Section A: Overview of the Research Project Proposal

1. Title of the research project:

Turbulent Radiative Mixing Layers and the Destruction of Cold Gas in Ram-Pressure Stripped Galaxies in the Fornax Cluster

2. Broad field of research:

Astrophysics

3. Academic level of the research project:

PhD

4. Research project abstract/summary:

Environmental quenching of galaxies in clusters is largely driven by the removal and destruction of cold gas through ram-pressure stripping. Deep HI imaging with MeerKAT has revealed spectacular tails, truncated discs, and extraplanar clouds in nearby systems such as the Fornax cluster. However, the physical mechanisms that govern the survival and mixing of stripped cold gas with the surrounding hot intracluster medium remain poorly constrained. Turbulent radiative mixing layer models provide a promising theoretical framework for describing the entrainment and destruction of multiphase gas under shear and pressure confinement. This project will use existing MeerKAT Fornax Survey data to test and extend turbulent radiative mixing layer models, building in particular on the framework of Fielding and Bryan (2022), and applying it to the geometry and dynamical conditions of ram-pressure stripped tails. By combining high-resolution HI observations, ancillary multi-wavelength data tracing the multi-phase gas, and targeted numerical simulations, the student will derive quantitative constraints on mixing efficiencies, destruction timescales, and the conditions under which cold gas can survive in cluster environments. The project directly exploits available MeerKAT data and addresses key questions in galaxy evolution in dense environments.

5. Primary supervisor's details

a. Full name of the primary supervisor
Dr. Mpati Ramatsoku
b. Primary supervisor's email address
m.ramatsoku@ru.ac.za
c. University where the primary supervisor is employed
Rhodes University

6. Co-supervisors' details

a. Full name of the research co-supervisor
Prof. Oleg Smirnov
b. Research co-supervisor's email address
o.smirnov@ru.ac.za
c. University where the co-supervisor is employed
Rhodes University

6. Co-supervisors' details

a. Full name of the research co-supervisor
Prof. Paolo Serra
b. Research co-supervisor's email address
paolo.serra@inaf.it
c. University where the co-supervisor is employed
Istituto Nazionale di Astrofisica (INAF) - Osservatorio Astronomico di Cagliari

6. Co-supervisors' details

a. Full name of the research co-supervisor
Prof. Greg Bryan
b. Research co-supervisor's email address
greg.bryan@columbia.edu
c. University where the co-supervisor is employed
Columbia University

Section B: Details of Research Project

1. Scientific merit

The transformation of star-forming galaxies into gas-poor, quiescent systems in clusters is one of the central problems in galaxy evolution. It has long been established that ram-pressure stripping can remove cold gas from galaxies moving through a hot intracluster medium (Gunn & Gott 1972). Observational surveys have shown systematic H I deficiencies in cluster galaxies (Giovanelli & Haynes 1985; Chung et al. 2009), and high-sensitivity imaging has revealed spectacular HI tails extending tens of kiloparsecs from stripped systems (Oosterloo & van Gorkom 2005). MeerKAT now provides an unprecedented opportunity to detect low-column-density gas at ~ kpc resolution, enabling quantitative studies of the structure and kinematics of stripped material in nearby clusters such as Fornax.

While the large-scale removal of gas can be described by classical pressure balance arguments, the subsequent fate of the stripped cold gas remains uncertain. Simulations have shown that shear between the cold cloud and hot ambient medium drives Kelvin–Helmholtz instabilities and generates turbulent interfaces that mediate mixing (Klein et al. 1994; Agertz et al. 2007). The efficiency of this mixing determines whether cold gas is rapidly destroyed or can survive. Recent work has emphasised the role of radiative cooling within these turbulent interfaces (Gronke & Oh 2018). In particular, Fielding et al. (2020) demonstrated that fractal turbulent radiative mixing layers can reach a quasi-steady state in which cooling balances turbulent heating, leading to characteristic scalings of entrainment rates and layer thickness with ambient pressure and shear velocity. Related numerical studies have shown that cooling can significantly prolong cloud survival under certain conditions (McCourt et al. 2018; Gronke & Oh 2020).

However, these theoretical models have not yet been systematically compared with spatially resolved H I observations of ram-pressure-stripped galaxies. In particular, the geometry of a continuously stripped tail differs from that of an isolated cloud in a uniform wind. In a cluster environment, the wind properties vary along the orbit, and stripped gas may experience pressure confinement, turbulence injection, and thermal conduction from the surrounding intracluster medium (Tonnesen & Bryan 2009; Tonnesen & Stone 2014). The Fornax cluster, with its well-characterised galaxy population and high-quality MeerKAT data (Serra et al. 2023), provides an ideal laboratory to test whether turbulent radiative mixing layer models can reproduce observed tail widths, velocity dispersions, column density gradients, and survival lengths. Ambient (hot) gas densities and temperatures can be found from existing Chandra and eROSITA data.

The specific scientific objectives of this project are:

- To measure detailed structural and kinematic properties of H I tails in a representative sample of Fornax cluster galaxies using MeerKAT data.

- To infer empirical constraints on cold gas survival times and mass loss rates as functions of cluster-centric distance and estimated ram pressure.
- To extend the turbulent radiative mixing layer framework of Fielding and Bryan (2022) to a ram-pressure stripped tail geometry, including sustained shear and pressure gradients.
- To generate forward-modeled observables from theoretical predictions and compare them directly to beam-convolved HI data.
- To determine whether a single set of mixing efficiency parameters can simultaneously explain the ensemble of observed Fornax tails, or whether additional physics, such as conduction suppression or magnetic draping, is required.

2. Feasibility and resources

The MeerKAT Fornax Survey data required for this project are already observed and processed as part of the approved Large Science Programme. High-quality HI data cubes, source catalogues, and ancillary imaging tracing stars and multi-phase gas are available to the collaboration. The student will have immediate access to calibrated data products and value-added data products, including moment maps and source masks, which significantly reduce start-up time and ensure rapid scientific progress.

The analysis tasks are technically well-defined and build on established methodologies within the MeerKAT community. Measurement of tail morphology, column density structure, and velocity dispersion can be carried out using existing radio astronomy software packages and Python-based analysis tools. The project does not require the development of new instrumentation or proprietary data reduction pipelines. Instead, it focuses on advanced scientific interpretation and model comparison, which is appropriate for a three-year PhD time frame. Theoretical extensions of the turbulent radiative mixing layer framework will build directly on published analytic scalings and numerical results, minimising technical risk.

The project will proceed in three main phases:
Year 1: Literature review on environmental quenching, ram-pressure stripping, and turbulent radiative mixing layers. Training in MeerKAT HI data analysis and measurement of tail properties for a defined sample of stripped galaxies in Fornax. Development of robust methodology to extract column density profiles, velocity dispersion maps, and morphological metrics. Initial characterisation of a pilot subsample and presentation of early results.

Refinement of scientific questions based on preliminary analysis.
Year 2: Development and implementation of an extended turbulent radiative mixing layer model adapted to ram-pressure stripping geometry. Analysis of existing numerical simulations to calibrate entrainment efficiencies and mixing scalings. Generation of forward-modelled HI observables including beam convolution and noise properties matched to MeerKAT data. Systematic comparison between theoretical predictions and observed tail properties.

Year 3: Expansion of the analysis to the full galaxy sample in Fornax. Statistical inference of mixing parameters and destruction timescales across the cluster environment. Exploration of parameter degeneracies and possible additional physical effects. Preparation and

submission of a second peer-reviewed paper focused on model–data comparison. Completion of doctoral thesis and dissemination of results at international conferences.

The computational requirements are fully compatible with the existing high-performance computing facilities at the collaborating institutions, including access to multi-core clusters for data cube processing and moderate-scale numerical analysis. The data volumes, while substantial, are well within the storage and processing capabilities routinely used for MeerKAT Large Science Projects. Theoretical modelling will rely primarily on analysis of existing simulation outputs and semi-analytic calculations, rather than requiring large new simulation campaigns. This combination of already available data, mature analysis techniques, and established theoretical frameworks ensures that the project is feasible within the prescribed three-year PhD period.

Finally, we note that some small funding would be made available from co-supervisor Bryan for visits of the student to Columbia University and the Flatiron Institute, and from co-supervisor Paolo Serra for visits to INAF - Cagliari.

3. SARAO research priority areas

This project is addressing the following SARAO priority area;

- Topics exploiting data projected to be available by 2026-27 from key existing radio astronomy instruments located in South Africa: this is a MeerKAT project.

4. Student academic abilities/skills required

For this project, a candidate would require a Master's degree (NQF 9 level) in astronomy, physics, engineering or a similar discipline. They need to have a working knowledge of scripting languages, e.g., Python, Matlab, etc, and if not, the candidate must be capable of becoming rapidly familiar with a scripting language of their choice. Some experience with observational/theoretical radio astronomy is desirable but not required.

The student will develop advanced skills in:

- Radio interferometric data analysis and HI spectral cube processing.
- Statistical characterisation of multiphase gas structures.
- Theoretical modelling of turbulent radiative mixing layers.
- Numerical simulation analysis and forward modelling of observables.
- Scientific programming in Python and related scientific computing tools.
- Scientific writing, publication, and presentation.

References: Agertz, O., Moore, B., Stadel, J., Potter, D., et al. 2007, *Monthly Notices of the Royal Astronomical Society*, 380, 963–978.; Chung, A., van Gorkom, J. H., Kenney, J. D. P., Crowl, H., & Vollmer, B. 2009, *The Astronomical Journal*, 138, 1741–1816.; Fielding, D. B., & Bryan, G. L. 2022, *The Astrophysical Journal*, 935, 76.; Giovanelli, R., & Haynes, M. P. 1985, *The Astrophysical Journal*, 292, 404–425.; Gronke, M., & Oh, S. P. 2018, *Monthly Notices of the Royal Astronomical Society: Letters*, 480, L111–L115.; Gronke, M., & Oh, S. P. 2020, *Monthly Notices of the Royal Astronomical Society: Letters*, 494, L27–L31.; Gunn, J. E., & Gott, J. R., III. 1972, *The Astrophysical Journal*, 176, 1–19.; Klein, R. I., McKee, C. F., & Colella, P. 1994, *The Astrophysical Journal*, 420, 213–236.; McCourt, M., Oh, S. P., O'Leary, R. M., & Madigan, A.-M. 2018, *Monthly Notices of the Royal Astronomical Society*, 473, 5407–5422.; Oosterloo, T., & van Gorkom, J. 2005, *Astronomy & Astrophysics*, 437, L19–L22.; Serra, P. et al. 2023, *Astronomy & Astrophysics*, 673, 146; Tonnesen, S., & Bryan, G. L. 2009, *The Astrophysical Journal*, 694, 789–804.; Tonnesen, S., & Stone, J. 2014, *The Astrophysical Journal*, 795, 148.

Mpati Ramatsoku

Curriculum Vitae

Drosty Rd, Physics Building
6139 Grahamstown, South Africa
0027 046 603 7487
m.ramatsoku@ru.ac.za

Scientific Interests

Observational radio astrophysics

- Formation and evolution of galaxies, star formation, gas evolution.
- Galaxy clusters and large-scale structures.

Publications

37 articles in peer-reviewed journals, 26 in conference proceedings and catalogues, 60 in total, *1193 citations. h-index: 20, source SAO/NASA astrophysics Data System (ADS).*

Work Experience

2019 - 2026 **Research fellow**, *Rhodes University, South Africa.*

2017 - 2019 **Postdoctoral fellow**, *Istituto Nazionale di Astrofisica (INAF), Italy.*

Education

2013 – 2017 **PhD in Astrophysics**, *University of Groningen, Netherlands and University of Cape Town, South Africa.*

2010 – 2012 **M.Sc in Astrophysics and Space Science**, *University of Cape Town, South Africa.*

Telescope Time Allocation

2018 **Lead technical and science investigator**, *HI Imaging of the ram-pressure stripped ESO 137-001 with MeerKAT.*

2020 **Lead technical investigator**, *MKT-20122: A MeerKAT view on galaxies in filaments falling onto the Virgo cluster (VirgoFil).*

2022 **Lead technical investigator**, *MeerKAT - DDT: HI observations of PGC75143.*

2022 **Lead technical investigator**, *MKT-22135: A MeerKAT view on gas-deficient galaxies in the Virgo III filament.*

2023 **Science and technical investigator**, *MKT-23175: A Filament Feeding the Virgo Cluster*

Student and Postdoc (Co)Supervision

2025 - present **Postgraduate student (MSc)**, *Tebogo Chipaze. Project: Galaxy Cluster Environments Traced by HI.*

2025 - 2025 **Postgraduate student (BSc, Hons)**, *Karabo Rantwane. Project: Galaxy Cluster Environments Traced by HI.*

2024 - present **Postdoc**, *Eric Maina. Project: Exploring HI in the MGCLS-HI Catalogue.*

2024 - present **Postgraduate student (PhD)**, *Andrew Firth. Project: The Gas Tails of the Fornax Cluster.*

2023 - present **Postgraduate student (PhD)**, *Koketso Mophahlane. PhD Thesis topic: The Neutral Gas in Clusters and Environments - The first MGCLS - HI database.*

2019 - 2022 **Postgraduate student (MSc)**, *Koketso Mophahlane. MSc Thesis topic: An HI view of the Norma cluster with MeerKAT. Graduated with distinction.*

2023 - 2023 **Postgraduate student**, *Neo Namane. Project: Quality Assessment of the MGCLS-HI cubes (6 months).*

Selected Publications

- **Ramatsoku, M.**, Serra, P., Sun, M., Smirnov, O. M., & Makhathini, S. (2025), MeerKAT HI imaging of the jellyfish galaxy ESO 137-001, A&A, 694, A159.
- Finn, R. A., Rudnick, G., Jablonka, P., **Ramatsoku, M.**, Nagaraj, G., Vulcani, B., Koopmann, R. A., Fossati, M., Agostino, J., Bahé, Y., Garcia-Burillo, S., Castignani, G., Combes, F., Conger, K., De Lucia, G., Desai, V., Moustakas, J., Norman, D., Sperone-Longin, D., Townsend, M., Xie, L., Zakharova, D., Zaritsky, D. (2025), Virgo Filaments. V. Disrupting the Baryon Cycle in the NGC 5364 Galaxy Group, ApJ, 985, 81.
- Dabbech, A., Terris, M., Jackson, A., **Ramatsoku, M**., Smirnov, O. M., & Wiaux, Y. (2022), First AI for Deep Super-resolution Wide-field Imaging in Radio Astronomy: Unveiling Structure in ESO 137-006, The Astrophysical Journal, 939, L4.
- **Ramatsoku, M**., Verheijen, M. A. W., Kraan-Korteweg, R. C., Jarrett, T. H., Said, K., & Schröder, A. C. (2020), A near-infrared study of the obscured 3C129 galaxy cluster, Astronomy and Astrophysics, 644, A107.
- **Ramatsoku, M**., Serra, P., Poggianti, B. M., Moretti, A., Gullieuszik, M., Bettoni, D., Deb, T., Franchetto, A., van Gorkom, J. H., Jaffé, Y., Tonnesen, S., Verheijen, M. A. W., Vulcani, B., Andati, L. A. L., de Blok, E., Józsa, G. I. G., Kamphuis, P., Kleiner, D., Maccagni, F. M., Makhathini, S., Molnár, D. C., Ramaila, A. J. T., Smirnov, O., & Thorat, K. (2020), GASP. XXVI. HI gas in jellyfish galaxies: The case of JO201 and JO206, Astronomy and Astrophysics, 640, A22.
- **Ramatsoku, M**., Murgia, M., Vacca, V., Serra, P., Makhathini, S., Govoni, F., Smirnov, O., Andati, L. A. L., de Blok, E., Józsa, G. I. G., Kamphuis, P., Kleiner, D., Maccagni, F. M., Molnár, D. C., Ramaila, A. J. T., Thorat, K., & White, S. V. (2020), Collimated synchrotron threads linking the radio lobes of ESO 137-006, Astronomy and Astrophysics, 636, L1.
- **Ramatsoku, M**., Serra, P., Poggianti, B. M., Moretti, A., Gullieuszik, M., Bettoni, D., Deb, T., Fritz, J., van Gorkom, J. H., Jaffé, Y. L., Tonnesen, S., Verheijen, M. A. W., Vulcani, B., Hugo, B., Józsa, G. I. G., Maccagni, F. M., Makhathini, S., Ramaila, A., Smirnov, O., & Thorat, K. (2019), GASP - XVII. H I imaging of the jellyfish galaxy JO206: gas stripping and enhanced star formation, Monthly Notices of the Royal Astronomical Society, 487, 4580.

.....Truncated ...

CURRICULUM VITAE

Paolo Serra

Contact and links

email: paolo.serra@inaf.it
homepage: https://www.oa-cagliari.inaf.it/personale/paolo-serra
publication list: https://ui.adsabs.harvard.edu/#/public-libraries/M6-CR6DQQVGcqfGcv_Pf1Q
orcid: https://orcid.org/0000-0001-5965-252X

Positions held

2016 - *now*: Researcher (*Primo Ricercatore*), INAF - Osservatorio Astronomico di Cagliari
2013 - 2016: OCE SL research scientist, CSIRO-ATNF, Sydney, Australia
2011 - 2013: NWO/Veni fellow, ASTRON, Dwingeloo, the Netherlands
2008 - 2011: Postdoctoral fellow, ASTRON, Dwingeloo, the Netherlands

Education and qualifications

2018: Eligible for the position of Full Professor in Astronomy, Astrophysics, Earth and Planetary Science (*Abilitazione Scientifica Nazionale I fascia*)

2008: Ph.D. in Astronomy, Kapteyn Instituut, University of Groningen, NL
Thesis: "Stars, neutral hydrogen and ionised gas in early-type galaxies"
(supervisor S.C. Trager)

Personal grants

2022: 2 year Guest Observer INAF grant – €100k
2018: 5 year "FARE" grant of the Italian Ministry of Education, Universities and Research – €180k
2016: 6 year "Starting Grant" of the European Research Council – €1.5M
2014: CSIRO grant to hire a 3-year postdoctoral fellow – $270k AUD
2010: 3 year "Veni" fellowship of the Netherlands Organisation for Scientific Research (NWO) – €250k

Main projects since PhD

Atlas3D
SoFiA
MeerKAT Fornax Survey
WALLABY
WEAVE-APERTIF
ViCTORIA
CARACal
GASP
HALOGAS
MAGNET

Greg L. Bryan

Department of Astronomy, Columbia University
1325 Pupin Physics Laboratories
550 West 120th Street
New York, New York 10027
greg.bryan@columbia.edu
Born: July, 1967 / Citizenship: US

Research Interests

X-ray clusters, Galaxy formation, Formation of the first stars, Cosmology, Computational astrophysics, High-performance computing, Artificial Intelligence

Education

1990-1996 Ph.D. in astrophysics from the University of Illinois, Urbana, IL.
1985-1989 B.Sc. in physics from the Department of Physics, University of Calgary, Canada.

Awards and Fellowships

2012 Columbia University Presidential Mentoring Award
2006 NSF CAREER Grant (NSF's most prestigious award for junior faculty)
2003 Leverhulme Trust Prize (£50,000 prize for "outstanding young researcher")
1998 Hubble Fellowship, Space Telescope Science Institute
1997 Lyman Spitzer Fellowship, Department of Astrophysical Sciences, Princeton University
1997 Worked on visualization for IMAX film "Cosmic Voyage", which was nominated for an Academy Award (best short documentary)
1990 Merit Fellowship, Department of Astronomy, University of Illinois at Urbana-Champaign
1985 University of Calgary Merit Scholarship, University of Calgary, Canada

Professional Experience

2021-present Director, Learning the Universe Collaboration
2022-2025 Chair, Dept. of Astronomy, Columbia University
2014-present Full Professor, Dept. of Astronomy, Columbia University
2016-2019 Group Leader, Flatiron Institute (50% appointment)
2009-2013 Associate Professor, Dept. of Astronomy, Columbia University
2004-2009 Assistant Professor, Dept. of Astronomy, Columbia University
2001-2004 University Lecturer, Dept. of Physics, University of Oxford
1998-2001 Hubble Fellow, MIT Center for Space Research and Department of Physics
1997-1998 Lyman Spitzer Fellow, Princeton University Observatory.
1996-1997 Research Associate, MIT Department of Physics.
1991-1996 Teaching/Research Assistant, National Center for Supercomputing Applications.
1989-1990 Research Assistant, University of Colorado.

Society Memberships

1996-present American Astronomical Society

Publications

Approximately 230 refereed publications
From Google Scholar: 26,000 citations (6000 normalized citations), h-factor 82
Google Scholar link: https://scholar.google.com/citations?user=3B1rkj8AAAAJ&hl=en
Website: http://user.astro.columbia.edu/~gbryan/Site/home.html

Distinguished Professor Oleg Mikhailovich Smirnov

o.smirnov@ru.ac.za https://www.linkedin.com/in/oleg-smirnov-2203a92/ +27 78 216 7951

SARAO Research Chair
Centre for Radio Astronomy Techniques & Technologies (RATT)
Department of Physics & Electronics, Rhodes University
PO Box 94, Makhanda, 6140, South Africa

Head: Radio Astronomy Research Group
South African Radio Astronomy Observatory (SARAO)
Liesbeek House, Mowbray, 7700, South Africa

Research Associate
Institute for Radioastronomy / National Institute of Astrophysics (INAF IRA)
Via Gobetti 101, 40129 Bologna, Italy

Academic Employment

2012–present: Rhodes University. Professor (Distinguished Professor from 2023), SARAO Research Chair in radio astronomy techniques and technologies.

2012–present: South African Radio Astronomy Observatory (SARAO). Head: Radio Astronomy Research Group (RARG).

1999–2012: Netherlands Institute of Radio Astronomy (ASTRON, Dwingeloo, The Netherlands, http://www.astron.nl). Post-doctoral researcher, scientific software developer, software architect, researcher.

1988–1999: Institute of Astronomy of the Russian Academy of Sciences (INASAN, Moscow, Russia, http://www.inasan.ru). Lab assistant, PhD student, researcher.

Education

1995–1998 PhD Astronomy & Astrophysics
Institute of Astronomy of the Russian Academy Of Sciences, Moscow
Supervisor: Dr. N.N. Samus (Sternberg Astronomical Institute)
Thesis “CCD photometry of globular clusters” defended at the Astro Space Center, Lebedev Physics Institute, Moscow.

1990-1995 BSc Mathematics & Applied Mathematics
Mechanics and Mathematics Faculty, Moscow State University

Awards & Professional Achievements

Awarded an A2 rating by the National Research Foundation (2022).

Science Team of the Year award from the National Research Foundation (2023).

Research Profile

Research into radio interferometric calibration and imaging: mathematical modelling of the measurement process (radio interferometry measurement equation); software and methods for radio astronomical calibration, imaging, and simulations, ionospheric modelling. Mathematical treatment of direction-dependent effects. Data compression techniques for radio interferometry. Bayesian techniques for estimating scientific parameters from radio observations. Radio imaging at extreme dynamic range.

Development of software systems for radio astronomy: primary developer of the MeqTrees package (http://meqtrees.net) for implementing arbitrary measurement equations, calibration and simulation. Lead developer and/or contributor to various other current packages (CASA via AIPS++, CubiCal, QuartiCal, Stimela2, CARACal).

Funding leveraged

SARAO/SARChI, "Radio astronomy techniques and technologies" chair grant, 2012–2027, **ZAR 69,800,000**

SARAO, "New Scientific Frontiers" group grant, 2017–2022, **ZAR 15,100,000**

SARAO, "New Scientific Frontiers" group grant extension**,** 2022–2027, **ZAR 8,906,000**

SARAO, "New Scientific Frontiers II" group grant, 2022–2024, **ZAR 4,871,000**

BRICS STI Framework Programme, "Precision Radio Imaging In The SKA Era" trilateral grant, 2020–2022, **ZAR 2,590,000**

Swiss-South Africa Joint Research Programme, "Wide-band imaging in the SKA era" bilateral grant, 2017--2021, **ZAR 2,578,000**

NWO/NRF Astronomy Co-Operation And Enabling Technologies For Astronomy Programme, "Next-generation Algorithms & Techniques for Radio Interferometry: Maximizing the Scientific Output of MeerKAT, LOFAR and the SKA" bilateral grant, 2017–2019, **ZAR 500,000**

NWO/NRF Cooperation Programme, "Towards the SKA: instruments, R&D, calibration and imaging" bilateral grant, 2013–2016, **ZAR 450,000**

Student supervision

MSc: J. Kenyon, C. Nunhokee (graduated 2015), L. Philip, B. Hugo (graduated 2016), L. Sebokolodi, U. Mbou Sob, T. Blecher (graduated 2017), A. Akoto-Danso (graduated 2018), S. Zitha (graduated 2019), A. Ramaila (graduated 2019), I. Rammala (graduated 2019), S. Twum (graduated 2019), D. Kluste (graduated 2019), L. Andati (graduated

2021),
E. Maina (graduated 2020), C. Mugwariri (graduated 2020), G. Sichone (graduated 2020), J.Chenge (graduated 2020), J. van Staden (graduated 2021), C. Russeawon (graduated 2021), N. Charles (graduated 2021), P. Legodi (graduated 2021), R. Kincaid (graduated 2022), S. Kupa (graduated 2022), P. Sejake (graduated 2022), S. Manaka (graduated 2023), K. Trehaeven (graduated), K. Mophahlane (graduated 2023), V. Samboco (graduated 2024), N. Namane (graduated 2024), S. Stanbury (graduated 2024), B. Welman (graduated 2024), S. Gcilitshana (graduated 2024), E. Kamau (graduated 2026), N. Mokoena, P. Mulunda

PhD: H. Shukla (graduated 2014), M. Atemkeng (graduated 2017), S. Makhathini, I. Natarajan (graduated 2017), C. Nunhokee (graduated 2018), J. Kenyon, E. Bonnassieux, D. Klutse (graduated 2019), K. Iheanetu, U. Mbou Sob, T. Ansah Narh (graduated 2020), G. Molenaar (graduated 2021), L. Sebokolodi (graduated 2022), I. Rammala (graduated 2023) N. Charles (graduated 2024), B. Hugo (graduated 2024), L. Andati (graduated 2024), P. Legodi (graduated 2024)
In progress: A. Ramaila,, K. Mophahlane, C. Russeawon, K. Trehaeven, L. Gwebushe, B. Ngcebetsha, T. Mabote, T. Myburgh, I. Sihlangu, K.Dichaba

Theses examined

MSc: R. Baxter, University of Cape Town; M. Menegaldo, University of Pretoria; J.C. Andrianjafy, University of Mauritius

PhD: S. Sikhosana, UKZN; L.S. Legodi, UCT; J. Bij de Vaate, Stellenbosch University; J. Albert, Leiden University; B. Veenboer, Vrije Universiteit Amsterdam; J. Borg, University of Malta; D. Muscat, University of Malta; L. Pratley, University College London; J. Birdi, Heriot-Watt University; A. Dabbech, University of Nice; V. Karthik, EPFL; P. van Zyl, University of the Witwatersrand

Publications

301 total, 15590 citations, h-index 58

Main publications 2015-present:

Smirnov, O.M. et al., Mining the time axis with TRON – I. Millisecond pulsars in Omega Centauri, Terzan 5, and 47 Tucanae detected through MeerKAT interferometric imaging; MNRAS 2025, 538, L62
Smirnov, O.M. et al., Mining the time axis with TRON – II. MeerKAT detects a stellar radio flare from a distant RS CVn candidate; MNRAS 2025, 538, L89
Smirnov, O.M. et al., The RATT PARROT: serendipitous discovery of a peculiarly scintillating pulsar in MeerKAT imaging observations of the Great Saturn--Jupiter Conjunction of 2020. I. Dynamic imaging and data analysis; MNRAS 2024, 528, 6517
Dabbech, A., Terris, M., Jackson, A., Ramatsoku, M., **Smirnov, O.M.** and Wiaux, Y.; First AI for Deep Super-resolution Wide-field Imaging in Radio Astronomy: Unveiling Structure in ESO 137-006; ApJL 2022, 939, L4
Sob, U.M.; Bester, H.L.; **Smirnov, O.M.**; Kenyon, J.S.; Grobler, T.L.; Radio interferometric calibration using a complex Student's t-distribution and Wirtinger

derivatives; MNRAS 2020, 491, 1026
Kenyon, J.S.; **Smirnov, O.M.**; Grobler, T.L; Perkins, S.J.; CubiCal - Fast radio interferometric calibration suite exploiting complex optimisation; MNRAS 2018, 478, 2399
Dabbech, A.; Onose, A.; Abdulaziz, A.; Perley, R. A.; **Smirnov, O. M.**; Wiaux, Y.; Cygnus A super-resolved via convex optimization from VLA data; MNRAS 2018, 467, 2853
Atemkeng, M.; **Smirnov, O.**; Tasse, C.; Foster, G.; Keimpema, A.; Paragi, Z.; Jonas, J.; Baseline-dependent sampling and windowing for radio interferometry: data compression, field-of-interest shaping and outer field suppression; MNRAS 2018, 477, 4511
Smirnov, O. M., Tasse, C. 2015, “Radio interferometric gain calibration as a complex optimization problem”, MNRAS, 449, 2668

Personal Information

Born 10 May 1973, Moscow, Russia Nationality: Dutch