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.
Work Address:	Department of Mathematics and Applied Mathematics, University of Cape Town, 7701 Rondebosch, South Africa.
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Education, research and advisory positions

2025-	**Advisory board member for Awarenearth.**
2025-	**Advisory board member for Conscium.**
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:	1^{st} **Class Honours, MPhys, Bristol University.**
1990-1997:	**Secondary school education at Abingdon School, England.**

Publications

1. *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*

2. *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*

3. *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*

4. *Lessons learnt and insights shared: The Diagnostic Mathematics Information for Student Retention and Success (DMISRS) Case Studies Dialogue on teaching first-year mathematics, S Steyn, T Sango, L Boshoff et al, Perspectives in Education*

5. *Sophisticated Learning: A novel algorithm for active learning during model-based planning, Rowan Hodson et al, ArXiv*

6. *Thermodynamics and DC conductivity of 2D anisotropic fluids from axion holography, Alfonso Ballon-Bayona et al, Journal of High Energy Physics*

7. *Opportunities of Reinforcement Learning in South Africa's Just Transition, C Formanek, C Tilbury, J Shock, Southern African Conference on AI Research, 2024*

8. *Increasing the location rate of positron emission particle tracking (PEPT) measurements for froth flotation, Rayhaan Perin et al, Minerals Engineering*

9. *Coordination failure in cooperative offline marl, Callum Rhys Tilbury et al, arXiv preprint arXiv:2407.01343*

10. *Dispelling the Mirage of Progress in Offline MARL through Standardised Baselines and Evaluation, C Formanek, C Tilbury, L Beyers et al, arXiv preprint arXiv:2406.09068, published at Neurips 2024 datasets and benchmarks workshop*

11. *Assessing the Case for Africa-Centric AI Safety Evaluations, G. Ireri et al, arXiv preprint arXiv:2602.13757*

12. *PyBatchRender: A Python Library for Batched 3D Rendering at Up to One Million FPS, E Rudakov, J Shock, BU Cowley, arXiv preprint arXiv:2601.01288*

13. *Graph-Based Exploration for ARC-AGI-3 Interactive Reasoning Tasks, E Rudakov, J Shock, BU Cowley, arXiv preprint arXiv:2512.24156*

14. *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*

15. *Optimisation of Resource Allocation in Heterogeneous Wireless Networks Using Deep Reinforcement Learning, O Giwa, J Shock, JD Toit, T Awodumila, preprint arXiv:2509.25284*

16. *I call it math therapy: student narratives of growth, belonging and confidence in mathematical thinking workshops, M Mokhithi, A Campbell, J Shock, P Padayachee, International Journal of Mathematical Education in Science and Technology, 126*

17. *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*

18. *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)*

19. *Toward an African agenda for AI Safety, S. Segun et al, Whitepaper: arXiv preprint arXiv:2508.13179*

20. *SSSUMO: Real-Time Semi-Supervised Submovement Decomposition, E Rudakov, J Shock, O Lappi, BU Cowley, arXiv preprint arXiv:2507.08028*

21. *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*

22. *A Note on Spinning Billiards and Chaos JS Lund, J Murugan, JP Shock arXiv preprint arXiv:2505.15335*

23. *Thermodynamics and DC conductivity of 2D anisotropic fluids from axion holography, A. Ballon-Bayona, J.P. Shock, D. Zoakos, JHEP 2025 (4), 1-41*

24. *Putting Data at the Centre of Offline Multi-Agent Reinforcement Learning, C. Formanek, C. Tilbury, L. Beyers, J.P. Shock, A. Pretorius, https://arxiv.org/pdf/2409.12001*

25. *Learning Operators with NEAT for Boolean Composition in Reinforcement Learning, A. Esterhuysen, S. James, GN. Tasse, B. Rosman, J. Shock, preprint*

26. *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*

27. *Opportunities of Reinforcement Learning in South Africa's Just Transition, C. Formanek, C. Tilbury, J.P. Shock, Southern African Conference on AI Research, 2024*

28. *Dispelling the Mirage of Progress in Offline MARL through Standardised Baselines and Evaluation, C. Formanek, C. Tilbury, L. Beyers, J.P. Shock, A. Pretorius, https://arxiv.org/abs/2406.09068, accepted in Neurips datasets and benchmarks2024*

29. *Coordination Failure in Cooperative Offline MARL, C. Formanek, C. Tilbury, L. Beyers, J.P. Shock, A. Pretorius, https://arxiv.org/abs/2407.01343. Paper accepted into ARLET workshop at ICML 2024*

30. *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.org:2308.08029*

31. *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*

32. *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*

33. *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*

34. *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*

35. *Policy-based Reinforcement Learning for Generalisation in Interactive Text-based Environments, EACL 2023, E. Toledo, J. Shock, J. Buys*

36. *A Sequence Modelling Approach to Question Answering in Text-Based Games, NAACL 2022 workshop, Wordplay, G. Furman, E. Toledo, J. Shock, J. Buys*

37. *Magnetising the N=4 SYM Plasma, JHEP, A Ballon-Bayona, J. Shock, D. Zoakos*

38. *Brain Structural Saliency Over The Ages, ArXiv: 2202.11690, Machine Learning, Optimization, and Data Science. LOD 2022, D. Taylor, J. Shock, D. Moodley, J. Ipser, M. Treder*

39. *Causal Multi-Agent Reinforcement Learning: Review and Open Problems, ArXiv: 2111.06721, S. J. Grimbly, J. Shock, A. Pretorius, Cooperative AI Workshop, NeurIPS 2021*

40. *Remarks on Fermions in a Dipole Magnetic Field, JHEP 2021 (82), J. Murugan, J. Shock, R. Slayern*

41. *An analysis of the time-frequency structure of several bursts from FRB121102 detected with MeerKAT, Mon.Not.Roy.Astron.Soc. 505 (2021) 2, E. Platts et al.*

42. *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*

43. *The relationship between mindset and academic achievement at university: A quantitative study of South African students, 2020 IFEES World Engineering Education Forum - Global Engineering Deans Council (WEEF-GEDC), M. Mokhithi, A. Campbell, J. Shock.*

44. *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*

45. *Strongly Coupled Heavy and Light Quark Thermal Motion from AdS/CFT, Annals of Physics,Volume 436, 168675, A. K. Mes, R. W. Moerman, J. P. Shock, W. A. Horowitz*

46. *Magnetic catalysis and the chiral condensate in holographic QCD, JHEP 2020 (10) 193, A Ballon-Bayona, J. Shock, D. Zoakos*

47. *"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, S. Parisi et al*

48. *Structural neuroimaging biomarkers for obsessive-compulsive disorder in the ENIGMA-OCD consortium: medication matters, Transl Psychiatry 10, 342 (2020), W. Bruin et al.*

49. *Notes on the Squashed Sphere Lowest Landau Level, arXiv:1909.08042, J. Murugan, J. Shock, R. Slayen*

50. *Outcome prediction with serial neuron-specific enolase and machine learning in anoxic-ischaemic disorders of consciousness, Computers in Biology and Medicine 107 (2019) 145152, E. Muller, J. Shock, A. Bender, J. Kleeberger, T. Hogen, M. Rosenfelder, B. Bah, A. Lopez-Rolon*

51. *Chaos and Scrambling in Quantum Small Worlds, arXiv:1901.04561, J. Hartmann, J. Murugan, J. Shock*

52. *Astrophysical Quantum Matter: Spinless charged particles on a magnetic dipole sphere, arXiv:1811.03109, to appear in GERG, J. Murugan, J. Shock, R. Slayen*

53. *Consciousness Indexing and Outcome Prediction with Resting-State EEG in Severe Disorders of Consciousness, Brain Topography, 1-15, S. Stefan, B. Schorr, A. Lopez-Rolon, IT. Kolassa, J. Shock, M. Rosenfelder, S Heck, A.Bender*

54. *P 132 Automated outcome prediction and assessment with quantitative EEG in severe disorders of consciousness, Clinical Neurophysiology 128 (10) e393, S. Stefan, B. Schorr, A. Lopez-Rolon, I. Kolassa, J. Shock, A. Bender*

55. *A Universal Order parameter for Inverse Magnetic Catalysis, JHEP 2017 (10) 38, A. Ballo-Bayona, M. Ihl, J. Shock, D. Zoakos*

56. *Severe Disorders of Consciousness after Acquired Brain Injury: A Single-Centre Long-Term Follow-up Study - NeuroRehabilitation A. Lopez-Rolon et al*

57. *A cross-sectional, descriptive study of Chagas disease among citizens of Bolivian origin living in Munich, Germany - BMJ Open M. Navarro et al*

58. *Quantum discord in de Sitter space - arXiv:1608.02853 S. Kanno, J. Shock, J. Soda.*

59. *The Information Metric on the moduli space of instantons with global symmetries - arXiv:1507.08894, Phys.Lett. B753 (2016) 660-663, E. Malek, J. Muguran, J. Shock.*

60. *Probability Density Functions from the Fisher Information Metric - arXiv:1504.03184, T. Clingman, J. Murugan, J. Shock.*

61. *Entanglement negativity in the multiverse - arXiv:1412.2838, JCAP 1503 (2015) 03, 015. S. Kanno, J. Shock, J. Soda.*

62. *Entanglement entropy of α-vacua in de Sitter space - ArXiv:1404.6815, JHEP 1407 (2014) 072, S. Kanno, J. Murugan, J. Shock, J. Soda.*

63. *Particle-vortex and Maxwell duality in $AdS_4 \times CP^3$/ABJM correspondence - ArXiv: 1404.5926, JHEP 1410 (2014) 051, J.Murugan, H. Nastase, N. Rughoonauth, J. Shock.*

64. *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.*

65. *Evaluation of Plasmodium falciparum gametocyte detection in different patient material - Malaria Journal 2013, 12:438, Kast et al.*

66. *Magnetic field induced lattice ground states from holography - ArXiv:1210.6669, JHEP 1303:165, 2013, Y.Y. Bu, J. Erdmenger, J. Shock, M. Strydom*

67. *Holographic Superfluidity from a Magnetic Field - PoS ConfinementX 268 (2012), Y.Y. Bu, J. Erdmenger, J. Shock, M. Strydom*

68. *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*

69. *On Stability and Transport of Cold Holographic Matter- ArXiv:1108.1798, M.Ammon, J.Erdmenger, S.Lin, S.Muller, A.O'Bannon, J.P.Shock*

70. *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- ArXiv:1107.5053, N.Evans, K.Y.Kim, J.P.Shock*

71. *The open string membrane paradigm with external electromagnetic fields- ArXiv:1103.4581, JHEP 1106:017, 2011 K.Y.Kim, J.P.Shock, J.Tarrio*

72. *Sum rules, plasma frequencies and hall phenomenology in holographic plasmas - ArXiv:1010.5613, JHEP 1102:015, 2011 J.Mas, J.P.Shock, J.Tarrio*

73. *Strings on bubbling geometries - ArXiv:1003.4190, JHEP 1006:055,2010. H.Lin, A.Morisse, J.P.Shock*

74. *Holographic hadrons in a confining finite density medium - ArXiv:0912.4013, JHEP 1003:115, 2010. Y.Seo, J.P.Shock, S.J.Sin, D.Zoakos*

75. *A note on the velocity of holographic long lived mesons - ArXiv:0912.2945, Phys.Lett.B688:244-247, 210. J.P.Shock, J. Tarrio*

76. *Holographic operator mixing and quasinormal modes on the brane - arXiv:0911.3610, JHEP 1002:021,2010. M.Kaminski, K.Landsteiner, J.Mas, J.P.Shock, J.Tarrio*

77. *Universal holographic chiral dynamics in an external magnetic field - arXiv:0903.5345, JHEP 0908:013,2009 V.Filev, C.V.Johnson, J.P.Shock*

78. *The AdS/CFT Correspondence and Non-perturbative QCD - arXiv:0901.2534, AIP Conf.Proc.116:265-284, 2009. J.Edelstein, J.P.Shock, D.Zoakos*

79. *On the Einstein relation in holographic systems at finite baryon density - arXiv:0812.4432, 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*

80. *Holographic flavor in N=4 gauge theories in 3d from wrapped branes - ArXiv:0812.1975, JHEP 0902:001,2009. A.V.Ramallo, J.P.Shock, D.Zoakos*

81. *A note on conductivity and charge diffusion in holographic flavour systems - ArXiv:0811.1750, JHEP 0901:025,2009. J.Mas, J.P.Shock, J.Tarrio*

82. *Holographic Spectral functions at finite baryon density - ArXiv:0805.2601, JHEP 0809:009,2008. J.Mas, J.P.Shock, J.Tarrio, D.Zoakos*

83. *AdS/CFT with flavour in electric and magnetic Kalb-Ramond fields - hep-th/0709.1551, JHEP 0712:091,2007. J.Erdmenger, R.Meyer and J.P.Shock*

84. *Holographic confinement/deconfinement phase transitions of AdS/QCD in curved spaces - hep-th/0705.3388, JHEP 08 (2007) 095. R.G.Cai and J.P.Shock*

85. *A Note on chiral symmetry breaking from intersecting branes - hep-th/0704.3913, Phys.Rev. D76 (2007) 046003. Y.H.Gao, J.P.Shock, W.S.Xu and D.F.Zeng*

86. *An Exotic Approach to Hadron Physics - hep-ph/0704.1721, YKIS06 proceedings. M.Bando, Y.Fukase, J.P.Shock, A.Sugamoto and S.Terunuma*

87. *AdS/QCD phenomenological models from a back-reacted geometry - hep-ph/0611227, JHEP 03 (2007) 064. J.P.Shock, F.Wu, Y-L.Wu and Z-F.Xie*

88. *Embedding Flipped SU(5) into SO(10) - hep-ph/0606087, JHEP 10 (2006) 035. C-S.Huang, T.Li, C.Liu, J.P.Shock, F.Wu and Y-L.Wu*

89. *Three Flavour QCD from the holographic principle - hep-ph/0603142, JHEP 08 (2006) 023. J.P.Shock and F.Wu*

90. *Canonical Coordinates and Meson Spectra for Scalar Deformed N=4 SYM from the AdS/CFT Correspondence - hep-th/0601025, JHEP 10 (2006) 043. J.P.Shock*

91. *Towards a Perfect QCD Gravity Dual - hep/th-0505250, Phys.Lett. B622 (2005) 165-171. N.Evans J.P.Shock and T.Waterson*

92. *D7 Brane Embeddings and Chiral Symmetry Breaking - hep/th-0502091, JHEP 0503 (2005) 005. N.Evans J.P.Shock and T.Waterson*

93. *Chiral Dynamics from AdS Space - hep/th-0403279, Phys.Rev. D70 (2004) 046002. N.Evans and J.P.Shock*

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*
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- *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 Understsanding. 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 (Feburary 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 schoolMilos, 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

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

- Kelvin Wei, Catherine Li (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 (2021)
- Claude Formanek, Siphelele Danisa, Jeremy Du Plessis, StJohn Grimbly, Abram Schoenfeld (2020)
- Jibran Bohra, Jeremy Wilkinson, Darien Hillebrand,Logan Geldenhuys (2019)
- Luke Taylor, Jason Connie, Storm Johnson (2018)
- Robert Spencer, Lauren Denny, Dean Rance (2017)
- Lizelle Niit, Cara Pienaar, Dominic Bauer, Sabina Steffen (2016)
- Emma Platts (2015)

Masters

- Co-supervisor for Ben van Dugteren, David Andai, Tumelo Matobo (2026-)
- Co-supervisor for Antonia Grindrod, Collins Maripane, Shiling Deng, Sian Heesom-Green, Kival Mahadew, Kristin Haskins (2025-)
- Co-supervisor for Jean du Plessis (2024)
- Co-supervisor for Binyi Zou (2023)
- Co-supervisor for Jiahao Zhang, Yvetta Lin (2022)
- Supervisor for Tswelopele Moshe, Vuyiswa Kubalasa (2024-)
- Supervisor for Ruan de Kock, Benjamin Sturgeon, Batsi Ziki (2023-)
- Supervisor for Roland Dubb (2022-2024)
- Supervisor for St John Grimbly, Rachel Catzel (2021-2024)
- Supervisor for Rivan Rughubar (2021-2023)
- Cosupervisor for Jeremy Du Plessis (2022-2024)
- Co-supervisor for Arinze Follarin (2021-2023)
- Supervisor for Siphelele Danisa (2021-2022)

- Co-supervisor for Daniel Taylor, Rowan Hodson, Zach Wolpe, Abram Schoenfeld (2020-2022)
- Co-supervisor for Mashudu Mokhithi (2020-2021)
- Supervisor for Tom Makkink (2020-2021)
- Supervisor for Dean Rance (2019)
- Supervisor for Alexes Mes (2019-2021)
- Co-supervisor for Jean-Gabriel Hartman (2018-2020)
- Supervisor for Lizelle Niit (2017-2022)
- Co-supervisor for Ruach Slayen (2017-2019)
- Co-supervisor for Vladimir Makic (2017-2020)
- Co-supervisor for Alistair Grant-Stewart (2016-2017)
- Co-supervisor for Tslil Clingman (2015)
- Co-supervisor for Alex Antrobus (2013-2015)
- AIMS Masters supervisor for Lupiya Musonda (2021)
- AIMS Masters supervisor for Linda Agyapomah Osei-Agyare, Jeasy Roger Bavibidila (2020)
- AIMS Masters co-supervisor for Yasser Salah Eddine Bouchareb (2018)
- AIMS Masters supervisor for Morris Munyoka (2017)
- AIMS Masters co-supervisor for Mohammad Mansour (2015)
- AIMS Masters co-supervisor for Alzaahra Farrag (2014)

PhD

- Postdoctoral Research Fellow: Ian Ocholla (2026-)
- Supervisor for Jack Ngare (2026-)
- Co-supervisor for Wei-Yu Louis Feng (2026-)
- Postdoctoral Research Fellow: Nicolas Kuske (2025-)
- Co-supervisor for Tatiana Sango (2025-)
- Co-supervisor for Asad Jeewa (2024-)
- Postdoctoral Research Fellow: Jeremiah Fadugba (2024-)
- Co-supervisor for St John Grimbly (2024-)
- Co-supervisor for Alyssa Amod (2022-)
- Co-supervisor for Evgenii Rudakov (2022-)
- Co-supervisor for Mashudu Mokhithi (2022-)

- Co-supervisor for Yasser Salah Eddine Bouchareb (2022-)
- Supervisor for Claude Formanek (2021-)
- Co-supervisor for Rayhaan Perin (2020-)
- Co-supervisor for Ruach Slayen (2020-2024)
- Co-supervisor for Emma Platts (2018-2021)
- Co-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)

Public outreach

- Chief writer and organiser of Mathemafrica.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