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EXCLUSIVE

UNIVERSITY OF PRETORIA SECURES NATIONAL QUANTUM TECHNOLOGY HUB IN MAJOR BOOST FOR SA INNOVATION

GLOBAL CALL FOR COMPUTATIONAL PHYSICS RISING STARS: 2026 IUPAP EARLY CAREER SCIENTIST PRIZE OPENS

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Katlego Sebopela

"WHY NUCLEAR PHYSICS MATTERS NOW MORE THAN EVER"

Editor's Note

Dear Readers,

As South Africa grapples with stagnant research funding and the risk of losing our brightest scientific talent overseas, this edition of PC Magazine arrives as both a necessary mirror and a much-needed beacon of hope.

In the pages that follow, we celebrate the resilience and brilliance of our scientific community. We take you inside the new national quantum technology hub at the University of Pretoria—a major step forward for South African innovation, backed by five years of DSTI funding. We also report on the opening of the 2026 IUPAP Early Career Scientist Prize in Computational Physics, offering global recognition to rising stars. And we pay tribute to Professor Emeritus John Darrell Comins of Wits, a giant in optical spectrometry whose decades of leadership and mentorship have left an enduring mark on South African physics.

This issue is a testament to the fact that even in challenging times, our capacity for discovery, creativity, and progress remains boundless. We hope it inspires you as much as the work within it inspires us.

Enjoy the read.

— EDITOR-IN-CHIEF

Dr. Edwin Mapasha

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UNIVERSITY OF PRETORIA
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University of Pretoria secures national quantum technology hub in major boost for SA innovation

PRETORIA – The University of Pretoria (UP) has been selected to host a new node of the South African Quantum Technology Initiative (SA QuTI), positioning the institution at the forefront of one of the world's fastest-moving scientific frontiers and strengthening South Africa's capacity in next-generation computing, sensing and secure communications.

Quantum technologies exploit the unusual properties of matter and light at extremely small scales, enabling capabilities such as vastly increased computing power, ultra-secure communications and measurement precision beyond classical limits. Governments and industries worldwide are investing billions into the field, recognising its potential to reshape sectors including healthcare, finance, energy and national security.

The new UP-based SA QuTI hub – to be known as [QUP] – will become the sixth national SA QuTI node and will receive five years of funding from South Africa's Department of Science, Technology and Innovation (DSTI) to advance research, technology development and postgraduate training in quantum technologies.

These include quantum computing, ultra-sensitive measurement systems, and quantum-based sensing techniques, with applications ranging from agriculture and mining to cybersecurity and fraud detection.

The initiative brings together expertise from across multiple UP faculties and departments, in collaboration with partners including UP's Forestry and Agricultural Biotechnology Institute (FABI), engineering disciplines, computer science, physics, chemistry and researchers connected to the ATLAS experiment at CERN, the world's largest particle physics laboratory, located near Geneva in Switzerland. The interdisciplinary approach is designed to accelerate the translation of advanced physics into practical technologies with commercial and societal value.

Quantum technologies, local impact

"This is a significant milestone not only for the University of Pretoria but for South Africa's quantum ecosystem," said Professor Tjaart Krüger of UP's Department of Physics, who will lead the node. "Quantum technologies are expected to transform industries globally over the next decade. By establishing this node, we are building local capability so that South Africa can participate competitively in that future rather than importing solutions."

He said the research would focus on three core areas: quantum computing, quantum sensing and quantum metrology – the science of ultra-precise measurement. "Our goal is to develop technologies that solve real-world problems," Prof Krüger explained. "For example, quantum-enhanced sensors could detect crop diseases earlier, improve mineral processing efficiency, or enable more sensitive medical diagnostics. At the same time, quantum computing approaches may help tackle complex engineering simulations and cybersecurity challenges that are currently beyond classical computing."

The node will also explore emerging applications such as quantum-enhanced deepfake detection and ransomware analysis tools, aimed at strengthening digital trust and protecting financial and information systems.

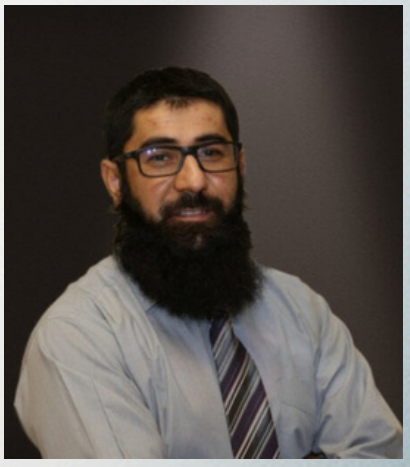
"This is about more than academic research," Krüger added. "It's about economic competitivenes skills development and creating technologies that can ultimately be commercialised."

Uniting expertise for national impact

The [QUP] project is led by Prof Krüger, at the request of UP Vice-Principal: Research, Innovation and Postgraduate Education Professor Sunil Maharaj, and with the support of the faculties of Natural and Agricultural Sciences (NAS) and Engineering, Built Environment and Information Technology (EBIT). The team includes more than a dozen principal investigators across physics, engineering, computer science and chemistry, as well as postdoctoral researchers and postgraduate students who will be supported through the programme.

Prof Tjaart Krüger

Prof Sunil Mahara



Prof Muaaz Bhamjee

Professor Muaaz Bhamjee, UP's ATLAS CERN Team Leader and one of the project's principal investigators, said the collaborative nature of the node is central to its impact.

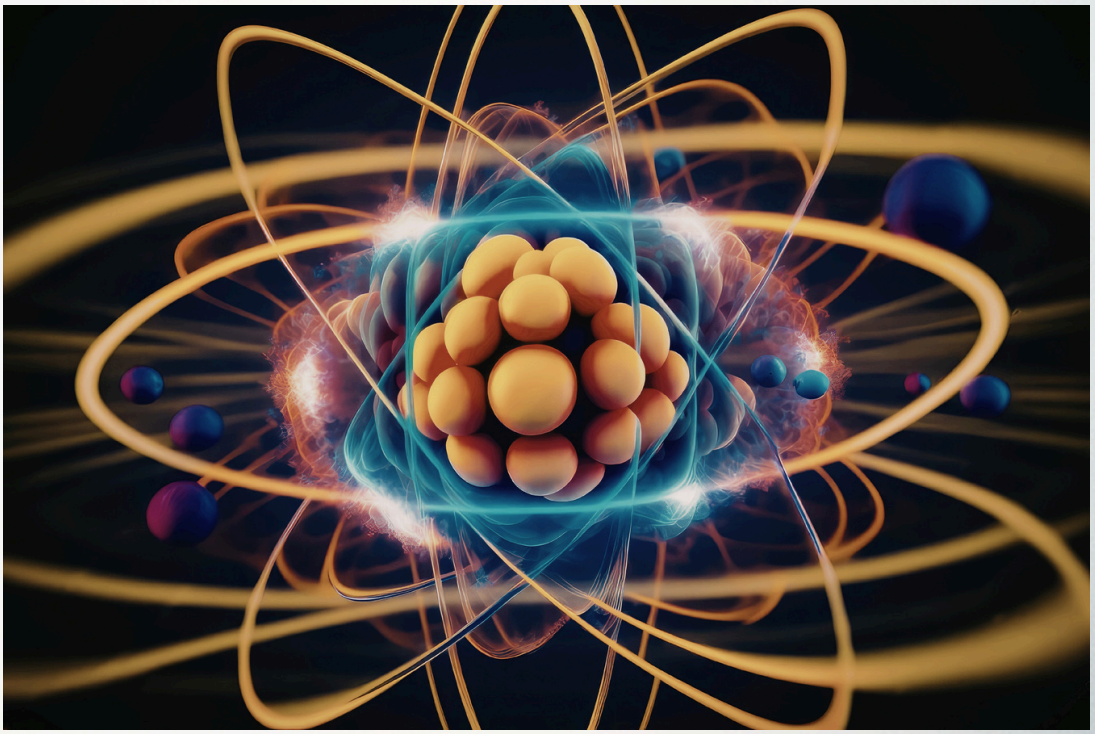
"This initiative highlights the power of transdisciplinary collaboration," Prof Bhamjee said. "We are bringing together physicists, engineers, computer scientists, chemists, and materials scientists to develop solutions that address national priorities – from industrial efficiency to high performance computing and digital resilience. The funding also creates opportunities for postgraduate bursaries, emerging researcher development and access to advanced research platforms."

He added that links with international projects, including work connected to CERN, would expose South African students and researchers to cutting-edge global science networks.

Professor Maharaj said the new node aligns with national priorities to build advanced technological capacity and develop scarce skills.

"Quantum technologies are recognised worldwide as strategic capabilities that will shape future economies," he said. "By investing in research, training and innovation in this field, we are strengthening South Africa's knowledge economy and creating opportunities for young scientists and engineers to contribute to globally significant breakthroughs."

Building a sustainable SA quantum ecosystem



Beyond research outputs, the node is expected to develop new technologies and support the development of new curricula in quantum computing and metrology, helping to prepare a new generation of specialists in a field where demand is rapidly growing internationally.
In the longer term, the team hopes the initiative could evolve into a permanent quantum research institute, further consolidating South Africa's presence in the global quantum landscape.
Krüger said building critical mass is essential. "We want to create a sustainable ecosystem – not just projects that run for a few years," he said. "That means training students, developing infrastructure, forming industry partnerships and positioning South Africa as a credible contributor to international quantum research."

For South Africa, participation in this technological wave could bring both scientific prestige and economic opportunity. "Countries that build expertise early will benefit most," Krüger said. "This node is an important step in ensuring that South Africa is part of that future."

WHY NUCLEAR PHYSICS MATTERS NOW MORE THAN EVER

By Vukosi Mashele — Cover Story

There are moments in history when a scientific field quietly moves from the margins to the center of global relevance. Today, Nuclear Physics is having exactly that moment.

As the world confronts energy insecurity, climate pressure, and technological transformation, nuclear physics is no longer just the domain of laboratories and textbooks—it is fast becoming the backbone of modern civilization's next leap forward.

TAPPING INTO THE UNIVERSE'S MOST POWERFUL FORCE

At its core, nuclear energy is remarkably simple to describe—even if its implications are profound. It is the power of the Strong Nuclear Force in action: the fundamental "glue" that binds protons and neutrons together inside the atomic nucleus. When we unlock that force, we access an energy source millions of times more powerful than chemical reactions like burning coal or oil.

This isn't just about electricity. It's about scale and precision. Nuclear science allows us to:

- Electrify entire cities with minimal fuel
- Treat diseases through advanced nuclear medicine
- Preserve food and improve agricultural resilience via irradiation

In short, nuclear physics turns the smallest building blocks of matter into one of humanity's most powerful tools.

THE RELIABILITY FACTOR: ENERGY THAT DOESN'T BLINK

In a world increasingly dependent on stable electricity—from data centers to AI infrastructure—reliability isn't optional.

Nuclear energy delivers what engineers call baseload power: a constant, uninterrupted supply. While renewable sources like wind and solar fluctuate with weather conditions, nuclear plants operate with remarkable consistency.

Take Koeberg Nuclear Power Station, for example. It operates at over 90% availability and can run for up to 16 months on a single fuel cycle. The numbers are equally compelling. A uranium pellet weighing just 20 grams can produce as much energy as roughly 1,000 kilograms of coal. That level of energy density is unmatched. And the future? Even more promising. Thorium—a potential alternative nuclear fuel—is significantly more abundant than uranium.

Combined with innovations like fast breeder reactors, which can generate more fuel than they consume, nuclear energy moves from being finite to effectively sustainable.

SOUTH AFRICA'S JUST ENERGY TRANSITION—WITHOUT SACRIFICE

South Africa faces a unique challenge: reducing carbon emissions while preserving economic stability. The country cannot simply abandon coal overnight. It underpins industry, employment, and economic output. This is where nuclear physics becomes not just relevant—but essential.

Through the lens of the Paris Agreement, nuclear energy offers a path forward. It provides large-scale, carbon-free power without dismantling industrial capacity. In other words, it enables a Just Energy Transition—one that protects both the environment and the economy.

KOEBERG: THE QUIET BACKBONE OF THE GRID

Often overlooked in public discourse, Koeberg is arguably the most reliable performer in South Africa's energy fleet. Generating about 2 GW—roughly 5% of the nation's electricity—it delivers power at a cost of approximately 40–50 cents per kWh. More importantly, it does so consistently, cleanly, and without interruption. While other sources struggle with variability or maintenance cycles, Koeberg remains a steady force—proof that nuclear energy is not theoretical, but already working.

ENERGY SOVEREIGNTY IN AN UNSTABLE WORLD

Perhaps the most compelling argument for nuclear physics today is geopolitical.
Energy is no longer just an economic issue—it is a matter of sovereignty. Countries dependent on fossil fuels are exposed to global price shocks, currency fluctuations, and geopolitical tensions.
Even with regional oil reserves in countries like Angola and Nigeria, pricing is still dictated by global markets and the US dollar. Nations that control their energy supply control their future
France demonstrated this in the 1970s by pivoting aggressively to nuclear power, insulating itself from oil crises and achieving long-term energy stability. South Africa stands at a similar crossroads. Reimagining Industry: Nuclear Meets Innovation.

The implications of nuclear physics extend far beyond electricity generation. Consider companies like Sasol. By integrating nuclear reactor heat into industrial processes such as coal gasification, it becomes possible to dramatically reduce both costs and carbon emissions. This is where nuclear physics transitions from energy solution to industrial revolution. Imagine smart cities powered by nuclear grids. Electric vehicles charged by constant, carbon-free energy. Manufacturing sectors operating without the fear of blackouts. This vision—sometimes described as a “nuclear-powered future”—is not science fiction. It is a strategic pathway grounded in physics.

THE CASE FOR NOW

Why does nuclear physics matter now more than ever?
Because the stakes have never been higher.

- Climate targets demand clean, scalable energy
- Digital economies require uninterrupted power
- Nations seek independence from volatile global markets

Nuclear physics sits at the intersection of all three.

It offers not just a solution—but a foundation. A way to power economies, stabilize societies, and unlock innovation at a scale few other technologies can match.
The atom, once feared, is now one of humanity’s most promising allies.
And in the race to define the future, those who understand—and harness—it will lead.

PC Magazine brings readers exclusive, in-depth interview with Katlego and Vukosi available now on our YouTube channel: ***South African Institute of Physics***.

REMEMBERING PROFESSOR EMERITUS JOHN DARRELL COMINS (1943- 2026)

Wits mourns the passing of Professor John Comins

It is with profound sadness that the school of physics at the university of Witwatersrand, announces the passing of one of its own very esteemed academic, Professor Emeritus John Darrell Comins. Professor Comins passed away peacefully last week at the age of 83, leaving behind a legacy of more than three decades with passion and dedication in the scientific rigour, mentorship and leadership in the field of Physics at Wits. He is remembered fondly by his daughter as a dedicated family man and an academic. “My father spent most if academic life at Wits university until his retirement in his 70s and he sadly passed away last week at 83”, she shared. “As it has been some time since he left Wits, I am not sure how many of his colleagues or students may still be at the university, but I wanted to ensure those who knew him had the chance to pay their respects”.

A DISTINGUISHED CAREER

Professor Comins’ academic trajectory was marked by steady ascent and groundbreaking work. After graduating with his PhD in 1970, he rose through the ranks, obtaining the rank of Associate Professor in 1981. In a statement to his expertise, it was brought forward that he was promoted ad hominem to the position of professor of Optical spectrometry in 1990, a niche field in which he became a global authority. He had advanced to the special list of professors by 1993, and in 1994 he was Acting Head of the Department of Physics, a role he honoured until 1997. Beyond the classroom, Professor was involved in shaping the administrative and research future of the university, he was dedicated and deeply involved with the Schonland Research Centre for Nuclear Sciences, serving as chairman of the Search Committee for the Chair of Physics/ Directorship from 1994 to 1996. He then became a chairman of its interim Governing Committee, overseeing a significant restructure of the Centre in 1997.

In 1997, he was made director of Wits-NRF Raman and Luminescence laboratory when Wits and National Research Foundation established in as NRF facility, this was one of his profound achievements.

‘His leadership carried on to flourish into the new millennium. By 2023, he was appointed Professor of solid-State physics, also occupying the role of Chairman of the Material physics Research institute. In 2024, he was appointed director of the departmental of science and technology (DST)/ NRF Centre of excellence in Strong materials which is a position he held with distinction from 2004 to 2007. He remained active as Research Professor even after his retirement.

MEMORIAL SERVICE

A memorial service was held to celebrate the life and work of Professor Comins . The university extends its heartfelt condolences to his daughter, wider family, friends, colleagues and students who had the privilege to learn and work alongside with him. He will be remembered for his guidance and steady hand in guiding Wits’ physics community through decades of significant growth and shaping the future. Rest in peace Professor Comins, you will always be remembered, your light in the laboratory will not be forgotten.

Global call for computational physics` rising stars: 2026 IUPAP Early Career Scientist Prize Opens

The International Union of Pure and Applied Physics (IUPAP) has officially opened nominations for its prestigious 2026 Early Career Scientist Prize in Computational Physics, offering global recognition to exceptional researchers shaping the future of stimulation driven discovery.

The prize, administered by IUPAP`s Commission on Computational Physics (C20), will reward 1000 euros, a commemorative medal, and a certificate to the winner, who will also be invited to deliver a talk at the 37th IUPAP international Conference in Computational Physics (CCP2026) in Seoul, South Korea, from August 9-a4 2026.

Honouring Original Scientific Excellence

Established by IUPAP in 1996, the Commission on Computational Physics (C20) promotes the exchange of information among the international community of physicists engaged in computational studies of physics related problems. Through its early Career Scientist Prize, the commission seeks to identify and celebrate original work of outstanding scientific quality in the field.

The 2026 prize is open to nominees with a maximum of eight years of research experience following their PhD, measured as of January 1, 2026. Career interruptions are taken into account, and nominees must be the principal performers of the work for which they are recognised.

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How to Nominate

Nominations must be submitted via email to Professor Alfonso Muñoz at amunoz@ull.edu.es by May,10 2026. The nomination form (IUPAP- ECSP- Form- C20.pdf) is available online. Unsuccessful nominations remain active for an additional two years, ensuring promising candidates are reconsidered in subsequent cycles.

Prof. Muñoz, a full Professor of Condensed Matter and Computational Physics at the Universidad de La Laguna in Spain, has over three decades of experience in high pressure and electronic structure research.

A Legacy of Excellence

The price has a distinguished history of recognising luminaries in computational physics, Previous winners include: 2025- Prof. Felipe H. da Jornada (Stanford University), recognised for developing first principles methods advancing the understanding of excited state phenomena in two-dimensional materials. Jornada`s work relies on many body perturbation theory and open-source software for material specific predictions without empirical fitting parameters. 2024- Dr. Yang Zhang (University of Tennessee, Knoxville) honoured for innovative achievements in computational study of topological bands and quantum anomalous Hall states in two-dimensional semiconductors. 2023- Dr. Sinéad Griffin (Lawrence Berkely National Laboratory), cited for significant achievements in computational materials physics, expanding understanding of topological quantum materials and establishing new paradigms for dark matter detection. Other past laureates include prof. zhijum Wang (Chinese Academy of Sciences, 2020), Dr Noa Marom (Carnegie Mellon, 2018), and Dr Jianwei Sun (University of Texas at El Paso, 2016)

About CCP2026

The 37th IUPAP conference on computational physics (CCP2026) will take place in Seoul, South Korea from August 9-14, 2026. The winner will receive their prize and present at talk at this gathering of the global computational physics community.

For more information or to submit a nomination, contact Prof. Alfonso Muñoz at amunoz@ull.edu.es. The deadline for submissions is May,10 2026.

This announcement is reported with permission from the IUPAP Commission on Computational Physics (C20).