

# HANNES BREYTENBACH

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## PERSONAL INFORMATION

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**Names:** Johannes Benjamin Breytenbach  
**Date of Birth:** 26 June 1987  
**Place of Birth:** Santiago, Chile  
**Citizenship:** South African  
**Languages:** English, Afrikaans (Highly Proficient);  
German (Intermediate)  
**Current Occupation:** PhD. Student at  
South African Astronomical Observatory (SAAO) &  
University of Cape Town, (UCT)  
**Work Address:** Room 4-31, RW James Building  
9 University Avenue  
Upper Campus, UCT  
Rondebosch, 7001  
Cape Town  
South Africa

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## EDUCATION

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**2011 - present:** UCT - PhD (Astrophysics)  
• Thesis title: *“Rapid Variability in magnetic Cataclysmic Variable Stars”*  
• Supervisors: Dr. David Buckley, A. Prof Patrick Woudt  
• Modules: Cataclysmic Variable Stars, Stellar Structures, Advanced General Relativity, Hot Topics in Cosmology, High Energy Astrophysics

**2010:** UCT - BSc Honours (Astrophysics and Space Science)  
• Project title: *“The Sferic Count Rate from SANA-IV, Antarctica”*  
• Supervisors: Dr. Andrew Collier  
• Modules: General Astrophysics, Electrodynamics, General Relativity, Computational Astrophysics, Galaxies and Large Scale Structure, Observational Techniques, Radio Astronomy

**2006 - 2009:** University of Pretoria (UP)- BSc (Physics and Astronomy)  
• Project title: *“Rutherford Backscattering Spectroscopy and X-ray Diffraction Spectroscopy of Aluminium 100”*  
• Supervisors: Prof. Chris Theron  
• Modules: Quantum Mechanics, Solid State Physics, Statistical Mechanics, Differential Calculus, Vector Calculus, Partial Differential Equations, Abstract Algebra, Mathematical Modelling

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## AWARDS AND SCHOLARSHIPS

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- 2013 - 2016: NRF, Postgraduate Development Programme (PDP) Doctoral Scholarship
- 2010 - 2012: South African Square Kilometre Array (SKA) Postgraduate Scholarship
- 2008 - 2009: SKA Undergraduate Bursary Award

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## SPECIAL SKILLS

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### Data & Computational skills

- Public code repository: <https://github.com/apodemus>
- Languages:
  - Python (Expert)
  - IRAF, MATLAB (Octave) (Highly proficient)
  - IDL, R, C, Mathematica, Maple, LabView (Intermediate)
  - SQL (Novice)
- Algorithm Development:
  - Machine learning algorithms for classification of EEG data (epileptic seizure prediction)
  - Time series analysis & Spectral estimation techniques (Ph.D. Thesis)
  - Data reduction pipeline for Sutherland High Speed Optical Camera (SHOC)
  - Computational modelling of Dwarf Novae in Outburst (M.Sc. Thesis)

### Observing

- 98 nights on 1.9m telescope at SAAO, Sutherland
  - Rapid photometry of CVs (SHOC CCD)
  - Polarimetry of magnetic CVs (HIPPO)
  - Spectroscopy of Dwarf Stars
- 21 nights on 1.0m telescope at SAAO, Sutherland
  - Multi-colour photometry of interacting galaxies
  - High speed photometry of CVs
- 7 nights on 1.4m Infra-red Survey Facility telescope (IRSF) at SAAO, Sutherland
  - Photometry of interacting galaxies (during ISYA)

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## PROFESSIONAL DEVELOPMENT

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### Conference Attendance

- 2016 July: South African Institute of Physics (SAIP2016), UCT
  - Presentation: “Quasi-Periodic Oscillations in magnetic CVs”
- 2015 September: The Golden Age of Cataclysmic Variables and Related Objects - III
  - Presentation: “Quasi-Periodic Oscillations in magnetic CVs”
- 2015 June: SALT Science Conference 2015, STIAS, Stellenbosch
  - Poster: “Probing accretion in magnetic CVs through rapid photometry with SALTICAM”

- 2014 July: South African Institute of Physics Conference (SAIP2014)
  - Presentation: “Rapid Variability of magnetic Cataclysmic Variable Stars”
- 2013 September: The Golden Age of Cataclysmic Variables and Related Objects - II
  - Presentation: “Modelling Quasi-Periodic Variability in Cataclysmic Variable Stars”
- 2013 July: SKA Joint Radio Transients Conference
- 2012 December: SKA Postgraduate Bursary Conference
  - Presentation: “Modelling Quasi-Periodic Variability in Cataclysmic Variable Stars”
- 2012 August: IAU XXVIII General Assembly
  - Poster: “Modelling Quasi-Periodic Variability in Cataclysmic Variable Stars”
- 2011 December: SKA Postgraduate Bursary Conference
  - Poster: “A study of DNOs and QPOs in Cataclysmic Variable Stars”
- 2011 March: Middle-East and African Regional IAU Meeting II (MEARIM-II)
- 2010 - 2008 November: SKA Postgraduate Bursary Conference

## Workshop Attendance

- 2017 April: Workshop on Magnetic Accretion, SAAO
- 2017 April: SKA Big Data Africa Summer School, Cape Town
- 2016 November: Workshop on Bayesian Analysis in Physics and Astronomy, Stellenbosch
- 2016 May: CDS Tools Workshop, SAAO
- 2015 November: Workshop on using ALMA for science, UCT
- 2015 April: GPGPU programming workshop, UCT
- 2014 November: GADGET Simulations workshop, UCT
- 2014 October: 2<sup>nd</sup> Machine learning JEDI Workshop, Cape Town
- 2012 February: IAU International School of Young Astronomers (ISYA), UCT & SAAO, Cape Town
- 2011 October: Workshop on Space Science and Astrophysics, Centre for High Performance Computing (CHPC), CSIR, Pretoria
- 2010 December: Workshop on Convection in stars, University of the Witwatersrand (WITS), Johannesburg
- 2010 January: National Astrophysics and Space Science Program (NASSP) Summer School, UCT & SAAO, Cape Town

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## PUBLICATIONS

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### Peer-reviewed

- [1] D. Bérard, B. Sicardy, J. I. B. Camargo, J. Desmars, F. Braga-Ribas, J. L. Ortiz, R. Duffard, N. Morales, E. Meza, R. Leiva Espinoza, G. Benedetti-Rossi, M. Assafin, R. Vieira-Martins, F. Colas, J. L. Dauvergne, P. Kervella, J. Lecacheux, L. Maquet, F. Vachier, A. A. Sickafoose, **H. Breytenbach**, A. Genade, et al. The structure of Chariklo’s rings from stellar occultations. *ArXiv e-prints*, June 2017. URL: <https://arxiv.org/pdf/1706.00207.pdf>.
- [2] M. Mouchet, J. Bonnet-Bidaud, L. Van Box Som, E. Falize, D. A. H. Buckley, **H. Breytenbach**, R. P. Ashley, T. R. Marsh, and V. S. Dhillon. A VLT-ULTRACAM study of the fast optical quasi-periodic oscillations in the polar V834 Centauri. *A&A*, 600:A53, 2017. URL: <https://doi.org/10.1051/0004-6361/201630166>.
- [3] A. Semena, M. Revnivtsev, D. Buckley, A. Lutovinov, and **H. Breytenbach**. Peculiarities of the accretion flow in the system hl cma. *Astronomy Letters*, 42(6):379–392, 2016. URL: <https://arxiv.org/pdf/1610.00874.pdf>.

- [4] D. L. Coppejans, P. A. Woudt, B. Warner, E. Körding, S. A. Macfarlane, M. P. Schurch, M. M. Kotze, **H. Breytenbach**, A. A. Gulbis, and R. Coppejans. High-speed photometry of faint cataclysmic variables—VIII. Targets from the Catalina Real-Time Transient Survey. *MNRAS*, 437(1):510–523, 2014. URL: <https://academic.oup.com/mnras/article/437/1/510/1001483/High-speed-photometry-of-faint-cataclysmic>.
- [5] A. N. Semena, M. G. Revnivtsev, D. A. Buckley, M. M. Kotze, I. I. Khabibullin, **H. Breytenbach**, A. A. Gulbis, R. Coppejans, and S. B. Potter. On the area of accretion curtains from fast aperiodic time variability of the intermediate polar EX Hya. *MNRAS*, 442(2):1123–1132, 2014. URL: <https://academic.oup.com/mnras/article-abstract/442/2/1123/981562/On-the-area-of-accretion-curtains-from-fast>.

## Conference Proceedings

- [1] D. A. H. Buckley, **H. Breytenbach**, A. Kniazev, M. Kotze, M. Motsoaledi, S. Potter, P. Woudt, V. Lipunov, and E. Gorbovskoy. MASTER-SAAO transient detections: new Cataclysmic Variable discoveries. In *Proceedings of Science*, accepted, 2017. URL: [https://pos.sissa.it/archive/conferences/255/027/Golden2015\\_027.pdf](https://pos.sissa.it/archive/conferences/255/027/Golden2015_027.pdf).
- [2] **H. Breytenbach**, Buckley, D. A. H., Bonnet-Bidaud, J.-M., and Mouchet, M. Quasi-periodic oscillations in magnetic Cataclysmic Variables: Results for V834 Cen. In *Proceedings of Science*, accepted, 2017. URL: [https://pos.sissa.it/archive/conferences/255/018/Golden2015\\_018.pdf](https://pos.sissa.it/archive/conferences/255/018/Golden2015_018.pdf).
- [3] D. Buckley, S. Potter, E. Kotze, M. Kotze, and **H. Breytenbach**. New Observations of Accretion Phenomena in Magnetic Cataclysmic Variables. In *EPJ Web of Conferences*, volume 64, page 07005. EDP Sciences, 2014. URL: [www.epj-conferences.org/articles/epjconf/pdf/2014/01/epjconf\\_mag2013\\_07005.pdf](http://www.epj-conferences.org/articles/epjconf/pdf/2014/01/epjconf_mag2013_07005.pdf).

## Short publications

- [1] D. Buckley, **H. Breytenbach**, A. Kniazev, M. Kotze, M. Motsoaledi, S. Potter, J. Thorstensen, E. Gorbovskoy, V. Lipunov, and P. Woudt. Classification of master ot j061451. 70-272535.5 as an eclipsing polar. *The Astronomer's Telegram*, 7169:1, 2015. URL: <http://www.astronomerstelegam.org/?read=7169>.
- [2] D. Buckley, **H. Breytenbach**, A. Kniazev, M. Kotze, S. Potter, E. Gorbovskoy, and V. Lipunov. Salt spectroscopy of the flaring blazar j141922. 55-083832.0. *The Astronomer's Telegram*, 7167:1, 2015. URL: <http://www.astronomerstelegam.org/?read=7167>.

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## WORK AND TEACHING EXPERIENCE

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- 2013: Tutor: Stellar Structures (AST3002F), UCT
- 2012: Tutor: Introductory Astronomy (AST2002S), UCT
- 2012: Tutor: Introductory Astronomy (private)
- 2011: Tutor: Electrodynamics Honours, NASSP, UCT
- 2009: Tutor: Biological Physics (PHY103), 1<sup>st</sup> year course, UP
- 2007 Dec - Jan: Student Data Processor, Hartebeest Hoek Radio Astronomy Observatory (HartRAO)

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## RESEARCH INTERESTS

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### Academic

- Astrophysical Accretion on all scales
- Compact binary stars
- Astrophysical transients

### Techniques

- Multi-wavelength astronomy

- Machine Learning
- Bayesian Modelling and Inference

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## LEADERSHIP & EXTRACURRICULAR INVOLVEMENTS

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### Academic

- 2017: Astronomy/Physics Dept. Mentorship programme volunteer
- 2014 - 2016: Postgraduate Student Representative, Astronomy Dept., UCT
- 2011: Siyavula Education Outreach Program
  - Tasks: Proof reading and Translation into Afrikaans of open source High School science textbooks

### Sport

- 2014: Chairperson: UCT Mountain and Ski Club
- 2011 - 2015: Committee member: UCT Mountain and Ski Club
- 2012: UCT Sports Merit Award
  - UIAA Youth expedition to summit the highest mountain in Europe, Mt Elbrus at 5 642m
- 2011: UCT Sports Performance of the Year Award
  - UCT Mountain and Ski Club (MSC) mountaineering expedition to summit the 6 264m Himalayan peak, CB13-A

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## REFERENCES

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- Prof. Patrick Woudt  
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- Dr. Nadeem Oozeer  
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African Institute for Mathematical Sciences  
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