



Connecting Quarks to the Cosmos and People to Science

Dr Thuthukile Khumalo (iThemba LABS & NITheCS)

Monday, 18 May 2026 | 16h00–17h00 SAST

HOW TO ATTEND:

In person (main venue):

- Road House Cinema (Neelsie) Stellenbosch University

Watch at satellite venues:

- Room P215, 2nd Floor Physics Building University of the Witwatersrand
- Seminar Room K310 Physics Building G5 North-West University

Online (live stream)

--- Please note, a recording of the lecture will be published on the NITheCS YouTube channel following the event ---

ABSTRACT

Neutron stars are among the most mysterious and extreme objects in the universe. These city-sized "stellar laboratories" offer a unique window into the fundamental nature of matter. This talk explores the profound connection between the subatomic world of quarks and the macroscopic scale of the cosmos, tracing a journey from the early universe at the Big Bang to ultra-relativistic heavy-ion collisions at CERN's Large Hadron Collider (LHC). Drawing from early research at NITheP (now NITheCS) in 2018 under the mentorship of Prof Azwinnini Muronga, the speaker will discuss how statistical mechanics allows for the estimation of particle densities during the hadronic stage of the Quark-Gluon Plasma (QGP). These microscopic insights are then scaled to the core of neutron stars to examine how the Equation of State (EoS) governs the stability and structure of these cosmic remnants.

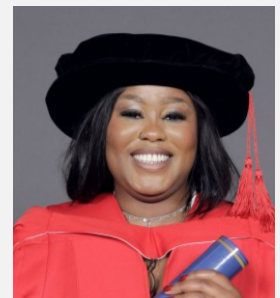
Beyond the equations, science is fundamentally a human endeavour. The presentation shares a personal trajectory within NITheCS – evolving from a 2018 intern to a coordinator of national programmes. Central to this journey is the belief that to understand the cosmos, we must first empower the people. The speaker will highlight efforts in science engagement, specifically through the Carpentries Software Workshops, the annual Coding Summer Schools, internship programmes, and National Science Week. These initiatives bridge the critical gap between coding proficiency and cutting-edge research, ensuring that the next generation of South African scientists is equipped to unlock the secrets of the universe.

BIOGRAPHY

Dr Thuthukile Khumalo is a Postdoctoral Fellow at iThemba LABS specialising in experimental nuclear physics. She will join the School of Physics at the University of the Witwatersrand starting 1 June 2026 as a lecturer. She earned her PhD from the University of the Witwatersrand in 2024, where her research investigated the microscopic nature of the Pygmy Dipole Resonance (PDR) in 96Mo. The PDR helps constrain the parameters that govern the asymmetric part of the Equation of State (EoS), which is essential for calculating neutron star properties.

Her journey with NITheCS began in 2018 as an intern at Nelson Mandela University, applying statistical mechanics to heavy-ion collisions. Between 2020 and 2024, she transitioned into a mentorship role, tutoring graduate topics such as neutron stars and core-collapse supernovae. A dedicated leader in science engagement, she manages the Carpentries Software Workshops and serves on the organising committee for the annual CHPC-NITheCS Coding Summer School.

In recognition of her work, she received the Best Young Researcher award at the COMEX7 international conference in Italy in 2023.



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