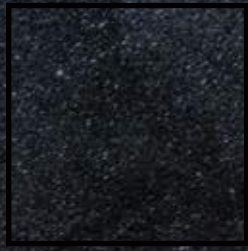


20 YEARS OF NASSP





20 YEARS OF NASSP



science & innovation

Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA



National
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FOREWORD

FOREWORD

NASSP HAS BEEN INTEGRAL
to the creation of the next generation of astronomers and space scientists



Participants in the NASSP@20 symposium in January 2024 at UCT.

The South African National Astrophysics and Space Science Programme (NASSP) celebrated its twentieth anniversary in 2024, focusing on the achievements of its graduates. This book and a symposium were the result.

These celebrations showed us that NASSP touched countless students, providing a world-class education and a vast variety of research opportunities. We start with a brief history of NASSP and its growth over the last 20 years, before delving into the very diverse careers of just a few of its many graduates. NASSP has been integral to creating of the next generation of astronomers and space scientists, as well as to preparing students for a range of interesting careers outside academia.

The NASSP@20 symposium was held at UCT in January 2024. It brought together current NASSP students, alumni, supervisors, lecturers and supporters with two days of celebration, science and reflection. Video recordings of the individual presentations at that meeting are linked to the programme (<https://nassp-at20.saa.ac.za/programme/>). It is clear that the NASSP graduate community in South Africa, across the African continent and around the world is full of diversity, vibrance and excellence.

Patricia Whitelock & Rosalind Skelton • July 2024
(co-chairs of the NASSP@20 organising committee)

INTRODUCTION FROM THE UNIVERSITY OF CAPE TOWN VICE CHANCELLOR



The National Astrophysics and Space Science Programme (NASSP) saw the light of day in the Science Faculty at the University of Cape Town (UCT), during my deanship of the faculty. The first group of students joined in 2003, so NASSP had, and continues to have, a special significance for me.

NASSP began at a time when there was strong national support for space science as an avenue for development. A national review of astronomy was followed by government support for the Southern African Large Telescope (SALT). That far-sighted decision – to allocate significant funding to a scientific project at a time of multiple urgent demands on the national fiscus – shows an understanding of its developmental impact well beyond astronomy. This was followed by further major development in the form of the Square Kilometre Array (SKA) and the MeerKAT Radio Observatory, the pathfinder to the SKA.

NASSP was based on a clear understanding of the breadth of careers that graduates, with their quantitative, modelling and computational skills, would be equipped with to pursue. This argument has been borne out by the spectrum of destinations and careers in which NASSP graduates are making their mark.

The success of NASSP lies first and foremost in its collaborative structure, with strong inter-departmental and inter-institutional collaboration, and an innovative teaching model. UCT served as host for the first decade. But now we have three nodes, with the addition of the University of KwaZulu-Natal and Northwest University.

It is important also to acknowledge the role of national facilities and agencies. The South African Astronomical Observatory, the SA Radio Astronomy Observatory, and the South African National Space Agency are core components of a consortium supporting the programme.

NASSP has to date graduated 465 Honours students and 229 Master's students, with a further 50 in the pipeline.

It is gratifying to note the many graduates from other African countries. It is important not only to celebrate this connection, but also to strengthen it and extend its reach to include students from African countries not thus far represented in the NASSP student body.

The African connection is certainly important for NASSP, but also for the continent, which has so much to offer global science. NASSP's impact on African research and development activity is highlighted by the award to South Africa to host the quadrennial General Assembly of the International Astronomical Union in August 2024, the first time an African country has been honoured in this way.

These developments have resulted in South Africa in particular, and Africa generally, becoming a real partner in global scientific research and development in astronomy and space science. NASSP graduates and academics are sought after as collaborators and our institutions are recognised for their superb teaching and research programmes.

All this has been made possible by the partner universities and national facilities that are such an integral part of NASSP, and which have contributed to making it such a wonderful achievement.

*I warmly congratulate NASSP on its 20th anniversary
and extend my best wishes for the programme to continue to grow and flourish.*

Sincerely
Emeritus Professor Daya Reddy

Vice-Chancellor interim
University of Cape Town

MESSAGE FROM THE NASSP PARTNERSHIP CHAIR

In 2003, the National Astrophysics and Space Science Programme (NASSP) welcomed its first cohort of students, marking the beginning of a transformative journey. In celebration of 20 years of NASSP, we reflect on the remarkable achievements of the NASSP graduates and the considerable growth of the astronomical and space science communities. Over the past two decades we have developed world-class astronomical facilities such as SALT and MeerKAT, set up a national space agency and space-weather forecasting unit and, through many projects that span the globe, taken massive strides towards better understanding our universe.

NASSP Vision

To create human capacity in astronomy, big data and space physics, particularly in under-represented communities, and to build a cohort of scientists at the core of an international network of African astronomers, big data scientists, space physicists and citizens, who are bonded by the common experience of schooling, interlinked both professionally and personally and able to make a major contribution to the transformation of society.

We are grateful to the Department of Science and Innovation and the National Research Foundation for their steadfast support of NASSP. Serving as the primary sponsors of student funding since inception, they have played a pivotal role in enabling the success of the programme. Their generous contributions have not only covered a significant part of this book and the related symposium, but have also played a crucial role in shaping the achievements of the graduates.

By the end of 2023, 465 Honours and 229 Master's students had graduated through NASSP. Graduates of NASSP have gone on to have an impact far beyond academia, with many of them embarking on highly successful careers across diverse sectors, including data science, finance, education, engineering and government, as well as in science. To get more information on the careers of the graduates, a survey of NASSP alumni was done in mid-2023. The response was fantastic, with 242 people completing the survey and indicating overwhelmingly positive reflections on their time in NASSP. It's unfortunately impossible to present all of the wonderful stories in one book, but the authors of the book hope to give the reader a flavour of the accomplishments of NASSP's graduates and the contributions they are making in South Africa and across the world. Thank you to all who responded to the survey and contributed to the book and 20th anniversary symposium!

The progress that has been made in astronomy and space science in South Africa is directly tied to the considerable investments that have been made into human capacity development programmes like NASSP. While financial support from the government and other organisations has been essential, it is the vision, time, and effort of those who formed, led, supported and administered it over the years that has led to its considerable success. Sincere thanks to all!

As you will read in this book, NASSP is a collaborative effort that spans different universities, national facilities and even scientific fields. It is a fantastic example of what can be achieved by working together towards a common goal. I am proud to have been part of NASSP as a student, lecturer, supervisor and more recently as the NASSP Partnership Chair, and I look forward to a bright future for NASSP and its graduates.

Rosalind Skelton



1

A BRIEF HISTORY
OF NASSP

1.1

SOUTH AFRICAN ASTRONOMY IN 2000: FACILITIES

In the year 2000, there were several astronomical facilities operating in South Africa. Representing optical and infrared astronomy, the South African Astronomical Observatory (SAAO) maintained four telescopes, the largest with an aperture of 1.9m, and the new 1.4m Infrared Survey Facility (IRSF) run jointly with Japan that was opened that same year. Radio astronomy primarily involved the 26m dish at Hartebeesthoek Radio Astronomy Observatory (HartRAO), originally a NASA satellite tracking facility. SAAO and HartRAO were National Facilities managed by the National Research Foundation (NRF). At the high energy end of the spectrum, the High Energy Stereoscopic System (H.E.S.S.), a European led project with South African involvement, was about to start operations in Namibia, from where it would detect the very highest energy gamma-rays. Also by 2000, construction of SALT had been approved by Cabinet, though it was not yet fully funded and construction had not begun. This telescope, projected to be the largest in the Southern Hemisphere, represented a major increase in the facilities potentially available to South African astronomers.

1.2

SOUTH AFRICAN ASTRONOMY IN 2000: PEOPLE

The South African community that conducted research with these facilities included fewer than 40 PhD scientists. Only SAAO had a critical mass of astronomers (13 PhDs), while HartRAO had only five radio astronomers, and another 15 researchers were distributed amongst six universities. The largest university group was at UCT, though they were spread over three different departments (Astronomy, Physics, Mathematics & Applied Mathematics) with expertise covering a wide range of theoretical and observational astronomy.

Appreciating the significance of the SALT, the then President of the NRF, Khotso Mokhele, initiated a planning process to prepare the community to make best use of this telescope while at the same time looking to the future and the next big scientific project. There were a series of meetings starting in early 2001 that set the strategic course for astronomy. This led ultimately to the development of radio astronomy and the formation of the South African Radio Astronomy Observatory (SARAO) following the decision by the SKA international Consortium for South Africa and Australia to co-host the SKA radio telescope.

The small number of South African astronomers, and the extreme lack of black astronomers (in 2000 the only SA black PhD astronomer was Aroon Beesham, a theoretical cosmologist at the University of Zululand) was a serious threat to SALT and any future development of astronomy in SA. Recognizing this, Patricia Whitelock initiated a process to rectify the situation that eventually led to the National Astrophysics and Space Science Programme (NASSP).

1.3 EARLY DAYS OF NASSP

Clearly, training more astronomers was going to be the priority. Only UCT and the University of South Africa (UNISA) had any undergraduate astronomy teaching, but they produced only one or two graduates every year or so. It thus made sense to start with physics graduates who would have most of the essential background to transition to astronomy research. The formal requirements meant that NASSP students would need to do an Honours degree, followed by a Master's, to be prepared to start the PhD required to qualify as an astronomer. This preparation could nominally be completed in 2.5 years, and had the advantage that those who, after one year, did not wish to progress in astronomy could exit with an Honours degree and the essential experience to contribute to the data science needs of a broad range of industries. Some, such as banking and the finance sector were already established, others only started around the time that NASSP was developing. The initiative was broadened by allowing students to study space physics as well as astronomy. At that time there were strong groups at the University of Natal and at Potchefstroom University for Christian Higher Education, as well as at the Hermanus Magnetic Observatory (then a National Facility of the NRF, later to become the South African National Space Agency). Furthermore, the strong government interest at the time in the African Union's New Partnership for Africa's Development (NEPAD) facilitated the involvement of students from elsewhere in Africa.

A critical challenge throughout the 20 years of NASSP – as important now as it has ever been – has been the competitive nature of the universities, driven in part by their funding realities. This dictated the early focus of preparing students to be ready to commence a PhD degree, rather than to complete one. Individual universities insisted on training their own students; such students were, however, in very short supply in the country.

In 2002 a meeting was convened to decide where NASSP should be hosted. Representations were made by Justin Jonas for Rhodes University, Christo Raubenheimer for Potchefstroom, and Peter Dunsby for UCT. The meeting concluded that UCT was the best choice by virtue of both its own expert staff and its proximity to and support from SAAO. This decision was agreed to apply for the first five years, after which the question should be revisited.

SOUTH AFRICAN

NATIONAL ASTROPHYSICS AND SPACE SCIENCE PROGRAMME

POSTGRADUATE STUDIES

Are you interested in some of the biggest and most challenging questions, like the nature of the Universe, life on other planets and the origin everything around us? Well then Astrophysics and Space Science might be for you!

If you have a degree in Physics, Mathematics or Engineering then you may be eligible to take an Honours or Masters degree in collaboration with one or more of the NASSP partner institutions.

Generous bursaries available to students from anywhere in Africa.

Details available on the website or from the address below.

NASSP CONSORTIUM

- University of Cape Town
- University of KwaZulu-Natal
- University of the Free State
- North-West University
- University of Stellenbosch
- Rhodes University
- University of South Africa
- University of the Western Cape
- South African Astronomical Observatory
- Potchefstroom Centre for Astronomy
- South African National Space Agency
- Space Research Centre (UCT)

NASSP
www.star.ac.za

The NASSP Administrator
University of Cape Town, Rondebosch 7701, South Africa
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NRF

This poster was designed at SAAO and distributed widely in 2002, prior to the first NASSP intake in 2003. It was mentioned several times during the NASSP@20 symposium by early students whom it had attracted into astronomy. This image shows an updated version (circa 2011), which includes the South African National Space Agency (SANSA) and SKA-SA. The original colours have faded, particularly those listing the consortium members.

Steering Committee circa 2002, i.e., near the beginning



Patricia Whitelock
(SAAO) - Chair



Mike Gaylard
(HartRAO)



Justin Jonas
(Rhodes)



Christo Raubenheimer
(PUCHE –
later NWU, H.E.S.S.)



Derck Smits
(UNISA)



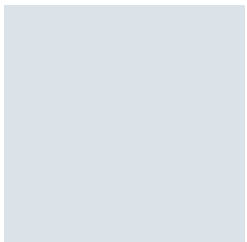
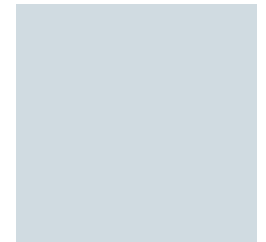
Tony Fairall
(UCT Astronomy)



Peter Dunsby
(UCT Maths and
Applied Maths)



Thebe Medupe
(University of North
West later NWU)



Pieter Meintjes
(UFS)



Catherine Cress
(University of Natal –
Pietermaritzburg,
later UKZN)



Dave Walker
(University of Natal –
Durban, later UKZN)



Lee-Anne McKinnell
(HMO, later SANSO)
joined the SC
somewhat later

1.4 CHALLENGES AND CHANGES

Funding was always a challenge, particularly at the beginning, and it was only possible to commence because of strong support from the Ford Foundation, thanks to Ahmed Bawa, together with considerable help from the Mellon Foundation, Canon Collins Trust, UCT, SAAO and HartRAO, in addition to basic grants from the NRF. Thus, in 2003 NASSP began operations with Peter Dunsby as Director and the first group of students entered UCT.

The primary problem, identified after the first few years, was that only a small number of black South Africans joined NASSP, and most of these failed or dropped out before completing their studies. The biggest challenge for students from historically disadvantaged universities (HDUs) was their very limited experience with computational physics, compounded by a complete lack of prior exposure to astronomy.

The USA National Society of Black Physicists (NSBP), and Charles McGruder (Western Kentucky, USA) in particular, were very helpful in the early days of NASSP and, with financial support from the Kellogg Foundation, brought some African American students and several lecturers to South Africa to participate in NASSP. Before that, and until recently, the NASSP lecturers were almost entirely white, so the NSBP initiative helped impress on the South African Academic Community that black students could achieve just as much as anyone else.

NASSP was governed by a Steering Committee that was chaired from 2000 until 2013 by Patricia Whitelock (SAAO), followed by Roy Booth (HartRAO) until 2015. At this stage the structure changed as NASSP transitioned to a multi-node activity, fully funded by the Department of Science and Innovation (DSI), through NRF.

The Postgraduate Bridging Programme (see section 2.0) was started in 2008 by Thebe Medupe (NWU) and Saalih Allie (UCT) with support from UCT's Academic Development programme. Students graduating from previously disadvantaged institutions entered a two year programme for their Honours course which allowed them the time and space to catch up with material they had not encountered as undergraduates. This programme has done a great deal to produce black South Africans with qualifications in astrophysics and space science.

The expansion of NASSP into three nodes (see section 3.0), starting operations in 2016, has been the most important development in recent times. Following a competitive process,



Inaugural Master's intake, with Peter Dunsby (front) & Penny Middlekoop (far left) - 2003

new nodes were opened at the University of KwaZulu Natal, initially led by Sunil Maharaj and then by Sivakumar Venkataraman, and at North West University, led initially by Adri Burger and later by Stefan Ferreira. In 2013, with a view to the future expansion, a curriculum workshop was hosted by SANSA (at the invitation of the late Lee-Anne McKinnell) at which a common core curriculum for all three nodes was established. By this time Kurt van der Heyden had taken over as Director of the UCT node, and he was followed by joint directors Sarah Blyth and Saalih Allie. All three nodes worked in collaboration with specific historically

disadvantaged institutions. Since that time NASSP has been working under a Partnership Committee with representatives from all the major partners, including DSI and NRF, most recently chaired by Rosalind Skelton (SAAO).

That NASSP has been a success can be seen from the statistics, but most clearly by the achievements of, and comments from, the graduates themselves. They wonderfully illustrate how much Africa can contribute to international science. Congratulations and thank you! That this has been possible is due to many people, including the funders and support staff at all levels, but special mention must go to all of those who lectured in NASSP as well as to those who have supervised student projects. We highlight here only two, sadly deceased, who made major contributions at the very beginning of NASSP: Okkie de Jager, from Potchefstroom (pictured) and Dave Walker, from Durban.



1.5 THE FUTURE

By about 2008 the major source of funding for NASSP was the DSI. More recently, funding has been supplemented by bursaries from a variety of sources including SARAQ, SANSA and UWC's Centre for Radio Cosmology. While this stability has made forward planning very much easier, it has also led to the unfortunate situation where there is little to no funding for students from outside South Africa. This undermines NASSP's ability to produce a cohort of African graduates bonded by the common experience of schooling – an important part of its original vision. This issue is being taken up by AfAS, which is seeking sponsors to allow for the admission of students from other African countries, possibly with the African Union. The current status is that the DSI/NRF allows 5% of the student intake to be non-South African which equates to a mere 6 students across both the Honours and Master's courses.

As the graduate survey shows, NASSP has been a great success, but its future depends on how it responds to new challenges. In the early days there was much stronger collaboration between institutions than there is today, so is NASSP still necessary now that astronomy is growing in so many universities? There is no doubt that our departments are still tiny compared to the big international schools, but the university funding model has not changed and the pressure is still to compete rather than collaborate. Unrelated, but just as important, the way NASSP teaches students to deal with new challenges, such as Artificial Intelligence, will determine if they go on being useful in industry, academia or international research. The future is potentially very exciting and we should take care not to tie NASSP too tightly to any existing structure so that it can grow as it needs to. Plans to increase student intake and/or to add additional nodes to the current three are severely hampered by the current funding regime. The annual grant increase from the DSI/NRF is always below inflation, well below the average increase in university fees and accommodation costs. If the current funding model is continued, the annual student enrolment must actually decrease, which will be detrimental to the need to produce quality graduates to support the projected growth in astronomy within South Africa and across the African continent.



These five pictures show the 2004 Honours students during the Summer School at SAO that preceded their starting at UCT.



2

THE WINTER SCHOOL AND
EXTENDED HONOURS PROGRAMME (EHP)



2023 Winter School students at SAO Sutherland with Dr Ramotholo Sefako (far right)..

Apart from the major challenge for astronomy and space science to build a community of local users for its facilities there was an understanding that the scientific complement should, in the longer term, reflect the national demographics of the country so that South African astronomy could develop into a truly “owned” and self-sustaining activity within the broader societal context. The first challenge was that astronomy was not taught at most universities, in particular at HDUs, where there was a large pool of physics graduates who could potentially be drawn into NASSP. To address this, Thebe Medupe conceived the idea of a two week long Astronomy Winter School hosted by SAAO to bring astronomy to the attention of final year physics students at HDUs. The second challenge was how to transition BSc physics graduates so that they could engage meaningfully in NASSP.



Saalih Allie

Thebe Medupe and Patricia Whitelock approached Saalih Allie who held a joint post in the Physics Department and the Science Academic Development Programme (ADP), to see how to address the issue of increasing academic participation of black South African students in NASSP. In August 2007 Patricia Whitelock and Saalih Allie submitted a proposal to the Department of Science and Technology (DST) and NRF to fund a three year pilot project aimed at increasing the diversity of NASSP, in particular black students from HDUs. The key aspects of the proposal included funding (a) students for two years during which time they would transition into astronomy and build a solid foundation for the Honours degree and (b) the Winter School, which aimed at both educating students about astronomy and recruiting them into NASSP.

The resulting academic structure, the NASSP Postgraduate Bridging Programme (PGBP), was established and convened by Saalih Allie as a shared project between the Science Faculty and the Science ADP, part of UCT’s Centre for Higher Education. The University as a whole was highly supportive of the PGBP and afforded the students full privileges even though they were not registered formally for a degree in the PGBP year.

Thus, from 2008 onwards a cycle of recruitment was started with visits to HDUs to invite 3rd year students to apply for the Winter School. These visits were largely carried out by Thebe Medupe and Ramotholo Sefako from SAAO who convened the Winter School each year. The Winter School grew in popularity over the next one-and-a-half decades with an average of 30 students per year attending, and an annual attendance of up to 50 in the years just preceding COVID-19. The universities that were represented over the years include: North West (Mahikeng), Venda, Fort Hare, Limpopo, UWC, Zululand, Nelson Mandela University, Free State (Qwa Qwa), Walter Sisulu and Sol Plaatje.

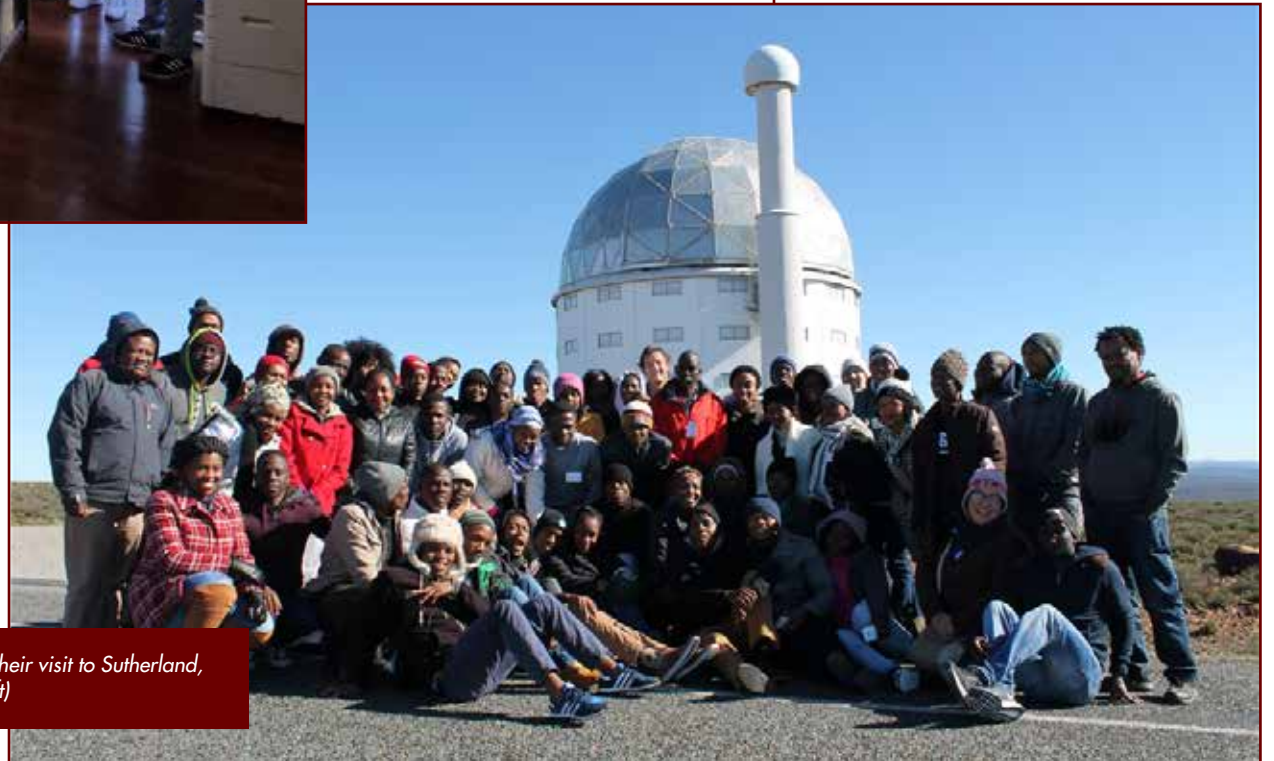


The 2024 Winter School students visit to Sutherland.

Thus, the PGBP, which relies predominantly on recruitment via the Winter School, also reflects this institutional diversity. During the period 2008–2023, 119 students entered NASSP through the UCT NASSP PGBP of whom over 100 went on to obtain an Honours degree. With the formation of the North West University (NWU) and University of KwaZulu Natal (UKZN) nodes a broadened notion of an “extended Honours programme (EHP)” was devised to accommodate the academic structures at these nodes. This has led to an additional 28 students entering NASSP at UKZN and NWU over the period 2017-2023. Overall about 75% of students who entered NASSP have gone on to register for a Master’s degree.



The 2024 Winter School students taking a tour of the Library with Dr Christian Hettlage.



Cold but happy: the 2016 Winter School students during their visit to Sutherland, with Prof Thebe Medupe (extreme left)



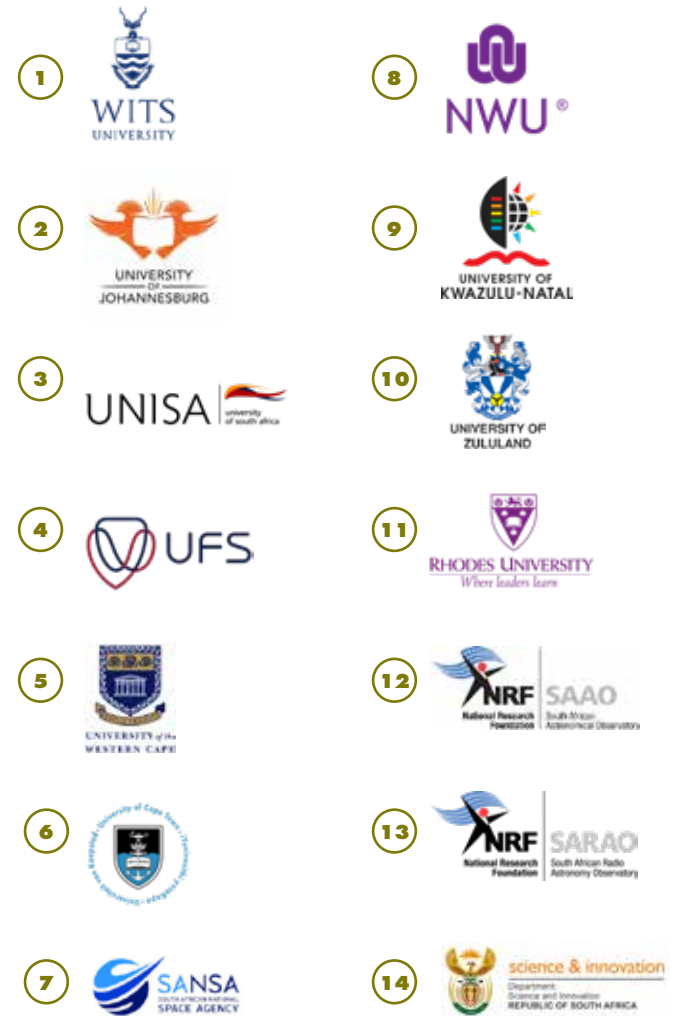
3

THE NASSP
PARTNERSHIP

The NASSP Partnership encompasses all the universities and facilities that contribute to the programme through funding, teaching and supervision. It includes the three host universities (UCT, UKZN and NWU), SANSA and the NRF and its astronomy facilities (SAAO and SARAO). At different times, different universities have been involved.

The partner universities have included University of the Free State, University of the Witwatersrand, University of Zululand, Rhodes University, University of Johannesburg and University, University of South Africa and University of the Western Cape.

THE NASSP PARTNERSHIP



3.1 UNIVERSITY OF CAPE TOWN (UCT)



IN 2008, THE IMPORTANT STEP WAS TAKEN TO START THE NASSP PGBP *to address the challenge of transformation in Astronomy in South Africa ...*

UCT has hosted NASSP since the programme started in 2003. Peter Dunsby was the first Director of the programme and oversaw it for the first 10 years, initially based in the Department of Mathematics and Applied Mathematics. In 2013, Kurt van der Heyden was appointed as Director and the hosting of NASSP moved to the Department of Astronomy, where it has been located ever since. Saalih Allie and Sarah Blyth took over as co-directors of NASSP in 2018. Patrick Woudt stood in for Sarah Blyth as co-director from the end of 2021 to mid 2023. Over the years, the directors have been strongly supported by NASSP administrative staff including at various times Penny Middelkoop, Sabastian Spitzner, Nicky Walker, Rushana Fagodien, Nomphele Lungisa and Siphelo Funani.

In 2008, the important step was taken to start the NASSP PGBP to address the challenge of transformation in Astronomy in South Africa and to encourage the participation and success of black South African students in postgraduate study in astrophysics and space science (see section 2.0).

The UCT Department of Astronomy's strengths lie in multi-wavelength observational astronomy, particularly at optical and radio wavelengths, and these focus areas have been reflected in the Honours and Master's modules offered as part of NASSP. Over the past 20 years, lecturers for the programme have been drawn from various departments at UCT (Astronomy, Mathematics and Applied Mathematics, Physics) as well as the broader South African astronomy and space science communities, including colleagues from the other NASSP nodes at UKZN and NWU, as well as from UWC, Rhodes University (RU), University of Johannesburg (UJ), University of the

Witwatersrand (Wits), SAAO, SANSA and SARAO. Several visiting international academics have also contributed short courses over the years on a variety of topics.

NASSP started at UCT in 2003 and by the end of 2023, 346 Honours students have graduated, 52% black and 31% female. Between 2005 and 2023 UCT produced 169 Master's graduates, 36% black and 28% female.

While the majority of UCT NASSP alumni are South African, NASSP has also had the participation of students from countries all over the African continent including Burkina Faso, Egypt, Ethiopia, Ghana, Ivory Coast, Kenya, Rwanda, Madagascar, Malawi, Mauritius, Morocco, Namibia, Nigeria, Sudan, Uganda, Zambia, Zimbabwe, and from elsewhere (Saudi Arabia, France, USA).

In addition to many of the NASSP graduates moving on to PhDs and jobs in academia in South Africa or abroad, the training received through NASSP has enabled the students to move into a wide variety of other jobs after graduation. Some have taken up posts at observatories around the world, including SAAO and SARAO, while others have become school educators. There are NASSP graduates in data science careers at technology companies both in South Africa and abroad. Others have become entrepreneurs founding their own companies and start-ups. We are extremely proud of the achievements of our students and look forward to seeing and hearing about their contributions to astronomy and society into the future.

3.2 NORTH-WEST UNIVERSITY (NWU)



A workshop to discuss an expanded model for NASSP was held at the NRF in November 2012. It was decided that a working goal of the expansion should be to “Build a National Astrophysics and Space Science programme that is distributed across the country while operating as a unit”. Discussions by a smaller northern group from Wits, UJ and NWU, led by Chris Engelbrecht, were held at the NRF in January 2013.

NWU submitted a bid to host what was then called the NASSP Northern node, in June 2013. The University has been training students in the Astrophysical Sciences since the 1950s, including in research in cosmic-ray physics in the Antarctic since 1964. In 1982, the then Unit for Cosmic Ray Physics constructed the Mk I gamma-ray telescope, which was in operation until the end of the 1980s, after which it was replaced with a second-generation telescope in the early 1990s. The Mk II gamma-ray telescope was decommissioned in the mid-90s in anticipation of the H.E.S.S. project. During the same time, significant progress was made with the development of numerical models to theoretically study the modulation of cosmic rays in the heliosphere, and the local group became one of the leading international groups in this field. In the early 1990s a separate research group in radio astronomy developed with an interest in studying processes related to the formation of young massive stars. Thebe Medupe and his group from the Mahikeng campus, whose expertise includes numerical modelling of stellar pulsations and observational multi-wavelength stellar astrophysics, joined the Centre for Space Research in 2013. The programme on the Mahikeng campus was tightly linked to the NASSP PGBP (later called the EHP) and the annual Winter School held at SAAO (see section 2.0). Each year, Medupe recruited students nationally for this school from HDUs. The research activities on the two campuses as well as the establishment of a DST/NRF Research Chair in Astrophysics and Space Physics in 2008 made NWU a viable candidate for a node. The bid was strongly supported by senior management, who also committed to additional office space for the additional students. The then-VC, the late Dan Kwadi, concurred with our proposed management plans for NASSP, with Adri Burger as programme director, and was very supportive of the initiative.

The NASSP Consortium’s Steering Committee eventually decided that two additional nodes would be established, one at UKZN and one at NWU. Planning for the expanded NASSP was done by the NASSP Executive Steering Committee, consisting of the three node directors, the Chair of the NASSP Consortium and an NRF representative, Yunus Manjoo. Numerous meetings followed, and NRF funding to set up the NASSP NWU node commenced in 2015, with a director and an administrative assistant, the latter position filled by Lendl Fransman since 2016.



NASSP Winter School 2019

Mahikeng Astronomical Observatory (MAO) of the North-West University (NWU) hosted the annual Winter School of the National Astrophysics and Space Science Programme (NASSP) from 28 June to 6 July 2019. The event brought together young South African final-year physics students from previously disadvantaged universities to experience and enjoy astronomy. The lectures were presented by astronomy and space science experts from the NWU’s campuses in Mahikeng and Potchefstroom, as well as experts from UKZN, and SAAO.

At NWU we decided that the best option for NASSP students would be to retain traditional semester-long courses and not to teach in blocks, given that initially all lecturers were from the Potchefstroom campus (In later years this would change). Between 2016 and 2023 71 Honours students graduated, 42% black and 38% female, while between 2017 and 2023 there were 41 Master’s graduates, 27% black and 37% female.

Upon the retirement of Adri Burger in 2020, Stefan Ferreira was appointed as NASSP NWU Node Director.

3.3 UNIVERSITY OF KWAZULU-NATAL (UKZN)



UKZN succeeded in obtaining one of the two additional NASSP nodes after extensive negotiations and discussions held within the university and with various national participants. Their strategy was a consequence of the strong academic and research groups at UKZN in both physics (space science, plasma physics and astrophysics) and mathematics (notably the Astrophysics Research Centre). Physics academics at UKZN have been involved with the South African National Antarctic Programme, the base of High Frequency Radar, for more than two decades and had strong collaborations with the Hermanus Magnetic Observatory (now SANSA). Research into space-weather, in collaboration with SANSA, is still underway at UKZN. There are also strong links with the astrophysics-cosmology research from the School of Mathematics (notably HIRAX, MeerKAT, etc.).

Historically, UKZN physics faculty contributed by teaching plasma physics and electrodynamics during the period that NASSP was based at UCT. UKZN hosted NASSP students from 2016, while formal NASSP Honours teaching started in 2017. Up to the end of 2023 UKZN had graduated 48 Honours students, 94% black and 33% women, and 19 Master's, 84% black and 26% women. The student research projects were shared equally between space physics and astrophysics. The node has been a success with strong contributions from SANSA and SARAO as well as other NASSP partner universities. Their contributions include participation in teaching and student supervision, and bursary support for a few students. Over 80% of the UKZN NASSP students have proceeded to doctoral studies.

This programme has inspired and attracted students from all over South Africa to study Physics. "This has been a great programme for the discipline and the University is fully supportive of it", said the DVC of Research & Innovation, Mosa Moshabela. The Dean of Research, Neil Koorbanally, also added that "this has been one of the flagship programmes in the College and the students from NASSP have fully participated in all College Research events, in addition to holding its own colloquia and events".

Since the formal commencement of NASSP at UKZN in 2016, Sivakumar Venkataraman has led the programme as the node director. In addition to the above activities, the UKZN node contributes to NASSP nationally by producing the newsletter and maintaining the NASSP-online portal.

This programme has inspired and attracted students from all over South Africa to study Physics.



UKZN Honours group, 2017

3.4 SOUTH AFRICAN NATIONAL SPACE AGENCY (SANSA)



SANSA came into existence in early 2011 by an act of parliament in 2010. Two existing facilities, the satellite tracking station in Hartebeesthoek and the magnetic observatory in Hermanus were incorporated into SANSA as the Space Operations and Space Science Programmes, respectively. Earth Observation and Space Engineering were newly created Programmes located with the Administration Programme at Innovation Hub in Pretoria. Today, SANSA has a staff complement of about 200 people. The Hermanus Magnetic Observatory (HMO) started life in 1932 on the campus of the University of Cape Town. In 1941, the magnetic observatory moved to Hermanus onto a 16 ha plot of magnetically clean land in order to escape the disturbing influence of the electric railway.

When HMO was incorporated into SANSA as the Space Science Programme, the small research group was dominated by white male staff members. We are proud to have grown the research group up to 21 persons and transformed it to include 12 women and 9 men of which 15 are black and 12 have PhD degrees. Over time, the equity and qualification profiles will continue to improve. SANSA Space Science in Hermanus now has about 80 staff members in Hermanus and includes the new 24/7 operational Space Weather Centre, which came to life in 2022 with a brand new building. The operational centre is run by nine Space Weather Forecasters, all of whom are black and eight of whom are women. The head of Space Weather is also a woman. The Centre was the brainchild of our late managing-director, Lee-Anne McKinnell, who passed away on 19 August 2023.



Key functions include fundamental and applied space science research, the support of space science through data acquisition, the coordination and administration of scientific data, and the provision of space weather and magnetic technology products and services on a commercial and non-commercial basis. The magnetically clean environment of the Hermanus facility contributes significantly to space systems and applications development through, for example, space qualified magnetic sensors and space weather information and impact forecasting.

SANSA is mandated to support human capital development with a focus on space science. Hence, SANSA has always supported NASSP, including delivering lectures at UCT in the early years, subsequently delivering lectures at the Space Science node at the University of KwaZulu-Natal and running a variety of week-long schools on the Hermanus campus. SANSA Space Science has also benefited itself from NASSP, namely, many of the present researchers, postdocs, forecasters and Antarctic expedition participants are graduates of NASSP. SANSA is proud to have a research group that demonstrably competes favourably with the best both nationally and internationally.

3.5 SOUTH AFRICAN ASTRONOMICAL OBSERVATORY (SAAO)



SAAO serves as the National Facility for optical and infrared astronomy in South Africa. It receives funding from the Department of Science and Innovation and operates as a National Facility under the administration of the National Research Foundation. SAAO is active at two key locations, one in Cape Town and the other, approximately 360 kilometres away, near Sutherland. The headquarters, workshops, administration offices, and staff involved in public relations and outreach are based in Cape Town on the site of the historic Royal Observatory. The telescopes are located at Sutherland, where they benefit from the dark, clear skies of the Northern Cape. They include SALT, which ranks as the largest telescope in the southern hemisphere. SAAO operates SALT on behalf of an international consortium. SAAO Cape Town also hosts the International Astronomical Union's Office of Astronomy for Development (IAU OAD) and the secretariat of the African Astronomical Society (AfAS).

SAAO employs professional astronomers, engineers, technicians and educators. When NASSP started, SAAO was the only organisation that employed any significant number of astronomers (see section 1.2), so it is not surprising that the observatory has played a leading role in NASSP since its inception. This includes lecturing and supervising/co-supervising NASSP Honours and Master's projects as well as hosting the NASSP Summer Schools and most of the Winter Schools. Trips to Sutherland to see the telescopes are recalled as highlights by many of the NASSP graduates. SAAO staff members have chaired the NASSP Steering Committee, later the NASSP Partnership Committee, for much of its history (Patricia Whitelock for the first 13 years and Ros Skelton for the last 3 years).

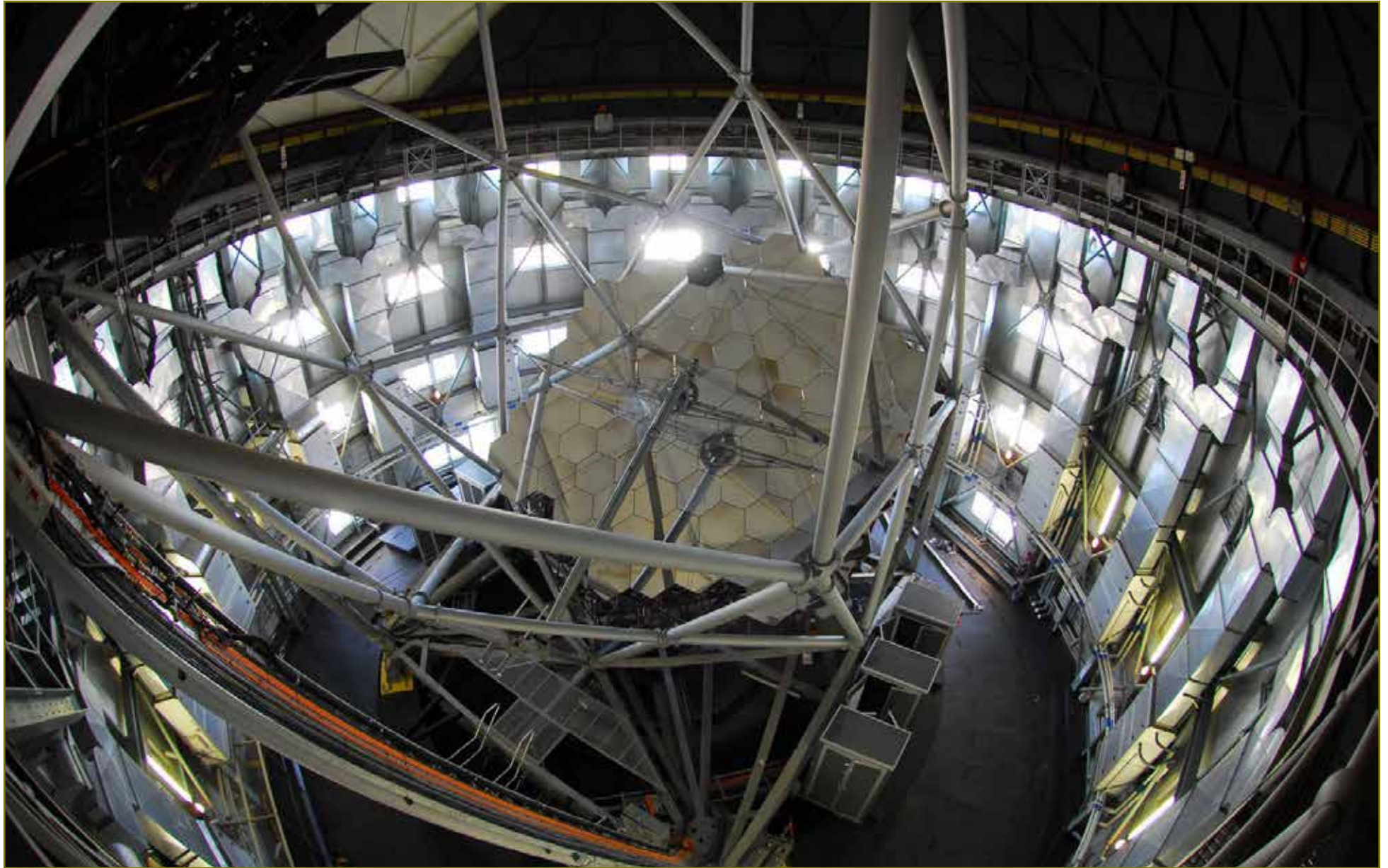
As of mid 2023, SAAO employs 29 professional PhD astronomers, including 9 NASSP graduates. NASSP graduates are also found among the SALT operators and software engineers. There are opportunities to work part time towards a PhD while performing other jobs. The various astronomers at SAAO are engaged in a wide variety of research, ranging from cosmology, though extra-galactic and stellar astronomy to solar system studies, and actively supervise postgraduate students at all levels. They also manage various aspects of the observatory, which includes observing with SALT and other telescopes, overseeing the quality of observations, writing code for data-reduction and instrument control, speaking to the media and the public, and more. Most of the research students are based at SAAO in Cape Town, and spend a small fraction of their time supporting the work of SAAO and/or the IAU OAD.



The dome housing the Southern African Large Telescope at SAAO Sutherland; in the background is the centre of our Milky Way galaxy. Credit: SAAO/SALT



SAAO Sutherland at sunrise. Credit: SAAO/SALT



The Southern African Large Telescope (SALT), which is made up of 91 individual segments each one controlled by three actuators. Credit: SAAO/SALT

3.6 SOUTH AFRICAN RADIO ASTRONOMY OBSERVATORY (SARAO)



The history of radio astronomy observations in South Africa began at the Hartebeesthoek site, located in a valley in the Magaliesberg hills, 50 km north-west of Johannesburg, in the province of Gauteng, South Africa. The Observatory began as Deep Space Station 51, built in 1961 by the National Aeronautics and Space Administration (NASA) to get data from, and send commands to, many unmanned US space probes going beyond Earth orbit. The station was handed over to South Africa in 1975 and was converted to a radio astronomy observatory. The original function of the observatory post-NASA was purely research in radio astronomy, but a new science developed at the SARAO Hartebeesthoek site from the 1980s, namely Space Geodesy, i.e. geodesy using space-based techniques.

It is in this era, in 2003, that the facility became a founding member of the NASSP partnership, under the local leadership of Mike Gaylard. Various NASSP training sessions and practicals have been held at Hartebeesthoek since 2003.

The Hartebeesthoek site was used to partially construct and build the eXperimental Development Model (XDM) dish as part of the technology development towards an SKA bid. The KAT-7 radio telescope was subsequently built - primarily as a precursor to the 64-dish MeerKAT radio telescope array as well as to demonstrate South Africa's ability to host the SKA. The international SKA Organisation announced that Southern Africa would co-host the SKA telescope with Australia on Africa Day (25 May 2012). The MeerKAT radio telescope was officially inaugurated on 13 July 2018.

Today, SARAO, as a National Facility of the National Research Foundation, is responsible for managing all radio astronomy initiatives and facilities in South Africa, including the MeerKAT Radio Telescope in the Karoo, and the Geodesy and Very Long Baseline Interferometry (VLBI) activities at the Hartebeesthoek facility. SARAO also coordinates the African Very Long Baseline Interferometry Network (AVN) for the eight SKA partner countries in Africa, as well as South Africa's contribution to the infrastructure and engineering planning for the Square Kilometre Array Radio Telescope.



From August 25 to 29, 2003, the Honours students in the programme visited HartRAO for their Radio Astronomy practical. They are flanked by Director Prof. Justin Jonas on the left, and Dr. Mike Gaylard on the right, who led the spectroscopy part of the practical. Credit: SARAO

Dr Nadeem Oozeer, Data Scientist at the South African Radio Astronomy Observatory(SARAO) facilitates a guided tour of the Observatory, in the Northern Cape, with learners from the local community. Credit: SARAO





The MeerKAT radio telescope. Credit: SARA0



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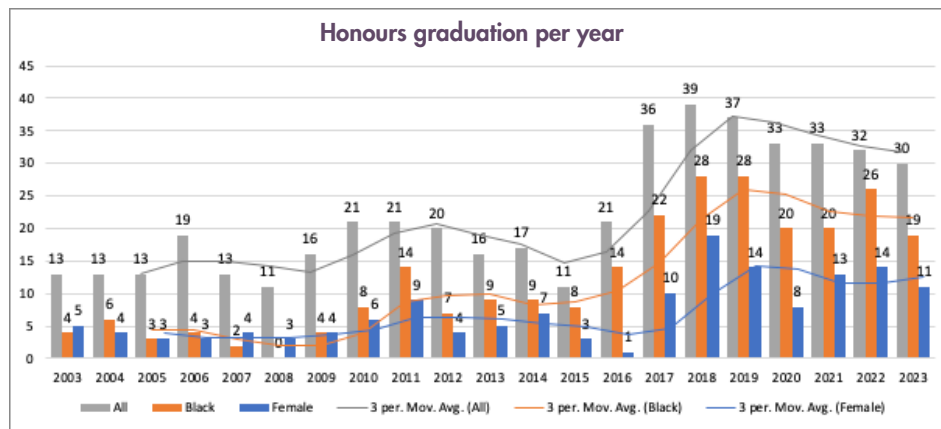
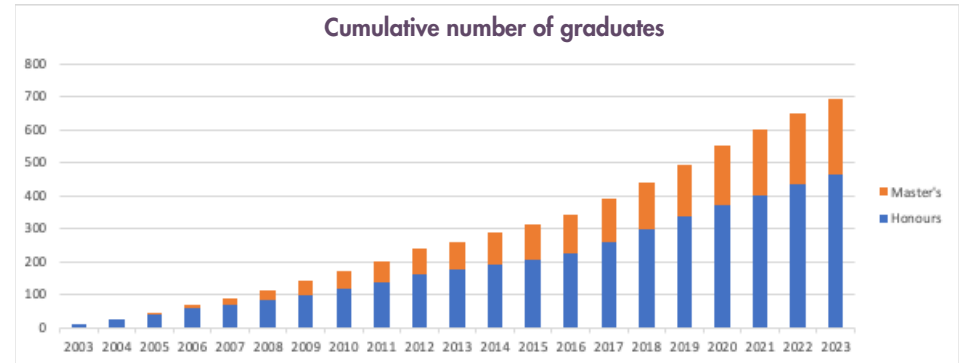
GRADUATES
OF NASSP



THE SURVEY OF NASSP ALUMNI SHOWED THAT NASSP students originate from 18 different African countries, as well as France, Saudi Arabia and the USA.

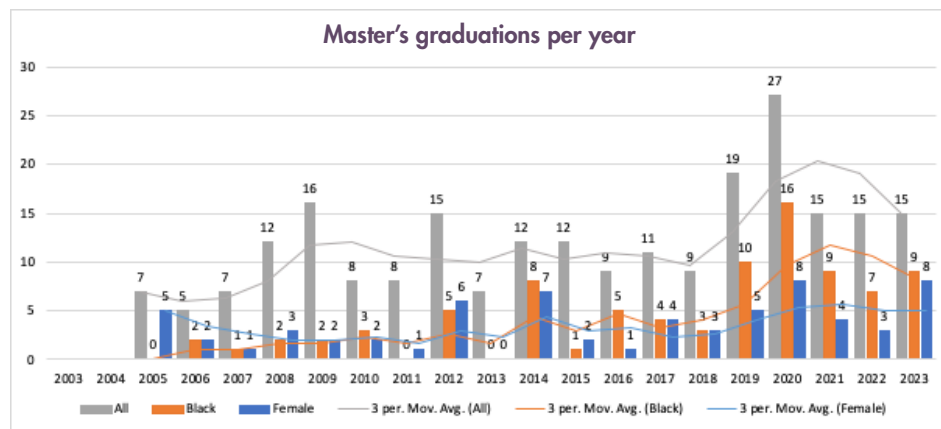
While the majority of NASSP students are South African, the early years of the programme, in particular, included many participants from across Africa and a few from other places around the world. The great diversity of cultures enriched the experience of the students, as many alumni noted in their reflections. Being part of an international network of people with a common training background has been of great importance, particularly for growing the South African and other African astronomical communities.

There have been a total of **694 NASSP graduations** since 2003: 465 students with Honours degrees and 229 with Master's. The growth of the total numbers can be seen in the chart below. Master's students who have submitted their theses, but not yet graduated are not included here. COVID-19 had a significant impact on the NASSP students, with courses being taught remotely for most of 2020-2022. Research students were unable to undertake experiments and observations for some time, and had less personal interaction with their supervisors. As a result, many students required more than the nominal two years to complete their Master's degrees. The number of ongoing Master's dissertation students was only just beginning to normalise at the end of 2023.

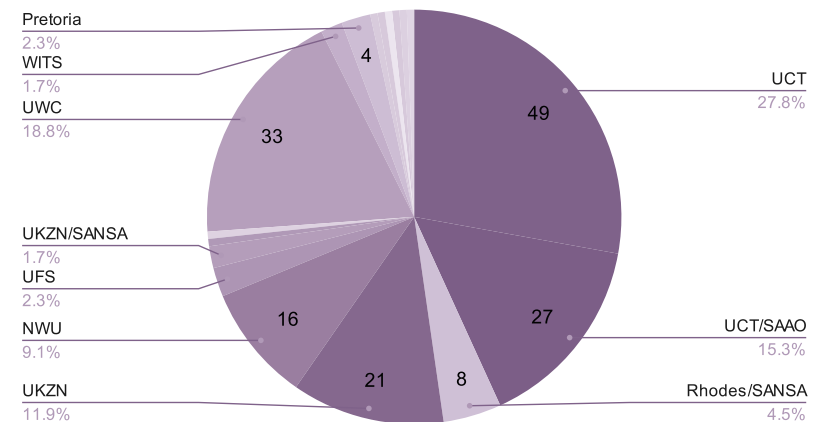


At **Honours** level, **465 NASSP students** have graduated since 2003, with an average of 22 per year over the full period. The establishment of two more nodes in 2016 led to significant growth - an average of 33 Honours students per year have graduated over the last five years. In total, 346 Honours students graduated from UCT, 71 from NWU and 48 from UKZN by the end of 2023. More than half of the Honours graduates are black South Africans (55%). Three distinct phases can be distinguished - in the first five years there were fewer than 4 black Honours graduates per year, with more graduates from other countries in Africa. After the introduction of the PGBP at UCT, the average number of black graduates rose to 9 per year, and with the addition of the NWU and UKZN nodes, it has risen to an average of 23 students per year over the last five years (68% of the total Honours graduates). Overall, 32% of the Honours graduates have been female (150 graduates) with an average of 7 women graduating per year over the full period and 11 per year over the last five years (33%).

There have been **229 NASSP students** graduating with **Master's degrees** in total, 169 registered initially at UCT, 41 from NWU and 19 from UKZN. There are an average of 12 MSc graduates per year since the start of the programme and 18 per year over the last five years. In addition, approximately one MSc student per year upgrades directly to a PhD. Of the Master's graduates, 87 (38%) are black, and 67 (29%) are female. Here again, the effect of the PGBP and additional nodes can be seen, with an average of only 1.4 black students graduating per year in the first five years (17%), compared to 10 per year over the last five years (56%). The fraction of female students varies considerably from year to year, but seldom exceeds a third of the total graduates. Over the last five years, 31% of the MSc graduates have been female and in 2023, women made up more than half of the graduates (8 out of 15). The very first Master's intake was exceptional, with five of the seven students being women!



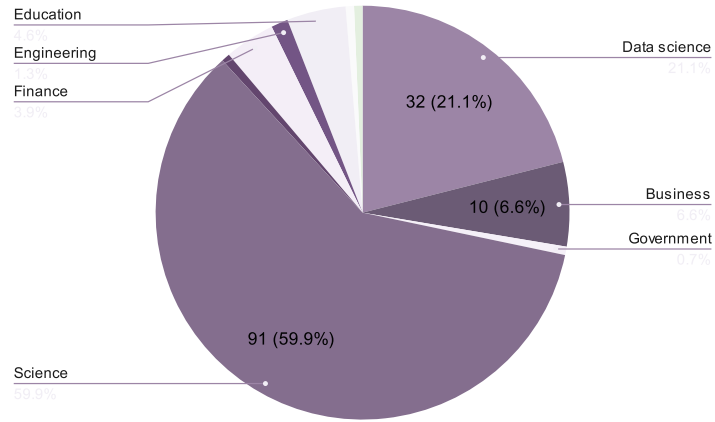
MSc Thesis Institute as reported in the alumni survey



Many of the NASSP graduates have gone on to do a PhD, with topics spanning a wide range including astronomy, cosmology, space science, data science and theoretical physics. Amongst the 240 survey respondents, 140 said they had gone on to do a PhD. Of these, 97 had graduated or expected to graduate by the end of 2023. The institutions at which PhD research was done span the globe.



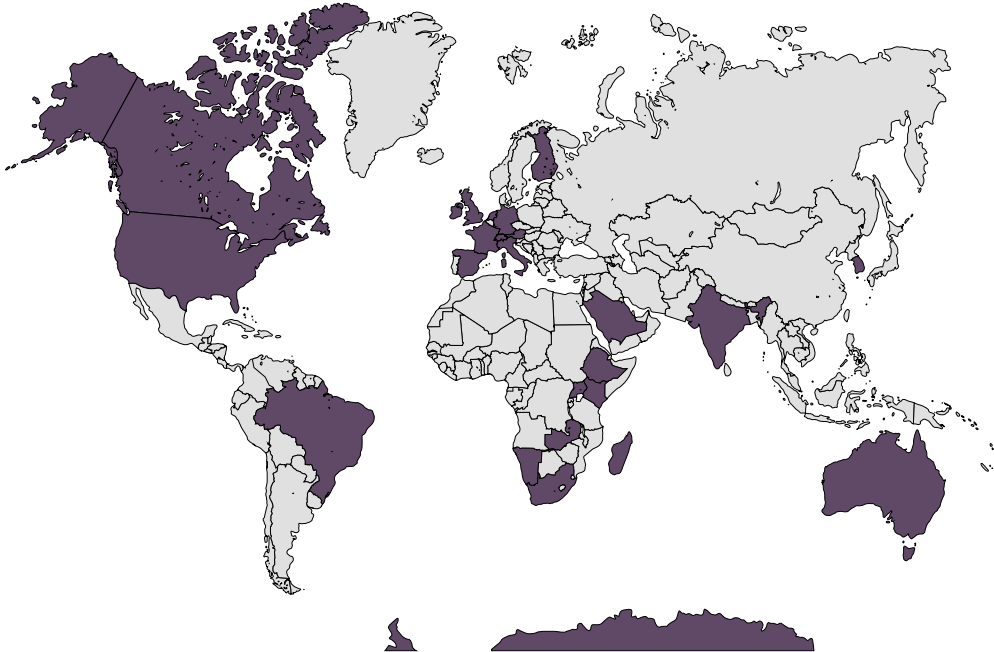
In the survey of NASSP alumni 91 of the 100 respondents who were suitably qualified by the end of 2023 had gone on to work in an academic environment, including universities, national facilities, computational and other technical facilities. 28 work at South African universities, 28 work at South African science facilities (SARAO, SAAO, SANSA, CSIR, IDIA), 17 work at African universities and 18 at other universities around the world. The next most common career is data science, where NASSP graduates work in a range of areas, from tech firms to finance to retail.



Careers of NASSP graduates as reported in the alumni survey

We highlight here just a few of the many exciting careers of NASSP graduates and of the important contributions they are making.

By early 2024 NASSP graduates could be found on all seven continents, including Antarctica!



Map of where NASSP alumni that completed the survey are based now.

4.1 GROWING THE SOUTH AFRICAN SCIENTIFIC COMMUNITY



...the South African astronomy and space science communities have seen substantial growth over the past two decades. Huge investments have been made into world-class astronomical facilities...

As discussed above, the South African astronomy and space science communities have seen substantial growth over the past two decades. Huge investments have been made into world-class astronomical facilities, including SALT, MeerKAT and SKA, providing access to big science projects across the electromagnetic spectrum. At the same time there have been great developments in the space science arena through the newly formed Space Agency. All of these activities require people with high level technical skills. Thus opportunities have also grown in academia, which must cater for the sophisticated data-handling skills required by a broad range of industries.



4.1.1 SANSA

Dr John Bosco Habarulema



- Country of origin: Uganda
- NASSP Hons: (UCT, 2005)
- NASSP MSc: Space Science, supervised by Dr Lee-Anne McKinnell (Coursework: UCT; Dissertation: Rhodes University, 2006 - 2008)
- PhD: Space Science, supervised by Dr Lee-Anne McKinnell (Rhodes University, 2011)
- SANSA, Research Scientist: space science

"I am a research scientist at the South African National Space Agency. Having benefitted from the all-round expertise provided by NASSP, I strongly believe in training others in research and teaching. I have so far supervised 8 PhD and 5 MSc students to completion as well as a number of Honours candidates. I am a B-2 rated researcher by the South African NRF."

"Indeed. The welcome committee did a fantastic job in making us feel at home. Introduction to Summer Schools where we were taught different Astronomy concepts. NASSP formed the foundation for me to progress in my research career by providing bursary to further postgraduate studies, enabling me to be in a group of diverse colleagues (we have continued to support and benefit from each other as professionals). The approach taken by NASSP, to introduce different research disciplines at Honours and MSc levels, allowed every student to make a choice they were comfortable/happy with for further research careers. I would sum up the efforts of NASSP as hugely successful."

Fondest memory: "There are many and being in NASSP was, and remains, a lifetime experience. Opportunities include touring different institutions such as HartRAO, Boyden Observatory, NWU, etc; colloquia series which featured experts in different disciplines; group activities (over pizzas); Introduction given by late Prof Tony Fairall and other colleagues; spending time in the planetarium."

Dr Zama Katamzi-Joseph



- Country of origin: South Africa
- NASSP Hons: (UCT, 2005)
- NASSP MSc: Ionospheric tomography, supervised by Dr Lee-Anne McKinnell and Dr Pierre Cilliers (Coursework: UCT; Dissertation: Rhodes University, 2006-2007/6)
- PhD: Ionospheric Physics, supervised by Prof Cathryn Mitchell (University of Bath, United Kingdom, 2011)
- SANSA, Researcher

Dr Zama Katamzi-Joseph is a space physics researcher at SANSA. She completed her undergraduate training in Physics at the University of Cape Town in 2004 after which she joined the National Astrophysics and Space Science Programme for BSc Hon and MSc training. After completing her MSc with distinction at Rhodes University in 2007, she went on to do her PhD at the University of Bath (UK) and graduated in 2011. She has won several awards including the American Geophysical Union's Sunanda and Santimay Basu (International) Early Career Award in Sun-Earth Systems Science, the International Union of Radio Science's (URSI's) Young Scientist Award and Ikusasa Awards – Youth Leadership: Science and Technology. She was also selected to participate in the Fulbright Visiting Research Scholar Program, hosted by the University of Illinois at Urbana-Champaign (USA). Dr Katamzi-Joseph represents South Africa as the national representative for Commission G (Ionospheric Radio and Propagation) of URSI, COSPAR and SCOSTEP. She is also a research associate at Rhodes University and a NASSP guest lecturer at the University of KwaZulu-Natal.

"NASSP was truly an amazing experience in my long academic journey. I was finally no longer a minority in my classes as the NASSP students were from very diverse backgrounds and so being different in some way was normal. There was a sense of camaraderie straight from the beginning, during our days in the summary school days, which with some of my classmates who later became friends still continues today; we worked together and supported each other. From my interactions with my NASSP colleagues, I learnt to diversify my knowledge to content outside of academia, as there would be intense debates on political and socio-economic topics that helped me grow as a person. I made lifelong friends that I am still in contact with even though we all live in different countries, continents even. We had very supportive teachers and admin staff, which enabled us to achieve, and in some instances expanded, our academic goals; Penny was particularly a gem, no problem was too small or too big or irrelevant for her, she assisted us wholeheartedly. Importantly, NASSP helped set a foundation which helped me to grow as a space scientist and for that I am eternally grateful."

Ms Tankiso Moso



- Country of origin: South Africa
- NASSP Hons: (UKZN, 2018)
- NASSP MSc: Instrumentational Astrophysics/ Low-Frequency Observations of the Radio Sky from Marion Island, supervised by Prof H. Cynthia Chiang (Coursework: UKZN; Dissertation: UKZN, 2019 - 2020)
- SANSA, Antarctic Electronics Engineer

"I am currently employed by SANSA as an Antarctic Electronics Engineer, which is a position I took up from June 2023 directly after completing my contract as a Marion Island Electronics Engineer, which I held from Feb 2022 to May 2023, also with SANSA. Prior to joining SANSA, I was a Graduate Engineer in Training at SARAQ under the radio frequency interference (RFI) division/department, a position I took up in February 2021 directly after completing my Master of Science degree in Applied Mathematics cum laude from UKZN. My specialisation was Instrumentation for Astrophysics, and my MSc focused on Low-Frequency Observations of the Radio Sky from Marion Island. During my years of study at UKZN, I was a member of the Astrophysics Research Centre and had a chance to go to the mysterious Marion Island in 2019 as a team member and again in 2021 as a UKZN research team leader. In 2020, I was invited to McGill University, Montreal, Canada, to develop and test radio astronomical equipment, which was going to be installed at Marion Island as part of a collaborative effort between McGill University and UKZN. This is when I realised I wanted to do the overwintering in the South African National Antarctic Programme (SANAP) stations."

"NASSP took me in from a very different background from any other students during my year (2018) of joining. I had just finished my Bachelor of Technology (BTech) degree in Electrical Engineering (Light Current) from the Durban University of Technology (DUT), and I had no prior knowledge of most of the modules that were taught at the Honours level. The only modules I could relate to were the mathematics-based modules. Otherwise, I had to self-teach myself and work twice as hard as any other students because I was the only one who didn't have a background in physics-related modules. In transitioning to NASSP astrophysics, I overcame the formidable challenge of teaching myself several years' worth of physics material while taking Honours-level classes. I achieved a certificate of merit in my physics research project class. I am proud to say that this leap of faith of jumping from engineering (from a university of technology) to physics (at the university) helped me successfully bridge the gap between engineering and physics. I was awarded a national award (South African Women in Science Award 2019 – DST-Albertina Sisulu Fellowship (Master's)) by the DSI. And this is one of my proud moments during my NASSP years."

Ms Nondumiso Khumalo



- Country of origin: South Africa
- NASSP Hons: (UKZN, 2018-2019)
- NASSP MSc: Tracing star formation in groups and filaments around a young, active galaxy cluster at $z \sim 1.46$, supervised by Prof. Matthew Hilton (Dissertation: UKZN, 2019 - 2023)
- SANSA, Space Weather Forecaster

"My career at SANSA began in June 2021, when I was offered an opportunity to train as a space weather forecaster. In November 2022, SANSA launched a new, state-of-the-art 24/7 Operational Space Weather Centre where I am currently working alongside seven fellow space weather forecasters responsible for operating this centre. My job entails issuing space weather forecasts, warnings, alerts, and space weather information to our clients."

"I am truly grateful to NASSP for providing me with the opportunity to pursue my postgraduate studies. When I was in the program, I learnt a lot and was able to grow as a person."

Fondest Memory: "My fondest memory in NASSP was when we took a trip to Cape Town in 2018 to visit the space industries that they have there. We visited places like SANSA, Houwteq, SAAO, SALT and the astronomy department at UCT. This trip was really exciting for me as I got the opportunity to explore the space industry and see what we can expect when we go into the workplace."

4.1.2 SOUTH AFRICAN UNIVERSITIES

Prof Amare Abebe



- Country of origin: Ethiopia
- NASSP MSc: Cosmology, supervised by Prof Peter Dunsby (UCT, 2008 - 2009)
- PhD: Cosmology, supervised by Prof Peter Dunsby (UCT, 2013)
- North-West University, Director of Centre for Space Research (CSR): Cosmology

"Right after my PhD, I joined NWU as a postdoc, and I have stayed there ever since: moving up the academic ladder from senior lecturer (2015) to associate professor (2019) and to full professor as of 2022. I am currently the director of the Centre for Space Research (CSR) at NWU.

NASSP opened a whole world of academic training and career opportunities for me that I would never otherwise have had. It's hard to imagine where I would be - personally and professionally - without NASSP, but I am sure it would not be anywhere better."

Fondest memory: "The all-night studies, the social and academic interactions with fellow NASSPies!"

Dr Itumeleng Monageng



- Country of origin: South Africa
- NASSP Hons: (UCT, 2011)
- NASSP MSc: Stellar Astrophysics, supervised by Assoc. Prof Vanessa McBride (Coursework, Dissertation: UCT, 2012 - 2014)
- PhD: Stellar Astrophysics, supervised by Assoc. Prof Vanessa McBride (UCT, 2018)
- UCT and SAAO, Lecturer

"My NASSP experience began at the start of 2011 during a two-week long Summer School that took place at SAAO. During that time I met my classmates who hailed from various parts of the continent, some of whom would become life-long friends. This would be the beginning of a memorable years' long journey that would have a lasting impact on my life.

Among the many things that I appreciate about the postgraduate program is the diversity of modules that were offered, which were presented by experts from different institutes from across the country. This was particularly important as it allowed for networking to commence at the early stages of our careers. The broad range of skills obtained from the training is evidenced by the different career paths that my former classmates followed (from academia to senior positions in private companies).

My involvement with NASSP is ongoing, as I continue to share my experience from the "other side" through the training and teaching of students."

Dr Sthabile Kolwa



- Country of origin: South Africa
- NASSP Hons: (UCT, 2013)
- MSc: The effects of environment on radio-loud AGN activity in Stripe 82, supervised by Prof. Matt Jarvis (Coursework: UCT; Dissertation: University of the Western Cape, 2014 - 2015)
- PhD: The kinematic nature of baryons within the circumgalactic media of high-z radio galaxies, supervised by Dr. Carlos de Breuck (Institution: The European Southern Observatory (ESO); degree-granting institute: The Ludwig-Maximilian University of Munich; country: Germany, 2016 - 2019)
- The University of Johannesburg, Lecturer

"Since completing my Ph.D. in Munich, I began work as a post-doctoral research associate at IDIA/UCT in South Africa. I study galaxy evolution using state-of-the-art radio surveying instruments such as MeerKAT, LOFAR, and GMRT. Additionally, I teach physics at the University of Johannesburg."

"NASSP was a key preparatory step in pursuing a career in Astronomy. The course modules strengthened my understanding of fundamental concepts in Astrophysics that are vital to master for success in the field."

Fondest memory: "The opening week of our NASSP Honours year was very memorable. We received a series of inspirational talks from several distinguished South African astronomers and bonded over our shared interest in the mysteries of the Universe. Learning about NASA's association with the Hartebeesthoek Radio Telescope – which we visited over a week-long field trip – was fascinating."

Prof Roger Paul Deane



- Country of origin: South Africa
- NASSP MSc: Radio Astronomy - Neutral hydrogen in the nearby interacting galaxy NGC1512, supervised by Prof Renee Kraan-Korteweg (Coursework: UCT; Dissertation: UCT, 2007 - 2008)
- PhD: Radio Astronomy - Strong gravitational lensing, supervised by Prof Steve Rawlings (Oxford University, United Kingdom, 2012)
- University of the Witwatersrand/University of Pretoria, Academic
- Event Horizon Telescope

"I have been fortunate to work at several South African universities as an astronomer, starting off as a postdoc at UCT, followed by Rhodes University. I secured a permanent position and started the astronomy research group at the University of Pretoria, and then onto Wits University, where I hold the SKA Chair in Radio Astronomy and serve as Director for the Wits Centre for Astrophysics. Career highlights include a first-author publication in Nature as a young postdoc trying to figure out my career path; attending the MeerKAT Inauguration Event in 2018; being part of the Event Horizon Telescope Collaboration who made the first image of a black hole; leading the Wits Anglo American Digital Dome project and securing a R75 million upgrade to this iconic STEM facility; and seeing my first postgraduate students graduate and publish first-author papers. One particular NASSP-centric highlight of mine was going back to NASSP as an astronomer to deliver the NASSP weekly colloquium. At the post-colloquium tea, it was a great trip down memory lane to chat to the current NASSPies and even recruit a couple of students."

"The astronomy community in SA was still very small in 2008 and NASSP played a pivotal role in bringing us together, and giving us exposure to the leading astronomers in the country through lectures and social occasions. This was extremely helpful in assessing astronomy as a career as well as the possible paths forward as a PhD and postdoc. My NASSP contemporaries that are still in astronomy remain close and I am thrilled to continue to bump into them in various places in the world, as well as a network of astronomers throughout South Africa."

Fondest memory: "One of my best memories was building and launching a ~2.5 metre long two-stage rocket with fellow NASSPies who took Prof Peter Martinez's Space Technology course in the first year it was offered (2007). Just to add to the thrill, the launch was at the Denel Overberg Test Range next to the Overberg Air Force Base, supervised by military personnel."

** Photo Credit: Chris Collinridge*



Dr Michelle Lochner



- Country of origin: South Africa
- NASSP Hons: (UCT, 2010)
- PhD: Cosmology, supervised by Prof Bruce Bassett (UCT, 2014)
- University of Western Cape / South African Radio Astronomy Observatory, Senior Lecturer/ Staff Scientist
- P-rated researcher, Ruben Observatory PI, Supernova foundation

"My research focus is on cosmology and trying to get the best out of combining optical and radio telescopes like the Vera C. Rubin Observatory, in Chile, as well as the Square Kilometre Array and its precursor, MeerKAT, in South Africa. I work on developing new statistical techniques and using machine learning to tackle the masses of data we are dealing with in astronomy, currently focusing on the use of anomaly detection for scientific discovery. After obtaining my B.Sc. from Rhodes University, I pursued postgraduate studies at the University of Cape Town and completed my PhD in 2014. I then took up a two-year postdoctoral position at University College London, UK, focusing on machine learning techniques in cosmology. I returned to South Africa in 2016 as a researcher at the African Institute for Mathematical Sciences before taking up my current position at UWC. I am a South African Principal Investigator for the Rubin Observatory, an NRF P-rated researcher and have published more than 30 peer-reviewed papers and technical reports. I am also the founder and director of an international mentoring programme for women and gender minorities in physics called the Supernova Foundation."

Fondest memory: "Visiting Sutherland and bonding with my classmates."

Assoc. Prof Bob Osano



- Country of origin: Kenya
- NASSP MSc: Cosmology, supervised by Prof Peter Dunsby (Coursework, 2003, upgraded to PhD)
- PhD: Cosmology/Cosmological Perturbation Theory, supervised by Prof Peter Dunsby (UCT, 2008)
- UCT, Associate Professor in Applied Mathematics

"Lecturer: 2008-2011 Senior Lecturer: 2012-2018 Ass. Prof.: 2019- to date."

"My NASSP MSc project on perturbation theory and supervisor set me on my research trajectory."

Fondest memory: "The diverse 'band of six' in the first NASSP MSc class."

Dr Zolile Mguda



- Country of origin: South Africa
- NASSP MSc: Stellar Modeling, supervised by Dr Thebe Medupe (Coursework, Dissertation: UCT, 2008 - 2011)
- PhD: Extragalactic Astronomy, supervised by Dr KJ van der Heyden and Dr Petri Vaisanen (UCT, 2021)
- UNISA, Lecturer; Chair of Astronomy Community Task Team (ACTT)

"NASSP was the most difficult thing I had ever done academically. I had only done first year Physics and my Honours was in Applied Mathematics with some Computer Science electives. So in my time with NASSP I learnt to think like a Physicist, communicate like an academic, do the NASSP MSc coursework, survive in Cape Town and maintain my humanity through it all. I feel like I changed as a person through the experience. It remains to be seen if the change was for the better. I met and interacted with students and scientists from different backgrounds. These are people I consider to be friends to this day. The journey was worth it."

Dr Mpati Ramatsoku



- Country of origin: South Africa
- NASSP MSc: Extragalactic Astronomy, supervised by Prof. Renee Kraan-Korteweg (Coursework, Dissertation: UCT, 2011-2012)
- PhD: "The WSRT ZoA Perseus-Pisces Filament blind wide-field HI imaging survey.", supervised by Marc Verheijen, Renee Kraan-Korteweg, Erwin de Blok (2017, Kapteyn Institute, Netherlands and University of Cape Town, South Africa)
- Rhodes University, Research Fellow

"I am currently a research fellow at Rhodes University. After doing my MSc with NASSP, I went on to do a PhD at the Kapteyn Institute in the Netherlands. After completing the PhD, I received an ERC-funded postdoctoral fellowship at INAF in Cagliari, Italy. My research has covered a wide range of extragalactic astronomy. On larger astronomical scales, I have led and contributed to surveys that uncovered galaxies previously hidden by our Galaxy and not studied before, revealing their intrinsic properties and significance to the flow fields observed.

On intermediate scales, I focused on the role played by the environment in which galaxies reside (nurture) and how it affects their evolution. For this work, I led and contributed to various multiwavelength studies of galaxy clusters to determine what causes galaxies to stop growing and ultimately transform into the so-called "red and dead" galaxies. I have also led and contributed to numerous studies of individual galaxies in exploring the role of nature (intrinsic properties of galaxies) in galaxy transformation to gain further insights into the details of galaxy evolution.

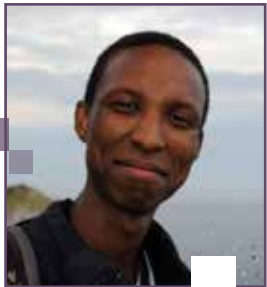
The large amount of data analysed has resulted in some exciting contributions to extragalactic astronomy and observational techniques, ranging from serendipitous astronomical mysteries to the technical development of some helpful and necessary data analysis algorithms."

"I learned resilience, which I have applied to both my work and life."

Fondest Memory: "One of my fondest memories is the late nights we would spend on campus finishing work. There was a sense of support and camaraderie amongst all of us."

4.1.3 SALT/SAAO

Dr Moses Mogotsi



- Country of origin: South Africa
- NASSP Hons: (UCT, 2009)
- NASSP MSc: Extragalactic Astronomy, supervised by E. de Blok (Coursework, Dissertation: UCT, 2010 - 2012)
- PhD: Extragalactic Astronomy, supervised by C. Carignan, G.R. Meurer, E. de Blok (UCT, year 2016)
- SAAO/SALT, SALT astronomer

"NASSP was invaluable to my career because it introduced me to the world of astronomy research. I got to meet real astronomers, see what they did, learn about different local and international astronomy facilities, and about the different fields in astronomy. I don't think I would have reached this far in my career without going through NASSP. It also allowed me to interact with other students from the rest of Africa and from all around the world. This helped to expand my view of the world and to better appreciate the international nature of science and how it can bring people of different backgrounds together."

Fondest memory: "The group visits to the HMO and Sutherland."

Dr Zara Randriamanakoto



- Country of origin: Madagascar
- NASSP Hons: (UCT, 2008)
- NASSP MSc: Extragalactic Astronomy, supervised by Prof Petri Vaisanen and Assoc. Prof Sarah Blyth (Coursework: UCT; Dissertation: UCT/SAAO, 2009 - 2010)
- PhD: Extragalactic Astronomy, Star Clusters in strongly star-forming galaxies, supervised by Prof Petri Vaisanen and Dr Kurt van der Heyden (UCT/SAAO, 2015)
- SAAO, Research Astronomer
- 2023 National Geographic Explorer

"I am a research astronomer at the South African Astronomical Observatory. My research interests mainly revolve around the multiwavelength observations of the most massive star clusters in the Universe and the study of the lifecycle of radio galaxies. I have received pan-african and international scientific awards including the 2023 National Geographic Explorer and the 2020 L'Oréal-Unesco For Women in Science Sub-Saharan Africa Young Talents. I have also been recognized by the UN Economic Commission for Africa in 2022 as one of the 25 Outstanding African Women Scientists. I am the current chair of the Malagasy National Committee for Astronomy of the International Astronomical Union (IAU), and an outgoing Board member and Chair of the Early-Career working group of the relaunched African Astronomical Society (AfAS). I now serve as a Science Committee member of AfAS. My passion for science and women empowerment led me to set up Ikala STEM, which is a women-led community of 500+ members spread across the world. Our mission is to empower and raise the profile of Malagasy women in STEM. I was selected as one of the Mail & Guardian 200 Young South Africans 2021 in recognition of my public engagement with Science."

NASSP is an experience of a lifetime that I will always cherish. It indeed requires self-discipline and resilience because of its hectic schedules and peak workloads but the astronomy skills and knowledge I acquired throughout the journey have served as a strong foundation of my research career. Thanks to NASSP, I am now part of a pan-african network of young astronomers eager to make a difference in their country of origin. After graduating from UCT/NASSP, I have started to pay it forward by supervising postgraduate students in South Africa and Madagascar, and leading an active community of Malagasy Astronomers in my home country. On a personal level, I was able to discover my potential and to slowly get out of my comfort zone. NASSP is worth the investment as it creates a ripple effect of human capacity building in South Africa and beyond.

Mr Xola Ndaliso



- Country of origin: South Africa
- NASSP Hons: (UCT, 2018)
- NASSP MSc: Extragalactic - Modelling the HI kinematics and dark matter content of the nearby interacting galaxy pair - NGC 1512/1510, supervised by Ed Elson, Marcin Glowacki and Roy Maartens (Coursework: UCT; Dissertation: UWC, 2019 - 2020)
- PhD: Extragalactic - A dynamical perspective of the dense cluster environment on member galaxies, supervised by Prof Roger Deane (University of the Witwatersrand, in progress)
- SAAO/SALT, Telescope operator/Software developer

“Out of 5 children, Xola Ndaliso grew up as the last born, in a village near the small town of Ditywa in the Eastern Cape. He pursued an undergraduate degree in Physics at UWC in 2015 and was awarded a 4 year SKA scholarship, under the mentorship of Prof. Roy Maartens, Dr. Siyambonga Matshawule, and Siyanda Matika. In the final year of his undergraduate degree, he did a mini-project on Extragalactic astronomy with Assoc. Prof. Ed Elson and that paved the way into his Honours.”

Xola then went on to join the National Astrophysics and Space Science Program with the UCT node in 2018. He describes this period as one of the most challenging yet transformative phases of his life. In his Honours year, he completed a project with Assoc. Prof. Ed Elson, in which he modelled the rotation curve of the Whirlpool galaxy using THINGS data, graduating amongst the top of the class. In 2019, he did six-months coursework and took on a research project with Prof. Ed Elson at UWC, where he used HI data from Australian Telescope Compact Array (ATCA) to generate a dynamical model of the nearby interacting pair NGC 1512/1510, finishing in 2020. In 2021, he then joined the SAAO as a SALT Operator/Software Developer whilst simultaneously pursuing a Ph.D with Prof. Roger Deane. His current project focuses on studying the impact of the cluster environment on individual galaxies in Abell 3408.”

“First of all NASSP was quite intense, however I really liked the support we got, from tutors, lecturers, and Astronomy department staff. I remember walking into Prof. Claude Carignan’s office at some point to ask about something totally different from what he was teaching us in class, and he happily assisted. The Astronomy department staff would spend some time chatting to us in the Astronomy library, asking if all is okay. I also liked how the class interacted with each other. I’m still in touch with almost everyone that was in my Honours class. I personally enjoyed NASSP, with all the hard work that came with being there.”

Dr Rosalind Skelton



- Country of origin: South Africa
- Hons: Theoretical Physics (UCT, 2004)
- NASSP MSc: Extragalactic Astronomy, supervised by Renee Kraan-Korteweg and Patrick Woudt (Coursework, Dissertation: UCT, 2005 - 2007)
- PhD: Extragalactic Astronomy, supervised by Eric Bell (MPIA/ University of Heidelberg, Germany, 2010)
- SAAO/SALT, Astronomer
- SAAO Head of Research; NASSP Partnership Chair

“Dr Rosalind Skelton is head of research and a support astronomer for the SALT at SAAO. Her research interests are in the field of galaxy formation and evolution. She completed her PhD on galaxy mergers at the Max Planck Institute for Astronomy (University of Heidelberg) in 2010 and then took up a postdoctoral research position at Yale University. Rosalind then returned to South Africa in 2013 for a Professional Development Programme postdoctoral fellowship at the SAAO, and became a member of the SALT team in 2016. She has close links with the University of Cape Town, where she enjoys lecturing for NASSP and mentoring students at all levels. Her group investigates galaxy formation processes and interactions in different environments, from the formation of low surface brightness galaxies to the most massive galaxies and large-scale structures in the universe.”

“NASSP gave me a wonderful opportunity to build up background knowledge on a range of astronomical topics before choosing what to specialise in, and introduced me to the astronomy community and a fantastic group of fellow students. ”

4.1.4 SARAQ

Dr Miriam Nyamai



- Country of origin: Kenya
- NASSP Hons: (UCT, 2014)
- NASSP MSc: Optical and X-ray observations of supersoft X-ray sources, supervised by Prof P. Meintjes and Dr A. Odendaal (Coursework: UCT; Dissertation: University of the Free State, 2015 - 2017)
- PhD: Radio observations as a tool to study shock interactions and mass ejections in novae, supervised by Prof. P. A. Woudt, Dr. V. A. R. M. Ribeiro, Prof. L Chomiuk (UCT, 2021)
- SARAQ: Postdoctoral Research Fellow (UCT; 2021 -2022)
- SARAQ: Associate Operation Scientist (2022-present)

"Dr. Miriam Nyamai is an astronomer and an associate operation scientist at the South African Radio Observatory (SARAQ). She completed her Ph.D. in Astronomy at the University of Cape Town in 2021. Throughout her studies, she has won different awards/prizes and scholarships. Her highlight was the Ph.D. prize awarded by AFAS in 2022 for the best Ph.D. thesis in Southern Africa. She has participated in different astronomy Summer Schools as a student and a tutor. She enjoys working with postgraduate students on research projects and doing observations with radio telescopes such as the MeerKAT radio telescope located in the Karoo in South Africa. Her research focuses on dying stars and radio transients. Using radio data, she investigates the interaction mechanism between two stars orbiting each other, known as Cataclysmic Variables."

"NASSP was a great program because it helped me network with other students and embrace multiculturalism. The bursary offered through the program helped alleviate the financial burden during the postgraduate studies at both Honours level and Master's level. Collaboration with international researchers through the program enabled me to do world-class research and publications, attend international conferences, and give talks on my work. NASSP also opened up an entire new world of possible careers."

"During my time at NASSP, I made good friends. I also visited Sutherland and the Karoo. It was great to visit the sites where telescopes used by researchers from all over the world are located."

Dr Aletha de Witt



- Country of origin: South Africa
- NASSP Hons: (UCT, 2003)
- NASSP MSc: Shock Excited 1720 MHz Masers, supervised by Derck Smits (Coursework: UCT; Dissertation: UNISA, 2006)
- PhD: Radio Astronomy Techniques, supervised by Michael Bietenholz, Roy Booth (UNISA, 2012)
- HartRAO, Operations Astronomer (2013-2023)
- DSI, Director: Radio Astronomy Projects (starting Jan 2024)

Starting in January 2024, Aletha will take on the role of Director: Radio Astronomy Projects within the Department of Science and Innovation (DSI).

Her primary research focus revolves around celestial reference frames (CRFs), with a keen emphasis on enhancing the Southern Hemisphere CRFs at higher radio frequencies, and investigating source structure. Her contributions include her role as the principal investigator of the K-band (24 GHz) CRF project. Under her leadership, this project has secured over 2000 hours of observing time on the Very Long Baseline Array (VLBA) and has leveraged various VLBI instruments in South Africa, Australia, Spain, and Korea.

Aletha also served as an at-large member of the International VLBI Service for Geodesy and Astrometry (IVS) Directing Board from 2019 to July 2023. Furthermore, she chairs the IVS CRF Committee and spearheads the Southern IVS CRF programs. She is also an active member of the IVS Committee on Education and Training.

Her influence extends to the African VLBI Network, where she played a pivotal role as the South African Chair of the DARA (Development in Africa with Radio Astronomy), AVN Newton Fund Project from 2015 to 2020. Additionally, she holds the position of Vice-President within the International Astronomical Union (IAU) Commission A1 on Astrometry. Her contributions extend to participation in the IAU Division A ICRF3 Working Group and her role within the current Multi-waveband International Celestial Reference Frame Working Group.

Throughout her career, she has been at the forefront of developing, implementing, and coordinating various astrometric and geodetic VLBI programs, both in Africa and on the international stage. Her work stands as a testament to her unwavering commitment to advancing the fields of astrometry, geodesy and also radio astronomy. It was only because of NASSP that she was able to pursue a career in Astrophysics."

Dr Pfesani van Zyl



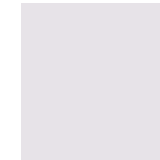
- Country of origin: South Africa
- NASSP Hons: (UCT, 2011)
- NASSP MSc: Radio Astronomy/Active Galactic Nuclei, supervised by Dr Mike Gaylard, Prof Sergio Colafrancesco and Dr Roopesh Ojha (Coursework: UCT; Dissertation: University of the Witwatersrand, 2012 - 2015)
- PhD: Radio Astronomy/Active Galactic Nuclei, supervised by Prof Andrew Chen, Dr Aletha de Witt (University of the Witwatersrand, 2023)
- Postdoctoral Researcher, SARAO-HartRAO

"My time in the NASSP program proved to be a truly transformative experience, leaving an indelible mark on my perspective and aspirations. It afforded me the opportunity to witness a real telescope for the first time, which was nothing short of awe-inspiring; a pivotal moment that reshaped my understanding of what I could achieve. Growing up in a small town, the idea of a career in astronomy felt like an unattainable dream, particularly as a black female, given prevailing media narratives depicting it as a domain reserved for foreign, older, white males. However, engaging with actual astronomers and collaborating with some of Africa's brightest students shattered these limiting beliefs. It ignited a fire of possibility within me, bolstering my confidence to see myself as an active participant in the world of astrophysics. The experience revealed the boundless opportunities within this field that I once deemed beyond my reach.

During my time at NASSP, I not only found inspiration but also a profound sense of belonging. I came to realize that the cosmos knew no barriers of race or gender; its mysteries were there for anyone with a passion for exploration and a desire to understand the universe's secrets. The experience emboldened me to embrace my unique identity, breaking free from the constraints imposed by societal norms setting me on a profound journey of self-discovery. Now, as I live out my dreams, I owe a debt of gratitude to that extraordinary decision to join NASSP that expanded my horizons and showed me that I, too, could reach for the stars in the truest sense."

"I would like to just say a special thank you to everyone and the hard work they do. I would not be here if I wasn't for your dedicated commitment to be inclusive and intentional about exposing everyone to astronomy. I've made so many connections just by being a part of NASSP and have made meaningful contributions to the sciences which I doubt I would have had the opportunity to do if I were in a different field. Please keep doing what you're doing so that others can continue to benefit from this as well.

Fondest memory: "The end-of-year functions hold a cherished place in my memory. These events provided a wonderful opportunity to unwind, socialise, and draw inspiration from one another. "



4.1.5 COMPUTATIONAL FACILITIES

Dr Sean February



- Country of origin: South Africa
- NASSP Hons: (UCT, 2007)
- NASSP MSc: Cosmology, supervised by Prof. Christopher Clarkson (Coursework: UCT; Dissertation: UCT, 2008 – 2009)
- PhD: Cosmology/Structure formation in inhomogeneous models, supervised by Prof. Christopher Clarkson/Prof. George Ellis (UCT, 2010 – 2014)
- Research Scientist, Centre for High Performance Computing (CSIR, 2014 – 2018)
- Software Developer, SARAO (2018 – 2023)
- HPC Technologist, Centre for High Performance Computing (CSIR, 2023 – present)

"After completing my PhD, I decided to side-step academia somewhat and take up an Astronomy support scientist role at the CHPC. A few years later I joined the MeerKAT SDP team at SARAO, where I delved more into the system administration and data storage aspects. A few more years later, I rejoined the CHPC, in particular their Advanced Computer Engineering laboratory, where I'm currently diving into the exciting world of Cloud Computing."

"NASSP was a valuable stepping stone in shaping my path towards a career in Astrophysics/Cosmology. It sparked the foundation of my ability to conduct scientific research, and ultimately hunger for knowledge more broadly."

Fondest memory: "There are a few, but the most memorable was during my visit to HMO, where I ended up volunteering to help hoist a radio antenna up a mast several metres high, in an attempt to conquer my fear of heights! To top it off, using that very antenna I spoke to someone all the way in Antarctica!"

Mr Walter Silima



- Country of origin: South Africa
- NASSP Hons: (UCT, 2019-2020)
- NASSP MSc: Extragalactic Astronomy/Machine Learning/ Multi-wavelength astronomy, supervised by Prof. Mattia Vaccari (Coursework: UCT; Dissertation: University of the Western Cape, 2021 - 2023)
- Inter-university Institute for Data Intensive Astronomy (IDIA), Software Developer

"I am a software developer at the Inter-university Institute for Data Intensive Astronomy (IDIA) based at the University of Cape Town (South Africa). I am also an MSc (Astrophysics and Space Science) research student at the University of the Western Cape (South Africa) (graduating 15-December-2023). I hold a First-Class Honours degree in Astrophysics and Space Science from the University of Cape Town and obtained a cumlaude in BSc (Physical Science) from the University of Limpopo. My research focuses on adopting statistical and machine learning techniques to automate tasks such as the classification of galaxies and estimating photometric redshifts that astronomers carry out using conventional techniques."

"I think NASSP gave me the learning opportunity I would not find anywhere else. I had amazing support from NASSP for me to focus on the studies I am interested in. I had the privilege to meet and work with amazing supervisors who are best in the field. During my Honours and MSc years I was able to travel, attend conferences where I could present my work and learn what other scientist from different parts of world are working on "

Fondest memory: "The NASSP Winter School in 2018, It was the great learning curve for me to realise I can have a career in astronomy."

4.2 CAREERS IN FINANCE AND INDUSTRY

Mr Themba Gqaza



- Country of origin: South Africa
- NASSP Hons: (UCT, 2015)
- NASSP MSc: Radio Astronomy, supervised by Prof. Renée Kraan-Korteweg (Coursework: UCT; Dissertation: UCT, 2016 - 2018)
- Reach Digital Health, Senior Data Scientist

"NASSP has been instrumental in shaping a strong bedrock for my professional path. The program's diverse student body has facilitated my seamless integration into cross-functional teams, drawing from various backgrounds."

Fondest memories:

Running NASSP Summer School over two spells: 2016 & 2017

Dr Laura Richter



- Country of origin: South Africa
- NASSP MSc: Astronomical masers around late-type stars, supervised by Prof Justin Jonas, Prof Athol Kemball (Coursework: UCT; Dissertation: Rhodes University, 2004 - 2005)
- PhD: Astronomical masers around late-type stars, supervised by Prof Justin Jonas, Prof Athol Kemball (Rhodes University, 2012)
- MeerKAT/SKA, Science Processing Developer (2012-2017)
- Aruba (A Hewlett Packard Enterprise Company), Data Scientist (present)

"Laura's involvement in Astronomy started during her Honours degree at Rhodes University, with a Radio Astronomy course and trip to HartRAO. She then joined the first ever NASSP Master's class at UCT, returning to Rhodes after her coursework. At Rhodes she did a Master's thesis and eventually a PhD on spectral VLBI observations of Silicon Monoxide Masers in the atmosphere of the supergiant star VY CMa. All in all, she spent 10 years studying one star! She had the privilege of being supervised by Professor Justin Jonas and Professor Athol Kemball from the University of Illinois. After her PhD she joined the science processing developer team at the South African SKA project, where she worked on pipeline processing of KAT-7 and MeerKAT data, and found some time in between to do some research. During her PhD and SKA employment years she kept her NASSP connections, lecturing some courses on Radio Astronomy and Fourier Transforms. She is currently a Data Scientist at Aruba (a Hewlett Packard Enterprise Company), where she works with Wifi network data."

Fondest memories:

- » "Our wonderfully friendly and efficient course administrator Penny Middelkoop!
- » Peter Dunsby's young (maybe 5 year old!) daughter singing twinkle-twinkle little star for us at our end of year function :)
- » Not having a clue what was going on in plasma physics until Professor Manfred Hellberg helped me! (I don't think we did any of that sort of physics in my Rhodes undergrad)
- » Professor Thebe Medupe setting us an impossibly difficult exam!
- » Michelle having a nap at her desk across from me most days after lunch!"

Mr Given Phaladi



- Country of origin: South Africa
- NASSP Hons: (UCT, 2004)
- NASSP MSc: Remote Sensing, supervised by Mike Inggs (Coursework: UCT; Dissertation: UCT, 2005 - 2007)
- REGIVE Investment Group, Group CEO

"I have been in the financial services industry for just over 17 years with responsibilities ranging from asset consulting to portfolio management. I have advised on a wide variety of clients across the continent on both traditional and alternative investments. In 2018, I decided to set up a company called REGIVE Capital- a fund manager with a primary focus on managing hedge fund portfolios, private equity funds and structured product solutions on behalf of predominantly retirement funds."

"NASSP has given me the confidence to engage with almost anyone at any level. The quantitative nature of the programme has also made it easy to blend into the world of financial services, particularly on modelling complex financial problems and being able to simplify them to members of retirement funds that may not even have gone beyond matric in some instances. One of my fellow NASSPIes is also a non-executive member of the Board of Directors at REGIVE Capital."

Fondest memory: "Relationships with fellow NASSPIes that I have built and maintained over the years have been rewarding. The following are some of the fondest memories: 1. Travelling to various institutions and visiting various observatories such as HartRAO, SAAO, HMO. 2. Dealing with Dr. Pierre Cilliers who was my Honours supervisor remains the greatest experience of my career at NASSP. 3. Being interviewed and profiled for the science text book was also incredible."

Mr James Tagg



- Country of origin: South Africa
- NASSP Hons: (UCT, 2005)
- NASSP MSc: Optimising the NIR Survey Strategy in Unveiling Hidden Galaxies in the Great Attractor, supervised by Patrick Woudt and Renee Kraan-Korteweg (Coursework: UCT; Dissertation: UCT, 2006 - 2008)
- Quicket, CEO

"After finishing at UCT, I went into commercial web development and in 2011 founded Quicket, which was the first self-managed ticketing platform in South Africa - a sort of "Airbnb" type approach to ticketing. At that stage, Computicket was the incumbent dominant ticketing service in the country. I am still at Quicket, 12 years later. We've grown into Africa's biggest self-service ticketing system, doing ticketing in over 35 countries and 20 currencies, with 15 million tickets sold to over 200,000 events."

"I was always fascinated by astronomy as a child, strong at maths and sciences. When I found out that NASSP had just started while I was studying a B.Sc in physics and applied mathematics at UCT, I knew I had to be there. How lucky I was to be accepted into the program, and what a journey it was! The wide array of topics covered in the program and incredible scientists I met during the program helped shape my thinking and remains a part of who I am today. Although I don't use the techniques I learned in my field, it remains a strong influence in my critical thinking process which I have used throughout my career. My love of astronomy matured throughout 3 years studying it, and I still remain close to the developments in the field to this day. I intend on getting a decent telescope for my own observations when I make it out of the city one day...!"

Fondest memory: "There were too many incredible experiences - learning radio astronomy (and seeing a cheetah roaming around) at HartRAO, seeing the old satellite facility near Hermanus, learning the history of SAAO in Observatory. Perhaps my favourite memory was the first time I entered one of the telescopes at Sutherland, finding Brian Warner and Patrick Woudt in the warm room listening to classical music and drinking tea, observing some binary system. And who can forget Brian Warner's lectures to his "students" in the rocky amphitheater on the road to Sutherland..."

Dr Mellony Spark



- Country of origin: South Africa
- NASSP Hons: (UCT, 2004 - 2005)
- NASSP MSc: Cataclysmic Variable stars and Instrumentation, supervised by Darragh O'Donoghue and Patrick Woudt (Coursework: UCT; Dissertation: UCT/SAAO, 2005 - upgraded to PhD)
- PhD Thesis: Exploring the Application of New Telescope Techniques in the Testing of Dwarf Novae Accretion Models, supervised by Darragh O'Donoghue and Patrick Woudt (UCT/SAAO, 2011)
- Conservation International Ventures, Portfolio Manager and Africa Deal Lead

"After my postdoc at SAAO, I pivoted my craving for understanding "why things are the way they are" into the financial sector. First as a trainee investment analyst at Kagiso Asset Management where I gained broad and applicable knowledge across sectors analysing JSE listed companies. I became interested in impact, specifically the intersection of asset management, investment and transformation of supply chains and enterprise development towards regenerative, values-based growth. After 3.5 years Kagiso, I took up a coveted role as an Investment Analyst at Titan, a newly launched bespoke global asset management team, under Old Mutual. In addition to making cases for globally listed equities I also led thinking on how to integrate AI across the investment boutiques. After two years with Titan, I returned to the JSE and joined Matrix Fund Managers, South Africa's top performing hedge fund. I designed and implemented the full integration of an ESG framework into the firm's existing investment process. Whilst at Matrix, I participated in UCT GSB's Impact Investing in Africa ExecEd course, pursuing my commitment to moving from traditional investment to impact investment as my next career pivot. Thus, after two years at Matrix, I joined CI Ventures, the venture philanthropic arm of Conservation International, the world's second largest conservation NGO housing the largest Conservation Finance Division. As an Investment Officer for the Africa portfolio, I built up considerable experience in green SMME ventures across sectors, deal making. In late 2022, just after a year at CIV, I took on the role of acting director and am now single handedly managing a portfolio of diverse SMME investees, exploring new pipelines for investment deals and negotiating complex restructurings across Kenya and South Africa. I have found a spiritual home; learning and contributing to the role of finance in catalysing nature-based solutions to Africa and the world's most pressing climate crises is my vehicle for self-actualisation and contribution to society."

"It was a deep privilege to begin my career as a NASSP, surely one of the most privileged curricula in the world to study. While the complete turn into the finance sector was hard, I wouldn't have had it any other way or chosen any other route."

Mr Malema Ramonyai



- Country of origin: South Africa
- NASSP Hons: (UCT, 2018 - 2019)
- NASSP MSc: Machine learning and time series astronomy supervised by Dr Michelle Lochner (Coursework: UCT; Dissertation: UWC, 2020 - 2022)
- Systems Developer, Ikeja Wireless

"I am originally from a small village in Limpopo, where I completed my primary and secondary schooling. I have always wanted to be a geologist, but life had other great plans for me. I completed a BSc degree in physical science from the University of Limpopo in 2017 and joined a NASSP bridging program at UCT in 2018. I then completed my NASSP Honours in 2019 (first class) and moved to UWC for a Master's degree under the supervision of Dr. Michelle Lochner, which was completed in 2022 (Summa Cum Laude). I have received awards for exceptional performance from all the universities I attended, but the award that is close to my heart is that from UWC for being the best Master's student for the year 2022. My experience at NASSP made me realise that I love programming, which is why I decided to start a career in tech. I am currently working as a system developer, where I am building cool web applications and systems. My job also includes data science and data analysis, which is where my training as an astrophysicist comes in handy."

"NASSP is an intense program, and with that being said, I believe anyone who completed NASSP can complete anything in life. Especially those who joined NASSP with zero coding and astronomy background. NASSP taught me independence and resilience. I am using that in my day to day life, for example, when I started working, I knew nothing about websites and systems, but because of the independence I learned from NASSP, I managed to pull through."

Fondest memory: "It was very nice to have those once in a while lunches with Prof Saalih, just to check up on all of us. I will definitely do that with my team when I become senior in my career :)."

4.3 CONTRIBUTIONS TO EDUCATION

Dr Anne Marie Kasyoka Nzioki



- Country of origin: Kenya
- NASSP MSc: Astrophysics - Modified Gravity, supervised by Prof. Peter Dunsby (Coursework: UCT; Dissertation: UCT, 2008 - 2009)
- PhD: Astrophysics - Modified Gravity, supervised by Prof Peter Dunsby (UCT, year completed)
- The Book Haven NPC, director and co-founder
- The Open Lens Collective, co-founder
- Learning facilitator and NASSP ad-hoc lecturer

"I consider myself an educator both in academia and facilitation. My general work is guided by questions that explore group processes in and out of the learning spaces to enhance group cohesiveness and community interconnectedness anchored on diversity and inclusion culture. I am a protagonist of social impact that supports children and youth, which continues to inform and be the heart of my work today."

"My time in NASSP augmented my scientific dexterity and the exposure to collaborative forums within South Africa and internationally, building skills that have contributed to a creative and resourceful career journey which includes community-building and establishing coalitions and partnerships, both locally in South Africa and internationally. Special gratitude to my research supervisor Prof Dunsby for believing in me and for the social support from Mrs Nicky Walker and Mrs Penny Middelkoop."

Fondest memory: "Social conversations with a diverse community."

Mr Sibusiso Mdhlu



- Country of origin: South Africa
- NASSP Hons: (UCT; Extended Honours Programme, 2016-2017)
- Acornhoek Institute for Science and Technology, Director

"I'm currently the director of Acornhoek Institute for Science and Technology, a non-profit company which I led from its formation in 2020 where we have been focusing on developing programs to help students improve in mathematics and science in rural areas. Secondly we focus on training unemployed youth in digital skills also from rural areas."

"One of my current tasks (at our organisation) is exploring how best we can use astronomy to inspire students into STEM fields/subjects-the knowledge got introduced in NASSP-which I believe, without going through the program, I would have not been working on today. I got to learn in the program to conduct scientific research, computer programming with confidence and also gave me the opportunity to coordinate some of the its programs such as the Winter School, Summer School and Colloquiums which gave me the opportunity to learn how coordinate/lead projects which are the skills that I use at our organisation."

Fondest memory: "My fondest memory has been meeting new people from different countries and different races which gave me the opportunity to learn different cultures. Secondly, has been the time I've spent at the NASSP houses which gave me the opportunity to build strong friendships which I got to keep till today."

AN ASTRONOMICAL IMPACT ON SOUTH AFRICAN STUDENTS

INSPIRED TEACHERS *inspire students.*

Sibusiso Mdhuli, a NASSP EHP graduate, [see his profile] is going to great lengths to improve the quality of education amongst South African youth. He is the director of Acornhoek Institute for Science and Technology (AIST), a non-profit company which he has been leading since its formation in 2020. The non-profit focuses on developing programs to address the substandard performance of South African students in mathematics and science, with an emphasis on impacting rural areas, and training unemployed youth in digital skills also from rural areas.

Some of the projects AIST organises take place in schools in Sibusiso's local town. One of these includes a Maths, Science and Astronomy Summer School for grade 11 learners, which runs during the December and January holidays, wherein learners are introduced to grade 12 syllabus. Students are also introduced to Astronomy concepts- a tool used to inspire students into pursuing STEM fields. Acornhoek also arranges science clubs which are being set up in schools for grade 8 and 9 students, with a goal to inspire students as early as possible into STEM by encouraging them to work on mathematics, science and astronomy activities.

Not only do students benefit from Sibusiso's work- regular Astronomy Teacher Workshops for (high school teachers) who teach STEM subjects are put together, so as to spark new inspiration into educators, since inspired teachers inspire students.

To invoke some appreciation for learning science practically, a science centre is currently a project in the works. This will be used to expose students to science practicals since many schools in the area lack the resources for such activities. Many students rely purely on theory to grasp science which AIST believes is one of the contributing factors to students' poor performance. Above all the various projects, Sibusiso's team are working on launching an Astronomy Winter School for Girls in 2024 which will run during June/July holidays with the aim to address the less participation of women/girls in STEM fields.

All of AIST's projects are hosted in Acornhoek, Mpumalanga province, South Africa.



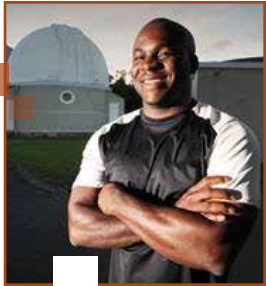


5

THE GROWTH OF
ASTRONOMY IN AFRICA

5.1 NAMIBIA

Dr Eli Kasai



- Country of origin: Namibia
- NASSP Hons: (UCT, 2010)
- NASSP MSc: The Type Ia Supernova Rate in Intermediate Redshift Galaxy Clusters, supervised by Prof. Bruce Bassett, Dr. Steve Crawford (Coursework, Dissertation: UCT, 2011 - 2013)
- PhD: SALT Spectroscopy and Classification of Supernova Spectra using Bayesian Techniques, supervised by Prof. Bruce Bassett, Dr. Steve Crawford (UCT, 2017)
- University of Namibia, HoD Physics, Senior Lecturer

"I am a senior lecturer and Head of the Department of Physics, Chemistry & Material Science at the University of Namibia (UNAM). Post NASSP into my PhD starting in 2013, I was the principal investigator (PI) of a supernova follow-up program with SALT as part of the 5-year Dark Energy Survey. The program culminated into several collaboration publications in which I was featured and also provided a substantial amount of data for my PhD, from which I graduated in December 2017. Since mid 2019, I have been the PI of another SALT semester and later on a multi-semester observing program that involves taking spectra of BL Lac objects to measure their redshifts. This is to support the next generation Cherenkov Telescope Array key science project on AGNs of blazar type. I am currently the IAU National Outreach Coordinator for Namibia, where I have been coordinating a number of astronomy outreach projects locally and serve as the point of contact between Namibia and the IAU office of astronomy outreach."

"NASSP is one the greatest inventions and initiatives of the African continent. Its sheer impact in Africa in training, development and capacity building in the field of Astrophysics and Space Science has been hugely paramount since its inception in the early 2000s. Under NASSP, I've been equipped with the best training in my understanding of our place in the Universe and the physical processes observed in Astrophysical objects, through the learning and use of rigorous Physics and Mathematical concepts. NASSP also honed my computational skills, which were almost non-existent prior to 2010 and gave me an opportunity to interact with great thinkers and achievers in the field of Astrophysics and Space Science, whom I learned greatly from. The education and skills gained from the NASSP education and training agenda have turned me into a professional researcher in the field of Astrophysics and an avid computer programmer in my own right, that is actively involved in digital transformation initiatives and discussions on the African continent."

5.2 ZAMBIA

Dr Patrick Sibanda



- Country of origin: Zambia
- NASSP Hons: (UCT, 2004)
- NASSP MSc: Particle Precipitation Effects on The South African Ionosphere, supervised by Dr Lee-Anne McKinnell (Coursework: UCT; Dissertation: Rhodes University, 2005 - 2006)
- PhD: Challenges in Topside Ionospheric Modelling Over South Africa, supervised by Dr Lee-Anne McKinnell (Rhodes University, 2010)
- Kwame Nkrumah University, Zambia, University Lecturer – Teaching Physics, Astrophysics and Space Science Courses.

"I hold a BSc in Physics from the University of Zambia obtained in 2003 and a BSc (Honors) in Astrophysics and Space Science from the University of Cape Town obtained in 2004. After completing MSc course work at UCT in July 2005, I moved to Hermanus to join my supervisor Lee-Anne and complete my MSc dissertation at Rhodes university. I proceeded to register for my PhD at Rhodes University and continued to work from Hermanus at the Hermanus Magnetic Observatory (HMO). Life at HMO as a PhD student was exciting, with my highest highlight being the trip to Antarctica in 2008. Upon graduating with my PhD in March 2012, I went on to take up a post-doctoral research fellow position at the University of Michigan, USA, in the Department of Atmospheric, Oceanic and Space Sciences working with Prof. Mark Moldwin for one year. He supported my trip to Zambia in August 2010 to attend interviews for an academic position at the University of Zambia. I later moved back to Zambia to join the University of Zambia in May 2011. I served as Head of the Department of Physics at the University of Zambia and later moved to the KWAME Nkrumah University where I am currently serving as the Director for Research, Postgraduate Studies and Innovation."

I am forever grateful for the opportunity to be part of NASSP and I am who I am and what I am and where I am today because of NASSP. I will never forget the support Penney Middelkoop gave me and my classmates and also the wonderful support from Peter Dunsby."

Fondest memory: "The many road trips across the country visiting the national astronomy facilities in Free State and in Gauteng. As well as the experience of a powerful team of lecturers from across the various universities and facilities was a great experience."

5.3 MADAGASCAR

During SKA Phase 2, there is a plan to implement a portion of the mid-frequency antennas in eight other African partner countries, including Madagascar. These countries initiated their collaboration with the South African SKA Project (renamed as South African Radio Astronomy Observatory) in 2006 to train the next generation of African astronomers. In 2007, the first batch of SARAO-funded Malagasy students arrived in South Africa to pursue BSc Honours degree at the University of Cape Town under NASSP. To date, 9 out of 11 Malagasy students who attended NASSP have been awarded a PhD degree, with the remaining two in their final PhD year.

Given the number of astronomy projects and initiatives that have been launched in Madagascar following its collaboration with South Africa, there is an increased interest in astronomy from the general public and the Malagasy youth to pursue a degree in the field. In 2014, an astronomy MSc program was established at the University of Antananarivo (UoA) with the help from NASSP Alumni PhD holders. They have been instrumental in making the program successful by ensuring the supervision of the student research projects. So far, 20 students graduated from the program with 8 of them currently pursuing a PhD degree abroad.

NASSP has definitely played a major role in growing the astronomy community in Madagascar. The program did not only equip the current Malagasy Astronomers (with no prior knowledge of the field) with skills and experience and triggered the creation of the UoA MSc program, but also helped provide a better income to its graduates, allowing them to fund local STEM-related initiatives to promote further Science & Astronomy in the country. NASSP is an excellent model for any pan-African initiative aiming for a positive impact in South Africa and beyond.

NASSP has definitely played a major role in growing the astronomy community in Madagascar.



Dr Fidy Andriamanankasina Ramamonjisoa



- Country of origin: Madagascar
- NASSP Hons: (UCT, 2007)
- NASSP MSc: Astrophysics/Modelling radio galaxies in the Millennium simulation: SKA/MeerKAT sources and CMB contaminants, supervised by Prof. C. Cress (Coursework: UCT; Dissertation: UWC, 2008 - 2009)
- PhD: Cosmology/Non-circularity of Beams in the CMB Polarisation Power Spectrum Estimation, supervised by Prof. S. Ray (UKZN, 2014)
- University of Antananarivo, Madagascar, Lecturer

"I have been working as a Lecturer since 2021 at the University of Antananarivo, Madagascar at the Department of Physics, Astronomy and Astrophysics Group.

I was a postdoctoral fellow at the University of the Free State, Bloemfontein Campus from 2018 to 2021 at the Astrophysics Group under the supervision of Prof. P.J. Meintjes. The research topic was on the modelling of the polarisation signatures of the white dwarf pulsar in AR Scorpii. I did my first postdoctoral research at the University of KwaZulu-Natal, Westville Campus from 2014 to 2017 at the School of Mathematics and Computer Science under the supervision of Prof. S. Ray. The research topic was on the non-circular beam systematic effects in the CMB polarisation power spectrum estimation."

"My experience of attending NASSP has helped me to develop a strong work ethic in my research career. Thanks to the intense workloads at NASSP, spending long hours in the computer laboratory doing tutorials and assignments, I am now able to tackle any hardcore tasks in my career."

Dr Solohery Randriamampandry



- Country of origin: Madagascar
- NASSP Hons: (UCT, 2008)
- NASSP MSc: "Stellar masses of star-forming galaxies in clusters", supervised by Dr. S. Crawford, & Prof C. Cress (Coursework: UCT; Dissertation: University of the Western Cape, 2009 - 2011)
- Ph.D: "Far-Infrared-Radio Relations in Clusters and Groups at Intermediate Redshift", supervised by Dr. S. Crawford, & Prof C. Cress (University of the Western Cape, 2014)
- SALT Astronomer at the SAO, South Africa; lecturer in astrophysics at the University of Antananarivo, Madagascar.

"Dr Solohery Randriamampandry holds a PhD and MSc in Astrophysics from the University of the Western Cape through the National Astrophysics & Space Science Programme (NASSP), Cape Town. He obtained a BSc Hons in Astrophysics & Space Science from the NASSP at the University of Cape Town, and a BSc Hons in Physics from the University of Antananarivo, Madagascar. He was a PDP and SKA post-doc based at UKZN and at SAO. He is currently a SALT astronomer at SAO and a lecturer in astrophysics at the University of Antananarivo.

Solohery does research in galaxy formation and evolution using multi-wavelength data. He is a member of the International Astronomical Union (IAU) as well as a professional member of the Malagasy Astronomical Society (MAS) starting in 2018. Further, he is a member of the African Astronomical Society (AfAS) since 2011. He was a junior member of the American Astronomical Society (AAS) in 2009 - 2013."

"My time at NASSP, hosted by UCT back in 2008/2009, was both challenging and transformative. As a non-native English speaker, I faced demanding courses that stretched me to my limits, often requiring long hours and sleepless nights. With unwavering determination, I persevered, even dedicating weekends to the NASSP computer lab. Thanks to the invaluable support of SAO, this experience propelled me into a thrilling global journey of exploring the cosmos and travelling to many countries around the world. I'm grateful for the rewarding yet demanding journey at NASSP/SAO, which has shaped my personal and career growth."

5.4 UGANDA

The introduction of astrophysics has not only created awareness among students but also cultivated a lot of interest in pursuing further careers in astrophysics.

As part of its mandate in promoting science and technology in Uganda, Mbarara University of Science and Technology (MUST) introduced Astrophysics as an undergraduate course in the Physics department in 2003. The ultimate goal was to develop the discipline and eventually create a department of Astrophysics and Space Science in the University.

The exposure of students to a course, such as Astrophysics and Space Physics, that articulates an in-depth description and analysis of the structures and forms that characterise the universe has played a central role in broadening their perception and activating their awareness about the importance of studying and understanding our natural heritage, the universe. The introduction of Astrophysics has not only created awareness among students but also cultivated a lot of interest in pursuing further careers in Astrophysics.

At this stage, there were no opportunities for postgraduate studies in Astronomy or Space Physics in Uganda and training had to be sought elsewhere. Between 2003 and 2018, 10 students from Uganda joined NASSP, completing their Honours and Masters degrees. All the 10 went on to do a PhD, some through the NASSP scholarship and others through other scholarships. A number of them then returned to Uganda to take up faculty positions at various universities. This led to the introduction of Astrophysics and Space Science at postgraduate (MSc and PhD) level at MUST in 2013. The ultimate aim was to develop human resources in Astrophysics and Space Science. Since then, about 12 PhDs and over 30 MScs have graduated in Astrophysics and Space Science at MUST. This was made possible with financial support from the International Science Programme (ISP) based in Uppsala University in Sweden.

All the PhD graduates from MUST and a number of NASSP alumni are now employed in various Universities in Uganda and this has resulted in the introduction of Astrophysics and Space Science in these Universities. For example, in Busitema University, Astrophysics and Space Science have been introduced as course units under Physics, and a number of students do their research in Astrophysics and Space Science at undergraduate and MSc level. A number of Universities, e.g., Muni University and Kabale University, have already developed a curriculum for Astrophysics and Space Science for postgraduate studies.

As a result of these achievements, there is a strong national interest in developing Astrophysics and Space Science in Uganda. This has led to the introduction of some components of astronomy and Space Science in the secondary school curriculum and establishment of the Aeronautics and Space Science Bureau under the Ministry of Science, Technology and Innovations.

Assoc. Prof Edward Jurua



- Country of origin: Uganda
- NASSP Hons: (UCT, 2003)
- NASSP MSc: Cataclysmic Variables, supervised by Prof. P.J. Meintjies (Coursework: UCT; Dissertation: University of the Free State, 2004 - 2005)
- PhD: High Energy Astrophysics, supervised by Prof. P.J.Meintjies (University of the Free State, 2008)
- Mbarara University of Science and Technology; HoD Physics, Assoc. Prof

"I completed my Bachelor of Science (Physics) in Makerere University in 1999 and obtained an Upper Second class BSc. I then joined UCT in 2003, under the NASSP Programme for an Honours degree in Astrophysics and obtained a first-class BSc Honours degree. I started my MSc in 2004, also under the NASSP programme. The course work component of the MSc was in UCT and the research component was at University of the Free State. My MSc research was on Cataclysmic Variables (Topic: Secondary star surface magnetic activity and mass transfer in cataclysmic variables). I completed my MSc in 2005 and started a PhD in the same year. My PhD research was in High Energy Astrophysics on (Topic: The Anomalous Low State of the X-ray Binary System Hercules X-1). I completed my PhD in 2008 and graduated in the same year. After my PhD, I came back to Mbarara University of Science and Technology (MUST), in Uganda, as a lecturer and I am currently an Associate Professor. While at MUST, I introduced Astrophysics and Space Science at postgraduate (MSc and PhD) level. Since the introduction of the postgraduate programme, I have supervised 12 PhD and 38 MSc students to completion. I am currently the HoD Physics at MUST and Visiting Professor in Busitema University, in Uganda"

"We were the first set of students who started NASSP at Honours level in 2003. We were exposed to committed and dedicated lecturers and professors from different Universities and institutions within South Africa. All the lecturers and Professors were very loving and paid special attention to individual students' needs and challenges. Through these Lecturers and Professors, I learnt how to interact with students, both in lectures and in supervision of student's dissertations and thesis. The administrators were loving and caring and this made us, who came from outside South Africa, to feel at home. The NASSP Programme was so intense that it trained me to concentrate and focus to achieve so much regardless of the workload at hand. The NASSP programme was a turning point in my career."

Dr Elizabeth Naluminsa



- Country of origin: Uganda
- NASSP Hons: (UCT, 2011)
- NASSP MSc: Analysis of Galaxy H-alpha Kinematics Using SALT RSS Fabry-Perot Observations, supervised by Petri Vaisanen, Steve Crawford, Kurt van der Heyden (Coursework: UCT; Dissertation: UCT, 2012 - 2014)
- PhD: Star Formation and Disk Stability in Nearby Galaxies, supervised by Thomas Jarrett, Edward Elson (UCT, 2019)
- Makerere University, Kampala, Lecturer

"My name is Elizabeth Naluminsa. I am a Ugandan and a professional astronomer, currently a lecturer at Makerere University in Uganda. My area of research is star formation in nearby galaxies, but I also have a passion for STEM education, computer programming, outreach, and mentorship. My work involves lecturing in physics and astrophysics courses, research, as well as student supervision. My teaching mission is to demystify science, make it attainable and relatable for everyone."

"My dream to study astronomy was conceived when I read the story of the moon landing. There were a couple of reasons why that story sparked something within me, but that small spark lingered on throughout my primary school years until high school when the flame began to grow steadily. After high school, I went to Mbarara University of Science and Technology and studied BSc (Physics major) with education. When I left high school, there wasn't any university in my country that offered a program for astronomy and astrophysics, so a BSc was the natural path to take from there, and I thank God for the BSc that led me to NASSP."

"I had wanted to study astronomy from a young age. It was one of my deepest desires to get totally immersed in the study of the stars. However, when I finally got to the end of high school, I found that there was no such course of study at the universities in my country at that time. The absence of my preferred career option back home, made me think I'd never get to live that dream, but then NASSP happened! And as they say, the rest is history :)"

Fondest memory: "Many good memories, but nothing could beat the feeling that I was finally living my dream."

UGANDA'S FIRST FEMALE ASTRONOMER



For Dr Elizabeth Naluminsa, her journey into astronomy had always been about pursuing her passion and realising her dreams. It was only after the revelation of her unique status that she recognised the responsibility it carried. As the first female astronomer in Uganda, she now sees the importance of inspiring young girls and encouraging them to explore careers in the STEM (Science, Technology, Engineering and Mathematics) fields. "To get more Ugandan girls interested in the field of astronomy, and even more generally in the STEM fields, is a responsibility I gladly embrace," says Dr Naluminsa. "Now there's a generation of Ugandan kids that have female astronomers to look up to (plus access to the internet), and we will make this count."

Her admission to NASSP at UCT was a major pivot in her career journey. It was during her time at NASSP that she began to fully live her dream of becoming an astronomer. "Every day that I woke up to go to the university to study astronomy felt like a dream come true," she shares. It was during her time at NASSP that she began to fully live her dream of becoming an astronomer.

"Career highlights were getting to live my dream through NASSP, and getting to work at SALT as a postdoc. Nothing in my young mind could have prepared me for that thrill. To this day, it still feels surreal."

She also mentions that her experience working at SALT (the largest optical telescope in the southern hemisphere) and teaching at Makerere University (the largest, oldest and best university

in Uganda) as key career highlights, which allows her to share her passion for astronomy and science with the next generation. "To walk into work every morning with gladness in my heart and to see the lives of students take shape in our hands as their teachers, it's a blessing," she says.

As a woman who has broken barriers in the male-dominated field of astronomy, Dr Naluminsa emphasises the importance of creating opportunities and providing mentorship to aspiring female astronomers. She believes that fostering early interest in STEM subjects among young girls is crucial. Dr Naluminsa encourages women to pursue careers in astronomy and STEM fields, emphasising that astronomy is a beautiful and captivating field that allows individuals to explore the mysteries of the universe. Her own journey from Uganda to the stars serves as an inspiring example for aspiring astronomers, particularly women, to chase their dreams and reach for the cosmos.

As Uganda's first female astronomer, she continues to inspire the next generation of scientists and astronomers, helping to bridge the gender gap in STEM fields and fostering a brighter future for science in Uganda and beyond.

Article credit: African Science Stars Magazine, Uganda's first female astronomer





6

INTERNATIONAL
REACH

Prof Renée Hložek



- Country of origin: South Africa
- NASSP Hons: (UCT, 2006)
- PhD (DPhil): Cosmology, supervised by Joanna Dunkley (University of Oxford, United Kingdom, 2011)
- University of Toronto, Canada, Associate Professor
- LSST DESC (Dark Energy Science Collaboration): Cosmology

"I got a Rhodes scholarship for my DPhil based on the research and experiences I had during NASSP and my SKA HCD-funded MSc. After my DPhil I went on to Princeton as a prize research fellow, and started my faculty job at the University of Toronto in 2016. I've received some awards as a faculty member (Alfred P. Sloan Fellowship, CIFAR Azrieli Global Scholarship, the Harvey B. Richer Medal for early career science in astronomy, elected to the College of New Scholars, Artists and Scientists of the Royal Society of Canada). I've just started as the Spokesperson for the LSST Dark Energy Science Collaboration which will use data from the Rubin Observatory. This is especially important to me as I started research on the kind of supernova cosmology that will be possible with the Rubin Observatory during my NASSP Honours year."

"NASSP was an incredible experience. In addition to providing me with excellent instruction and research experience, it also brought me together with future leaders in astronomy from around the world (I studied with Yabebal Tadesse, Tana Joseph, Nikki Pekeur, Roger Deane, Patrice Okouma, Jean Uwamahoro, James Mason and others). It was an amazing opportunity."

Fondest memory: "I really loved getting to know each other in the first Summer School before we started (we programmed LEGO robots together!). In general, I think it was amazing to build the community spirit."

Dr Wendy Williams



- Country of origin: South Africa
- NASSP Hons: (UCT, 2008)
- PhD: Evolution of radio-loud AGN, supervised by Prof Huub Rottgering (Leiden University, the Netherlands, 2015)
- SKAO, SKAO Project Scientist

"Since a young age, I have been interested in astronomy – I loved everything to do with space and my favourite subjects at school were maths and science. In 2008, NASSP was still a very young programme and it gave me the opportunity to do my BSc Honours degree in the subject of my passion, Astrophysics. The Summer School at the start of the year was an enjoyable and memorable time, with the highlights of programming lego robots, launching rockets and visiting Hermanus and Sutherland. As was the school the following year when Kosma von Maltitz and I co-ordinated the Summer School for the next cohort of NASSP Honours students. The existence of the NASSP programme, as well as the establishment of new facilities like the SALT meant that the prospect of pursuing a career in Astronomy was optimistic. In fact, the potential of the largest radio telescope, SKA, being built in South Africa, is what sparked my interest in radio astronomy. Funding from the South African SKA project allowed me to pursue a MSc by research in Astronomy at UCT, where I continued working on near-infrared observations of galaxies behind the Milky Way, but now combining these data with information from radio wavelengths to map out the large scale cosmic web structures in which the galaxies live. I even took some new data at the 64-m Parkes Radio telescope in Australia! Towards the end of my MSc, an opportunity arose for me to do a PhD at Leiden Observatory in the Netherlands on the topic of active galactic nuclei (AGN) and the low frequency array (LOFAR), a pathfinder instrument for what will soon be the SKA Low telescope. Moving abroad and living in another country brought new challenges for me, but it was also stimulating and full of adventure. I continued this line of research first as postdoctoral research associate at the University of Herfordshire in the UK and then back at Leiden Observatory in the Netherlands, moving back and forth over the English Channel. I realised during this time that I enjoy both the technical aspects of this work, dealing with the details of the instruments and data, as well as the scientific research, and I particularly enjoy enabling other people to do further research, so I started looking for an Observatory role. I was fortunate to find such a position at the SKA Observatory, so since July 2022 I have been a project scientist based at the SKAO headquarters in the UK. This is a very exciting place to be right now, with construction just started on the two SKA telescopes – Mid in South Africa and Low in Australia, something that was just a dim hope at the start of my NASSP journey!"

Assoc. Prof Michelle Cluver



- Country of origin: South Africa
- NASSP MSc: Probing Distant Clusters: a Pre-SALT Near-infrared Photometric Study of Intermediate Redshift Galaxy Clusters, supervised by Prof. Anthony Fairall, Dr Patrick Woudt (Coursework, Dissertation: UCT, 2003 - 2005)
- PhD: The Nature and Nurture of a Starburst, Supermassive H I Galaxy, HIZOA J0836-43, supervised by Prof. Renee Kraan-Korteweg, Dr Patrick Woudt, Dr Tom Jarrett (UCT, 2009)
- Swinburne University of Technology, Researcher and Lecturer
- Co-PI of 4MOST Hemisphere Survey: extragalactic

"Postdoc at the Spitzer Science Centre (Caltech, USA), Super Science Fellow (AAO, Australia), Research Career Advancement Fellow (UWC), Future Fellow (Swinburne, Australia). Medal for best PhD in Faculty of Science, UCT. Anne Green medal for achievements by a mid-career researcher, Astronomical Society of Australia."

"NASSP was the reason I went back to study and allowed me to pursue a career in astronomy. It was a turning point in my life for more than one reason!"

Fondest memory: "The NASSP Summer Schools (as participant, organiser and lecturer)."

Dr Sultan Hassan



- Country of origin: Sudan
- NASSP Hons: (UCT, 2011)
- NASSP MSc: Thesis title: Collective effects in multi-field inflation, supervised by Jeff Murugan & Amanda Weltman (Coursework: UCT; Dissertation: UCT, 2012 - 2013, awarded MSc with distinction in both coursework and dissertation.
- PhD: Astrophysics, supervised by Romeel Dave (UWC, April 2018) Thesis title: Simulating the neutral hydrogen distribution during cosmic reionization
- Prestigious postdoctoral fellowships including:
 - » SKA postdoctoral fellow at UWC, South Africa from January - August 2018.
 - » Tombaugh postdoctoral fellow at New Mexico State University, New Mexico, United States of America, from September 2018 to September 2020.
 - » Flatiron Research Fellow at the Center for Computational Astrophysics (CCA) in the Flatiron Institute, New York, United States of America, from September 2020 to December 2022.
 - » NASA Hubble Fellow at New York University, United States of America.

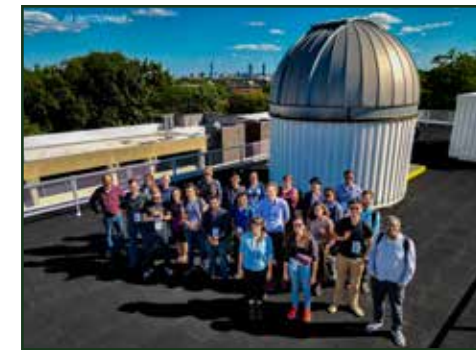
"I am currently holding the NASA Hubble Fellowship at New York University, a dream of every researcher in our field. This fellowship is the most prestigious award in our field and is worn as a badge of honour throughout an Astronomer's entire career. I have been a Flatiron Research Fellow in the Center for Computational Astrophysics (CCA) at the Flatiron Institute during 2020-2022. Prior to joining the CCA in September 2020, I was a Tombaugh Postdoctoral Fellow in the Department of Astronomy at New Mexico State University (NMSU) in 2018-2020. Shortly after submitting my PhD at UWC in South Africa in January 2018, I held the SKA Postdoctoral Fellowship at UWC for 8 months. I work at the intersection of Astrophysics, Cosmology and Machine learning. My expertise ranges from Cosmic Dawn, reionization, star and galaxy formation to large scale intensity mapping techniques by upcoming experiments such as SKA, and HIRAX.

I have also been playing an important role in training and mentoring the next generation of historically disadvantaged South African MSc students. In particular, I supervised two MSc NASSP students, Mr. Tumelo Mangena from 2018-2020 in UWC, and Mosima Masipa from 2021-2023 in UWC. Both students have successfully published their MSc work in peer reviewed journals and conferences. Mosima also participated in the Machine Learning Summer School at the Flatiron Institute last summer in New York, and her paper was accepted to the International Conference on Learning Representations (ICLR) 2023, and she featured in Simons Foundation 2022 annual report."

“My story is a continuation of the beautiful series of successful stories that NASSP has made possible. Many thanks to NASSP for the generous funding, support and opportunity. Without NASSP, I would have never been able to make a very successful career in Astronomy.” - Dr Sultan Hassan



Image Credit (above group image): Emily Tan/Simons Foundation



picture on the roof of Center for Astrophysics (CIA) at Harvard University during the 2023 NASA Hubble Fellowship Symposium



Here's a picture for me and my student Mosima (also NASSP student) during the poster session for the machine learning Summer School at the Flatiron Institute in New York

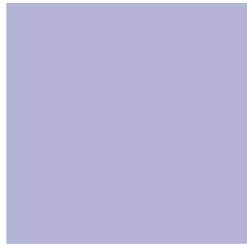


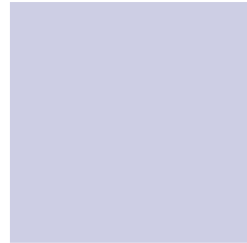
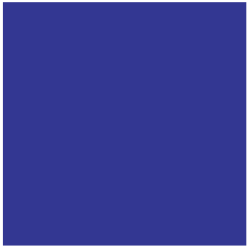
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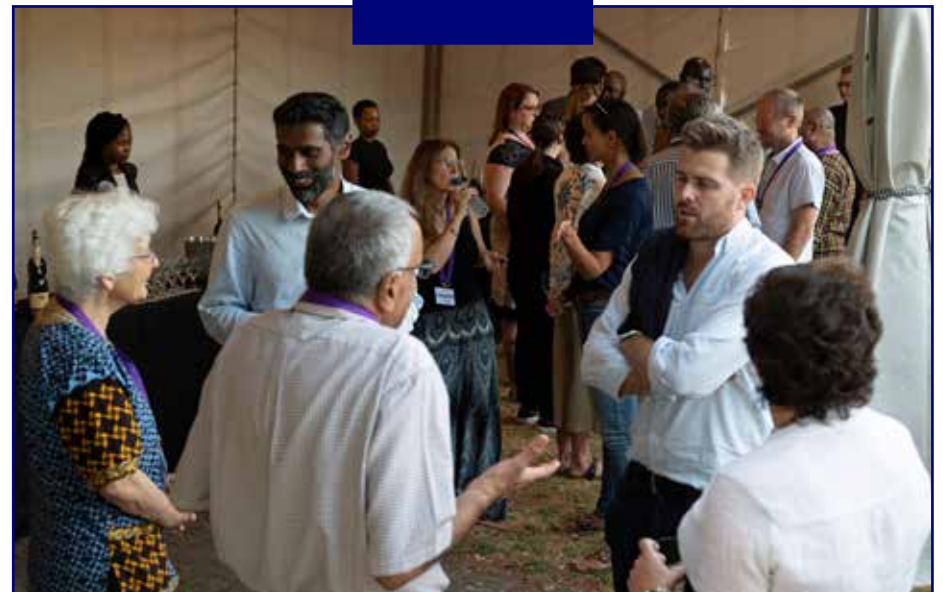
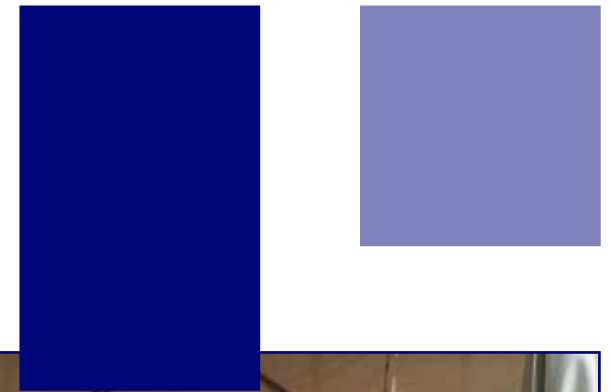
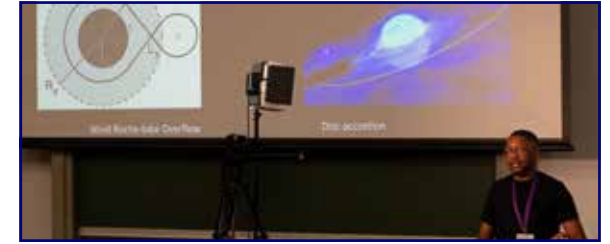
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REUNION

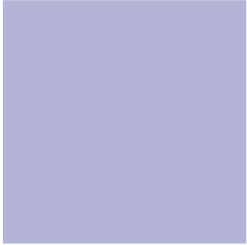




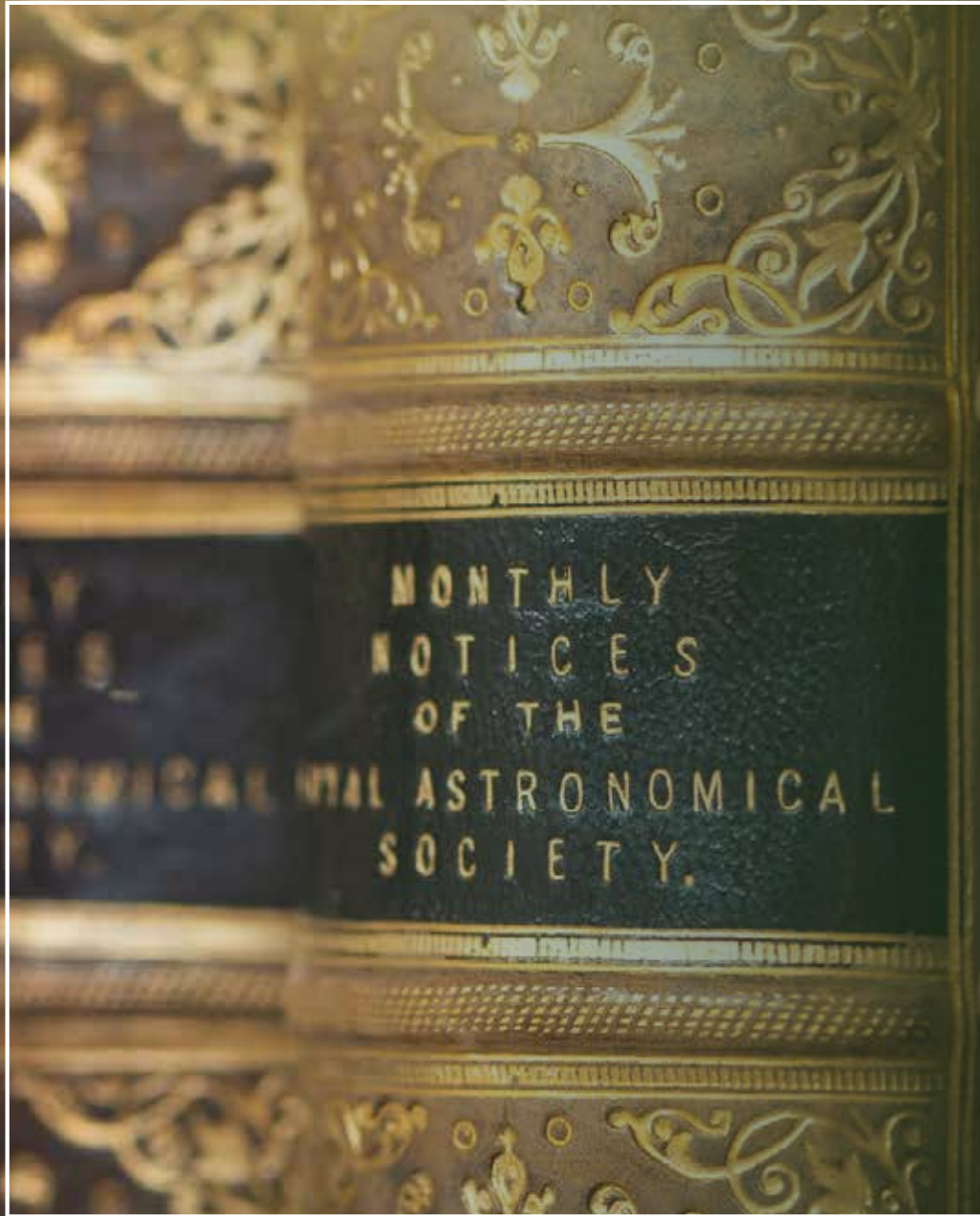








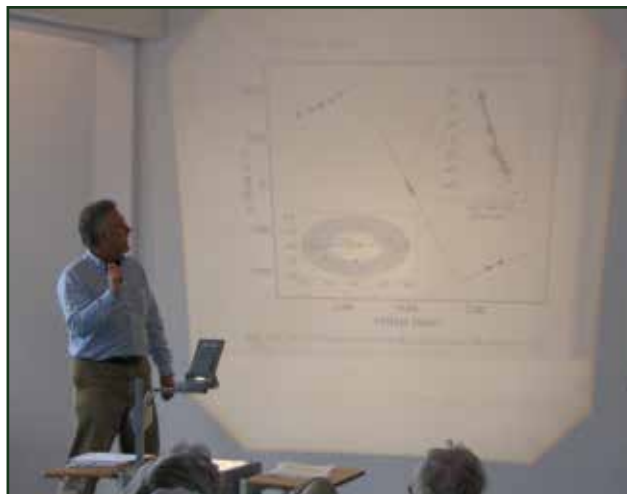
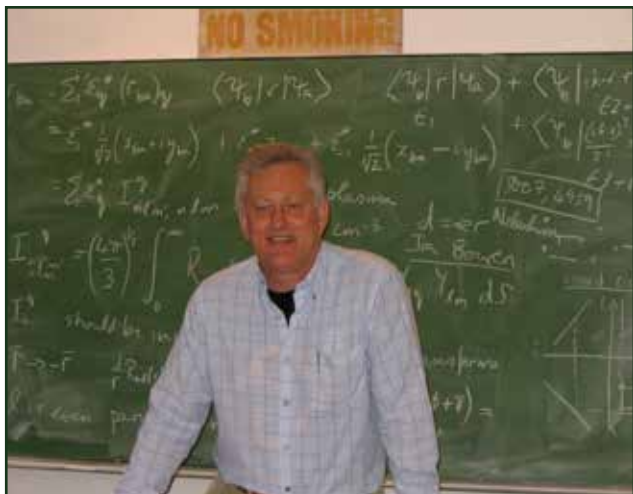


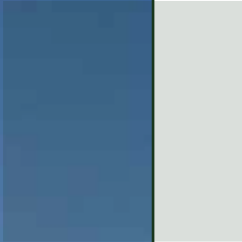
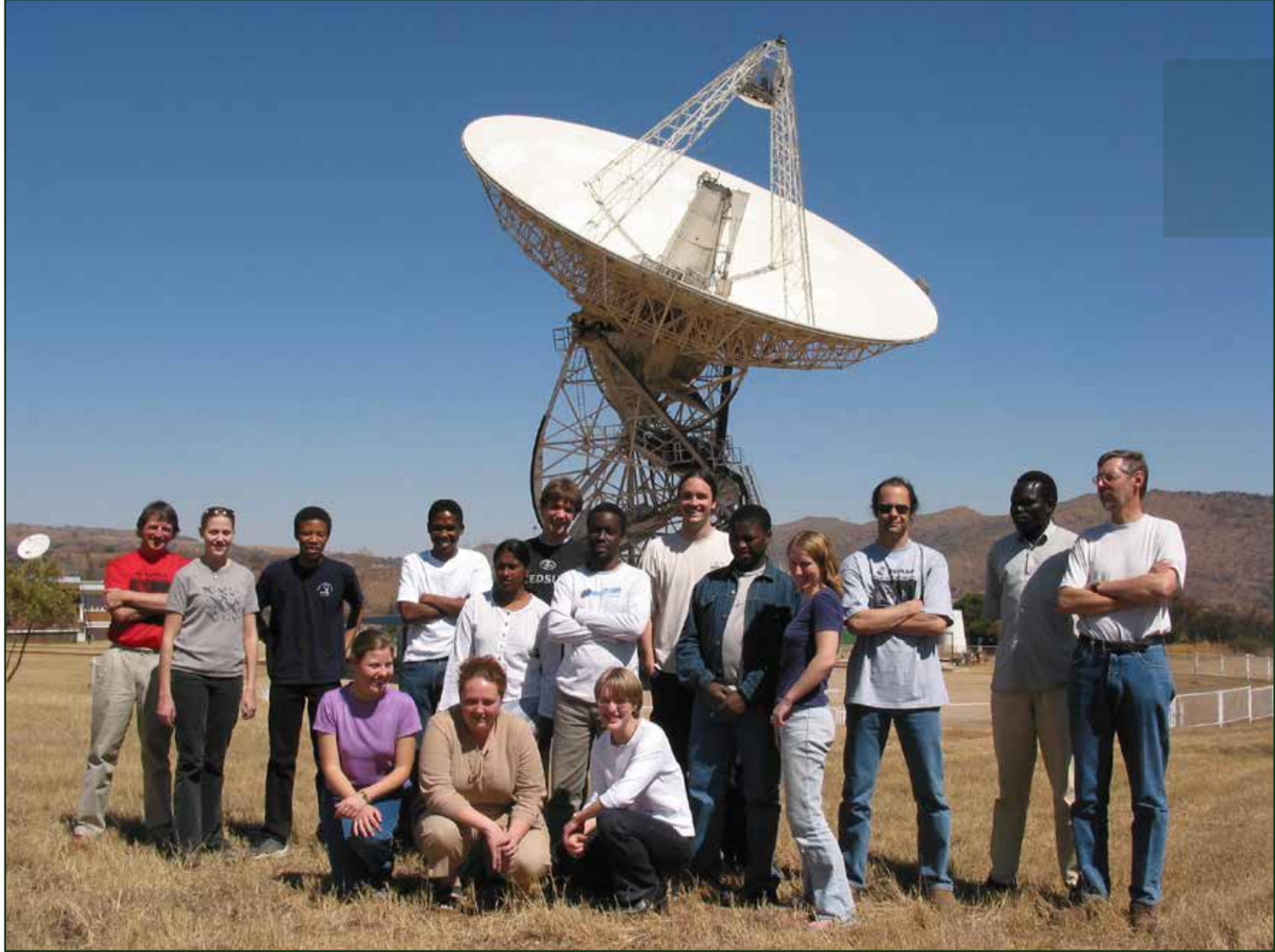


8

THROUGH
THE YEARS

2003

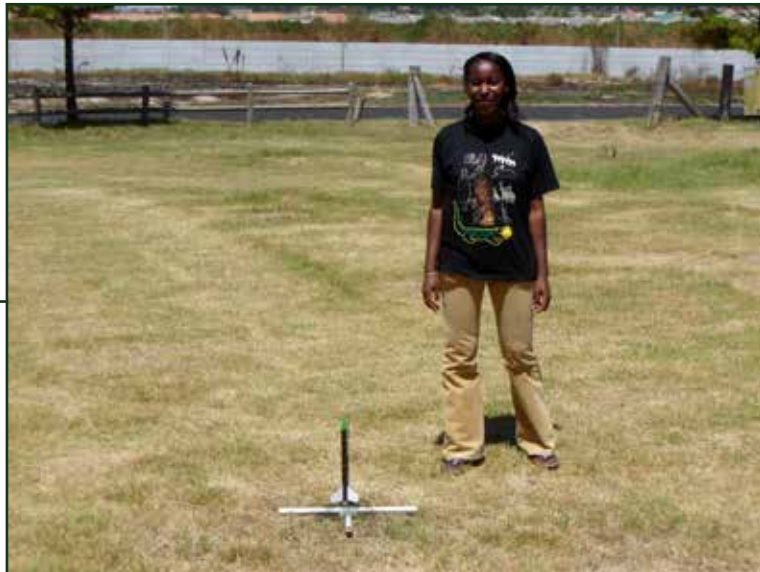




2004



2005



2006





2007





2008



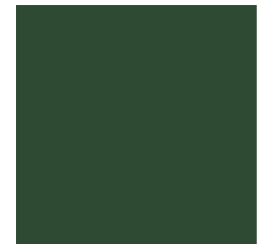
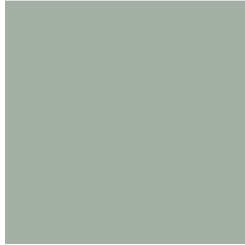


2009





2010





2011





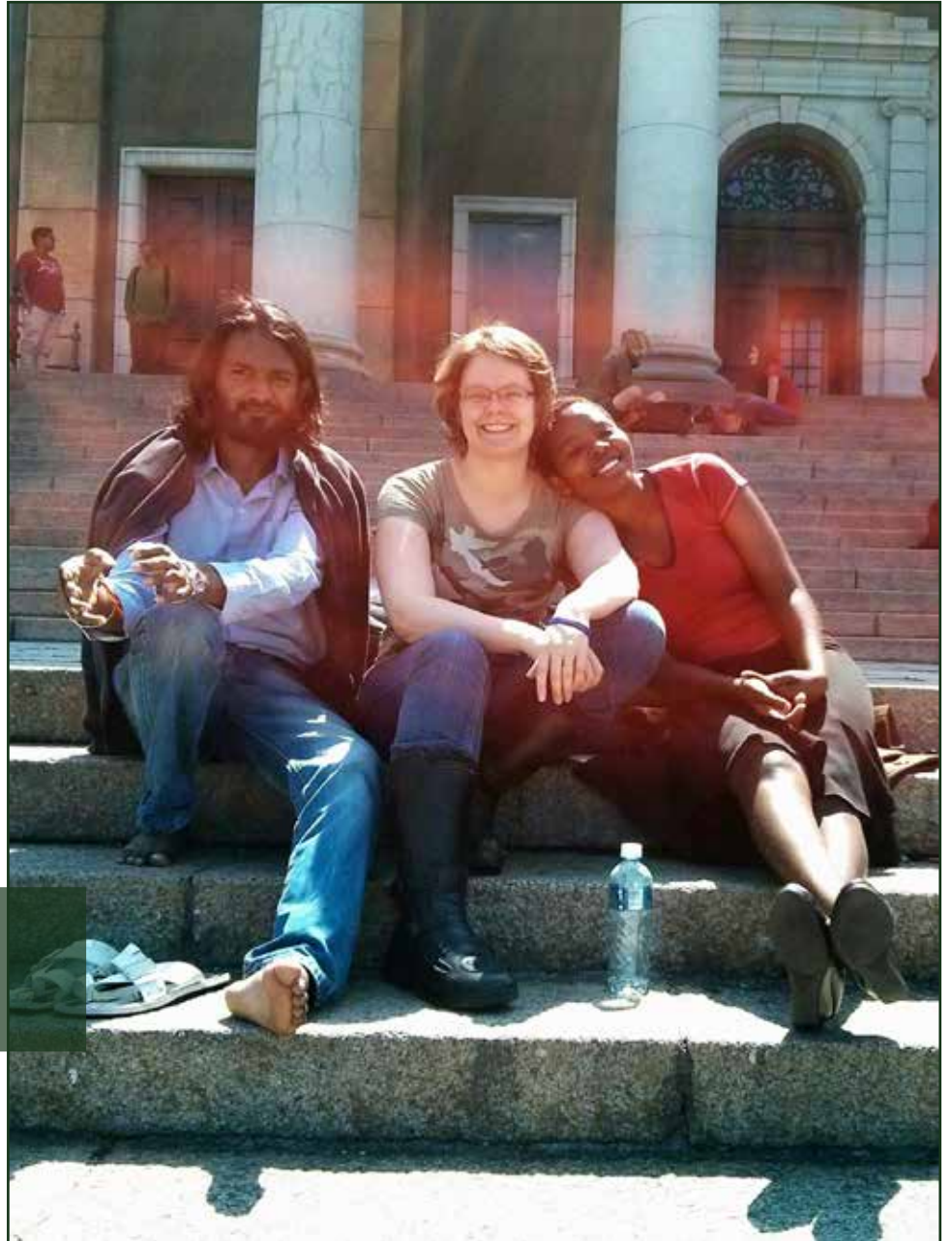
2012



2013



2014



2016

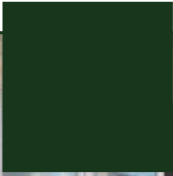


2017





2018





2019



2020



2020



2022



2023





2023









9

APPENDIX

9.1 CONTRIBUTORS

Saalih Allie (UCT)

Roelf Botha (SARAO)

Adri Burger (NWU)

Sarah Blyth (UCT)

Michael Kosch (SANSA)

Abigail Thambiran (SAAO, Wits, UCT)

Rosalind Skelton (SAAO)

Sivakumar Venkataraman (UKZN)

Patricia Whitelock (SAAO, UCT)

Peter Dunsby (UCT)

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9.2 SOME ACRONYMS AND ABBREVIATIONS

AVN	African VLBI Network	NWU	North-West University
DSI	Department of Science and Innovation	PGBP	Postgraduate Bridging Programme
DST	Department of Science and Technology (now DSI)	PUCHE	Potchefstroom University for Christian Higher Education (now NWU)
EHP	Extended Honours Programme	SAAO	South African Astronomical Observatory
UFS	University of the Free State	SALT	Southern African Large Telescope
HartRAO	Hartebeesthoek Radio Astronomy Observatory	SANSA	South African National Space Agency
HDU	Historically Disadvantaged University	SARAO	South African Radio Astronomy Observatory
H.E.S.S.	High Energy Stereoscopic System	SKA	Square Kilometre Array
HIRAX	Hydrogen Intensity and Real Time Analysis eXperiment	SKAO	SKA Observatory
HMO	Hermanus Magnetic Observatory	UCT	University of Cape Town
IDIA	Inter-university institute for Data Intensive Astronomy	UJ	University of Johannesburg
IRSF	Infrared Survey Facility	UKZN	University of KwaZulu-Natal
KAT	Karoo Array Telescope	UNISA	University of South Africa
NASSP	National Astrophysics and Space Science Programme	UWC	University of the Western Cape
NEPAD	New Partnership for Africa's Development	VLBI	Very Long Baseline Interferometry
NRF	National Research Foundation	Wits	University of the Witwatersrand
NSBP	National Society of Black Physicists		



20 YEARS OF
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