

Jonathan Shock - CV

Personal Information

Name and title: Associate Professor Jonathan Phillip Shock.
Date of Birth: 16 September 1979.
Place of Birth: Oxford, UK.
Citizenship: British.

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University of Cape Town,
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Education, research and advisory positions

2026- **Board of Directors, Lanfrica Labs.**
2026- **Executive Committee member of the South African AI Association (SAAI).**
2025- **Advisory board member for Awareearth.**
2025- **Advisory board member for Conscium.**
2025-Present **Chair, International Alliance of Research Universities (IARU) Working Group on AI.**
2024-Present **Interim Director of the AI Initiative at the University of Cape Town.**
2022-Present: **Associate Professor at the University of Cape Town, department of Mathematics and Applied Mathematics.**
2021-Present: **Adjunct Professor at the INRS, Montreal, Canada.**
2017-present: **Senior Lecturer at the University of Cape Town, department of Mathematics and Applied Mathematics.**
Jul 2013-2017: **Lecturer at the University of Cape Town, department of Mathematics and Applied Mathematics.**
From Sept 2011: Voluntary **Scientific Consultant to the 166 Highschool, Beijing, China.**
Jan 2011-Jan 2013 **Postdoctoral position at the Max Planck Institute for Physics in Munich as a Marie Curie fellow.**
2007-:2010 **Postdoctoral position at the department of theoretical physics at the university of Santiago de Compostela in Spain.**
2005-2007: **Postdoctoral position at the Institute of Theoretical Physics in Beijing.**
2002 - 2005: **Ph.D. student in the High Energy Theory group at the University of Southampton.**
1998-2002: **1st Class Honours, MPhys, Bristol University.**
1990-1997: **Secondary school education at Abingdon School, England.**

Publications

1. *Intention Inference Under Execution Noise: Separating Aleatoric and Epistemic Uncertainty in Social Dilemmas*, K. Mahadew, J. Shock, *ProbML 2026* (accepted as full paper)
2. *Graph-Based Exploration for ARC-AGI-3 Interactive Reasoning Tasks*, E Rudakov, J Shock, BU Cowley, *AAAI 2026 Bridge on LM Reasoning*, 2026
3. *From theory to practice, and back: Student evidence testing ZPD, APOS, CLT, and constructivism in mathematical thinking workshops*, M Mokhithi, A Campbell, J Shock et al, *Education Sciences*, 2026
4. *Inferring Affective Consciousness in an Artificial Agent: A Case Study*, M. Solms, S.J. Grimbley, B. Bassett, E. Boonstra, R. Hodson, N. Kuske, K. Mahadew, B. Rosman, C. van Hoof, J. Shock, *Journal of Consciousness Studies*, 2025 (accepted)
5. *Thermodynamics and DC conductivity of 2D anisotropic fluids from axion holography*, A. Ballon-Bayona, J.P. Shock, D. Zoakos, *JHEP 2025*, 2 (2025)
6. *Artificial intelligence for HIV care: a global systematic review of current studies and emerging trends*, S. Ngcobo et al, *Journal of the International AIDS Society* 28 (10), 2025
7. *Diminishing Returns as a Lever for Fair Cooperation in Multi-Agent Reinforcement Learning*, C Formanek, K Letsholo, J Shock, *Southern African Conference for Artificial Intelligence Research (SACAIR)*, Vol. 6, Dec 2025. <https://2025.sacair.org.za/online-proceedings>
8. *Energy Costs and Neural Complexity Evolution in Changing Environments*, S Heesom-Green, J Shock, G Nitschke, *Proceedings of the 2025 Conference on Artificial Life*, 551-560
9. *Is an Exponentially Growing Action Space Really that Bad? Validating a Core Assumption for using Multi-Agent RL*, R de Kock, A Pretorius, J Shock, *Proceedings of the 24th International Conference on Autonomous Agents and Multiagent Systems*, 2025
10. *Lessons learnt and insights shared: The Diagnostic Mathematics Information for Student Retention and Success (DMISRS) Case Studies Dialogue on teaching first-year mathematics in South Africa*, S. Steyn et al, *Perspectives in Education* 43 (4), 364-410, 2025
11. *Putting Data at the Centre of Offline Multi-Agent Reinforcement Learning*, JC Formanek, L Beyers, CR Tilbury, JP Shock, A Pretorius, *Journal of Machine Learning Research – Data-Centric Machine Learning Research (DMLR)*, Vol. 3, Paper 11, pp. 1–24, 2026
12. *Optimisation of Resource Allocation in Heterogeneous Wireless Networks Using Deep Reinforcement Learning*, O Giwa, J Shock, JD Toit, T Awodumila, 2026 *EuCNC & 6G Summit – AI4C* (accepted), 2026
13. *'I call it math therapy': student narratives of growth, belonging and confidence in mathematical thinking workshops*, M Mokhithi, A Campbell, J Shock et al, *International Journal of Mathematical Education in Science and Technology*, 2025

14. *Dispelling the Mirage of Progress in Offline MARL through Standardised Baselines and Evaluation*, C. Formanek, C. Tilbury, L. Beyers, J.P. Shock, A. Pretorius, *NeurIPS 2024*, Article No. 4431, pp. 139650-139672
15. *Increasing the location rate of positron emission particle tracking (PEPT) measurements for froth flotation*, R Perin, SW Peterson, J Shock, P. Brito-Parada, D. Mesa, K Cole, *Minerals Engineering* 219, 109057, 2024
16. *Opportunities of Reinforcement Learning in South Africa's Just Transition*, C. Formanek, C. Tilbury, J.P. Shock, *Southern African Conference on AI Research*, 2024
17. *On the Ability of Positron Emission Particle Tracking (PEPT) to Track Turbulent Flow Paths with Monte Carlo Simulations in GATE*, R. Perin, K. Cole, M.R. van Heerden, A. Buffler, Y. Lin, J. Zhang, P.R. Brito-Parada, J.P Shock, and S.W. Peterson, *Appl. Sci.* 2023, 13(11), 6690
18. *PEPT-EC, a location algorithm based on anomaly detection for positron emission particle tracking (PEPT)*, R Perin, SW Peterson, J Shock, K Cole, *2023 IEEE Nuclear Science Symposium*
19. *Policy-based Reinforcement Learning for Generalisation in Interactive Text-based Environments*, *EACL 2023*, E. Toledo, J. Shock, J. Buys
20. *Magnetising the $N=4$ SYM Plasma*, *JHEP* 06 (2022) 154, A Ballon-Bayona, J. Shock, D. Zoakos
21. *An analysis of the time-frequency structure of several bursts from FRB 121102 detected with MeerKAT*, *Mon.Not.Roy.Astron.Soc.* 505 (2021) 2, E. Platts et al.
22. *Correlation constraints for regression models: controlling bias in brain age prediction*, *Front. Psychiatry*, 18 February 2021, M. Treder, J. Shock, D. Stein, S Du Plessis, S. Seedat, K. Tsvetanov
23. *Remarks on Fermions in a Dipole Magnetic Field*, *JHEP* 2021 (82), J. Murugan, J. Shock, R. Slayern
24. "We have already heard that the treatment doesn't do anything, so why should we take it?": A mixed method perspective on Chagas disease knowledge, attitudes, prevention, and treatment behaviour in the Bolivian Chaco - *PLOS Neglected Tropical Diseases*, 2020, S. Parisi et al
25. *A game-theoretic analysis of networked system control for common-pool resource management using multi-agent reinforcement learning*, *NeurIPS 2020*, A. Pretorius, S. Cameron, E. Van Biljon, T. Makkink, S. Mawjee, J. du Plessis, J. Shock, A. Laterre, K. Beguir
26. *Magnetic catalysis and the chiral condensate in holographic QCD*, *JHEP* 2020 (10) 193, A Ballon-Bayona, J. Shock, D. Zoakos
27. *Structural neuroimaging biomarkers for obsessive-compulsive disorder in the ENIGMA-OCD consortium: medication matters*, *Transl Psychiatry* 10, 342 (2020), W. Bruin et al.

28. *The relationship between mindset and academic achievement at university: A quantitative study of South African students, 2020 IFEEES World Engineering Education Forum - Global Engineering Deans Council (WEEF-GEDC), M. Mokhithi, A. Campbell, J. Shock.*
29. *Outcome prediction with serial neuron-specific enolase and machine learning in anoxic-ischaemic disorders of consciousness, Computers in Biology and Medicine 107 (2019) 145–152, E. Muller, J. Shock, A. Bender, J. Kleeberger, T. Hogen, M. Rosenfelder, B. Bah, A. Lopez-Rolon*
30. *Astrophysical Quantum Matter: Spinless charged particles on a magnetic dipole sphere, General Relativity and Gravitation 53, 29, 2021, J. Murugan, J. Shock, R. Slayen*
31. *A cross-sectional, descriptive study of Chagas disease among citizens of Bolivian origin living in Munich, Germany - BMJ Open 7(1), 2017, M. Navarro et al*
32. *A Universal Order parameter for Inverse Magnetic Catalysis, JHEP 2017 (10) 38, A. Ballo-Bayona, M. Ihl, J. Shock, D. Zoakos*
33. *Consciousness Indexing and Outcome Prediction with Resting-State EEG in Severe Disorders of Consciousness, Brain Topography 31(5), 848-862, 2018, S. Stefan, B. Schorr, A. Lopez-Rolon, IT. Kolassa, J. Shock, M. Rosenfelder, S Heck, A. Bender*
34. *Quantum discord in de Sitter space - Physical Review D 94(12), 2016, S. Kanno, J. Shock, J. Soda.*
35. *The Information Metric on the moduli space of instantons with global symmetries, Phys.Lett. B753 (2016) 660-663, E. Malek, J. Muguran, J. Shock.*
36. *Entanglement negativity in the multiverse, JCAP 1503 (2015) 03, 015. S. Kanno, J. Shock, J. Soda.*
37. *Entanglement entropy of α -vacua in de Sitter space, JHEP 1407 (2014) 072, S. Kanno, J. Murugan, J. Shock, J. Soda.*
38. *Efficient Quantification and Characterization of Bacterial Outer Membrane derived Nano-particles with Flow Cytometric Analysis - International Journal of Molecular Medicine 2014.07.012, Wieser et al.*
39. *Particle-vortex and Maxwell duality in $AdS_4 \times CP^3/ABJM$ correspondence, JHEP 1410 (2014) 051, J. Murugan, H. Nastase, N. Rughoonauth, J. Shock.*
40. *Evaluation of Plasmodium falciparum gametocyte detection in different patient material - Malaria Journal 2013, 12:438, Kast et al.*
41. *Magnetic field induced lattice ground states from holography, JHEP 1303:165, 2013, Y.Y. Bu, J. Erdmenger, J. Shock, M. Strydom*
42. *Evaluation of dried blood spots on filter paper for Plasmodium falciparum gametocyte detection with real-time QT-NASBA - Malaria Journal - May 2012, M. Pritsch, A. Wieser, V. Soederstroem, D. Poluda, T. Eshetu, M. Hoelscher, S. Schubert, J. Shock, T. Loescher, N. Berens-Riha*
43. *Holographic Superfluidity from a Magnetic Field - PoS ConfinementX 268 (2012), Y.Y. Bu, J. Erdmenger, J. Shock, M. Strydom*

44. *Chiral phase transitions and quantum critical points of the D3/D7(D5) system with mutually perpendicular E and B fields at finite temperature and density*, *JHEP* 09 (2011) 021, N.Evans, K.Y.Kim, J.P.Shock
45. *On Stability and Transport of Cold Holographic Matter*, *JHEP* 09 (2011) 030, M.Ammon, J.Erdmenger, S.Lin, S.Muller, A.O'Bannon, J.P.Shock
46. *Sum rules, plasma frequencies and hall phenomenology in holographic plasmas*, *JHEP* 1102:015, 2011, J.Mas, J.P.Shock, J.Tarrio
47. *The open string membrane paradigm with external electromagnetic fields*, *JHEP* 1106:017, 2011, K.Y.Kim, J.P.Shock, J.Tarrio
48. *A note on the velocity of holographic long lived mesons*, *Phys.Lett.B*688:244-247, 2010, J.P.Shock, J. Tarrio
49. *Holographic hadrons in a confining finite density medium*, *JHEP* 1003:115, 2010, Y.Seo, J.P.Shock, S.J.Sin, D.Zoakos
50. *Holographic operator mixing and quasinormal modes on the brane*, *JHEP* 1002:021, 2010, M.Kaminski, K.Landsteiner, J.Mas, J.P.Shock, J.Tarrio
51. *Strings on bubbling geometries*, *JHEP* 1006:055, 2010, H.Lin, A.Morisse, J.P.Shock
52. *Holographic flavor in N=4 gauge theories in 3d from wrapped branes*, *JHEP* 0902:001, 2009, A.V.Ramallo, J.P.Shock, D.Zoakos
53. *The AdS/CFT Correspondence and Non-perturbative QCD*, *AIP Conf.Proc.*116:265-284, 2009, J.Edelstein, J.P.Shock, D.Zoakos
54. *Universal holographic chiral dynamics in an external magnetic field*, *JHEP* 0908:013, 2009, V.Filev, C.V.Johnson, J.P.Shock
55. *A note on conductivity and charge diffusion in holographic flavour systems*, *JHEP* 0901:025, 2009, J.Mas, J.P.Shock, J.Tarrio
56. *On the Einstein relation in holographic systems at finite baryon density*, *The proceedings of the ESP School in High Energy Physics and Astrophysics: The LHC perspective and beyond*, Cargese, France, 16-28 June 2008, J.Mas, J.P.Shock, J.Tarrio
57. *Holographic Spectral functions at finite baryon density*, *JHEP* 0809:009, 2008, J.Mas, J.P.Shock, J.Tarrio, D.Zoakos
58. *AdS/CFT with flavour in electric and magnetic Kalb-Ramond fields*, *JHEP* 0712:091, 2007, J.Erdmenger, R.Meyer and J.P.Shock
59. *A Note on chiral symmetry breaking from intersecting branes*, *Phys.Rev. D*76 (2007) 046003, Y.H.Gao, J.P.Shock, W.S.Xu and D.F.Zeng
60. *AdS/QCD phenomenological models from a back-reacted geometry*, *JHEP* 03 (2007) 064, J.P.Shock, F.Wu, Y-L.Wu and Z-F.Xie
61. *An Exotic Approach to Hadron Physics*, *YKIS06 proceedings*, 2007, M.Bando, Y.Fukase, J.P.Shock, A.Sugamoto and S.Terunuma
62. *Holographic confinement/deconfinement phase transitions of AdS/QCD in curved spaces*, *JHEP* 08 (2007) 095, R.G.Cai and J.P.Shock

63. *Canonical Coordinates and Meson Spectra for Scalar Deformed $N=4$ SYM from the AdS/CFT Correspondence*, *JHEP* 10 (2006) 043, *J.P.Shock*
64. *Embedding Flipped $SU(5)$ into $SO(10)$* , *JHEP* 10 (2006) 035, *C-S.Huang, T.Li, C.Liu, J.P.Shock, F.Wu and Y-L.Wu*
65. *Three Flavour QCD from the holographic principle*, *JHEP* 08 (2006) 023, *J.P.Shock and F.Wu*
66. *D7 Brane Embeddings and Chiral Symmetry Breaking*, *JHEP* 0503 (2005) 005, *N.Evans J.P.Shock and T.Watson*
67. *Towards a Perfect QCD Gravity Dual*, *Phys.Lett. B* 622 (2005) 165-171, *N.Evans J.P.Shock and T.Watson*
68. *Chiral Dynamics from AdS Space*, *Phys.Rev. D* 70 (2004) 046002, *N.Evans and J.P.Shock*

Workshop Papers

1. *Molten Pot: Evaluations & Datasets for Social Offline Reinforcement Learning*, *J.C. Formanek, M. Hedman, K. Tessera, C.C. Holmes, J.P. Shock, ICML 2026 Workshop on Decision-Making from Offline Datasets to Online Adaptation (poster), 2026*
2. *Entity Multiplexing Through Activation Strength*, *B Sturgeon, J Shock, NeurIPS 2025 Workshop on Mechanistic Interpretability (accepted), 2025*
3. *Making progress in Trustworthy AI using DeepMind's AI Safety Gridworlds (workshop poster)*, *A Ghoor, J Shock, 4th Muslims in ML Workshop co-located with ICML 2025, 2025*
4. *Coordination Failure in Cooperative Offline MARL*, *C. Formanek, C. Tilbury, L. Beyers, J.P. Shock, A. Pretorius, ARLET workshop at ICML 2024, <https://arxiv.org/abs/2407.01343>*
5. *Off-the-Grid MARL: Datasets and Baselines for Offline Multi-Agent Reinforcement Learning*, *AAMAS 2023 extended abstract, J.C. Formanek, A. Jeewa, A. Pretorius, J. Shock*
6. *Reduce, Reuse, Recycle: Selective Reincarnation in Multi-Agent Reinforcement Learning*, *RRL 2023 poster, J.C. Formanek, C.R. Tilbury, J.P. Shock, K. Tessera, A. Pretorius*
7. *A Sequence Modelling Approach to Question Answering in Text-Based Games*, *NAACL 2022 workshop, Wordplay, G. Furman, E. Toledo, J. Shock, J. Buys*
8. *Brain Structural Saliency Over The Ages*, *Machine Learning, Optimization, and Data Science. LOD 2022, D. Taylor, J. Shock, D. Moodley, J. Ipser, M. Treder*
9. *Causal Multi-Agent Reinforcement Learning: Review and Open Problems*, *S. J. Grimbley, J. Shock, A. Pretorius, Cooperative AI Workshop, NeurIPS 2021*
10. *Automated outcome prediction and assessment with quantitative EEG in severe disorders of consciousness (conference poster abstract, P 132)*, *Clinical Neurophysiology* 128 (10) e393, 2017, *S. Stefan, B. Schorr, A. Lopez-Rolon, I. Kolassa, J. Shock, A. Bender*

Preprints / Under Review

1. *PyBatchRender: A Python Library for Batched 3D Rendering at Up to One Million FPS*, E Rudakov, J Shock, BU Cowley, *arXiv:2601.01288*, 2026 (under review)
2. *Planning to Learn: A Novel Algorithm for Active Learning during Model-Based Planning*, R. Hodson, B. Bassett, C. van Hoof, B. Rosman, M. Solms, J. P. Shock, R. Smith, *arXiv:2308.08029*, 2025 (under review)
3. *A Note on Spinning Billiards and Chaos*, JS Lund, J Murugan, JP Shock, *arXiv:2505.15335*, 2025 (under review)
4. *SSSUMO: Real-Time Semi-Supervised Submovement Decomposition*, E Rudakov, J Shock, O Lappi, BU Cowley, *arXiv:2507.08028*, 2025 (under review)
5. *Assessing the Case for Africa-Centric AI Safety Evaluations*, G. Ireri et al, *arXiv:2602.13757*, 2026
6. *Toward an African agenda for AI Safety*, S. Segun et al, *arXiv:2508.13179*, 2025
7. *Learning Operators with NEAT for Boolean Composition in Reinforcement Learning*, A. Esterhuysen, S. James, GN. Tasse, B. Rosman, J. Shock, <https://doi.org/10.21203/rs.3.rs-5455533/v1>, 2024
8. *Chaos and Scrambling in Quantum Small Worlds*, *arXiv:1901.04561*, J. Hartmann, J. Murugan, J. Shock, 2019
9. *Notes on the Squashed Sphere Lowest Landau Level*, *arXiv:1909.08042*, J. Murugan, J. Shock, R. Slayen, 2019
10. *Probability Density Functions from the Fisher Information Metric*, *arXiv:1504.03184*, T. Clingman, J. Murugan, J. Shock, 2015

Seminars

- *What can we learn about ourselves by studying artificial intelligence? Talk given at the University of Helsinki, June 2025*
- *Building an African AI Institute that bridges worlds. Talk given at the INRS, Montreal and the University of Toronto, August and September 2025*
- *Reinforcement Learning: Meta, Offline, Multi-agent and more. Talk given at the IndabaX, Wits, Johannesburg, South Africa, July 2024*
- *Active Inference, Generative Models and the Embedding Space of Ideas. Keynote address at Mind and Matter 2024, Helsinki, Finland*
- *Rich Embeddings and Deep Understanding. Keynote address at CEMDI 2024 conference, INRS, Montreal, Canada*
- *From Physics to Machine Learning and back again. NiTheCS Mini-school, 2023*
- *An Introduction to Active Inference. UCT, Department of Computer Science, 2023*
- *2-4 lecture series on the history of AI leading to ChatGPT - Talk given to:*

- *University of Oxford (October 2023 and Jan 2024)*
- *UCT summer school (Jan 2024)*
- *UCT Centre for Innovation in Learning and Teaching (April 2024)*
- *An introduction to machine learning - Talk given to:*
 - *AIMS-Imaginary (November 2020)*
 - *Mathematicians at UCT (September 2019)*
 - *Neuroscientists at UCT (September 2019)*
 - *Psychologists at UCT (August 2019)*
- *Reinforcement Learning - Talk given at:*
 - *University of Helsinki (June 2025)*
 - *NiTheCS (March 2022)*
 - *East African Institute for Fundamental Research (February 2022)*
 - *University of Sao Carlos, Brazil (November 2020)*
 - *UCT, Cape Town (August and September 2019)*
 - *Wits, Johannesburg (June 2019)*
 - *Deep Learning IndabaX - KwaZulu Natal (April 2019)*
 - *INRS, Montreal, Canada (July 2022)*
- *Information Geometry and AdS/CFT - Talk given at:*
 - *KITPC, Beijing (June 2015)*
 - *Wits, Johannesburg (March 2015)*
 - *Max Planck Institute for Physics, Munich, Germany (January 2015)*
- *An introduction to holographic dualities - Talk given at:*
 - *UCT, South Africa, (September 2014)*
 - *Chaos and nonlinear dynamics conference, Maribor, Slovenia, (June 2014)*
- *Entanglement entropy in alpha vacua of de Sitter space - Talk given at:*
 - *KITPC program (July 2014).*
 - *CMTP meeting, UCT, Cape Town (May 2014).*
- *The superconducting QCD vacuum at large magnetic field from holography - Talk given at*
 - *The Institute Henri Poincare, Paris, France (January 2014).*
 - *String theory and black holes conferences, Braga, Portugal (December 2013)*
 - *The Abdus Salam centre for Theoretical Physics, Trieste, Italy (December 2012).*
 - *The KITPC, Beijing, China (October 2012).*
 - *The DESY theory meeting, Hamburg, Germany (October 2012).*
- *A tour of atmospheric optics - Talk given at:*
 - *AIMS Muizenberg, South Africa (Feb 2016)*

- *The University of Cape Town physics society, South Africa (August 2014).*
- *Chaos and non-linear dynamics, Maribor, Slovenia (June 2014).*
- *APC, Paris, France (January 2014).*
- *The UCT winter program, Cape Town, South Africa (July 2014).*
- *The University of Northumbria, UK (December 2013).*
- *The KITPC, Beijing, China (October 2012).*
- *The Yukawa Institute, Kyoto, Japan (September 2012).*
- *The university of Cape Town, South Africa (April 2012).*
- *The university of Santiago de Compostela, Spain (16/12/10)*
- *The university of Andres Bello, Santiago, Chile (9/8/10).*
- *Centro Atomico de Balseiro, Bariloche, Argentina (3/8/10).*
- *The University of Cape Town, South Africa (12/5/10).*
- *An introduction to dualities - Talk given at the department of physics CMTP program at the University of Cape Town, South Africa (September 2013).*
- *An introduction to basic neuroscience - Talk given at the Abdus Salam centre for Theoretical Physics, Trieste, Italy (December 2012).*
- *An introduction to string theory - Talk given at:*
 - *City Varsity, Cape Town (February 2015)*
 - *Truth Coffee Cape Town (February 2015)*
 - *Two highschools in Beijing, China (October 2012).*
- *A passion for science and learning - Talk given at highschools in Beijing, China (October 2012).*
- *The open string membrane paradigm in AdS/CFT - Talk given at:*
 - *The Yukawa Institute, Kyoto, Japan (September 2012).*
 - *The University of Leiden, the Netherlands (June 2012).*
 - *The University of Cape Town, South Africa (April 2012).*
 - *The ITP, Beijing, China (September 2011).*
 - *The IHEP, Beijing, China (September 2011).*
 - *The Institut Henri Poincare, Paris, France (May 2011).*
 - *The university of Braga, Portugal (April 2011).*
 - *The university of Santiago de Compostela, Spain (April 2011).*
 - *The university of Southampton, UK (March 2011).*
- *Generalized linear models for neural systems - a three lecture course given at the University of Cape Town, South Africa (April 2012).*
- *The joys of physics: The history of the universe and fundamental forces - Talk given to four high schools in Beijing, China (September 2011).*
- *Spatially modulated phases in AdS/CFT - Talk given at:*

- Southampton University, Southampton, UK (June 2011).
- Talk given at the LMU, Munich, Germany (June 2011).
- *Strings on bubbling geometries* - Talk given at:
 - CQUEST, Seoul, South Korea (1/12/10).
 - Postec, Pohang, South Korea (29/11/10).
 - The ESU, Vienna, Austria (15/9/10).
 - The universidad Catolico de Chile, Santiago, Chile (7/8/10).
 - CECS, Valdivia, Chile (5/8/10).
 - Centro Atomico de Balseiro, Bariloche, Argentina (2/8/10).
 - Invited talk at Quantum Gravity in the Southern Cone V, Buenos Aires, Argentina (30/7/10).
 - The University of Cape Town, South Africa (10/5/10).
 - Santiago de Compostela, Spain (16/3/10).
- *Spectral functions and Einstein relations from AdS/CFT* - Talk given at:
 - The fifth Agian string school Milos, Greece (4/09/09).
 - Gijon, Spain (4/2/09).
 - The winter meeting in Madrid, Spain (16/12/08).
 - DIAS, Dublin, Ireland (20/11/08).
- *Photoproduction in Strongly Coupled Plasmas - The Braney solution* - Talk given at:
 - Porto, Portugal (24/10/08).
 - CQUEST, Seoul, Korea (08/08/08).
 - The IHEP, Beijing, China (24/07/08).
 - The KITPC, Beijing, China (17/07/08).
 - The Max Planck Inst. for theoretical physics, Munich, Germany (4/07/08)
- *AdS/CFT at finite temperature* - A series of three talks given at the KITPC, Beijing, China (17/07/08).
- *AdS/CFT with flavour in electric and magnetic Kalb Ramond elds* - Talk given at:
 - CQUEST, Seoul, Korea (13/08/08).
 - The DIAS, Dublin, Ireland (6/12/07).
 - The university of Santiago de Compostela, Spain (13/12/07).
- *The Confinement/Deconfinement phase transition from a variety of dual supergravity backgrounds* - Talk given at the University of Santiago de Compostela, Spain (10/11/07).
- *Advances in AdS/CFT and AdS/QCD* - Talk given at The Quark-Gluon plasma workshop, Wuhan, China (20/06/07).
- *Linear Confinement in AdS/QCD* - Talk given at the ITP in Beijing (20/06/07).
- *Three paths from AdS to QCD* - Talk given at Beida in Beijing (11/05/07).

- *Heavy quarks in AdS/QCD - Talk given at the ITP in Beijing (15/04/07).*
- *Hadrons from holography - Talk given at:*
 - *Ochanomizu University, Tokyo (5/03/07).*
 - *Tokyo University (30/02/07).*
 - *The Yukawa Institute in Kyoto (24/02/07).*
 - *Tsinghua University in Beijing (23/12/06).*
 - *The ITP in Beijing (17/12/06).*
 - *The IHEP in Beijing (15/12/06).*
 - *The AdS/CFT and strongly coupled quark matter workshop at CCAST in the ITP in Beijing (21/11/06).*
 - *The ITP in Beijing (11/06).*
- *Meson Spectroscopy from the AdS/CFT Correspondence - Talk given at The Quark-Gluon plasma workshop, Wuhan, China (14/8/06).*
- *The AdS/CFT Correspondence and Meson Spectroscopy (SU(3)) - Talk given at Topical Seminar on Frontier of Particle Physics 2006: Beyond the Standard Model, Beijing, China (8/8/06).*
- *Understanding the Strong Force through Gravity - Talk given at Nanchang University, Nanchang, China (06/06).*
- *Flavour Physics from the AdS/CFT correspondence - Talk given at:*
 - *The Yukawa Institute, Kyoto, Japan (03/06).*
 - *Ochanomizu University, Tokyo, Japan (03/06).*
- *An Introduction to the AdS/CFT correspondence - Two talks given in the ITP in Beijing (12/05).*
- *QCD Physics from the AdS/CFT correspondence - Talk given at TASI 2005 (6/05).*
- *The AdS/CFT correspondence with a non-SUSY Deformation and Fundamental Quarks - Talk given at Southampton University (10/1/05).*
- *Brane wrapping in the AdS/CFT correspondence - Talk Given at:*
 - *Southampton University (10/3/05).*
 - *Swansea University(17/3/05).*

Teaching duties

- Honours Computer Science - lectures on reinforcement learning in the artificial intelligence module.
- Machine Learning, from linear regression to deep learning - a one year course given for the National Institute of Theoretical and Computational Sciences from 2022-
- Honours string theory - one semester course, 2014-ongoing (classes ranging from 2-15 students)

- Advanced topics in Reinforcement Learning, 2019-ongoing (Honours module)
- An introduction to the mathematics of Machine Learning for Data Scientists, 2023
- MAM1000W - convenor, 2016-2019, (750 students with classes of up to 250 students)
- MAM1000W - first year undergraduate mathematics course, 2013-2022
- MAM1031F/MAM1033F - first year undergraduate mathematics course, 2023- ongoing
- MAM1034H - first year applied mathematics, 2021, 2022.
- 2ND - second year applied mathematics - nonlinear dynamics - 2022-ongoing
- Mathematics and Applied Mathematics Honours course convener 2014.

Committee duties

- Department Exco
- Department deputy head
- Outreach committee chair
- Workload committee
- Transformation committee
- Planning committee
- Business plan committee
- Faculty level: IT committee chair
- Faculty level: Physical planning committee
- University level: Open textbook award committee
- University level: Senate

Awards

- Distinguished Teacher Award - UCT, 2017
- Commended for the HELTASA teaching award 2019

Grants and external funding

- *Principal Investigator* — African Compute Initiative, IDRC, 2026–2029
- *Principal Investigator* — African Hub on AI Safety, Peace & Security, IDRC / FCDO, 2025–2029

Policy contributions and international advisory work

- Drafting contributor, U7+→G7 Communiqué on universities and AI governance (January 2025; signed by the UCT Vice-Chancellor and delivered to the G7)
- Invited contributor, World Bank *World Development Report 2026* regional consultation
- Chair, IARU Working Group on AI (11 research-intensive universities, 2025–)

Refereeing and Editing

- Reviewer for: JHEP, Phys Rev B, Neurips, ICML, ICLR, AAMAS, AAAI, SACAIR, ACAIN, General Relativity and Gravitation.
- Guest editor for special edition of Health and Quality of Life Outcomes

Student Supervision

Honours

- Tristan Phillips, Joshua Baillie, Kelvin Wei, Catherine Li, Jing Yeh (2026-)
- Tziyona Cohen, Oscar Duys, Max Elkington, Joseph Goldblatt, Karabo Letsholo, Catalina Althoff-Thomson, Caleb Bessit (2025)
- Nick Bossi, Jack Montgomery, Luke Davis (2024)
- Qiulin Li, Aaron Kovarsky (2023)
- Cher Chen, Lehasa Seoe, Batsi Ziki, Shaun Schoeman, Noah de Nicola (2022)
- Nicky Maluleke, Rahul Mistri, Kabelo Serage, Edan Toledo, Claude Andrews, Anele Siyotula (2021)
- Claude Formanek, Siphелеle Danisa, Jeremy Du Plessis, St John Grimbley, Abram Schoenfeldt (2020)
- Jibrán Bohra, Jeremy Wilkinson, Darien Hillebrand, Logan Guildenhuys (2019)
- Luke Taylor, Jason Connie, Daniel Taylor (2018)
- Lizelle Niit, Dominic Bauer, Lauren Denny (2017)
- Mpho Mafune, Robert Spencer (2016)
- Cara Pienaar, Dean Rance, Sabina Stefan (2015)
- Emma Platts, Tslil Clingman (2014)

Masters

- Primary supervisor for Ben van Dugteren (2026-)
- Co-supervisor for David Andayi, Tumelo Matobo (2026-)
- Co-supervisor for Sian Heesom-Green (2025-)

- Co-supervisor for Antonia Grindrod (2025)
- Co-supervisor for Kristin Haskins* (2025-2026)
- Primary supervisor for Kival Mahadew (2025-)
- Co-supervisor for Neville Varney-Horwitz (2026-)
- Primary supervisor for Collins Maripane (2025-)
- Co-supervisor for Shiling Deng (2025-2026)
- Primary supervisor for Jean du Plessis (2024)
- Co-supervisor for Binyi Zou (2023)
- Co-supervisor for Jiahao Zhang, Yvetta Lin (2022)
- Primary supervisor for Tswelopele Moshe, Vuyiswa Kubalasa (2024-)
- Primary supervisor for Noah de Nicola (2024-2026)
- Primary supervisor for Ruan de Kock, Benjamin Sturgeon (2023-)
- Primary supervisor for Batsi Ziki (2023-2025)
- Primary supervisor for Roland Dubb (2022-2024)
- Primary supervisor for St John Grimbly, Rachel Catzel (2021-2024)
- Primary supervisor for Rivan Rughubar (2021-2023)
- Primary supervisor for Jeremy Du Plessis (2022-2024)
- Primary supervisor for Arinze Folarin (2021-2023)
- Primary supervisor for Siphhelele Danisa (2021-2022)
- Primary supervisor for Daniel Taylor, Rowan Hodson (2020-2022)
- Co-supervisor for Zach Wolpe, Abram Schoenfeldt (2020-2022)
- Co-supervisor for Mashudu Mokhithi (2020-2021)
- Primary supervisor for Tom Makkink (2020-2021)
- Primary supervisor for Dean Rance (2019)
- Primary supervisor for Alexes Mes (2019-2021)
- Co-supervisor for Jean-Gabriel Hartmann (2018-2020)
- Primary supervisor for Lizelle Niit (2017-2022)
- Co-supervisor for Ruach Slayen (2017-2019)
- Co-supervisor for Vladimir Makic (2017-2020)
- Co-supervisor for Alastair Grant-Stuart (2016-2017)
- Co-supervisor for Tslil Clingman (2015)

- Co-supervisor for Alex Antrobus (2013-2015)
- AIMS Masters primary supervisor for Muhammad Said (2026-)
- AIMS Masters primary supervisor for Lupiya Musonda (2021)
- AIMS Masters primary supervisor for Linda Agyapomah Osei-Agyare, Jeasy Roger Bavibidila, Grace Ikhizama (2020)
- AIMS Masters primary supervisor for Yasser Salah Eddine Bouchareb (2018)
- AIMS Masters primary supervisor for Morris Munyoka (2017)
- AIMS Masters co-supervisor for Mohammad Mansour (2015)
- AIMS Masters co-supervisor for Alzaahra Farrag (2014)

Postdoctoral

- Ian Ocholla (2026-)
- Nicolas Kuske (2025-)
- Jeremiah Fadugba (2026-)

PhD

- Primary supervisor for Jack Ngare (2026-)
- Primary supervisor for Wei-Yu Louis Feng (2026-)
- Primary supervisor for Tatiana Sango (2025-)
- Primary supervisor for Asad Jeewa (2024-)
- Primary supervisor for St John Grimbly (2024-)
- Primary supervisor for Alyssa Amod (2022-)
- Co-supervisor for Evgenii Rudakov (2022-)
- Joint-primary supervisor for Mashudu Mokhithi (2022-2025)
- Co-supervisor for Yasser Salah Eddine Bouchareb (2022-)
- Primary supervisor for Claude Formanek (2021-)
- Co-supervisor for Rayhaan Perin* (2020-2026)
- Joint-primary supervisor for Ruach Slayen (2020-2024)
- Co-supervisor for Emma Platts (2018-2021)
- Primary supervisor for Anthony Sayster (2018-2023)
- Co-supervisor for Justine Tarrant (2014-2017)
- Joint academic advisor for Miguel Strydom (2011-2012)
- Joint academic advisor for Steffan Muller (2011-2012)
- Joint academic advisor for Xie Zhe Feng (2005-2007)

* subject to corrections

Public outreach

- Chief writer and organiser of Mathemafrika.org blogging platform - up to 20,000 visitors per month.
- Lecture notes on calculus for open source text book publishing.
- Participated in MAM high school mathematics day March 2015.
- Talks given at two highschools within Beijing during October 2012.
- Talks given at several highschools within Beijing during September 2011 on fundamental physics, from cosmology to modern particle physics.
- Talks on atmospheric optics given to the public in Argentina, Germany, Chile, Japan, Spain, UK, France and South Africa
- Popular talks on string theory given to the general public in South Africa

Languages

- Native: English
- Comfortable: Spanish
- Conversant: Mandarin Chinese