

MSc Project Proposal

Section A: Overview of the Research Project

1. Title of the research project: **Constraining the properties of a nearby Galactic Pulsar and its Wind Nebula via Observations and Modelling**
2. Broad area of research (Engineering or Science): **Science**
3. Academic level of research project (Masters or Doctoral): **Masters**
4. Abstract of research project:

Pulsars are extraordinarily stable clocks, rotating at rates of up to 700 revolutions per second. Their magnetosphere is a wonderful laboratory for testing the laws of physics under extreme conditions, including general relativistic, plasma, and quantum-mechanical effects. In some cases, a pulsar is the engine of a surrounding pulsar wind nebula, a bubble of magnetic field and relativistic plasma; their rotational kinetic energy provides the reservoir that drives an electron-positron wind acceleration as well as pulsed electromagnetic radiation. Using MeerKAT data, we propose to study a nearby pulsar / pulsar wind nebula system in some detail. The period and its derivative will constrain the pulsar energetics, while the spatial properties of the nebula will constrain the particle transport (e.g., diffusion or adiabatic losses) therein. Using a combination of modelling approaches to reproduce the pulsar light curves, polarisation angle sweep, as well as nebular surface brightness and spectrum, we will holistically constrain the properties of such a pulsar-nebular system.

5. Primary supervisor's details:

- a. Full name of primary supervisor: **Prof. Christo Venter**
 - b. Primary supervisor's email address (please note that if this project is approved, this email address will be made available to students to contact the primary supervisor): **Christo.Venter@nwu.ac.za**
 - c. University where primary supervisor is employed: **North-West University**
6. Co-supervisor/Research supervisor's details (if relevant):
 - a. Full name of co-supervisor/research supervisor: **Prof. Benjamin Willem Stappers**
 - b. University where co-supervisor/research supervisor is employed: **University of Manchester**

Section B: Details of Research Project

1. Scientific/Engineering merit: describe the objectives of the research project, placing them in the context of the current key questions and understanding of the field.

Pulsars are an important Galactic source class (e.g., Abdo et al. 2010). These intriguing objects have been studied for decades, but many questions remain unanswered as to their operation, evolution, and environment. Pulsars manifest themselves via pulses in the radio through gamma-ray bands, and most recently, they have also been detected in the very-high-energy gamma-ray band (e.g., Ansoldi et al. 2016). They furthermore power ambient young pulsar wind nebulae that shine across the electromagnetic spectrum (Gaensler and Slane 2006, Slane 2017).

To improve our understanding of these enigmatic systems, we propose to use MeerKAT data (of a recent pulsar / pulsar wind nebula detection) to first constrain the energetics of a pulsar embedded in a pulsar wind nebula. We will apply light curve modelling to constrain the geometry of the pulsar, i.e., its magnetic and observational inclination angles, via joint fitting of the radio and gamma-ray light curves (e.g., Corongiu et al. 2021). We will obtain complementary constraints on these parameters by fitting the rotating vector model to MeerKAT polarisation data. Next, we will model MeerKAT observations of the spatial and spectral structure of the surrounding pulsar wind nebula (Van Rensburg et al. 2019).

Thus, by applying several models to different aspects of the pulsar-nebula system, we will be able to form a holistic picture of such a system, thereby constraining aspects of the magnetospheric emission regions (e.g., geometry and location of the radio / gamma-ray beam, B-field structure) as well as constraining the properties electron-positron plasma (e.g., diffusion, bulk flow). The interplay of new data and mature models associated with such a case study will yield a sophisticated picture of nature's cosmic lighthouses.

2. Feasibility: outline the methods that will be used to achieve the objectives. Provide details on the availability of required data / access to required equipment / availability of research facilities and other resources required. Include any relevant expected intermediate milestones and associated timeframes towards attaining the overall objectives of the project.

Method / Data:

Liaising with the MeerTRAP and MeerTime experiments on MeerKAT, we will obtain access to new pulsar discoveries related to *Fermi* Large Area Telescope (LAT) pulsars or *Fermi* unidentified sources. We will first consolidate various radio data on a pulsar / pulsar wind nebula system, before applying several numerical codes to model these data.

Computing facilities:

We have access to IDIA computational resources (via past successful Open Time Proposals) as well as local clusters to analyse these data. In addition, we have computational time on the Centre for High Performance Computing (CHPC) that can be used to run our codes as needed, in addition to local machines used for code validation and calibration.

Expertise:

We have the technical expertise in our team to tackle the data analysis, as well as the theoretical expertise to apply existing models to new pulsar discoveries.

Timeline:

Year 1: Obtaining radio data, as well as multi-wavelength data, of a suitable source. Validation, calibration, and collection of various data.

Year 2: Running several codes, collaborating with other modellers, and obtaining a holistic picture of the source. Writing of a journal article.

3. Link the proposed project to one or more of the SARA0 research priority areas for 2023 (refer to Section 5 of the Application Guide), and explain in some detail how the proposed research will contribute to the priority area(s).

This project will focus not only on MeerKAT data of a pulsar and its wind nebula, but also on public multi-wavelength data of the same. To make this project feasible to be done in a two-year period, we will focus on existing radio data of a composite pulsar wind nebula / supernova remnant with embedded pulsar (pulsar timing data, polarisation data of the pulsar, and imaging data of the nebula).

4. If relevant, describe any particular qualifications, academic abilities, skills and/or experience that a student should have in order to successfully deliver on the objectives of the research proposed.

Strong interest in programming, data analysis, and suitable mathematical and scientific writing / presentation skills.

Section C: CV of Primary Supervisor (please include details of students supervised to date)

Prof. Christo Venter

1. PERSONAL DETAILS

1.1 General

Title: Prof.
Surname: Venter
Initials: C
First Name: Christo
Citizenship: South African
ID Number: 8005145054087
Race: White
Gender: Male
Marital Status: Married
Date of Birth: 14 May 1980
Email Address: Christo.Venter@nwu.ac.za,
christo.venter7@gmail.com
ORCID ID: [orcid.org/ 0000-0002-2666-4812](http://orcid.org/0000-0002-2666-4812)

1.2 Tertiary Education

Degree	Main Subjects	Institution	Degree Obtained	Comments
B.Sc.	Physics, Computer Science, Mathematics / Applied Mathematics	North-West University, Potchefstroom Campus	March 2002	<i>Cum laude</i>
M.Sc.	Astrophysics	North-West University, Potchefstroom Campus	May 2004	<i>Cum laude</i>
Ph.D.	Astrophysics	North-West University, Potchefstroom Campus	September 2008	First Class

1.3 Employment History

Period	Position	Institution
2005 – 2008	Lecturer	North-West University, Potchefstroom Campus
2009	Postdoctoral Fellow	NASA Goddard Space Flight Center, USA
2009 – 2014	Senior Lecturer	North-West University, Potchefstroom Campus
2015 – 2017	Associate Professor	North-West University, Potchefstroom Campus
2018 – present	Professor	North-West University, Potchefstroom Campus
2020 – 2022	Research Director	Centre for Space Research, North-West University

1.4 Membership of Professional Bodies

Period	Body	Comments
2002 – present	Golden Key International Honour Society	Top 15% of graduates
2002 – present	South African Institute of Physics (SAIP)	Secretary of Astrophysics and Space Science Division (2014 – 2016); Co-chair of Astrophysics

		and Space Science Division (2017 – 2018)
2006 – present	South African Council for Natural Scientific Professions (SACNASP)	
2011 – present	African Astronomical Society (AfAS)	
2012 – present	International Astronomical Union (IAU)	Member of Division D: High Energy Phenomena and Fundamental Physics; chair of the South African National Committee (SANC-IAU in 2017 – 2018).
2014 – present	Suid-Afrikaanse Akademie vir Wetenskap en Kuns (SAAWK)	

1.5 Awards and Honours

Year	Name of Award	Comments
2003, 2004	Labour (DoL) Scarce Skills Scholarship	
2005	Southern Africa Association for the Advancement of Science (S2A3) Bronze Medal	Best Natural Science Master's thesis at the North-West University
2006	Best report / presentation in Philosophy of Science	Assignment completed as part of training for new lecturers
2011	NWU Most Cited Researcher	
2014	Elsevier Young Scientist Award	Awarded to P-rated scientists, including research funds of R50 000.

2. TEACHING EXPERIENCE

2.1 Modules Taught

Year	Module	Description	Level
2005 – 2018	FSKM821	Introduction to General Relativity	Fifth-year
2008	FSKN313	Astronomy	Third-year
2010 – present	FSKS312 / NPHY312	Wave Mechanics	Third-year
2005 – 2020	Practica		First, second, and third-year
2011 – 2019	Practica	Head of Third-year practica	Third-year
2019	FSKM811	High-energy Astrophysics	Fifth-year

3. RESEARCH

3.1 Publications

Year	Refereed Papers	Refereed Proceedings	Proceedings	H.E.S.S. Collaboration	Fermi LAT Collaboration	MeerKAT Collaboration
2005	2	0	2	14	0	
2006	0	0	0	13	0	
2007	0	0	1	11	0	
2008	3	0	2	15	0	
2009	2	0	3	17	3	
2010	1	0	1	6	14	
2011	0	3	6	13	2	
2012	1	1	2	13	1	
2013	1	0	0	10	4	
2014	1	4	0	12	0	
2015	2	8	1	9	0	

2016	1	6	1	3	0	
2017	2	4	1	7	0	
2018	4	4	2	21	0	
2019	2	2	2	9	0	
2020	3	0	0	9	0	
2021	4	0	0	10	0	
2022	2	1	5	3	0	1
2023						
Total	30	33	29	195	24	1

Nine of the above publications were published in Science (impact factor 37; I was contacting author on one), and 4 in Nature (impact factor 41). NASA ADS lists about 22 000 citations to these papers, giving an h-index of 77 (Scopus: 14 400 citations, h-index of 63; Web of Science: 12 600 citations, h-index of 60). These citations are from over 80 countries. For the non-Collaboration papers, NASA ADS lists about 1 000 citations, giving an h-index of 17 (Scopus: 370 citations, h-index of 10; Web of Science: 311 citations, h-index of 9). These citations are from 36 countries. This means an increase in h-index of > 1 per year.

For details, see:

[https://ui.adsabs.harvard.edu/search/fq=%7B!type%3Dagp%20v%3D%24fq_database%7D&fq_database=database%3A%20astronomy&q=author%3A\(%22Venter%2C%20C%22\)&sort=date%20desc%2C%20bibcode%20desc&p_0](https://ui.adsabs.harvard.edu/search/fq=%7B!type%3Dagp%20v%3D%24fq_database%7D&fq_database=database%3A%20astronomy&q=author%3A(%22Venter%2C%20C%22)&sort=date%20desc%2C%20bibcode%20desc&p_0)

3.2 Graduate Student Supervision

Student	Level	Year Started	Year Completed	Description
Honours				
Mr M Mashaba	Hons. B.Sc.	2010	2010	Supervisor
Mr LE Mostert	Hons. B.Sc.	2010	2010	Supervisor
Ms M Breed	Hons. B.Sc.	2011	2011	Supervisor
Mr PL Prinsloo	Hons. B.Sc.	2012	2012	Supervisor
Mr MT Bezuidenhout	Hons. B.Sc.	2016	2016	Supervisor
Mr T Ayorinde	Hons. B.Sc.	2016	2016	Supervisor
Ms S McKee	Hons. B.Sc.	2017	2017	Supervisor
Mr L du Plessis	Hons. B.Sc.	2018	2018	Supervisor
Mr E Ellis	Hons. B.Sc.	2020	2020	Supervisor
Mr Douglas Moyeni	Hons. B.Sc.	2021	2021	Supervisor
Mr Heinrich Hurter	Hons. B.Sc.	2022	2022	Supervisor
Master's				
Mr TE Marubini	M.Sc.	2008	2013	Co-supervisor
Mr AS Seyffert	M.Sc.	2010	2014	Supervisor
Ms M Breed	M.Sc.	2012	2015	Supervisor
Mr C van Rensburg	M.Sc.	2013	2016	Co-supervisor
Ms H Ndiyavala	M.Sc.	2015	2017	Co-supervisor
Mr MC Bezuidenhout	M.Sc.	2017	2018	Supervisor
Mr L du Plessis	M.Sc.	2019	2020	Supervisor
Mr CJT van der Merwe	M.Sc.	2019	2020	Supervisor
Mr H Hurter	M.Sc.	2023	Ongoing	Supervisor
Doctoral				
Mr AS Seyffert	Ph.D.	2014	2021	Supervisor
Mrs M Barnard	Ph.D.	2016	2021	Supervisor
Mr C van Rensburg	Ph.D.	2016	2020	Supervisor
Ms H Davids	Ph.D.	2017	2021	Supervisor
Mr L du Plessis	Ph.D.	2021	Ongoing	Supervisor
Ms H Hamed	Ph.D.	2021	Ongoing	Supervisor
Postdocs				
Dr Z Wadiasingh		2018	2018	Co-supervisor
Dr S Chandra		2018	2019	Co-supervisor

Dr Anu Kundu		2020	2023	Supervisor
--------------	--	------	------	------------

Total: 11 Honours projects supervised; 8 completed M.Sc. theses; 4 completed PhD theses; 3 postdocs co-supervised.

3.3 Examiner of Dissertations / Theses

Year	M.Sc.	PhD
2011	1	
2013		1
2015		1
2019	1	
2020	1	
2021	1	2
Total	4	4

3.4 NRF Ratings

- I have been awarded a President's Award (P-rating) by the NRF in 2013, which was valid until 2019. This recognizes the potential of awardees to become world leaders in their respective fields of expertise.
- I have been awarded a B2 rating from 2020 – 2026, signifying substantial international research impact.

3.5 Research Grants

Year	Name	Role	Value
2010	<i>Fermi</i> Cycle 3 Guest Investigator (GI) Proposal	Co-investigator	Research visit covered
2010	<i>Fermi</i> Cycle 3 GI Proposal	Co-investigator	Research visit covered
2011	<i>Fermi</i> Cycle 4 GI Proposal	Collaborator	Research visit covered
2012	NRF Competitive Support for Unrated Researchers (CSUR)	Principal Investigator	R140 000
2012	Astrophysics Theory Program (ATP) Proposal	Collaborator	Research visit covered
2012	NRF Multi-wavelength Astronomy Research Programme (MAGR)	Principal Investigator	R425 000
2013	NRF Multi-wavelength Astronomy Research Programme (MAGR)	Principal Investigator	R185 000
2013	NRF Competitive Support for Unrated Researchers (CSUR)	Principal Investigator	R138 000
2014	NRF Competitive Support for Unrated Researchers (CSUR)	Principal Investigator	R138 000
2014	NRF Multi-wavelength Astronomy Research Programme (MAGR)	Principal Investigator	R345 000
2015 – 2016	NRF Multi-wavelength Astronomy Research Programme (MAGR)	Principal Investigator	R65 000 p.a.
2014 – 2019	Incentive Funding for Rated Researchers	Principal Investigator	R80 000 p.a.

2014	NRF Special Recognition Award / Elsevier Young Scientist Award	Principal Investigator	R50 000
2015	NRF Multi-wavelength Astronomy Research Programme (MAGR)	Principal Investigator	R415 000
2016 – 2018	NRF Competitive Programme for Rated Researchers	Principal Investigator	R890 000

Total ~ ZAR3.2 million

3.6 Conference Attendance

Year	International	National
2002	1	0
2003	0	1
2004	2	1
2005	2	2
2006	2	1
2007	2	1
2008	3	0
2009	5	0
2010	2	1
2011	2	2
2012	3	1
2013	3	2
2014	3	3
2015	2	3
2016	4	0
2017	3	1
2018	5	2
2019	3	0
2020	0*	0*
2021	3*	1*
2022	1*+3	1*
Total	54	23

*Virtual due to COVID-19 travel restrictions

3.7 Invited Talks

Nr	Date	Title of Talk	Conference Name	Venue
1	January 2022	Recent VHE results on Pulsars and Pulsar Wind Nebulae	28 th Epiphany Conference	Krakow, Poland (Virtual)
2	April 2021	What Have We Learned From Pulsar Curve Modelling?	Ninth International <i>Fermi</i> Symposium	Johannesburg, South Africa (virtual)
3	January 2021	Emission Mechanisms of Millisecond Radio and Gamma-ray Pulsars	COSPAR2020	Sydney, Australia (virtual)
4	March, 2018	The History of Gamma-ray Astronomy in South Africa	The Astronomical History Symposium 2018	Cape Town, South Africa
5	June, 2017	High-energy emission properties of pulsars	2017 Frascati Workshop FRASCATI WORKSHOP on Multifrequency Behaviour of High Energy Cosmic Sources - XII	Palermo, Italy

6	August, 2016	New Advances in the Modelling of Pulsar Magnetospheres	4 th Annual High Energy Astrophysics in Southern Africa (HEASA 2016)	Cape Town, South Africa
7	July, 2015	Cosmic Rays from Millisecond Pulsars	Non-specialist lecture at the 60 th Annual SAIP Meeting	Port Elizabeth, South Africa
8	August, 2014	Pulsar Radiation Models - Radio to High Energies	The 40 th COSPAR Assembly	Moscow, Russia
9	July, 2014	Astroparticle Physics in Pulsar Magnetospheres	Winter School of the 59 th Annual SAIP Meeting	Johannesburg, South Africa
10	May, 2013	High-energy Pulsar Models: Developments and New Questions	The Fast and the Furious: Energetic Phenomena in Isolated Neutron Stars, Pulsar Wind Nebulae and Supernova Remnants	Madrid, Spain
11	August, 2012	Pulsars in Globular Clusters	The Cosmic Kaleidoscope: Pulsars and their Nebulae, Supernova Remnants and More	Kruger Park, South Africa
12	April, 2011	The Status of H.E.S.S. and CTA in a Multi-wavelength Context	Second Middle-East and Africa Regional (MEARIM-II) IAU Meeting	Cape Town, South Africa

3.8 Acting as Reviewer of Papers

Year	Journal	Number
2010	Astrophysical Journal*	2
2010	Conference Proceedings	1
2012	Astrophysical Journal	1
2012	SAIP Conference Proceedings	2
2013	Astrophysical Journal	1
2013	SAIP Conference Proceedings	3
2014	Astrophysical Journal	1
2014	SAIP Conference Proceedings	8
2015	Astrophysics and Space Sciences Transactions (ASTRA)	1
2015	HEASA2015 Conference Proceedings	1
2015	SAIP Conference Proceedings	4
2016	Monthly Notices of the Royal Astronomical Society (MNRAS)**	1
2016	Proceedings of "The science of Time" Symposium	1
2017	PRL***	1
2017	HEASA2016 Conference Proceedings	1
2018	HEASA2017 Conference Proceedings	1
2018	SAIP2017 Conference Proceedings	1
2019	Astrophysical Journal	2
2019	HEASA18 Conference Proceedings	2
2019	SAIP2018 Conference Proceedings	4
2020	MNRAS	1
2021	HEASA2021 paper	1
2022	SAIP2021 Conference Proceedings	2
Total		43

* Impact factor 5.6 in 2018.

** Impact factor 5.0 in 2016.
 *** Impact factor 8.8 in 2017.

3.9 Acting as Reviewer of Research

- I have acted as a reviewer of a rating application of a colleague in gamma-ray astrophysics for the NRF Rating Programme (2014).
- I have acted as a reviewer for an application of promotion for a colleague in the field (2015, 2021).
- Member of NRF Panel on Reviewing of Rating Applications (2018 – 2020).
- I have acted as a reviewer for two NRF rating applications (2020, 2021).
- I was invited to be an NRF panel member, tasked to review the continuation of funding for a SARCHI SKA Chair in Cosmology for another 5-year cycle (2020).

3.10 H.E.S.S. Observational Proposals

Year	Number	Topics
2011	2	Globular clusters, pulsars
2013	2	Globular clusters, pulsars
2014	4	Globular clusters, pulsars
2015	3	Globular clusters, pulsars
2017	2	ToO, VHE pulsars
2018	2	ToO, 47 Tucanae
2019	5	ToO, VHE pulsars, Globular clusters
2020	3	VHE Pulsars, Millisecond binary, ToO
2021	5	Globular clusters, pulsars, FRBs
2022	2+3	Globular clusters, Pulsars
Total	33	

I have also been PI of 3 MeerKAT Open Time Proposals involving FRBs.

3.11 H.E.S.S. Observational Shifts

I spent a total of 75 days in Namibia during 2.5 shifts, conducting observations for the H.E.S.S. Telescope.

3.12 Research Visits

Year	Institute
2010	NASA Goddard Space Flight Center
2012	NASA Goddard Space Flight Center
2013	Ruhr Universität, Bochum
2014	NASA Goddard Space Flight Center
2016	NASA Goddard Space Flight Center
2019	NASA Goddard Space Flight Center

3.13 Research Visitors Hosted

Year(s)	Name	Home Institute
2010	Dr Andre-Claude Clapson	Max-Planck Institute, Heidelberg
2012, 2013, 2014, 2018	Dr Andreas Kopp	Kiel University / Ruhr-Universität, Bochum

4. ORGANIZATIONAL AND MANAGEMENT DUTIES

4.1 Conference Organization

Nr	Name of conference	Date	Venue	Role
1	X-ray Vision of the Energetic Universe -A Joint IAU I-HOW and COSPAR Capacity Building Workshop in X-ray Astronomy	6-17 February 2023	Potchefstroom, South Africa	LOC
2	2020/2021 SAIP Annual national conference	July 2021	Virtual	LOC
3	IAUS337: Pulsar Astrophysics – the Next 50 Years	4 – 9 September 2017	Jodrell Bank Observatory, Manchester, UK	SOC
4	International Pulsar Timing Array (IPTA) meeting	20 June – 1 July 2016	Stellenbosch, South Africa	LOC (outreach)
5	The Cosmic Kaleidoscope	August, 2012	Kruger National Park, South Africa	SOC*/ chair of LOC**

*Scientific Organizing Committee

**Local Organizing Committee.

4.2 Subject Group Head

I served as head of the NWU Subject Group Physics for the term 1 July 2015 – 30 June 2017.

4.3 Research Director

I served as research director for the Centre for Space Research for the period 1 January 2020 – 31 December 2022.

4.4 Committees

- I have participated in teaching committees involving reevaluation of Honours Project Grading Scheme, as well as other ad hoc tasks.
- I have been appointed secretary of the Astrophysics and Space Science Division of SAIP (2014 – 2016).
- I have been appointed co-chair of the Astrophysics and Space Science Division of SAIP (2016 – 2018).
- I have been appointed chair of the IAU national committee (SANC-IAU; 2017 – 2018). In this capacity, I co-chaired a committee that prepared a bid to host the General Assembly of the IAU in 2024 in Cape Town.
- I served as a co-editor for the SAIP 2021 conference proceedings, within the Astrophysics Subdivision.

5. COMMUNITY SERVICE

- I have judged student oral talks and posters at the annual SAIP meetings (2011, 2012, 2014). I have also been a judge at the Regional SASOL Expo for Young Scientists (2010, 2011, 2013).
- I have given a popular talk on research mentorship and another on gamma-ray astrophysics (2014)
- Acted as a representative from Subject Group Physics at the National Strategic Planning Meeting – Implementing Review of Undergraduate Physics Training, hosted by SAIP, 26 – 27 March 2015.

- I have been involved in organizing outreach activities (visiting schools, colloquia on campus) for the Science Week 2016.
- Public lecture: On the discovery of gravitational waves, 7 April, 2016 (<https://www.youtube.com/watch?v=zA-TCgU6xdo>)
- Talk to top science learners at the Free State Science Convention (15 - 16 August 2016)
- Talk on Opportunities in Physics at a special event organized by the Scientiae Student Body (2017)
- Radio interview on Gravitational Waves (2018).
- I provided input for an Afrikaans publication on "Time" in "Die Taalgenoot" (2019).

6. REFERENCES / POTENTIAL REVIEWERS

- Dr AK Harding, Theoretical Division Los Alamos National Laboratory, Los Alamos, NM 87545, Tel: +1-410-440-6257, ahardingx@yahoo.com
- Prof. PJ Meintjes, Department of Physics, University of the Free State, PB Box 339, Bloemfontein, South Africa, Tel: (051) 401 2191, MeintjPJ@ufs.ac.za
- Prof. SES Ferreira, Centre for Space Research, North-West University, Potchefstroom Campus, Private Bag X6001, Potchefstroom, 2520, South Africa, Tel: (018) 299 2412, Stefan.Ferreira@nwu.ac.za
- Prof. Bronek Rudak, Nicolaus Copernicus Astronomical Centre, Rabianska 8, 87-100, Torun, Poland, +48 56 621 9249, bronek03@gmail.com or bronek@ncac.torun.pl
- Dr DA David Smith, Centre d'Etudes Nucleaires de Bordeaux-Gradignan, France, Tel: +33 55 712 0891, smith@cenbg.in2p3.fr
- Dr A Kopp, Institut für Experimentelle und Angewandte Physik, Christian-Albrechts-Universität zu Kiel, Leibnizstrasse 11, D-24118 Kiel, Germany, Tel: +49 431 880 2518, ak@tp4.ruhr-uni-bochum.de
- Prof. Peter L. Gonthier, Department of Physics, 27 Graves Place, Hope College, Holland, MI 49423, Tel: (616) 395-7142, gonthier@hope.edu

Section D: CV of Co-Supervisor/Research Supervisor (if relevant) (please include details of students supervised to date)

Prof. Benjamin Willem Stappers

Current Position:

Occupation: Professor and Head of Pulsar and Time Domain Astrophysics Group
Institution: Jodrell Bank Centre for Astrophysics, School of Physics and Astronomy.
University of Manchester
M13 9PL, Manchester, United Kingdom
Telephone: +44 (0)161 275 4187 FAX: +44 (0)161 275 4247
Electronic Mail: Ben.Stappers@manchester.ac.uk

Education:

1994 - 1997 MSSSO, Australian National University, Canberra, Australia
1990 - 1993 Department of Physics and Astronomy, University of Canterbury, New Zealand
1985 - 1989 Nelson College, Nelson, New Zealand

Qualifications:

1998 Ph.D. Astronomy (Australian National University)
1993 B.Sc. Hons. (First Class) Physics (University of Canterbury)

Positions Held:

Sep 2014 - present Professor and Head of Pulsar and Time Domain Astrophysics Group, UoM, UK
Sep 2011- Sep 2014 Reader and Head of Pulsar Group, University of Manchester, United Kingdom
Mar 2009 - Sep 2011 Senior Lecturer and Head of Pulsar Group, University of Manchester, United Kingdom
Oct 2007 - Feb 2009 Senior Lecturer, University of Manchester, United Kingdom
Feb 2001 - Sep 2007 Staff Scientist for Pulsars, Stichting ASTRON, Netherlands
Feb 2001 - Sep 2007 Adjunct position at University of Amsterdam, Netherlands.
Oct 1997 - Jan 2001 Post-Doctoral Fellow, University of Amsterdam, Netherlands

Societies:

2006-present Member, International Astronomical Union.

Publication Summary:

- 459 Publications in top (MNRAS, A&A, ApJ, ApJL, Science, Nature) refereed journals attracting a total of 27000 citations¹.
- 64 publications with more than 100 citations.

Grants, Academic Awards and Prizes (since 2008):

2021 SKA Design - Co-I ~£3,500,000
2019 SKA Design - Co-I ~£12,000,000
2018 Royal Society Newton Fellowship - Co-I ~£93,500
2017 A UK Africa Data Science Network: Capturing the SKA-Driven Data Transformation – Co-I ~£1,400,000
2017 SKA Design and Pre-Construction Phase to Critical Design Review - Co-I Funding for SKA Design work (Non-imaging part) ~£697,000
2016 ERC Advanced Grant - PI MeerTRAP ~EUR3,488,000

¹All citation derived numbers based on ADS Abstract website on September 2022

2015	STFC SKA Funding Funding for SKA Prototype - Co-I (Non-imaging part) ~£203,000
2014	STFC Consolidated Grant - Co-I Pulsar Science at JBCA part ~£1,200,000
2013	Marie Curie Incoming International Fellowship - Co-I £309,000
2013	Royal Society Newton Fellowship - Co-I for Bhaswati Bhattacharya (turned down for MC) ~£100,000
2013	STFC - SKA Grant - Co-I Non-imaging processing work part amount £850,000
2011	STFC Consolidated Grant - Co-I Pulsar Science at JBCA part £1,100,000
2009	UK prepSKA Non-imaging processing work part amount £300,000
2008	Rolling Grant award for Pulsar Science at JBCA (Co-I with Kramer and Lyne) £1,500,000

Supervision Summary:

- Currently supervising 4 PhD students, manage 2 engineers and 1 technical staff member
- Currently mentoring 5 PDRAs, 3 STFC funded, 2 EU funded.
- Supervised 23 PhD students to successful completion, 11 still in Astronomy, 4 permanent positions.
- 1 graduate has own company, 4 took positions in industry, and two mature students have retired.
- Mentored 14 PDRAs: 4 permanent positions, 5 have another PDRA, 1 Physics Teacher & 4 in Industry.
- 7 out of 16 MPhys students supervised have gone on to do PhDs.
- 2 MPhys students won a prize for the computing work in their project.

Committees and Positions (started or continuing beyond Oct 2007):

2019	Member of the Astronomy Advisory Panel for STFC
2015	Member of Advisory Board of Astrophysics and Space Science Journal
2014-2015	Member of the SKA Science Review Panel
2013-2014	Chair of the International Pulsar Timing Array Steering Committee
2013-2016	Co-Chair of the Pulsar Science Working Group for the Square Kilometre Array
2013-2015	Chair of Panel D4 of the European Southern Observatory Program Committee
2012-	Chair of the Publication board for LOFAR
2011-2013	Member of the International Pulsar Timing Array Steering Committee
2010-2012	Member of the Publication board for LOFAR
2010-2011	Member of the International Lofar Astronomical Development committee
2010-2012	SKA: International PI of Work Package 2.4 - Non imaging processing for the SKA
2009-	Technical Representative on the LOFAR-UK Management Committee
2009-2013	Member of the E_elsberg PKE (Time Allocation Committee for E_elsberg)
2006-2010	Member of Technical Working Group for LOFAR
2004-	Co-PI of the Transients Key Project for LOFAR
2004-	PI of the Pulsars Science Working Group for LOFAR
1999-	Member of various LOFAR committees for Science and Technical Development

I regularly review papers for all the major astrophysical journals: ApJ, ApJL, A&A and MNRAS
Served as examiner for a number of PhD and MSc theses at the University of Manchester. Served on the reading and/or examination committees of Ph.D. students at Utrecht University, Radboud University Nijmegen, Leiden University, University of Amsterdam in the Netherlands, Curtin, Melbourne, Swinburne and Sydney Universities in Australia, Cambridge University in the UK.

Review proposals for a number of national funding agencies including STFC in the UK, NSF in the USA, NWO in the Netherlands, ARC in Australia, National Science Centre in Poland and ANR in France.

National/International Meetings (co-)Organised (Since Oct 2007):

2021/22	*IAUS 369 on Fast Radio Bursts at the IAUG
---------	--

2019	PHAROS Meeting 2020 (SOC)
2017	*IAU Symposium 337 - Pulsar Astrophysics: The Next Fifty Years, Manchester (Chair of SOC/LOC)
2013	*International CASPER meeting, JBO, Manchester (SOC / LOC)
2013	*Pulsars with SKA, Science Assessment Workshop, JBO, Manchester
2013	NS 2013 - Latest results from the neutron-star laboratory, Amsterdam, Netherlands (SOC Member)
2012	International Pulsar Timing Array Workshop, Kiama, Australia (Chair of SOC)
2012	National Astronomy Meeting, Manchester
2010	*Joint session on pulsar magnetospheres at the National Astronomy Meeting, Glasgow
2010	*International Pulsar Timing Array School and Workshop, Leiden Awarded 10,000 euros towards costs (with co-organisers)
2009	Stromfest, Celebrating the retirement of Richard Strom, Dwingeloo
2009	*LOFAR Single Station Use Meeting, Effelsberg
2008	*Low Frequency Pulsar Science, Leiden Awarded 15,000 euros towards costs (with co-organisers)
2008	*European Pulsar Timing and Neutron Star Dynamics Workshop, Manchester
2008	*Joint session on pulsar magnetospheres at the National Astronomy Meeting, Belfast

For all meetings labelled with a * was (co-)responsible for the idea for holding the meeting, proposing the meeting, in some cases obtaining funding, and for organising the meeting.

Summary of Presentations (since Oct 2007):

- Given 9 invited review talks at International Meetings
- A further 32 invited talks at National and International Meetings on scientific and technical topics.
- Presented contributed talks at 25 other meetings
- Given 12 colloquia at Universities in the UK.
- In 2021 gave a plenary talk on Fast Radio Bursts at the European Astronomical Society Meeting (Leiden)
- In 2011 presented an invited talk at the American Astronomical Society meeting (Seattle)
- In 2012 gave invited review talks at the Royal Society in London and the American Association for the Advancement of Science meeting in Vancouver.
- Given invited reviews on Pulsar Timing Arrays and Radio Transients at the Royal Society (2015 and 2017).
- Gave an invited review on the Future of Pulsar Timing Arrays at the General Assembly of the IAU in 2015.
- Gave an invited plenary talk at the European Astronomical Society meeting in 2021

Public Talks: Gives a couple of public talks at Astronomical Societies or Science events every year around the world. Frequently presents at the Bluedot Festival at Jodrell Bank Observatory including once on the main stage.

Radio, Print and Television: Regularly contacted by media outlets wanting to have input on stories and have contributed to a number news stories, documentaries and explanatory videos for the Institute of Physics.

Discovery Centre: Worked closely with the Discovery Centre at Jodrell Bank to develop some displays related to our work on Pulsars.

Pulsar Hunters: Contributed to the project led by Rene Breton to use citizen science to search for new radio pulsars. This was heavily promoted during Stargazing Live 2016 and attracted many thousands of people to use the zooniverse website to search for pulsars.