Curriculum Vitæ Jan de Gier

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Personal details

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Employment

2014 –	**Professor**, University of Melbourne
2002 – 2014	**Postdoc, ARC QEII Fellow and Associate Professor**, University of Melbourne
1999 – 2002	**Postdoc**, Australian National University
1998	**PhD Theoretical Physics**, University of Amsterdam

Appointments

2023 – 2025	College of Experts, Australian Research Council
2017 – 2020	Head of School, School of Mathematics and Statistics, The University of Melbourne
2015 –	Director of MATRIX, the Australian residential research institute for the mathematical sciences

Supervision

PhD: William Mead (current), Zeying Chen (2019), John Foxcroft (2018), Caley Finn (2015), Alex Lee (2015), Anita Ponsaing (2011), Anthony Mays (2011),
MPhil: Maria Tsarenko (2013).
Masters: Cengiz Gazi (2022), William Mead (2021), Scott Mason (2017), Noon Silk (2016), Kasyed al Qasemi (2013), John Foxcroft (2013), Chunhua Chen (2008).
Postdoc: Jean-Emile Bourgine, Caley Finn, Alexandr Garbali, Jules Lamers, Keiichi Shigechi, Mark Sorrell, Michael Wheeler, Joyce Zhang, Xin Zhang

Major grants awarded

2024	$460,000, ARC DP240101787
2022	$347,000, ARC LE220100107
2021	US$600,000, MATRIX support (Simons Foundation Targeted Grant to Institutes)
2019	$300,000, ARC DP190102897
2014	$27,000,000, ARC Centre of Excellence CE140100049
2014	$340,000, ARC DP140102201
2012	$355,000, ARC/VicRoads LP120100258
2012	$100,000, MERIT Iconic Project, Engineering (UoM)
2011	$75,000, VicRoads project
2009	$285,000, ARC DP0988563
2007	$400,000, ARC QEII and DP0772708

Major service and distinctions

2024 – 2026	National Committee for Mathematical Sciences of the Australian Academy of Science
2024	IUPAP Early Career Scientist Prize (ECSP) in mathematical physics
2024	Gavin Brown Prize Committee AustMS
2024	Co-organiser IPAM long program *Geometry, Statistical Mechanics, and Integrability*

2023	Session organiser ICMP2024 (Strassbourg)
2023	George Szekeres Medal Committee AustMS
2023 –	Member Steering Committee of the Australian Mathematical Society
2023	Chair of the Topics Committee of Topic 1, STATPHYS28 (Tokyo)
2022	Co-organiser GGI program *Randomness, Integrability and Universality*
2021	UoM Excellence Award in a Priority Area: Internationalisation of Research
2021	Member FPSAC Conference Program Committee (2021, 2017 (co-Chair), 2016)
2021 – 2023	Editor of *Communications in Mathematical Physics*
2019 – 2022	Member of the International Advisory Committee of the International Congress of Mathematicians 2022
2018	Gavin Brown Best Paper Prize of the Australian Mathematical Society
2017 – 2024	Member IUPAP Commission C18: Mathematical Physics
2016 – 2021	Editor of *SciPost Physics*
2015 – 2017	Member of Council of the Australian Mathematical Society
2014 – 2017	Associate member of IUPAP Commission C3: Statistical Physics,
2014 – 2021	Chief Investigator of the ARC Centre of Excellence for Mathematical and Statistical Frontiers (ACEMS); 2014–2016 Deputy Director
2013	Director national postgraduate summer school of the Australian Mathematical Sciences Institute (AMSI)
2012	Chair of the Mahler Committee of the Australian Mathematical Society (Lecture tour Akshay Venkatesh)
2011 – 2013	Inaugural Chair of the Australian and New Zealand Association of Mathematical Physics (ANZAMP)
2010	Key organiser of the major international conference STATPHYS24
2007	ARC Queen Elizabeth II Fellowship (QEII).
2004 –	Editor of *Journal of Statistical Mechanics: Theory and Experiment (JSTAT)*.

Best 10 publications

1. J. de Gier, R. Kenyon and S.S. Watson, *Limit Shapes for the Asymmetric Five Vertex Model*, Commun. Math. Phys. **385** (2021), 793–836.

2. Z. Chen, J. de Gier, I. Hiki and T. Sasamoto, *Exact confirmation of 1D nonlinear fluctuating hydrodynamics for a two-species exclusion process*, Phys. Rev. Lett. **120**, 240601 (2018).

3. L. Cantini, J. de Gier and M. Wheeler, *Matrix product formula for Macdonald polynomials*, J. Physics A **48** (2015), 384001.

4. N.R. Beaton, M. Bousquet-Mélou, J. de Gier, H. Duminil-Copin, A.J. Guttmann *The critical fugacity for surface adsorption of SAW on the honeycomb lattice is 1+*$\sqrt{2}$, Comm. Math. Phys. **326** (2014), 727–754.

5. L. Zhang, T.M. Garoni and J. de Gier, *A comparative study of macroscopic fundamental diagrams of arterial road networks governed by adaptive traffic signal systems*, Transp. Res. B: Meth. **49** (2013), 1–23.

6. J. de Gier and A. Nichols, *The two-boundary Temperley-Lieb algebra*, J. Algebra **321** (2009).

7. J. de Gier and F.H.L. Essler, *Exact spectral gaps of the asymmetric exclusion process with open boundaries*, JSTAT (2006), P12011, 45pp.

8. J. de Gier and F.H.L. Essler, *Bethe Ansatz solution of the asymmetric exclusion process with open boundaries*, Phys. Rev. Lett. **95** (2005), 240601, 4 pages.

9. M.T. Batchelor, J. de Gier and B. Nienhuis, *The quantum symmetric XXZ chain at $\Delta = -1/2$, alternating sign matrices and plane partitions*, J. Phys. A **34** (2001), L265–L270.

10. J. de Gier and B. Nienhuis, *Exact stationary state for an asymmetric exclusion process with fully parallel dynamics*, Phys. Rev. E **59** (1999), 4899–4911.

Publications

1. J. de Gier, W. Mead and M. Wheeler, *Transition probability and total crossing events in the multi-species asymmetric exclusion process*, J. Phys. A: Math. Gen. **56** (2023), 255204.

2. Z. Chen, J. de Gier, I. Hiki, T. Sasamoto and M. Usui, *Limiting current distribution for a two species asymmetric exclusion process*, Commun. Math. Phys. **395** (2022), 59–142.

3. J. de Gier, R. Kenyon and S.S. Watson, *Limit shapes for the asymmetric five vertex model*, Commun. Math. Phys. **385** (2021), 793–836.

4. A. Garbali and J. de Gier, *The R-matrix of the quantum toroidal algebra $U_{q,t}(\ddot{gl}_1)$ in the Fock module*, Commun. Math. Phys. **384** (2021), 1971–2008.

5. Z. Chen, Jan de Gier and Michael Wheeler, *Integrable stochastic dualities and the deformed Knizhnik-Zamolodchikov equation*, Int. Math. Res. Not. **19** (2020), 5872–5925.

6. J. de Gier, A. Schadschneider, J. Schmidt and G.M. Schütz, *Kardar-Parisi-Zhang Universality of the Nagel-Schreckenberg Model*, Phys. Rev. E **100** (2019), 052111.

7. X. Zhang, F. Wen and J. de Gier, *T-Q relations for the integrable two-species asymmetric simple exclusion process with open boundaries*, J. Stat. Mech. (2019), 014001.

8. Z. Chen, J. de Gier, I. Hiki and T. Sasamoto, *Exact confirmation of 1D nonlinear fluctuating hydrodynamics for a two-species exclusion process*, Phys. Rev. Lett. **120**, 240601 (2018).

9. L. Zhang, C. Finn, T.M. Garoni and J. de Gier, *Behaviour of traffic on a link with traffic light boundaries*, Physica A **503** (2018), 116-138.

10. G. Feher, A. Garbali, J. de Gier and K. Schoutens, *A curious mapping between supersymmetric quantum chains*, 2017 MATRIX Annals, 167–184, D. Wood, J. de Gier J., C. Praeger, T. Tao (eds), Springer.

11. A. Garbali, J. de Gier and M. Wheeler, *A new generalisation of Macdonald polynomials*, Commun. Math. Phys. **352** (2017), 773.

12. J. de Gier, J.L. Jacobsen and A. Ponsaing, *Finite-size corrections for universal boundary entropy in bond percolation*, SciPost Phys. **1**, 012 (2016).

13. L. Cantini, A. Garbali, J. de Gier and M. Wheeler, *Koornwinder polynomials and the stationary multi-species asymmetric exclusion process with open boundaries*, J. Phys. A: Math. Theor. **49** (2016), 444002.

14. J. de Gier, G.Z. Feher, B. Nienhuis and M. Rusaczonek, *Integrable supersymmetric chain without particle conservation*, J. Stat. Mech. (2016) 023104.

15. J. de Gier and M. Wheeler, *A summation formula for Macdonald polynomials*, Lett. Math. Phys. **106** (2016), 381–394.

16. L. Cantini, J. de Gier and M. Wheeler, *Matrix product formula for Macdonald polynomials*, J. Phys. A: Math. Theor. **48** (2015), 384001.

17. J. de Gier and C. Finn, *Exclusion in a priority queue*, J. Stat. Mech. (2014), P07014.

18. L. Zhang, T.M. Garoni and J. de Gier, *Traffic disruption and recovery in road networks*, Physica A **401** (2014), 82–102.

19. J. de Gier, A. Lee and J. Rasmussen, *Discrete holomorphicity and integrability in loop models with open boundaries*, J. Stat. Mech. (2013) P02029.

20. L. Zhang, T.M. Garoni and J. de Gier, *A comparative study of Macroscopic Fundamental Diagrams of arterial road networks governed by adaptive traffic signal systems*, Trans. Res. B: Meth **49** (2013), 1–23.

21. A. Elvey Price, J. de Gier, A.J. Guttmann and A. Lee, *Off-critical parafermions and the winding angle distribution of the O(n) model*, J. Phys. A: Math. Theor. **45** (2012), 275002.

22. N. Beaton, J. de Gier, A.J. Guttmann *The critical fugacity for surface adsorption of SAW on the honeycomb lattice is 1+*$\sqrt{2}$, Comm. Math. Phys. **326** (2014), 727–754.

23. J. de Gier, A. Lascoux and M. Sorrell, *Deformed Kazhdan-Lusztig elements and Macdonald polynomials*, J. Alg. Comb. Theory A **119** (2012), 183-211.

24. J. de Gier, C. Finn and M. Sorrell, *Relaxation rate of the reverse biased asymmetric exclusion process*, J. Phys. A **44** (2011), 405002.

25. J. de Gier and F.H.L. Essler, *Current large deviation function for the open asymmetric simple exclusion process*, Phys. Rev. Lett. **107** (2011), 010602.

26. J. de Gier, T.M. Garoni and O. Rojas, *Traffic flow on realistic road networks with adaptive traffic lights*, J. Stat. Mech. (2011), P04008.

27. J. de Gier and A. Ponsaing, *Separation of variables for symplectic characters*, Lett. Math. Phys. **97** (2011), 61–83.

28. J. de Gier, T.M. Garoni and Z. Zhou, *Autocorrelations in the totally asymmetric simple exclusion process and Nagel-Schreckenberg model*, Phys. Rev. E **82** (2010), 021107.

29. J. de Gier, B. Nienhuis and A. Ponsaing *Exact spin quantum Hall current between boundaries of a lattice strip*, Nucl. Phys. B **838** (2010), 371–390.

30. J. de Gier and P. Pyatov, *Factorised solutions of Temperley-Lieb qKZ equations on a segment*, Adv. Theor. Math. Phys. **14** (2010), 795–877.

31. J. de Gier, A. Ponsaing and K. Shigechi, *Exact finite size groundstate of the O(*$n = 1$*) loop model with open boundaries*, J. Stat. Mech. (2009), P04010.

32. J. de Gier, P. Pyatov and P. Zinn-Justin, *Punctured plane partitions and the q-deformed Knizhnik–Zamolodchikov and Hirota equations*, J. Alg. Comb. Theory A **116** (2009), 772–794.

33. J. de Gier and A. Nichols, *The two-boundary Temperley-Lieb algebra*, J. Algebra **321** (2009).

34. J. de Gier and F.H.L. Essler, *Slowest relaxation mode of the partially asymmetric exclusion process with open boundaries*, J. Phys. A **41** (2008), 485002.

35. J. de Gier, *The Razumov-Stroganov conjecture: Stochastic processes, loops and combinatorics*, J. Stat. Mech. (2007), N02001.

36. J. de Gier and F.H.L. Essler, *Exact spectral gaps of the asymmetric exclusion process with open boundaries*, JSTAT (2006), P12011.

37. J. de Gier and F.H.L. Essler, *Bethe Ansatz solution of the asymmetric exclusion process with open boundaries*, Phys. Rev. Lett. **95** (2005), 240601.

38. J. de Gier, A. Nichols, P. Pyatov and V. Rittenberg, *Magic in the spectra of the XXZ quantum chain with boundaries at $\Delta = 0$ and $\Delta = -1/2$*, Nucl. Phys. B **729** (2005), 387–418.

39. A. Nichols, V. Rittenberg and J. de Gier, *One-boundary Temperley-Lieb algebras in the XXZ and loop models*, J. Stat. Mech. (2005), P03003.

40. J. de Gier, *Loops, matchings and alternating-sign matrices*, Discrete Math. **298** (2005), 365–388.

41. J. de Gier and B. Nienhuis, *Brauer loops and the commuting variety*, J. Stat. Mech. (2005), P01006.

42. J. de Gier and V. Rittenberg, *Refined Razumov-Stroganov conjectures for open boundaries*, J. Stat. Mech. (2004), P09009.

43. S. Mitra, B. Nienhuis, J. de Gier and M.T. Batchelor, *Exact expressions for correlations in the ground state of the dense $O(1)$ loop model*, J. Stat. Mech. (2004), P09010.

44. J. de Gier and P. Pyatov, *Bethe Ansatz for the Temperley-Lieb loop model with open boundaries*, J. Stat. Mech. (2004), P03002.

45. J. de Gier, B. Nienhuis, P.A. Pearce and V. Rittenberg, *The raise and peel model of a fluctuating interface*, J. Stat. Phys. **114** (2004), 1–35.

46. M. Maslen, M.T. Batchelor and J. de Gier, *Magnetization plateaux in Bethe Ansatz solvable spin-S ladders*, Phys. Rev. B **68** (2003), 024418.

47. J. de Gier, B. Nienhuis, P.A. Pearce and V. Rittenberg, *Stochastic processes and conformal invariance*, Phys. Rev. E **67** (2003), 016101, 4 pages.

48. J. de Gier, *Loops, matchings and alternating sign matrices*, Discr. Math. **298** (2005), 365–388.

49. J. de Gier, B. Nienhuis, P.A. Pearce and V. Rittenberg, *Stochastic processes and conformal invariance*, Phys. Rev. E **67** (2003), 016101, 4pp.

50. P.A. Pearce, V. Rittenberg, J. de Gier and B. Nienhuis *Temperley-Lieb stochastic processes*, J. Phys A **35** (2002), L661–L668.

51. M.T. Batchelor, J. de Gier and B. Nienhuis, *The Rotor Model and Combinatorics*, Int. J. Mod. Phys. B **16** (2002), 1883–1890.

52. J. de Gier, M.T. Batchelor, B. Nienhuis and S. Mitra, *The XXZ spin chain at $\Delta = -1/2$: Bethe roots, symmetric functions and determinants*, J. Math. Phys. **34** (2002), 4135–4146.

53. M.T. Batchelor, J. de Gier and B. Nienhuis, *The quantum symmetric XXZ chain at $\Delta = -1/2$, alternating sign matrices and plane partitions*, J. Phys. A **34** (2001), L265–L270.

54. J. de Gier and V. Korepin, *Six - Vertex model with domain wall boundary conditions. Variable inhomogeneities.*, J. Phys. A **34** (2001), 8135–8144.

55. J. de Gier, *Exact stationary state for a deterministic high speed traffic model with open boundaries*, J. Phys. A **34** (2001), 3707–3720.

56. M.T. Batchelor, J. de Gier and M. Maslen, *Exactly solvable $su(n)$ mixed spin ladders*, J. Stat. Phys. **102** (2001), 559–566.

57. J. de Gier and M.T. Batchelor, *Magnetization plateaus in a solvable 3-leg spin ladder*, Phys. Rev. B **62** (2001), R3584–R3587.

58. J. de Gier, M.T. Batchelor and M. Maslen, *Phase diagram of the su(8) quantum spin tube*, Phys. Rev. B **61** (2000), 15196–15202.

59. M.T. Batchelor, J. de Gier, J. Links and M. Maslen, *Exactly solvable quantum spin ladders associated with the orthogonal and symplectic Lie algebras*, J. Phys. A **33** (2000), L97–L101 (2000).

60. J. de Gier, B. Nienhuis, *Exact stationary state for an asymmetric exclusion process with fully parallel dynamics*, Phys. Rev. E **59** (1999), 4899–4911.

61. J. de Gier, B. Nienhuis, *Bethe Ansatz solution of a decagonal rectangle triangle random tiling.*, J. Phys. A **31** (1998), 2141–2154.

62. J. de Gier, B. Nienhuis, *Integrability of the square-triangle random tiling*, Phys. Rev. E **55** (1997), 3926–3933.

63. J. de Gier, B. Nienhuis, *The Exact Solution of an Octagonal Rectangle Triangle Random Tiling*, J. Stat. Phys. **87** (1997), 415–437.

64. J. Kondev, J. de Gier, B. Nienhuis, *Operator Spectrum and Exact Exponents of the Fully Packed Loop Model*, J. Phys. A **29** (1996), 6489–6504.

65. J. de Gier, B. Nienhuis, *Exact Solution of an Octagonal Random Tiling Model*, Phys. Rev. Lett. **76** (1996), 2918–2921.

Refereed conference proceedings

66. A. Schadschneider, J. Schmidt, J. de Gier and G.M. Schütz, *Dynamical universality class of the Nagel–Schreckenberg and related models*, accepted for publication in the proceedings of *Traffic and Granular Flow 2017*.

67. J. de Gier, *Combinatorics of Kazhdan-Lusztig elements: Factorisation and fully packed loop models*, Oberwolfach Reports **7** (2010), 832–835,

68. J. de Gier, B. Nienhuis, *Solvable Rectangle Triangle Random Tilings.*, Proceedings of the 6th International Conference on Quasicrystals (World Scientific, Singapore), edited by S. Takeuchi and T. Fujiwara, Tokyo (1998), 91–94.

69. J. de Gier, B. Nienhuis and L. van Veen, *A solvable eight-fold random tiling model*, Proceedings of the 5th International Conference on Quasicrystals (World Scientific, Singapore), edited by C. Janot and R. Mosseri, Avignon (1995), 265.

Technical Reports

70. L. Zhang, T. Garoni, J. de Gier, *Study of Traffic Speed Limits*, Technical Report, VicRoads, January 2016.

71. L. Zhang, T. Garoni, J. de Gier, *Study of Wellington Road in Melbourne Southeast Suburbs*, Technical Report, VicRoads, October 2015.

72. L. Zhang, T. Garoni, J. de Gier and A. Bedini, *Study of Tram Networks in Melbourne Inner North Suburbs*, Technical Report, VicRoads, 2015.

73. L. Zhang, T. Garoni, A. Bedini and J. de Gier, *Hoddle St Project*, Technical Report, VicRoads, August 2015.

74. L. Zhang, T. Garoni T, J. de Gier and S. Shiri, *ARC Linkage Project Modelling large urban transport networks using stochastic cellular automata Interim Report IX: Study of tram stop relocation*, September 2014.

75. L. Zhang, T. Garoni, and J. de Gier, *ARC Linkage Project Modeling large urban transport networks using stochastic cellular automata: Interim Report III: Study of parking effect*, Technical report, VicRoads, January 2013.

76. L. Zhang, T. Garoni, and J. de Gier, *ARC Linkage Project Modeling large urban transport networks using stochastic cellular automata: Interim Report II: Modelling traffic incidents and diversion*, Technical report, VicRoads, September 2012.

Books, proceedings and miscellaneous

77. D. Wood, J. de Gier, C. Praeger and T. Tao eds., *2019–20 MATRIX Annals*, available at MATRIX, Springer.

78. D. Wood, J. de Gier, C. Praeger and T. Tao eds., *2018 MATRIX Annals*, available at MATRIX, Springer.

79. D. Wood, J. de Gier, C. Praeger and T. Tao eds., *2017 MATRIX Annals*, available at MATRIX, Springer.

80. D. Wood, J. de Gier, C. Praeger and T. Tao eds., *2016 MATRIX Annals*, available at MATRIX, Springer.

81. J. de Gier and S. Ole Warnaar eds., *Counting Complexity: An international workshop on statistical mechanics and combinatorics* (in honour of Prof. Tony Guttmann's 60th birthday), J. Phys: Conf. Series **42** (2006).

82. J. de Gier and S.O. Warnaar, *AustMS Gazette* **33** (2006), 5 issues, available at AustMS.

83. J. de Gier and S.O. Warnaar, *AustMS Gazette* **32** (2005), 5 issues, available at AustMS.

84. J. de Gier and S.O. Warnaar, *AustMS Gazette* **31** (2004), 5 issues, available at AustMS.

Public media

85. J. de Gier, *If Australia wants innovation it should value expertise more highly*, The Australian, 17 December 2021.

86. Communicated by Donna Lu, *New mathematical record: what's the point of calculating pi?*, The Guardian, 17 August 2021.

87. Communicated by Jill Rowbotham, *Brainstorming MATRIX wins $US600,000 mathematics grant*, The Australian, 2 February 2021.

88. J. de Gier and A. Rao, *Calculus ignored even though evidence is we rely on it*, Australian Financial Review, 7 December 2020.

89. Communicated by Adam Carey, *Melbourne traffic: Trams push cars out of the slow lane on Smith Street, Collingwood*, The Age, 17 July, 2016.

90. Communicated by T. Dodd, *Maths researchers enter the MATRIX to put Australia on the map*, Australian Financial Review, 4 July, 2016.

91. Communicated by Marissa Calligeros, *Melbourne trams may never have to stop at traffic lights, under VicRoads plan*, The Age, 13 February 2015.

92. Communicated by Loretta Florence, *Trams that never stop at traffic lights could be part of Melbourne's people-moving future*, ABC News, 13 February 2015.

93. J. de Gier and T. Guttmann, *Discovery for discovery's sake pays the biggest dividends*, Australian Financial Review, 4 September, 2015.

94. Communicated by Jennifer Foreshew, *Applying physics to better traffic flow*, The Australian, Australian IT, 17 January 2012.

95. J. de Gier and T. Garoni, *Going places: why better traffic lights make better sense*, The Conversation, 19 December 2011.

96. J. de Gier, *Maths Matters: Back to the future*, Austms Gazette **35** (2008), 79–83.