UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
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# NEWS RELEASE
# Dr Charissa Button becomes UP's first PhD graduate in Astrophysics

***Dr Charissa Button and Prof Roger Deane***

PRETORIA - Dr Charissa Button has made history by becoming the University of Pretoria's (UP) first PhD graduate in Astrophysics. She was capped during the University's autumn graduation ceremonies.

"I am excited to see UP growing in astronomy, especially as the Square Kilometre Array (SKA) and MeerKAT are such important, high-profile international projects," said Dr Button of the two projects in which UP is involved. "I am honoured that my PhD constitutes a milestone in developing UP's astronomy programme. I look forward to continuing to contribute to its development as an early-career researcher."

Dr Button completed her degree under the supervision of Professor Roger Deane, who established UP's Radio Astronomy Research Group in 2018. Prof Deane now serves as an Extraordinary Professor in the Department of Physics in the Faculty of Natural and Agricultural Sciences, and is the Department of Science and Innovation/National Research Foundation SARChI SKA Chair in Radio Astronomy at the University of the Witwatersrand.

"Dr Button's PhD is an excellent example of how a bright young mind can use the power of smart algorithms and big data to make new important cosmic discoveries with next-generation telescopes like the Square

Kilometre Array," Prof Deane says. "I'm excited that we'll soon be able to test her predictions with the SKA, building on a strong foundation of experience with MeerKAT."

Dr Button first became interested in pursuing postgraduate studies in radio astronomy because of its unique perspective in exploring several fundamental questions in physics, such as the nature and effects of dark matter, and the expansion of the universe.

"During my studies in radio astronomy, I became interested in the vast array of physical processes that contribute to galaxy formation and evolution," she explains. "This has included the neutral atomic hydrogen gas (HI) found in the outer discs of spiral galaxies, as well as hydroxyl megamasers (OHMs), typically found in the inner regions of merging galaxies, which both provide valuable information on the star formation taking place in these galaxies. Due to the intrinsic faintness of these emission lines, studies of them have historically been limited to the nearby universe.

"In my PhD, I explore gravitational lensing as an approach to probe the more distant universe. Gravitational lensing, which Einstein predicted in his general theory of relativity, arises when a massive object, like a galaxy, lying in the foreground of a more distant galaxy, bends the light rays from the distant galaxy (like a raindrop on a window), thereby amplifying the signal of the distant galaxy that would otherwise be too faint to detect with current instruments. My thesis explored methods for finding gravitationally lensed HI sources and OHMs in upcoming SKA surveys, which will significantly increase their scientific yield."

Dr Button adds that she had been pursuing postgraduate studies in astronomy when the Event Horizon Telescope collaboration published the first image of a black hole.

"However, Prof Deane's involvement in the collaboration and his standing in the South African astronomical community ultimately influenced my decision to undertake my PhD studies under his supervision," she says. "The wide range of discoveries that telescopes like MeerKAT has produced is inspiring; it is an exciting time for postgraduate and postdoctoral research opportunities in South African radio astronomy."

Dr Button would like to continue her research in exploring galaxies in the distant universe with gravitational lensing.

"My position as a postdoctoral fellow at UP will enable me to do so," she says. "I aim to build on international collaborations developed during my PhD with the Universities of Oxford and Western Australia as I pursue a broader research portfolio. UP's membership of the Inter-university Institute for Data-Intensive Astronomy has facilitated such partnerships, in addition to the high-performance computing and expert software support that made my computationally intensive PhD results feasible on a three-year timescale."

Dr Button did her PhD full-time thanks to funding from the South African Radio Astronomy Observatory (SARAO); she is now a SARAO postdoctoral fellow at UP.

"It's been a fantastic return to my alma mater, as I started my undergraduate studies in Physics at UP in 2014 and completed my honours in the subject in 2017. I then pursued a master's in Radio Astronomy at Wits University and returned to UP in 2020 to start my PhD studies under the supervision of Prof Deane.

During her studies, she recalls presenting her research at the annual SARAO bursary conference.

"This allowed me to see the diverse range of topics that other research groups around the country are interested in and to hear from international speakers," Dr Button says. "Also, last year, I attended a conference in Bristol in the UK, and also visited one of the research groups at the University of Oxford. This was an excellent opportunity to engage with the broader international radio astronomy community and start developing collaborations that I plan to continue building as I begin my postdoctoral fellowship."

"It is exciting for a new research group like the Radio Astronomy group to reach this milestone, having been built from the ground up and now seeing the fruits of that investment after many years of work," said Prof Chris Theron, Head of the Department of Physics. "Dr Button joining the Department of Physics as a SARAO postdoctoral research fellow, after having done her undergraduate degree here, is a proud moment for the department and a significant step for radio astronomy's continued growth and success."

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## ABOUT THE UNIVERSITY OF PRETORIA

The University of Pretoria (UP) is one of the largest contact and residential universities in South Africa, with its administration offices located on its Hatfield Campus in Pretoria. This 115-year-old institution is also one of the largest producers of research in South Africa.

Spread over seven campuses, it has nine faculties and a business school, the Gordon Institute of Business Science (GIBS). It is the only university in the country with a Faculty of Veterinary Science, which is ranked the best in Africa. UP has 120 academic departments and 92 centres and institutes, accommodating more than 56 000 students and offering about 1 100 study programmes. It has the most academic staff with PhDs (70%), NRF-rated researchers (613).

The 2024 Times Higher Education subject rankings placed UP first in South Africa in the fields of Law, Veterinary Science, Accounting and Finance; Agriculture and Forestry and Electrical and Electronic Engineering. Quacquarelli Symonds (QS) ranked the University among the top five in Africa, as part of their 2024 World University Rankings (WUR). UP was the only South African university featured in the 2023 World University Rankings for Innovation (WURI), falling within in the 101-200 range of innovative universities.

For more information, please go to www.up.ac.za