Pieter Roffelsen

Contact

Email: pieter.roffelsen@sydney.edu.au
Phone: +612 935 138 79
Online: Google Scholar, web page, ORCID
Address: School of Mathematics and Statistics
The University of Sydney
NSW 2006, Australia

Research Areas

Analytic and geometric aspects of differential and difference equations in the complex domain, in particular monodromy manifolds, Riemann-Hilbert theory, quantisation problems, Painlevé equations and special functions.

Employment

2021-now **Postdoctoral Research Associate,** *The University of Sydney*
Integrable Systems Group

2020-2021 **Career interruption**
1 year career interruption due to pandemic

2017-2020 **Postdoctoral Researcher,** *International School for Advanced Studies (Italy)*
Geometry and Mathematical Physics Group

2017 **Research Associate,** *The University of Sydney*
Integrable Systems Group

Teaching Experience

2023 **Lectured MATH2022** - Linear and Abstract Algebra.

2023 **Supervised research summer project** titled "*Heun polynomials and hyperbolic polygons.*"

2022 **Lectured MATH5410** - Special Topics in Applied Mathematics.

2015-2016 **Postgraduate Teaching Fellow**, 8 hrs/week, *The University of Sydney*
Leading tutorials and practice classes on courses ranging from Linear Algebra and Vector Calculus to PDEs and Waves, marking exams and conducting student consultations.

2014 **Mathematics Tutor**, 4 hrs/week, *The University of Sydney*

Education

2013–2017 **Doctor of Philosophy**, Applied Mathematics
The University of Sydney, Australia
Thesis Title: On the global asymptotic analysis of a q-discrete Painlevé equation
Supervisor: Nalini Joshi
Examiners: Boris Dubrovin, Masatoshi Noumi and Claude Viallet.

2010–2012 **Master of Science**, Mathematics *(summa cum laude)*
Radboud University Nijmegen, The Netherlands
Thesis Supervisor: Peter A. Clarkson of the University of Kent, England.

2007–2010 **Bachelor of Science**, Mathematics *(summa cum laude)*
Radboud University Nijmegen, The Netherlands.

Publications

2023 *On q-Painlevé VI and the geometry of Segre surfaces* arXiv: 2305.17912
P. Roffelsen, under review at Nonlinearity, 100 pages

2023 *On a class of elliptic orthogonal polynomials and their integrability* arXiv: 2305.04404
H. Desiraju, T.L. Latimer, P. Roffelsen, under review at Constr. Approx., 31 pages

2023 *On the monodromy manifold of q-Painlevé VI and its Riemann-Hilbert problem* arXiv: 2202.10597
N. Joshi, P. Roffelsen, Commun. Math. Phys, 46 pages doi: 10.1007/s00220-023-04834-2

2023 *On symmetric solutions of the fourth q-Painlevé equation* arXiv: 2212.11513
N. Joshi, P. Roffelsen, J. Phys. A, 30 pages doi: 10.1088/1751-8121/acc7dc

2021 *On the Riemann-Hilbert Problem for a q-difference Painlevé Equation* arXiv: 1911.05854
N. Joshi, P. Roffelsen, Commun. Math. Phys, 37 pages doi: 10.1007/s00220-021-04024-y

2021 *Roots of the Generalised Hermite Polynomials when both Parameters are Large* arXiv:1907.08552
D. Masoero, P. Roffelsen, Nonlinearity 34, 70 pages doi: 10.1088/1361-6544/abdd93

2018 *Poles of Painleve IV Rationals and their Distribution* arXiv:1707.05222
D. Masoero, P. Roffelsen, SIGMA 14, 49 pages doi:10.3842/SIGMA.2018.002
Special Issue in Memory of Andrei Kapaev, editors: P. Deift, B. Dubrovin, T. Grava, A. Its and P. Miller.

2016 *Analytic solutions of q-$P(A_1)$ near its critical points* arXiv:1510.07433
N. Joshi, P. Roffelsen, Nonlinearity 29, 46 pages doi:10.1088/0951-7715/29/12/3696

2012 *On the Number of Real Roots of the Yablonskii-Vorob'ev Polynomials* arXiv:1208.2337
P. Roffelsen, SIGMA 8, 9 pages doi:10.3842/SIGMA.2012.099

2010 *Irrationality of the Roots of the Yablonskii-Vorob'ev Polynomials and...* arXiv:1012.2933
P. Roffelsen, SIGMA 6, 11 pages doi:10.3842/SIGMA.2010.095

Professional Activities

Reviewer for Communications in Mathematical Physics, Journal of Physics A, Nonlinearity, SIGMA and other journals.

2024 Local organiser for 2024 ANZAMP meeting.

2022/2023 Organiser of the Integrable Systems workshops ('22,'23) at the University of Sydney.

2021 Organised a special session on Integrable Systems and Mathematical Physics at AUSTMS 2021.

2015–2016 Member of the Work, Health and Safety Committee of the School of Mathematics and Statistics at the University of Sydney.

Selected Presentations

2023 Integrable Systems and Random Matrix Theory seminar **(invited)**, University of Michigan (US), *A Riemann-Hilbert approach to q-difference Painlevé VI.*

2023 10th International Congress on Industrial and Applied Mathematics **(invited)**, Tokyo (Japan), *On q-Painlevé VI and the geometry of affine Segre surfaces.*

2023 Dualities and Symmetries in Integrable Systems, Isle of Sky (Scotland), *Singularities of Painlevé functions, Heun equations and generalised Hermite polynomials.*

2023 Symmetries and Integrability of Difference Equations 14.2 **(invited)**, Warsaw (Poland), *On q-Painlevé VI and the geometry of Segre surfaces.*

2023 ANZAMP 2023 meeting, Hobart, *Cubic surfaces, Segre surfaces and Painlevé equations.*

2022 AustMS 2022 conference, Sydney, *On q-Painlevé VI and the Geometry of Segre Surfaces.*

2022 Applicable Resurgent Asymptotics II **(invited)**, The Newton Institute, Cambridge (UK), *On some inverse problems related to Painlevé functions.*

2022 The charm of integrability, University of Bristol (UK), *On q-Painlevé VI and an associated affine Segre surface.*

2022 16th International Symposium on Orthogonal Polynomials, Special Functions and Applications, Montreal (online), *On q-Painlevé VI, singular Segre surfaces and associated orthogonal polynomials.*

2022 Web-seminar on Painlevé Equations and related topics **(invited)**, *On a space of connection matrices associated with q-Painlevé VI.*

2022 ANZAMP 2022 meeting, Melbourne, *On the monodromy manifold of q-difference Painlevé VI.*

2021 AUSTMS 2021 conference, Newcastle, *On the monodromy surface of q-Painlevé VI.*

2021 The Asia-Pacific Integrable Online Seminars, *A Riemann-Hilbert approach to q-Painlevé VI.*

2021 Applicable resurgent asymptotics workshop **(invited)**, Isaac Newton Institute, Cambridge (UK), *Panel discussion on discrete Painlevé equations and their open problems.*

2020 Baxter 2020 conference, Canberra (Australia), *Wronskians of Hermite polynomials, anharmonic oscillators and Painlevé IV.*

2019 AustMS 2019 conference, Melbourne (Australia), *On the Asymptotic distribution of Roots of the Generalised Hermite Polynomials.*

2019 Mathematical Physics seminar, The University of Melbourne (Australia), *Generalised Hermite Polynomials and anharmonic oscillators of biconfluent Heun type.*

2019 Mathematical Physics Seminar, The University of Lisbon (Portugal), *On the Asymptotic distribution of Roots of the Generalised Hermite Polynomials.*

2018 Integrable Systems Seminar, SISSA (Italy), *Singularities of Painlevé IV Transcendents*

2016 Painlevé Equations and Discrete Dynamics **(invited)**, Banff (Canada), *On critical expansions of solutions of the discrete Painlevé equation q-$P(A_1)$ and corresponding monodromy*

2016 Symmetries and Integrability of Difference Equations 12 **(invited)**, Montreal (Canada), *On critical expansions of the general solutions of the discrete Painlevé equation q-$P(A_1)$*

2015 Differential and Difference Equations, Lille (France), *On the series expansion of general solutions of the discrete Painlevé equation q-$P(A_1)$ at its fixed singular points.*

Volunteering

2020-2022 Committee member of the Melbourne Young Hikers bushwalking club.

2019 Volunteering for a MathsCraft event at Girton Grammar School, Bendigo.
Worked with groups of 4 students from years 5-9 as they tackled mathematical problems, asking them leading questions, prompting them to approach problems in a logical fashion and encouraging them to explain their own ideas to the group.