowerment is about including people, knowledge and views that may have been excluded before.

As such, partnerships and knowledge engagements between the North and South need to be duly recognised, and allowed to converge and enrich collaborations. It involves the need for knowledge systems to look back at their origins, search for places of resonance or dissonance, diminish their perceived differences and take the combined expanded paradigm into the future.

The African philosophy of ubuntu, which highlights the essence of empowering one another and recognises the power of connections between humanity, can be embraced and applied in North-South engagements.

"Ubuntu provides a powerful lens for re-examining the North-South knowledge imbalances by calling for joint efforts and engagements between partners from different regions in the world to be embraced," Prof Sehoole says. "Ubuntu's main principle is that 'I am, because we are', and encapsulates the essence of empowering one another across the various divides."

Why this research matters

The research questions how centuries of entrenched ways of thinking and doing things from a Global North perspective can be recalibrated to be authentically inclusive, more diverse, more equitable and more collaborative across the globe. It considers the actions that can be taken to reduce marginalisation, inequities and disparities, lack of resources and limited access, and addresses under-represented student populations in higher education. It puts forward ACE principles as a way of tackling these challenges.

SDG 10: Reduced Inequalities

How to ACE it:

A Become more **AWARE** of the lenses through which we operate and identify assumptions that we bring into collaborations.

C Review how we **CONNECT** with partners in a Global North-Global South context, with a view to making meaningful and equitable connections.

E Acquire actionable strategies and **EMPOWER** collaborators to adopt effective relationships that are holistic, equitable and inclusive to achieve a more balanced collaboration in line with the ubuntu philosophy.

This article is based on the publication in the *Journal of International Students* Volume 13, Issue S2 (2023), pp. 32-43

CATALYST OF THE FUTURE

UP's Sci-Enza, South Africa's oldest science centre, 'makes today matter' by creating impactful moments that spark curiosity and inspire future scientists, engineers and innovators.

Contributor:
Puleng Tsie, science centre manager

Science educators hold the future in their hands. The children they inspire today will help solve some of the world's most pressing challenges tomorrow.

Sci-Enza, the University of Pretoria's (UP) premier science centre and the first of its kind in Africa, has been moulding this future for 47 years. Since its inception in 1977, Sci-Enza has been at the forefront of science education, welcoming more than 20 000 people each year through innovative activities.

As a centre of excellence, Sci-Enza is both nationally and internationally renowned for making science accessible, interactive and tangible through its world-class displays and exhibits. The centre aims to inspire young minds by bringing scientific concepts to life, sparking curiosity and igniting a lifelong interest in science.

"Exposing children to science from a young age nurtures their natural curiosity and inquisitive nature," says science centre manager Puleng Tsie. "Children are born with a desire to explore and understand the world around them, and science education channels this curiosity into structured enquiry and exploration."

Through hands-on experiments and observations, children learn to ask questions, investigate phenomena and draw conclusions. This process not only satisfies their immediate curiosity but also lays the groundwork for developing critical thinking and problem-solving skills, which are essential for navigating and understanding complex issues throughout life.

Early exposure to science also promotes a deeper understanding of the natural and technological world. Through science education, children gain insight into how things work, from microscopic organisms to the vastness of space. This foundational knowledge can lead to a greater appreciation of the environment and the interconnectedness of all living and non-living things.

"A significant long-term benefit of introducing science at an early age is that it fosters a love for lifelong learning," Tsie says. "When children experience the joy of discovery and the thrill of finding answers through scientific enquiry, they're more likely to develop a sustained interest in learning."

This passion for knowledge can extend beyond science to other academic areas and aspects of life, creating well-rounded individuals who are consistently curious to explore new ideas. Lifelong learners are better equipped to adapt to changing circumstances and to contribute innovatively to society.

Privileged position

Sci-Enza's unique location within an academic environment such as UP encourages excellence and innovation. This setting allows for inspirational interactions, such as hosting special guests like astronauts or incorporating cutting-edge technologies like Lego robotics.

"Our mission is to use the principles of science communication to make science tangible for the broader community," Tsie says. "We are dedicated to developing and maintaining top-tier exhibits, resources and programmes that reach a diverse audience, fostering a deeper understanding and appreciation of science.

"It only takes one meaningful interaction to change the trajectory of a child's life. Whether it's through hands-on experiments, engaging exhibits or inspirational encounters with professionals, Sci-Enza offers experiences that can leave a lasting impression."

By providing these opportunities, Sci-Enza ensures that every day matters by planting the seeds for a brighter, more informed and innovative future.

Why this centre matters

In South Africa, there is a notable shortage of scientists and professionals in STEM (science, technology, engineering and mathematics) fields. This hinders technological advancements, innovation and economic growth. Sci-Enza addresses this gap by inspiring and nurturing the next generation of scientists, engineers and innovators. By sparking an early interest in STEM, Sci-Enza not only contributes to the development of future scientists and innovators, but also fosters a culture of scientific curiosity and discovery that benefits society as a whole.

SDG 4: Quality education

FAST FACT

Sci-Enza is the oldest interactive science centre in South Africa and is situated on the grounds of the University of Pretoria.

Advantages of early science exposure

- Exposes children to the numerous career opportunities in STEM fields
- Builds confidence in their abilities to understand and solve problems
- Enhances communication and teamwork skills, preparing them for success
- Enriches present understanding, while paving the way for a future of innovation

INSECTS
À LA CARTE?

There's a need to develop environmentally friendly ways of producing food that will have a very low carbon footprint. Research into edible insects as sustainable sources of protein could be the answer to food and nutrition security. That's how we make today matter.

Researchers:
Professor Abdullahi Ahmed Yusuf, Dr Tlhogi Selaledi and Keandra Langston, Department of Zoology and Entomology

Cricket à la king? How about a yellow mealworm burger? Foods that may previously have evoked a 'yuck' response are now firmly on the menu. Research into edible insects by the Department of Zoology and Entomology at the University of Pretoria (UP) is exploring how to rear and harvest this food of the future.

According to Professor Abdullahi Ahmed Yusuf, the Humboldt Ambassador Scientist in South Africa, their work focuses on developing cost-effective rearing techniques, harvesting and handling methods, value addition and legislation in order to ensure the sustainable use of insects.

"We use two commonly used edible insects: the household cricket and the yellow mealworm. The latter is used mostly in animal feed until its recent acceptance for human use by the European Union."

These insects are also easy to rear and have a high reproductive rate.

The study set out to develop alternative and cheaper rearing substrates for the yellow mealworm, which is usually reared on wheat bran.

"Wheat bran is expensive and not readily available, especially for low-income, would-be insect farmers," he explains. "As such, we evaluated the following six potential substrates: wheat flour, maize flour, Lucerne pellets, dog food, soya flour and oats. Of these, maize and wheat flour were found to be the most cost-effective in comparison to wheat bran."

The study group went further to see if the same flour could be reused to rear two generations of the yellow mealworm. They were successful, with both wheat and maize flour being the best substrates. Further analysis of the nutritional contents of the insects revealed that they are rich in protein, essential minerals (sodium, magnesium, phosphorus, potassium, copper and zinc) and saturated fatty acids, which are essential for energy, hormone production and signalling processes.

"These nutritional profiles were similar for both generations of insects raised," Prof Yusuf says. "The finding demonstrates the suitability of local, inexpensive substrates for commercial production of the yellow mealworm, and its use for food and feed."

Future food

Eating or using insects as animal feed is recommended because of their unique nutritional profile, which compares with or supersedes those of conventional foods. Insects are termed 'super food' due to their excellent protein, fatty acid, vitamin and mineral content.

Besides the traditional practice of eating insects, the demand for alternative sources of nutrients for humans and animals has increased, thus having an impact on the need to farm edible insects. Commercial edible insect farms are increasing on the African continent, with the industry projected to be worth US$8 billion by 2030. It is said to replace 60 million tons of traditional feed production and will lead to 200 million tons of recycled crop waste, 60 million tons of organic fertiliser and 15 million jobs.

"In Africa, edible insects are mainly collected from the wild for household consumption and informal trade," Prof Yusuf says. "Our research at UP has shown that there is a more cost-effective way to rear the most commonly used edible insects on a large scale, which will benefit rural farmers."

Edible insects could be an inexpensive, environmentally sustainable solution to both malnutrition and land use in Africa.

2 000+

Number of edible insect species that are used by humans as food, feed for animals and for therapeutic purposes

** Where each icon represents 300 insect species.*

US$8 billion

Projected value of the insect farming industry on the African continent by 2030

Why this research matters

With a rapidly growing population, increased demand and a changing climate, the future of food systems is facing increasing uncertainties. One way to attain food security and sustainable development in line with both the United Nations' Sustainable Development Goals and the African Union's Agenda 2063 is to move away from environmentally harmful food production practices to less-intensive ones, such as insect farming. Insect farming produces a much lighter carbon footprint, utilises fewer resources and is an ideal form of agriculture for women.

SDG 3: Good health and well-being

FAST FACT

When dried, yellow mealworms are said to taste a lot like peanuts.

15 million

Projected number of jobs the insect farming industry in Africa could deliver by 2030

Chicken or insect?

The nutritional numbers help you decide.

	Energy	Protein	Fat	Fibre
	k/cal/100g	g/100g	g/100g	g/100g
Mealworm	178	24	6	7
Beef (sirloin)	112	20	3.5	0
Chicken (drumstick)	125	17	6	0

FOOD FOR THOUGHT

COULD PROTEIN DETERMINE OUR SOCIO-ECONOMIC FUTURE?

Accurate data today could promote the development of affordable, sustainable food systems that prioritise nutrient-rich foods while optimising the efficient use of natural resources.

Researchers:
Dr Beulah Pretorius and Professor Hettie Schönfeldt, Department of Animal Science and School of Health Systems and Public Health

Our bodies need protein. But because protein-rich foods are expensive, millions of people do not have access to sufficient protein. Without it, people face health problems such as the loss of muscle mass, the inability to concentrate and, in severe cases, diseases such as kwashiorkor and marasmus.

Researchers at the Department of Animal Science and School of Health Systems and Public Health at the University of Pretoria (UP) have made a crucial discovery regarding the methods used to measure the protein content of foods. They have confirmed that current methods often produce inaccurate results, and that more accurate results could do much to prevent malnutrition, along with encouraging the cultivation of alternative sources of plant-sourced protein.

According to the World Health Organization, the recommended amount of protein for adults is about 0.83g per kilogram of body weight per day. A man weighing 90kg would therefore need around 75g of protein daily.

"To determine whether a person is getting enough protein, we need to know how much protein is present in the foods they routinely consume," Dr Beulah Pretorius says. "Traditionally, scientists have used a method called the 'proximate system' to measure protein content. By using specific nitrogen-to-protein conversion factors – also called the Jones conversion method – protein content is calculated based on the amount of nitrogen present in foodstuffs. This method assumes that most of the nitrogen in food comes from amino acids (the building blocks of protein) and that a significant portion of those amino acids are part of the protein."

The commonly used conversion factor is 6.25, which again assumes that all proteins contain about 16% nitrogen. This research has now shown that this method can over- or underestimate the true protein content present in foodstuffs.

"This is why scientists prefer to report protein in food composition tables, and to indicate 'true protein' on product labels as the sum of individual amino acid residues," Dr Pretorius says. "The chemical analysis to determine the amino acid content is, however, complicated and costly, and therefore not a feasible methodology to use in developing countries."

But what if we could update and improve the conversion factors that are being used?

In an exploratory study, data was collected on the amino acid content in foods from animal sources. The crude protein was calculated by using the nitrogen value of the samples (as determined by the Kjeldahl method for dairy samples and the Dumas method for meat samples). These were then multiplied by the respective Jones conversion factors of 6.25 for meat samples and 6.38 for dairy samples. True protein was calculated as the sum of amino acid residues (the molecular weight of each amino acid, less the molecular weight of water).

"The findings were concerning," Professor Hettie Schönfeldt says. "For all animal products, the protein content was over-reported. It became evident that the 'assumed' nitrogen content of protein is not 16% but varies significantly depending on the source of protein. By accurately determining protein content, we could not only counter malnutrition but also encourage the cultivation of a diverse range of plant species, including often-overlooked valuable sources of protein. A greater variety of crops would also result in much-desired biodiversity in regions."

"These changes will affect virtually all sectors in the food chain: agriculture, manufacturing, food preservation, labelling and regulatory compliance, to name a few," Dr Pretorius adds. "However, the greatest challenge would probably be to gain acceptance of new food options from the general population. Humans are by nature resistant to change. It would therefore require intensive, persuasive education to alter dietary preferences."

Given humankind's attachment to habits, the sooner we start changing ingrained preconceptions, the sooner more people will have the chance to see their children thrive.

Why this research matters

If scientists could deploy more accurate and affordable methods to determine the protein content of foods, we would be better equipped to counter malnutrition and diseases. An understanding of true protein content could also encourage the cultivation of more diverse, often-overlooked protein-packed plant species, while encouraging much-desired biodiversity in support of several Sustainable Development Goals.

SDG 2: Zero hunger

Protein needs

A 90kg man needs 75g of protein a day.

Costly:

Granola muesli **= 5g**

Half a cup of low-fat plain yoghurt **= 5g**

1 egg **= 7g**

2 slices of brown bread **= 8g**

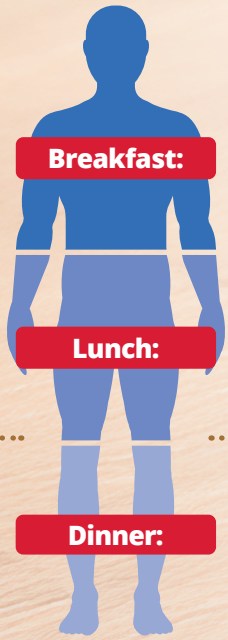
Half an avocado **= 1g**

2 slices of cheese **= 14g**

80g skinless chicken breast **= 23g**

Half a cup of mixed vegetables (green peas, corn, carrots, green beans) **= 2g**

Potato baked in skin **= 4g**



Inexpensive:

1 cup of stiff maize meal porridge = **9g**

1 cup of low-fat milk = **8g**

2 cups of cooked samp and beans = **23g**

2 slices of brown bread **= 8g**

Beef stew with cabbage **= 9g**

1 cup of maas (fermented milk product) = **8g**

PEP TALK FROM PLANTS

Veterinary scientists are on the hunt for a safer, effective and potentially more economical alternative to current treatments for rabies to make this life-saving solution available to those who need it most.

Researchers:
Professor Claude Sabeta and Professor Karen Keddy, Department of Veterinary Tropical Diseases

Rabies predominantly affects marginalised populations. Although effective human vaccines and immunoglobulins exist, the immunoglobulins are often inaccessible or unaffordable to those in need. An international drive to develop alternative post-exposure prophylaxis (PEP) biological alternatives, led by the World Health Organization, is underway.[1]

Researchers at the Faculty of Veterinary Science at the University of Pretoria (UP) have tested antibodies generated in tobacco plants that can neutralise certain strains of the rabies virus. This approach will make neutralising antibodies cheaper to produce. In addition, the antibodies are more stable, and their production is scalable.

"Rabies deaths are preventable with prompt PEP to stop the virus from reaching the central nervous system," Professor Claude Sabeta says. "Currently, PEP for dog bites that draw blood comprises the administration of a rabies vaccine together with rabies immunoglobulin (RIG) of either equine or human origin. Human RIG suffers from many restrictions, including limited availability, batch-to-batch inconsistencies and the potential for contamination with blood-borne pathogens."

He points out that in the developing world, RIG preparations are expensive, often in short supply and of variable efficacy.

"Therefore, we are seeking to develop a monoclonal (derived from a single cell) antibody mixture to replace RIG," he says. "Monoclonal antibodies (mAbs) are immune system proteins that are used in targeted drug therapy and prophylaxis, and are in high demand around the world to fight diseases."

This will have enormous impact on human health, as about 60% of human infectious diseases originate from animals (called zoonotic transmissions).[2] Lyssaviruses are a group of animal viruses that can cause central nervous system infections in all warm-blooded mammals, including humans. Rabies is only one of the 18 viral species found in this genus and is a neglected zoonotic disease. Although generally associated with domestic dogs, in South Africa wildlife host species such as the black-backed jackals and bat-eared foxes in the Limpopo, North West and Northern Cape provinces respectively have also been implicated. In 2015, a rabies outbreak in jackals was reported in KwaZulu-Natal.

Initial challenge and administration of the antibody cocktail on hamsters showed a protection level of up to 60%.

"The compelling need to find a less expensive and safe alternative for RIG alone is not sufficient to pave a smooth path for further development of recombinant mAb-based PEP for implementation in the clinic," Prof Sabeta says.

The biggest barrier to reaching the market is the complicated and untried clinical development path to replace effective immunotherapies for lethal but neglected infectious diseases, such as rabies. In most countries, human trials for replacement products for these diseases are impossible due to ethical considerations.

"Since 2002, the US Food and Drug Administration has made available an alternative 'animal rule' pathway for development where efficacy is established in well-controlled model animal trials and safety in normal human trial pathways," Prof Sabeta explains. "The situation in other parts of the world is more complicated and will require coordinated efforts for regulatory reform on a global level. There is no set clinical or regulatory path for this type of prophylaxis where it is needed the most, irrespective of whether it was produced from the somewhat novel plant-based platform or from the more established mammalian cell culture systems (such as Chinese hamster ovary cells). Proactive and early engagement with Asian and African regulatory authorities, such as South Africa's Medicines Control Council, is underway to sensitise them on approval frameworks and market entry elsewhere in the world."

55 000 – 70 000

Number of **annual human rabies fatalities**, with most occurring in the developing world

**** Where each icon represents 10 000 fatalities.***

Why this research matters

A plant-based anti-rabies monoclonal antibody has been identified as a promising alternative to rabies immunoglobulin of either equine or human origin. This will make the treatment of rabies infections more accessible and affordable for people in developing countries in Africa and Asia, where the highest rates of human rabies fatalities is experienced.

SDG 3: Good health and well-being

Sources:
1. https://www.who.int/news-room/fact-sheets/detail/rabies
2. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8808746/pdf/facrev-11-02.pdf
3.

EAU DE SAPIENS

CAN SCENT MIXTURES FROM HUMAN SKIN HELP COMBAT MALARIA?

Today's research to find novel ways of preventing mosquito bites and identifying malaria carriers – by studying the bouquet of compounds emitted from human skin – will go a long way towards eliminating malaria tomorrow.

Researchers:
Professor Egmont Rohwer, Dr Yvette Naudé and Dr Madelien Wooding, Department of Chemistry

Imagine the day when we can lure and trap mosquitoes with baits that are more attractive to the female mosquito than any human being. Imagine if we could drastically improve the control of malaria – which affects 10% of the South African population each year – and even eliminate it in the country.

This dream of the University of Pretoria Institute for Sustainable Malaria Control (UP ISMC) has also motivated analytical chemists to develop something more attractive than humans on which mosquitoes can feed. For more than a decade, UP ISMC's analytical chemistry team has been researching human skin emanations with the goal of recreating chemical mixtures that mimic the scent of the most mosquito-attractive human being.

Professor Egmont Rohwer, who initiated the project and works with team members Dr Yvette Naudé and Dr Madelien Wooding of the Department of Chemistry in the Faculty of Natural and Agricultural Sciences, elaborates: "A novel silicone rubber skin-sampler, worn as a patch on the forearm for 30 minutes, was successfully developed to capture thousands of compounds accurately for later release and analysis by sophisticated, state-of-the-art separation and identification techniques."

This provides reliable skin-emission profiles that can be processed by computerised pattern recognition techniques, allowing for chemical fingerprinting of metabolites originating from the infective agent and clues for designing a better lure for mosquitoes.

"The best available mixtures thus far use up to 12 different compounds," Prof Rohwer says. "We believe we require a lot more and that their relative concentrations – an aspect that has not received a lot of attention – would be crucial to provide the irresistible lure. This is a massive challenge and test for our team's international reputation in the research fields of chromatography and mass spectrometry. Our scientists have successfully diagnosed tuberculosis by this means and have obtained promising results for the screening of malaria."

Early results indicate that identifying latent cases might also be possible, which is important for malaria elimination as trans-border movement of asymptomatic carriers could be a significant reservoir of the *Plasmodium* parasite. Latent cases are carriers of malaria that show no symptoms but carry the parasite in the liver, spleen or bone marrow. Such cases are generally not found with the existing blood microscope test, the rapid diagnostic test, and the more sensitive and selective DNA-based tests.

Adding to the arsenal

The most successful tools available to keep malaria at bay are insecticide-treated bed nets (ITNs) and indoor residual spraying (IRS). The latter refers to the annual spraying of long-lasting insecticides on indoor walls to target female mosquitoes that often rest here before biting humans for their blood meal. This is where transmission occurs. Consistent implementation of IRS requires enormous manpower and funding.

Another challenge to eliminating malaria in South Africa is the influx of citizens who come from neighbouring countries where there is a higher malaria risk and who may be asymptomatic carriers of the *Plasmodium* parasites. A cheap and successful chemical lure-based trap, together with efficient screening of trans-border visitors for malaria, would go a long way to eliminate the disease in South Africa.

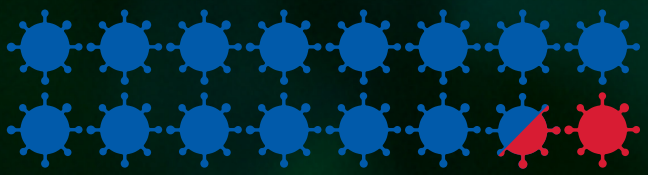
The UP ISMC team considers their "magic scent mixture" to be a missing third partner of IRS and ITNs as they work towards ending malaria.

"Another heart-warming result of our published skin-analysis research is an invitation by a top US-based research group to participate in a unique programme in Zambia where mosquito-biting preference is studied in response to volatile scent profiles of a large group of people," Prof Rohwer says. "The next challenge will be to extend our skin metabolic profiles technique to other species of mosquito (besides *Anopheles arabiensis*) and infective agents (beyond *Plasmodium falciparum*) to tackle other diseases spread by mosquitoes, such as Zika, chikungunya, West Nile and dengue fever."

Why this research matters

Malaria is a major health issue and killer in sub-Saharan Africa, and current elimination methods place a heavy burden on resources. The development of an alternative diagnostic method will reveal latent cases of malaria, which constitute a hidden reservoir of the disease, and help diagnose it more effectively. This groundbreaking method also holds the promise of prevention by luring and trapping mosquitoes with scents that are more attractive to the female mosquito than any human being.

SDG 3: Good health and well-being



700 million

Number of people worldwide who contract **mosquito-borne diseases** each year, of which malaria is the main contributor

1 million+

Number of people who die from mosquito-borne diseases each year

** Where each icon represents 50 000 000 people.*

THIRD EYELID PROVIDES THE PERFECT SITE

By adapting existing technology, researchers have discovered the best way to monitor the health of rhinos that have been immobilised for dehorning or relocation. Looking at the problem of poaching today through a different lens will help ensure against a drop in rhino numbers tomorrow.

Researcher:
Dr Thembeka Mtetwa, Department of Anatomy and Physiology

Dehorning rhinos to make them less attractive targets for poachers has become standard procedure for many conservation agencies. Ironically, the procedure to save these animals from future distress can place great stress on them. Immobilising rhinos for dehorning or relocation requires potent immobilising drugs to which the rhino's lungs and heart may not respond well. The drugs can negatively affect cardio-respiratory function, causing blood oxygen to drop to dangerously low levels.

Research by scientists and vets in the Faculty of Veterinary Science at the University of Pretoria (UP) has shown that pulse oximeters, originally designed for humans, can be adapted to monitor the blood oxygen levels of rhinos that are immobilised or under anaesthesia – by attaching them at an unusual site: the rhino's 'third eyelid'.

"The third eyelid is a crescent-shaped fold of the outer eye structure which forms a thin, semi-transparent 'blinking' membrane over the eye," explains Dr Thembeka Mtetwa, an early-career physiologist.

Monitoring blood oxygen levels is essential for making important decisions, such as whether to administer drugs to stimulate breathing or to give oxygen to the rhino.

"One of the greatest challenges to date has been identifying a reliable, field-friendly method," Dr Mtetwa says.

Up until now, scientists and vets have typically been monitoring the blood oxygen levels of immobilised rhinos with blood gas analysers and pulse oximeters – which are designed for humans, not for 2.5-tonne rhinos – without any certainty of their reliability.

"The pulse oximeters are not that different to the kind that a doctor might attach to a human's finger to measure blood oxygen levels," Dr Mtetwa explains. "To give the pulse oximeters the best chance of working, we had to think carefully about where to place them on the rhino's body – where the skin and membranes aren't too thick."

The third eyelid

The research by Dr Mtetwa and her collaborators was recently published in the journal *BMC Veterinary Research*. The group consists of the Faculty of Veterinary Science's Professor Leith Meyer, a wildlife vet and physiologist; experimental physiologist Prof Ned Snelling, also from the faculty; wildlife vet Dr Peter Buss of SANParks; wildlife vet Dr Annette Roug (an Extraordinary lecturer in the faculty); and ecophysiologist Dr Ashleigh Donaldson (an alumnus of the faculty). They tested the reliability of different pulse oximeters at various attachment sites on the body of immobilised rhino.

Prof Meyer, who has more than 20 years of experience in wildlife chemical immobilisation, came up with the novel idea to test the feasibility of placing the device on the third eyelid.

"The colour, moisture and capillary refill time of the external mucous membranes of the body are good indicators of hydration, circulation and the overall health of the animal, and are typically good sites to place a pulse oximeter probe," he says.

"However, making use of these membranes on a rhino can be challenging due to the thickness of their skin and poor accessibility on some areas of the body, like the mouth. That's why we decided to explore the mucous membranes of the third eyelid as an alternative. Luckily, it turned out to be a good idea!"

"The great thing about the rhino's third eyelid is that it is relatively thin," Prof Snelling adds. "It has lots of blood vessels close to the surface, and it's easy for vets and vet nurses to access it."

"Our findings highlight the importance of using appropriate monitoring techniques in large immobilised animals like rhinos, which have unique anatomical and physiological characteristics," Dr Mtetwa says. "This new research improves our ability to provide care and ensure the well-being of rhinos in the field."

Why this research matters

Immobilising rhino for dehorning or relocation is becoming a routine procedure for wildlife veterinarians working on the frontline to protect these animals from poaching. However, during these procedures, the rhino's lungs and heart may not respond well to the potent immobilising drugs. This research has adapted existing technology to find an appropriate solution to mitigate complications arising from low oxygen levels during procedures like immobilisation.

SDG 3: Good health and well-being

See the procedure in action here.

FILLING THE GAPS OF PLACENTAL INSUFFICIENCY

Ensuring healthy foetal development today – and determining why a placenta doesn't function as it should – will go a long way to reducing childhood stunting in South Africa, leading to adults with better cognitive development, better educational achievement and higher economic productivity.

Researchers:
Professor Bob Pattinson, Professor Ute Feucht, Dr Helen Mulol, Professor Friede Wenhold and Dr Sanja Nel, Centre for Maternal, Fetal, Newborn and Child Health Care Strategies

What do stillbirths, child stunting and impaired cognitive development have in common? It could be that all these problems start in the womb with a placenta that doesn't function as it should.

Researchers at the University of Pretoria's (UP) Centre for Maternal, Fetal, Newborn and Child Health Care Strategies have been studying these problems for years. They have also been looking into why South Africa has about 19 000 stillbirths a year, most of these among apparently healthy pregnant women.

"A major cause of stillbirths is placental insufficiency, a condition where the placenta does not function properly; the foetus is then deprived of the nutrients and oxygen it needs to survive and grow," says Professor Ute Feucht, Director of the centre. Placental insufficiency can be tested using the Umbiflow™ Doppler screening device, a portable, continuous-wave Doppler ultrasound device that was developed in South Africa and costs about one-tenth of conventional ultrasound equipment. This makes routine Doppler screening at public healthcare clinics feasible.

Studies by the centre showed that otherwise healthy South African pregnant women have about 10 times more placental insufficiency than those in high-income countries. Referring pregnant women with an abnormal Umbiflow™ result to a higher level of care resulted in 45% fewer stillbirths – a substantial reduction with enormous potential for a positive impact on the health system.

The next question

But what about the newborns who survived into infancy? Did placental insufficiency affect their growth and brain development in the longer term, or did they recover and go on to thrive?

"To answer these questions, we conceived the UmbiBaby study, which followed a group of infants over the first two years of their lives, looking at their growth, body composition and neurodevelopment," Dr Helen Mulol says.

The results were intriguing. Children with abnormal Doppler results had a lower birth weight, and remained lighter up to 24 months of age; they also grew at a slower rate and were more likely to be short for their age if the mother was also living with HIV. Additionally, they were also likely to have a lower fat-free mass trajectory (even if corrected for their shorter length), though fat mass was not affected. This suggests that placental insufficiency has an impact on the development of lean tissue, which includes muscles and organs, while fat tissue continues to grow normally. This could predispose these children to developing obesity. Furthermore, they had poorer cognitive development scores at 18 months, even more so if the mother was living with HIV. Children who were short for their age also had poorer motor development.

"Taken together, this paints a concerning picture," Dr Sanja Nel says. "Placental insufficiency is rife among even relatively healthy pregnant women, and it seems to be affecting children's growth and cognitive development."

Where to now?

"Pinpointing placental insufficiency as a common contributory factor to all these problems is an important step, but it is still far from a solution," Prof Feucht says. "The reason for the high prevalence of placental insufficiency is unknown. We initially suspected that HIV might be to blame, but the data from our Umbiflow studies don't support this. Thus, our next planned study (funded by ELMA Philanthropies) will look elsewhere – at factors that affect the development of the small placental blood vessels."

This will involve blood tests on pregnant women with a range of placental function, from normal Doppler results to severe placental dysfunction. At the same time, researchers will look at the women's nutritional status and diet.

"Finding the culprits will be the first step to developing a cure – or better yet, a way to prevent the condition entirely," Prof Feucht says.

Why this research matters

South Africa has an alarmingly high rate of stillbirths occurring in otherwise healthy women. Around half of stillbirths in these women could be prevented. The search to find the cause of the placental insufficiency that is so common among South African women, and a way to improve or prevent it, has enormous implications. Foetuses would get enough nutrients while in the womb, allowing their bodies and brains to develop optimally. This could go a long way to reducing childhood stunting in South Africa.

SDG 3: Good health and well-being

Watch Umbiflow™ in action.

SA stillbirth rate:

16.2 **babies per 1 000 births**

** Where each icon represents 50 stillbirths.*

98%

Most stillbirths occur in low- and middle-income countries.

Source: https://data.unicef.org/topic/child-survival/stillbirths/

BLOOD, SWEAT AND FEARS

Sport is an integral part of society, and children at school are motivated to emulate their global sporting heroes. But we need to protect vulnerable athletes from various levels of abuse in sport if we want to make today's athletes tomorrow's Olympic champions.

Researchers:
Professor Steve Cornelius and Anneli Hyman, doctoral candidate, Department of Private Law
Professor Ann Skelton, Department of Private Law/United Nations Committee on the Rights of the Child
Karabo Ozah, Centre for Child Law
Professor Rian Cloete, Department of Procedural Law
Professor John Wolohan, Syracuse University, New York

We live in a society where violence towards women and children has reached unimaginable and unacceptable levels. Sport is subject to all the ills that plague society at large. But can an environment in which blood, sweat and tears are required to achieve sporting glory claim that 'tough love coaching' is abusive?

Experts in the Faculty of Law at the University of Pretoria (UP), who have initiated a research project to address abuse in sport, point out that such abuse can be perpetrated in different ways. Contact mechanisms involve close proximity, interaction and handling. Spanish football official Luis Rubiales' non-consensual kiss of Jenni Hermoso after Spain won the FIFA Women's World Cup is a recent example.

"Non-contact mechanisms involve conduct as well as verbal mechanisms," says Professor Steve Cornelius, a sports law expert and Head of the Department of Private Law at UP. "Technology has also given perpetrators cyber mechanisms that can be used to direct abuse at victims."

Sport has been plagued by revelations of wide-ranging and long-term instances of sexual abuse. These include gymnasts in the US who suffered abuse at the hands of the national gymnastics team doctor; the sexual abuse of swimmers and athletes by various coaches in the UK; and the sexual abuse of tennis players and water polo players in South Africa by coaches and teachers.

The physical nature of sport means certain forms of violence or otherwise socially inappropriate conduct is often normalised.

"Athletes are particularly at risk of harassment and abuse that could easily go unreported and unnoticed," Prof Cornelius says. "For this reason, sports federations and institutions should ensure that they are aware of the various forms of harassment and abuse that can occur in the context of their sport, and should have the necessary measures and mechanisms in place to deal decisively with such instances."

Make safeguarding visible

In 2022, the South African Sports Confederation and Olympic Committee (SASCOC) adopted a Safeguarding Policy, which is a step in the right direction. In collaboration with NGO The Guardian, SASCOC has also held workshops to educate sports administrators about the risks. However, not all national sports federations have adopted their own policies and, if they have, such policies are not always readily available.

"Another challenge in South Africa is that school sport resides under the Department of Basic Education and does not fall within the immediate jurisdiction of SASCOC or national federations," Prof Cornelius explains. "As such, there is a disconnect that has allowed perpetrators to move around under the radar."

Athletes are fortunate to have Prof Cornelius on their side. He resigned from the International Association of Athletics Federations' (IAAF – now World Athletics) Disciplinary Tribunal in 2018 in protest against the hyperandrogenism rule that could result in female athletes being banned from international participation unless they undergo testosterone-reducing treatment. According to World Athletics, androgen-sensitive athletes such as Caster Semenya have to lower their testosterone levels to meet the criteria for 'female athletes'.

"Any meaningful discussion about abuse in sport should begin from the perspective of the victim," Prof Cornelius says. "Consequently, any intervention to safeguard participants should begin by identifying those participants most at risk to determine how these risks can be reduced or eliminated, and which measures can be provided to safeguard all participants."

UP's research project is now in its second phase, and is the perfect platform from which to address this, with the Centre for Child Law, the Centre for Sports Law, and the Centre for Human Rights under one roof.

"Our team aims to highlight the various forms of abuse that may occur and identify the risk factors that give perpetrators the space to abuse vulnerable participants," Prof Cornelius says. "By recommending measures to create a safe environment for all participants, we can nurture the talents of our future Olympic and world champions."

Why this research matters

Children and other vulnerable athletes can be subject to various forms of abuse in sport. Due to the physical nature of sport, which involves close proximity between participants and coaches and among participants, an environment could be created where perpetrators can direct abuse at vulnerable participants. The competitive nature of sport also means that parents, fans and peers can become perpetrators of abuse. It is vital to highlight the many forms of abuse and create a safe space for athletes where they can excel.

SDG 16: Peace, Justice and Strong Institutions

Help combat abuse in sport

- Educate children or other vulnerable athletes about unacceptable conduct and encourage them to seek help if they feel victimised.
- Schools, sports clubs and sports federations should be more vigilant when screening potential coaches, officials and volunteers. Directing questions about abuse in sport to applicants tends to drive perpetrators away.

DECOLONISING THE MIND OF A WOMAN LEADER

Purposeful interventions are needed to close the leadership parity gap, and to include women's ways of being, knowing and leadership. It starts with women re-authoring their own narratives.

Researcher:
Professor Tanya van Wyk, Department of Systematic and Historical Theology

"Who am I to lead?", Julie Owen[1] asked in her 2020 publication about perceptions surrounding women leaders of university campuses in the US. Research in the field of women's leadership broadly indicates that this is an existential question for many women.

It is also the question that Professor Tanya van Wyk of the University of Pretoria (UP) has grappled with for some time: What does it mean to be a woman leader, and what is the impact of people's perceptions around gender roles with regard to leadership? More specifically, how are women as leaders perceived in a religious context?

"Traditionally, religious contexts have struggled to approach leadership in a non-binary, equitable way," she says. "A large body of existing literature indicates that this is caused by particular intersections of culture and religion, as well as societal gender constructs being perpetuated uncritically over generations."

Research further indicates that over the past decade, there has been increased awareness of the potential of women as leaders and increased recognition that purposeful, sustained interventions are required to close the leadership parity gap.

One such intervention has been Prof Van Wyk's discussions around women's leadership, which has led to her church's leadership body commissioning a study on the topic – the first of its kind in the history of the Netherdutch Reformed Church of Africa.

A second outcome of her research has been that UP approached Prof Van Wyk to coordinate the development of a women leadership programme at the University. Its aim is to increase the number of women in leadership positions in higher education.

"To increase this number, we need to shift institutional culture to include women's ways of being, knowing and representing what success and leadership means," she says.

This shift must also occur within women themselves – something the programme hopes to help achieve.

Creating knowledge and understanding

Through her research, Prof Van Wyk has come to realise there is a much more nuanced picture about women, men and leadership than binary distinctions allow for.

"I have also come to realise that when it comes to women's leadership, the issue we need to interrogate is how we create knowledge about gender, and how we actually understand the idea of knowledge itself. At its core, this is what decolonisation is about – the way our minds are proverbially colonised to think about knowledge, who constructs it, what is regarded as knowledge and which topics we deem 'worthy' to create knowledge about."

Decolonising the Mind by Ngũgĩ wa Thiong'o, published in 1986, reflects on what it is like to have someone else describe who you are, and create definitions of your identity and activity.

"Through this they create a body of knowledge about you that ultimately becomes so real, that you internalise it, organise your life around it and adhere to it," Prof Van Wyk says. "It becomes history. It is then used by others to justify their understanding of reality (and of you) to the point that you first have to be taught that you have your own words and can re-create a reality that was based on your non-participation."

With regard to women, leadership and gender in general, there is a deeper level of colonisation that needs to be deconstructed and 'unlearned', as it were.

"The two outcomes of my research are examples of how each of us – women in particular – can apply our research and contribute in our different ways," Prof Van Wyk says. "Often it is about using our work to start difficult conversations 'on the ground', and to be catalysts of transformation in this regard."

Why this research matters

For women to become leaders they need to overcome barriers to leadership and navigate cultural perceptions across all sectors – both in academia and broader society. This research connects critical leadership studies with personal narrative (autoethnography) and the broader discipline of theology and religion. Autoethnography can be instrumental in the formation of women leaders and help women transform an environment by re-authoring their own narratives.

SDG 5: Gender equality

For more on this topic, read here.

Reference:
1. We are the Leaders We've Been Waiting for: Women and Leadership Development in College (Julie Owen) https://doi.org/10.1002/jls.21708

A REMOTELY BALANCED WORKFORCE

With women making up 46.1% of the total workforce in sub-Saharan Africa, creating a more inclusive, equitable and productive future for them is imperative. We make today matter by better understanding the dynamics of the work-life balance for remote workers and how to harness women's unique contribution to the future of work in Africa.

Researchers:
Dr Olebogeng Selebi, Deputy Director: Centre for the Future of Work
Professor Wesley Rosslyn-Smith, Director: Centre for the Future of Work

The COVID-19 pandemic unwittingly became a huge, focused experiment in remote and flexible work. While the advantages of working away from a fixed office space were clearly prompted by the pandemic, the number of people working remotely continues to increase as the workplace changes.

But, according to the World Economic Forum[1], remote work can be a double-edged sword for women. Few people understand this better than Dr Olebogeng Selebi and Professor Wesley Rosslyn-Smith of the Centre for the Future of Work (CFoW) at the University of Pretoria (UP).

"As the future of work disrupts the workplace, our focus shifts to how these changes will affect career equality, particularly in terms of remote work, which has become more common across serviced-based corporate businesses post-COVID-19," Dr Selebi says. "We know that remote work brings the flexibility needed to balance work and life demands, but also potentially exacerbates inequalities. It can empower women by enabling greater work-life balance and participation in the labour force. Conversely, it can also intensify work-family conflict due to higher family role expectations, and may reinforce biased perceptions of women. Amid the challenges, deep-rooted cultural values hindering gender equality are still prevalent in many cultures."

Economic empowerment is a cornerstone of achieving gender equality, yet significant gaps that hinder progress remain. In South Africa, women continue to face challenges in accessing economic opportunities, despite policies aimed at promoting inclusion.

South Africa has made inroads into gender equality by supporting transformation in the workplace. According to Stats SA[2], over the past decade, male participation rates in the economy increased by 1.7%, while female rates rose by 4.9%.

Family restrictions

"However, women are still limited by decisions that restrict mobility, such as the choice to have a family," Dr Selebi says. "Caregiving responsibilities are of particular importance in access to the future of work because they directly influence workforce participation, economic empowerment and gender equality."

A significant consideration for women residing in rural areas is the limited availability of childcare services. This scarcity implies that, despite the increased employment opportunities afforded by remote work, these women still need to secure adequate childcare arrangements.

"Remote work, though flexible, still necessitates dedicated working hours, thereby precluding the possibility of simultaneously managing childcare responsibilities," Dr Selebi points out. "Consequently, the challenges associated with childcare persist, even in the context of home-based employment."

The traditional division of labour places a heavier caregiving burden on women, which can limit their career progression, educational opportunities and participation in higher-paid, skilled jobs. As the future of work evolves, it becomes essential to ensure that these responsibilities do not become a barrier to entry for a significant portion of the workforce.

To address the above concerns, these UP researchers are undertaking a study targeting women in service-based companies which will significantly enhance understanding and contribute to shaping the future of work.

"By examining the intersection of gender, caregiving responsibilities and employment in a sector that is central to a country's economy, the research will yield insights that are pivotal to crafting gender-sensitive policies and fostering a conducive work environment," Dr Selebi says.

The data will be collected from professional services firms, which are ideal for revealing the connection between remote work and gender equality due to their diverse workforce, structured career paths and reliance on knowledge-based work. These firms often implement remote-work policies, allowing for a clear comparison of gender-specific outcomes. Additionally, their emphasis on measurable performance metrics and career progression provides robust data to analyse the impact of remote work on gender equality in terms of career advancement, work-life balance and job satisfaction.

In essence, this research holds the promise of informing a more inclusive, equitable and productive future of work for Africa, where the unique contributions of women are fully realised and valued.

Why this research matters

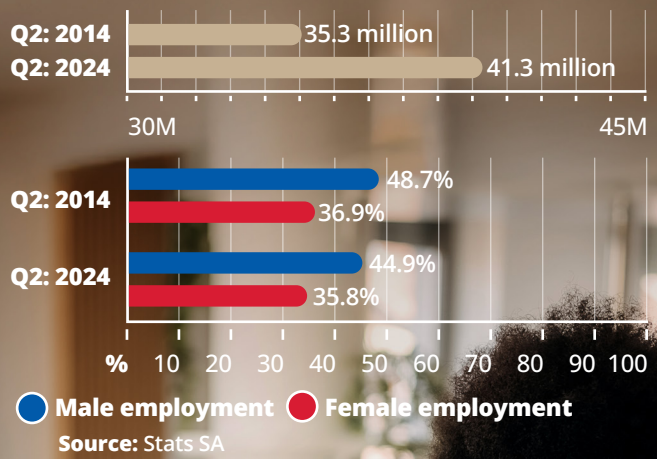
This research offers a nuanced understanding of the challenges and opportunities presented by flexible work arrangements, leading to strategies that promote a better work-life balance. The findings will serve as benchmarks for gender equity, especially in leadership within the service industry, providing a template that can be scaled across the continent.

SDG 5: Gender equality

Note: This research is being conducted in conjunction with Curtin University in Australia and Mauritius.

South African labour force: 10 years on

Working-age Population



Source: Stats SA

References:
1. https://www.weforum.org/agenda/2023/11/remote-work-workplace-women-careers/
2. https://www.statssa.gov.za/?p=17597#:~:text=The%20proportion%20of%20working%2Dage,55%2C8%25%20for%20women.

HOPE
FOR THE FUTURE

Being able to reframe negative events in a positive manner, actively cope with everyday challenges, and find comfort in spiritual faith and practices is how we create hope – and how we make today matter.

Researchers:
Professor Tharina Guse, co-principal investigator, University of Pretoria
Dr Andreas Krafft, principal investigator, University of St Gallen, Switzerland
Professor Alena Slezackova, co-principal investigator, Masaryk University, Czech Republic

How hopeful are people across countries and cultures? What is the basis of hope? What sustains hope?

These are some of the questions being explored in the International Hope Barometer Research Programme, for which Professor Tharina Guse of the Department of Psychology at the University of Pretoria (UP) is South Africa's co-principal investigator.

Global events in the recent past would not ordinarily provide fertile ground for hope to flourish. And yet, it does. What makes hope thrive, though, differs among countries and between cultures. The two countries with the highest levels of perceived hope, South Africa and Israel, endorsed different world views. For South Africans, hope is anchored in positive emotions, social relationships, the willingness to help others, religious faith and the connection to a higher power. Generally, they believe in the good. In the Israeli research sample, self-worth and believing in luck played a greater role in a hopeful mindset.

"The phenomenon of hope has been studied in several disciplines, including theology, philosophy, psychology, sociology and, more recently, economics," Prof Guse says. "Hope is essentially about the future. It entails how we think, feel and behave in relation to the future. It concerns having a wish or a desire for one or more important outcomes, and the belief that it will be possible to reach these outcomes, even though it may be uncertain.

Hope is also about trust in having the resources to attain important outcomes. These resources can be within the self (intrapersonal) or in the environment (interpersonal, community and transcendent resources)."

Research has consistently shown that higher levels of hope are linked to positive outcomes for individuals. These include higher levels of well-being, life satisfaction and positive affect.

"While the way we think has a very strong influence on hope, our research has expanded this understanding to also consider cultural and interpersonal facets of hope," Prof Guse adds.

"In [the book] *Hope Across Cultures: Lessons from the International Hope Barometer*, we reported on levels of hope from several countries and discussed how world views and basic beliefs influence hope," she says. "We also proposed a more comprehensive model to explain the phenomenon of hope. Importantly, we showed how hope mitigated the anxiety and negative psychological outcomes of the COVID-19 pandemic."

A sample of South African participants showed that support from family and friends was the strongest source of hope. Hope is further sustained by doing good for a meaningful cause. This indicates that hope can also be generated through activities that benefit others.

We need hope in dire situations, more so than when life is going well. People who are more hopeful are more likely to view difficult situations as challenges, and experience less stress and depressive symptoms. Given current global socio-political events and concerns about the environment, it is essential to examine how people and communities can sustain hope and leverage a hopeful outlook to attain positive outcomes in the future.

"The International Hope Barometer Programme continues to examine hope, its antecedents and consequences across cultures and countries," Prof Guse says. "Through our work, we intend to contribute to building positive future expectancies towards a more just, peaceful and sustainable world."

Why this research matters

As the world becomes increasingly complex and challenging, it is vital to find beacons of hope that transcend individual character traits and can create communities of 'hopers'. This research has shown how the world remained hopeful during one of the most difficult times by mobilising individual, communal and spiritual resources. By further refining our understanding of hope, particularly for younger people who will inherit the future, this research can contribute to well-being for all.

SDG 3: Good health and well-being

Sources of hope across the world

- Support from family and friends
- Doing good for a meaningful cause
- Being open to new challenges
- Trust in yourself and the world

How different countries and cultures find hope

Spain, Portugal, Colombia:
Social resources (supporting one another emotionally, talking to friends and family)

Nigeria, South Africa (African countries), India:
Religious resources and practices (praying, meditating, trusting in God)

Individualistic countries (Switzerland, France, Czech Republic):
Performance and mastery-oriented sources and activities (while also acknowledging support, luck and inspiring experiences in nature)

The Hope Barometer Research Programme

- The programme was created in 2009 as an annual survey to assess the hopes and future expectations in several countries.
- Researchers from universities in Australia, Colombia, the Czech Republic, France, India, Israel, Italy, Malta, Nigeria, Poland, Portugal, South Africa, Spain and Switzerland participate in the programme.
- Each year, 10 000 adult participants provide valuable insights into their daily life and how they extract hope for the future.

DOOMSCROLLING TOWARDS A CRISIS OF EMPATHY

Our digital devices grant us access to the plight of many around the world, while at the same time creating a false sense of connection. New research can help us to make today matter by learning how to cultivate empathy.

Researcher:
Professor Jenni Lauwrens, School of the Arts: Visual Arts

Ukraine. Palestine. Afghanistan. We know the wars; we see the trauma. But do we truly empathise from the other side of a screen, or has trauma turned into white noise?

Our smartphones facilitate intense engagement with global news. In fact, there's a word to describe this magnetic pull: doomscrolling, whereby we relentlessly scroll from one news item to the next. When we are bombarded by so much news all the time, it's only natural to feel disconnected from what we see on screen.

How to cultivate empathy in the face of the false sense of connection that comes with our digital devices is the subject of research by Professor Jenni Lauwrens of the School of the Arts: Visual Arts at the University of Pretoria (UP).

"We believe that our devices boost our efficiency and expand our knowledge," she says. "We also assume that having an internet connection deepens our 'connection' with others. But what is the nature of this so-called 'connection' in the digital realm?"

She asks the following questions: Are we able to have deep, meaningful connections online? Or are such connections superficial and meaningless? In short, can digital communication technologies enable empathetic connections with others, both known and unknown?

What is empathy?

"First applied in the field of art, empathy denotes the experience of 'feeling into' an aesthetic object (like a photograph or a painting)," Prof Lauwrens explains. "In psychology, empathy means to 'feel with' another person. When we empathise with someone, we come to understand their inner life and emotions. Images, both static and moving, can thus cultivate our capacity for empathising with others."

Unfortunately, our capacity to empathise with those depicted in images and on-screen can easily be manipulated and compromised. In her book *Regarding the Pain of Others*, cultural critic Susan Sontag contemplated how repeated exposure to photographs of people suffering and in pain can reduce people's emotional and empathic responses. She concluded that "compassion is an unstable emotion. It needs to be translated into action, or it withers".[1]

South African-born artist Candice Breitz also comments on how our empathy for others is manipulated by the screen-based technologies through which we increasingly live our lives. In an intriguing installation titled Love Story[2], which was exhibited at the Venice Biennale in 2017, Breitz exposes people's tendency to be more interested in looking at (and listening to) the familiar faces of celebrities than in the plight of unfamiliar, nameless people describing their traumatic experiences of migration and displacement.

"Owing to the ubiquity of digital devices in our lives, we have become overexposed to news stories that represent various people experiencing turmoil across the world," Prof Lauwrens says.[3]

"The screen, which connects us to the plight of those who are suffering, also manipulates us into disconnecting from them.

"Through constant (doom)scrolling, we never reach the end or any real depth, and we hardly pay attention to the images before us. It is the scrolling that brings satisfaction and not a deeper knowledge of the content. Thus, repeated exposure to images of suffering on our smartphones has a numbing effect rather than increasing connection and empathy."

Sociologist and media theorist Sherry Turkle[4] has argued that digital devices have led us to a "crisis of empathy". When we operate in a state of constant distraction, we neglect to ask deeper questions about a given situation. However, if we recognise how our digital tools manipulate us, it is possible to avoid the path of mindlessly interacting with them.

"Taking responsibility for our 'connection' with our digital devices can lead to deep, meaningful connections and ensure that our empathy for others does not wither and die," Prof Lauwrens says.

Why this research matters

Our relationship with our smartphones is an intimate one: we sleep with them, eat with them and keep them close to our bodies. Our cherished devices give us access to the world at large, allowing us to seamlessly connect with distant family, friends, colleagues and strangers. They also allow us constant access to news stories about world events. But we need to put distance between us and our smartphones to avoid emotional 'wear and tear' and risk becoming desensitised to global issues and the plight of others.

SDG 3: Good health and well-being

Disconnect to reconnect

- Turn off notifications so that you are not checking news feeds constantly.
- Check everything on verified news sites – don't let social media be your only news source.
- Be mindful of what you are reading and read news articles with intention.
- Search for content yourself instead of succumbing to the algorithm that feeds doomscrolling.
- Find websites that offer meaningful engagement with the stories of others.
- Designate screen-free periods to help you disconnect and decompress.
- Allocate screen-free zones, such as the dining room or kitchen, where families can connect.

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1. Sontag, S. 2003, Regarding the Pain of Others. Penguin, London
2. https://vimeo.com/165895593
3. Lauwrens, J. 2024. '(Inter)facing empathy: Interrogating our tragic love affair with screens'. Persona Studies 9(2): 68-82
4. Turkle, S. 2015, Reclaiming Conversation. The Power of Talk in the Digital Age. Penguin Press, New York.

DESTINATION: SOUTH AFRICA

By telling the stories of today through film, South Africa can attract the tourists of tomorrow. Film tourism – and the narratives we tell about the destination, culture or attributes of a location – can help make a place more famous. South Africa should start sharing these stories.

Researchers:
Hannes Engelbrecht, Professor Karen Harris and Dr Charlene Herselman,
Department of Historical and Heritage Studies

More than 80 million people select their travel destinations based almost exclusively on films and television series, according to TCI Research, the European leader in travel data intelligence.[1] Blockbuster films such as Marvel's *Avengers: Age of Ultron* and acclaimed TV series like *The Crown* have the power of drawing many an international tourist to Johannesburg and Cape Town, where some scenes were filmed. We just need to get the script right.

The perceived limited narratives of Africa as a place of violence, crime, racism and poverty do little to attract tourists, particularly to South African cities. With its biodiversity and rich cultural history, South Africa offers so much more than a safari destination.

For just under a decade, staff in the Department of Historical and Heritage Studies in the Faculty of Humanities at the University of Pretoria (UP) have been involved in studies related to film tourism. They explore the synergies between film and tourism as leisure activities and their wider impact on the social, cultural and economic fabric of societies.

"Travelling allows us to immerse ourselves in stories," explains Hannes Engelbrecht, a lecturer in heritage and cultural tourism. Stories in the form of film or television series are a significant part of the tourism industry. "This ranges from creating and distributing knowledge about destinations that inform pre-travel decision-making, to the creation of tourism products and services around film locations, to participants and fandoms engaging with fictional characters and places to become part of the story."

It is estimated that *The Lord of the Rings* and *The Hobbit* trilogies as well as the Harry Potter series have contributed between US$1.6 billion and US$5.3 billion to the tourism industries of New Zealand and the UK respectively.

South African potential

Film tourism successes such as Hobbiton, near Matamata in New Zealand, and the Home of Middle-earth campaign by New Zealand Tourism have mostly featured locations in the Global North. The Department of Historical and Heritage Studies' research highlights similar potential benefits for South Africa. Besides the multiplicity of destinations the country has to offer, the internationalisation of South African culture through appearances by John Kani and the late Connie Chiume in the *Black Panther* films draw tourists to experience the cultural richness of South Africa. Even local productions add to this richness.

"Productions like [Netflix series] *Blood & Water* have resulted in internet searches for the 'Parkhurst School', the fictional setting featured in the production," Engelbrecht says. "Every time a new season is released, there are significant spikes on Google Trends in places such as Australia and the Netherlands. This phenomenon could be further developed to create more diverse tourism products for these markets with the potential boon of job creation."

Heritage value

Heritage sites provide iconic filming locations such as Skellig Michael in Ireland, which featured in *Star Wars*, and the Castle of Good Hope in Cape Town in South Africa, which featured in season 2 of *The Crown*. The *Outlander* series extensively features Scottish heritage sites and has had such a significant impact on tourism that some of the most visited attractions in Scotland were those featured in the television series. Glasgow Cathedral almost tripled its number of annual visitors after it featured in the show.

Film tourism is not only beneficial for heritage sites in terms of boosting visitor numbers, but this increase also brings with it significant funding to facilitate the conservation and continued existence of these sites. "In South Africa, where heritage sites rarely receive the critical funding they need, filming and the concomitant tourism can be a much-needed avenue to procure funding," Dr Charlene Herselman says.

South Africa is already considered a popular filming destination due to the variety of environmental backdrops the country can provide, the incredible technical skills available in its creative industries, and the low production costs due to tax incentives and the favourable foreign exchange rate.

"We therefore simply have to leverage the resources we have to produce film tourism products for our visitors," she adds. "The stories we tell today can become the tourist attractions of tomorrow, and inspire both physical and spiritual journeys through the medium of film."

FAST FACT

A film can be produced in South Africa at a quarter of the price it would take to produce the same quality of product in Hollywood.

Why this research matters

New pathways for tourism and film industry development could diversify the South African tourism product away from mass tourism at congested sites and safari destinations. This could lead to a dispersed offering with a better geographic spread of economic benefits and job creation. Additionally, directing traffic to off-the-beaten-track locations may lighten the load on existing infrastructure, prevent over-tourism, and help destinations stay within their carrying capacities, promoting more responsible forms of tourism.

SDG 8: Decent Work and Economic Growth

Read more on film tourism here.

Reference:
1. https://tci-research.com/

IT TAKES ONLY ONE TO BREAK THE SILENCE

Speaking up and working with the government and appropriate organisations to disclose corruption is vital. Each of us has a right to protection, and with that, comes a responsibility to break the silence on unethical practices. That's how we make today matter and change the world for the better.

Researcher:
Professor Natasja Holtzhausen-Du Toit, School of Public Administration and Management

Whistleblowers should be rewarded for their courage; instead, many pay for it with their lives. This was the case for Babita Deokaran, a senior financial officer at the Gauteng Department of Health who didn't keep quiet about the fraud she'd uncovered, and was assassinated outside her home.

At the heart of this is the David-Goliath battle between ethical people and unethical conduct, and the decision to disclose wrongdoing or to remain silent.

The United Nations and World Economic Forum estimate the global cost of corruption to be 5% of the world's gross domestic product (GDP). Based on the world's GDP for 2022 of $101 trillion, this would equate to $5 trillion a year of global stolen funds. Corruption hampers governments' ability to alleviate poverty, and provide water, better social services, education and healthcare.

One way in which to curb the onslaught of corruption is to disclose wrongdoing, commonly referred to as whistleblowing. Whistleblowers promote transparency and accountability in both the private and public sectors. Their disclosures can lead to significant societal benefits, such as exposing corruption, preventing environmental disasters and saving lives. However, whistleblowers frequently encounter severe risks, including job loss, harassment and even physical harm.

"In South Africa, where corruption is a pressing issue, the protection of whistleblowers is crucial for upholding democratic principles and human rights," says Professor Natasja Holtzhausen-Du Toit of the School of Public Administration and Management at the University of Pretoria (UP). She researches ways to support an anti-corruption system and encourage active citizenry.

It is essential that policies be drafted in such a way that whistleblowers are protected. This means that those to whom disclosures are made must be trained with regard to the procedures that should be followed; claims must be investigated by competent investigators; and a criminal justice system that follows through and prosecutes those found guilty of misconduct is required.

A human right

Whistleblowing can be regarded as part of the human rights framework, particularly relating to the freedom of expression and the right to access information. The South African Constitution calls for human dignity, the right to life, freedom of security as well as just administrative action.

However, whistleblowers often face violations of their basic human rights, including the right to work, the right to security and the right to be protected from unfair treatment. These violations undermine the moral and legal obligations of states to protect individuals from reprisals when they disclose information in the public interest. In South Africa, the only legislation specifically protecting whistleblowers is the Protected Disclosures Act (PDA), which protects against retaliation in the workplace.

"Despite formal legal provisions, the implementation of whistleblower protections remains problematic," Prof Holtzhausen-Du Toit says.

Inefficiencies in the judicial system and lack of awareness among whistleblowers about their rights contribute to the vulnerability of those who choose to disclose wrongdoing. A socio-legal perspective is necessary to understand the interpretation of laws in relation to everyday behaviour. Challenges in enforcing anti-retaliation measures often leave whistleblowers unprotected and disillusioned.

"If we want to make the fight against corruption matter, we must ensure that whistleblowers are protected," Prof Holtzhausen-Du Toit says. "In order for this to happen, a transdisciplinary approach is required that involves a multitude of stakeholders and academic disciplines. Undeniably, the actions taken by civil society have led to whistleblower protection coming to the fore. To break the silence, all stakeholders – including policymakers, the media, whistleblowers and civil society – must work together."

A 2016 report by the Organisation for Economic Cooperation and Development states the following: "Whistleblower protection is the ultimate line of defence for safeguarding the public interest."

"Corruption steals from the poor and those who disclose wrongdoing hold those in power accountable, transparent and responsible," Prof Holtzhausen-Du Toit says. "If we do not curb corruption, values and principles such as equality, human dignity and social justice are eroded. Human rights violations do nothing to protect human rights defenders which, in essence, whistleblowers are."

Ways to encourage disclosure:

- Draft policies in such a way that whistleblowers are protected.
- Train those to whom disclosures are made so that they understand the procedures that must be followed.
- Ensure the claim is investigated by competent investigators.
- Strengthen the criminal justice system to ensure that it follows through and prosecutes those found guilty of misconduct.
- Reward whistleblowers according to the severity of the misconduct they have exposed.

Can money buy honesty?

In South Africa, the discussion around a whistleblower incentive programme has sparked considerable debate. Critics argue that the ethics and motivations of whistleblowers may be compromised, questioning whether their disclosures are truly genuine or merely influenced by the prospect of financial reward.

Conversely, proponents emphasise that such incentives could encourage employees to come forward with crucial information, providing them with a sense of physical, emotional and financial security when making disclosures.

Many whistleblower laws, particularly in the United States, offer financial incentives, ranging from 10% to 30% of the monetary sanctions collected as a result of whistleblower disclosures. For example, the US Security and Exchange Commission awarded almost $279 million to a whistleblower in 2023. This not only incentivises reporting, but also encourages others to disclose information, leading to broader compliance and accountability.

In South Korea, whistleblowers are awarded between 4% and 20% of profits recovered.

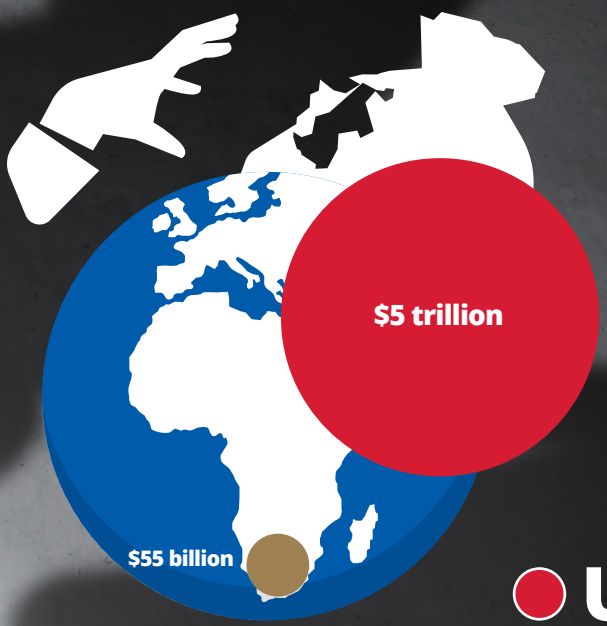
Significant financial awards can serve as powerful motivators for people to come forward and disclose wrongdoing, but it will require clear regulations in terms of the awarding of incentives.

Why this research matters

Exposing wrongdoing in the public and private sectors starts with one step – a single person having the courage to speak out. But the journey towards a better country gains momentum when we hold one another accountable, when the values detailed in South Africa's Constitution are universally enacted in the private and public sectors, and when we celebrate whistleblowing successes.

SDG 16: Peace, Justice and Strong Institutions

The scale of global fraud in 2023



US $5 trillion
Annual value of global stolen funds

US $55 billion
South Africa's GDP in 2023

Source: Figures are based on South Africa's GDP of R6.97 trillion and an exchange rate of R18 to the dollar.

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At the University of Pretoria, this is how we

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