CV Peter Hochs

Contact details

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Nationality: Dutch

Languages

Dutch (native); English (excellent); German (very good); French (good).

Employment

- *Assistant Professor* at the Radboud University in Nijmegen (since August 2020).
- *Senior Lecturer in pure mathematics* at the University of Adelaide, Australia (January 2019 – July 2020).
- *Lecturer in pure mathematics* at the University of Adelaide (July 2013 – December 2018; interrupted January 2014 – July 2016 for the research fellowship below).
- *Marie Curie International Outgoing Fellow* (March 2013 – July 2016; interrupted July – December 2013 for the lecturer position above). Hosted by the Radboud University in Nijmegen; based at the University of Adelaide from March 2013 – August 2015. Host in Adelaide: Prof. Mathai Varghese; host in Nijmegen: Prof. Klaas Landsman.
- *Alexander von Humboldt Postdoctoral Fellow* at the Leibniz University Hanover, Germany (May 2012 – February 2013). Hosts: Prof. Elmar Schrohe and Prof. Bernhard Krötz.
- *Research Geophysicist* at Shell (June 2009 – January 2012). Applied/numerical geophysics research.
- *Researcher in Industrial Safety* at the Netherlands Organisation for Applied Scientific Research TNO (September 2007 – April 2009). Research into modelling of gas dispersion in the atmosphere.

- *Junior Researcher* at the Radboud University (September 2004 – July 2007). Second phase of Ph.D. research. Advisors: Prof. Klaas Landsman and Prof. Gert Heckman.

- *Ph.D. student* at the University of Amsterdam (April 2003 – August 2004). First phase of Ph.D. research. Advisors: Prof. Klaas Landsman and Prof. Eric Opdam.

Education

- *Ph.D. in mathematics* at the Radboud University (February 2008). Advisors: Prof. Klaas Landsman and Prof. Gert Heckman. Thesis: 'Quantisation commutes with reduction for cocompact Hamiltonian group actions'.

- *M.Sc. in physics* at Utrecht University (December 2003, cum laude).

- *M.Sc. in mathematics* at Utrecht University (March 2003, cum laude). Thesis advisor: Prof. Erik van den Ban. Thesis: 'A Lefschetz fixed point theorem and the Weyl character formula'.

Teaching

- Basic Qualification for teaching at Dutch universities (BKO), obtained at the Radboud University in 2006–2007, through a 300 hour training programme.

- Lecturer at Radboud University for the Bachelor Seminar (2020), Introduction to Geometry (2020) and Advanced Linear Algebra (2021).

- Lecturer at the University of Adelaide for Symplectic Geometry (2013), Fields and Modules (2016 and 2017), Mathematics IB Calculus (2017), Advanced Mathematical Perspectives I (2017 and 2020), Mathematics IA Algebra (2017 and 2018), Professional Practice (2018–2020).

- Designed the new course Professional Practice on professional and communication skills at the University of Adelaide in 2017–2018.

- Supervised tutorials, designed tutorial and exam questions, and did occasional lecturing from 1999 to 2007.

Postgraduate student supervision

Current

- Matthias Fresacher, (M.Phil., University of Adelaide).

- Nicholas McLean, (M.Phil., University of Adelaide).

Completed

- David Brook, (M.Phil., 2020, University of Adelaide). Thesis: 'Higher twisted K-theory'.
- Sam Mills, (M.Phil., 2019, University of Adelaide). Thesis: 'Geometric K-homology and the Atiyah–Singer index theorem'.
- André Schemaitat (M.Sc., 2016, Radboud University). Thesis: 'Determinants by K-theory'.
- Niels Neumann (M.Sc., 2016, Radboud University), external research project at the Netherlands Organisation for Applied Scientific Research TNO. Thesis: 'Towards faster internet connections: connecting cabinets to the fiber glass network'.

Professional activities

Administrative roles

- Member of the Research committee (September 2016–2020) at the University of Adelaide.
- Member of the Library committee (September 2016–2020) at the University of Adelaide.
- Organiser of the Mathematical Colloquium (2017 and 2018) at the University of Adelaide.
- Member of the committee that redesigned the course Communication Skills (September 2016–July 2017) at the University of Adelaide.
- Organiser of the Differential Geometry Seminar (July 2014–July 2015) at the University of Adelaide.
- Organiser of the Geophysical Colloquium (2010–2011) at Shell.
- Member of the committee for industry engagement (2008–2009) at the Radboud University, representing the Netherlands Organisation for Applied Scientific Research TNO.

Service to the scientific community

- Secretary of the organising committee of the 2018 meeting of the Australian Mathematical Society.
- Co-organiser of the Workshop on Geometric Quantisation, University of Adelaide, 2015.

- Co-organiser of the workshop 'Representation Theory and Operator Algebras', University of Adelaide, 2013.
- Editor of Mathematical Physics, Analysis and Geometry (since 2020).
- Referee for various journals, including Acta Mathematica, Communications in Mathematical Physics, Compositio Mathematica, Duke Mathematical Journal, Proceedings of the American Mathematical Society.
- Assessor for Australian Research Council Discovery Project, Future Fellowship and Discovery Early Career Researcher Award proposals.
- Reviewer for the American Mathematical Society's Mathematical Reviews, and for Zentralblatt Mathematik.
- Presenter/instructor at various outreach activities at the Radboud University and the University of Adelaide.
- Accredited Member of the Australian Mathematical Society; Member of the Royal Dutch Mathematical Society.
- Representative for South Australia of the Australian Association of von Humboldt Fellows (2016–2020).

Funding obtained

Research grants

- Discovery Project DP200100729, Australian Research Council, 2020–2022, AUD 507.438.

Personal fellowships

- Marie Curie International Outgoing Fellowship, European Union, 2013–2016, EUR 274.504.
- Alexander von Humboldt Postdoctoral Fellowship, 2012–2013, EUR 80.000.

Conference support

- Support for the Workshop on Geometric Quantisation, Australian Mathematical Sciences Institute and Australian Mathematical Society, 2015, AUD 10.763.
- Support for the workshop 'Representation Theory and Operator Algebras', Australian Mathematical Sciences Institute, 2013, AUD 9.320.

Travel funding

- International Collaboration Award, University of Adelaide, 2019, to visit collaborators at the Washington University in St. Louis and Texas A&M University, and give seminar talks, AUD 3.720.
- Minor Research Initiative, University of Adelaide, 2018, to attend the conference 'K-theory, Hecke Algebras and Representation Theory' at the University of Sheffield, and to visit collaborators in the Netherlands, AUD 3.200.
- Minor Research Initiative, University of Adelaide, 2017, to attend the conference 'Future Directions in Representation theory' at the University of Sydney, and the Annual Meeting of the Australian Mathematical Society at Macquarie University, AUD 2.400.

List of publications

Journal articles

1. H. Guo, P. Hochs and V. Mathai, 'Equivariant Callias index theory via coarse geometry', *Annales de l'Institut Fourier*, to appear.
2. H. Guo, P. Hochs and V. Mathai, 'Coarse geometry and Callias quantisation', *Transactions of the American Mathematical Society*, to appear.
3. P. Hochs, Y. Song and S. Yu, 'A geometric realisation of tempered representations restricted to maximal compact subgroups', *Mathematische Annalen*, 378(1) (2020), 97–152.
4. P. Hochs and H. Wang, 'An equivariant orbifold index for proper actions', *Journal of Geometry and Physics* 154 (2020), special issue 'Index Theory, Duality and Related Fields'.
5. P. Hochs, Y. Song and S. Yu, 'A geometric formula for multiplicities of K-types of tempered representations', *Transactions of the American Mathematical Society* 372(12) (2019), 8553–8586.
6. P. Hochs and A.J. Roberts, 'Normal forms and invariant manifolds for nonlinear, non-autonomous PDEs, viewed as ODEs in infinite dimensions', *Journal of Differential Equations* 267(12) (2019), 7263–7312.
7. P. Hochs and H. Wang, 'Orbital integrals and K-theory classes', *Annals of K-theory*, 4(2) (2019), 185–209.
8. P. Hochs and Y. Song, 'An equivariant index for proper actions II: properties and applications', *Journal of Noncommutative Geometry*, 12(1) (2018), 157–193.

9. P. Hochs and H. Wang, 'Shelstad's character identity from the point of view of index theory', *Bulletin of the London Mathematical Society* 50 (2018), 759–771.

10. P. Hochs and H. Wang, 'A fixed point theorem on noncompact manifolds', *Annals of K-theory* 3(2) (2018), 235–286.

11. P. Hochs, J. Kaad and A. Schemaitat, 'Algebraic K-theory and a semi-finite Fuglede–Kadison determinant', *Annals of K-theory* 3(2) (2018), 193–206.

12. P. Hochs and H. Wang, 'A fixed point formula and Harish-Chandra's character formula', *Proceedings of the London Mathematical Society (3)* 116 (2018), 1–32.

13. P. Hochs and V. Mathai, 'Quantising proper actions on Spin^c-manifolds', *Asian Journal of Mathematics* 21(4) (2017), 631–686.

14. P. Hochs and Y. Song, 'On the Vergne conjecture', *Archiv der Mathematik* 108(1) (2017), 99–112.

15. P. Hochs and Y. Song, 'An equivariant index for proper actions I', *Journal of Functional Analysis* 272(2) (2017), 661–704.

16. P. Hochs and Y. Song, 'Equivariant indices of Spin^c-Dirac operators for proper moment maps', *Duke Mathematical Journal* 166(6) (2017), 1125–1178.

17. P. Hochs and Y. Song, 'An equivariant index for proper actions III: the invariant and discrete series indices', *Differential Geometry and its Applications* 49 (2016), 1–22.

18. P. Hochs and V. Mathai, 'Spin-structures and proper group actions', *Advances in Mathematics* 292 (2016), 1–10.

19. P. Hochs and V. Mathai, 'Formal geometric quantization for proper actions', *Journal of Homotopy and Related Structures* 11(3) (2016), 409–424.

20. P. Hochs and V. Mathai, 'Geometric quantization and families of inner products', *Advances in Mathematics* 282 (2015), 362–426.

21. P. Hochs, 'Quantisation of presymplectic manifolds, K-theory and group representations', *Proceedings of the American Mathematical Society* 143 (2015), 2675–2692.

22. P. Hochs, 'Quantisation commutes with reduction at discrete series representations of semisimple Lie groups', *Advances in Mathematics* 222 (2009), 862–919.

23. P. Hochs and N.P. Landsman, 'The Guillemin–Sternberg conjecture for noncompact groups and spaces', *Journal of K-theory* 1(3) (2008), 473–533.

Preprints

1. P. Hochs, B.-L. Wang and H. Wang, 'An equivariant Atiyah-Patodi-Singer index theorem for proper actions II: the K-theoretic index', ArXiv:2006.08086.

2. P. Hochs, Y. Song and X. Tang, 'An index theorem for higher orbital integrals', ArXiv:2005.06119.

3. H. Guo, P. Hochs and V. Mathai, 'Positive scalar curvature and an equivariant Callias-type index theorem for proper actions', ArXiv:2001.07336.

4. P. Hochs, B.-L. Wang and H. Wang, 'An equivariant Atiyah–Patodi–Singer index theorem for proper actions I: the index formula', ArXiv:1904.11146.

Conference proceedings

1. P. Hochs, 'Quantisation commutes with reduction at nontrivial representations', extended abstract, workshop *Geometric quantization in the noncompact setting*, Mathematisches Forschungsinstitut Oberwolfach report no. 09/2011 (2011).

Thesis

1. P. Hochs, 'Quantisation commutes with reduction for cocompact Hamiltonian group actions', ISBN 978-90-9022607-1, Ph.D. thesis, Radboud University, Nijmegen (2008).

Selected invited talks

Conferences

- Special Week of Operator Algebras, Research Center of Operator Algebras, East China Normal University, Shanghai, 14 August 2020.

- Workshop 'Analysis on manifolds', University of Adelaide, 30 September 2019.

- Conference 'Index theory, duality and related fields', Chern Institute, Nankai University, Tianjin, 17 June 2019.

- Winter program in operator algebras, East China Normal University, Shanghai, 20 November 2018.

- Conference 'Index theory. Interactions and applications', Paul Sabatier University, Toulouse, 17 October 2018.

- Workshop 'Index theory and K-theory', in honour of Gennadi Kasparov, Kyoto University, 8 August 2018.

- Conference 'K-theory, Hecke algebras and representation theory', in honour of Roger Plymen's 75th birthday, University of Sheffield, 5 July 2018.
- Workshop on geometric quantization, Banff International Research Station, 17 April 2018.
- Conference 'Conformal and symplectic geometry', University of Auckland, 8 February 2018.
- Australia–China meeting on noncommutative geometry and related areas, University of Adelaide, 22 December 2017.
- Conference 'Future directions in representation theory', University of Sydney, 8 December 2017.
- Autumn program in operator algebras, East China Normal University, Shanghai, 1 November 2017.
- Conference 'Index theory and singular structures', Paul Sabatier University, Toulouse, 29 May 2017.
- Workshop 'KK-theory and dynamics', MATRIX conference centre of the University of Melbourne, 27 July 2016.
- Conference 'Gauge theory and noncommutative geometry', Radboud University, Nijmegen, 4 April 2016.
- Workshop 'KK_1-day', Radboud University, Nijmegen, 26 November 2015.
- Colloquium of the Geometry and Quantum Theory cluster, Woudschoten conference centre, Zeist, 29 October 2015.
- Spring Program 2015 at Research Center for Operator Algebras, East China Normal University, Shanghai, 14 May 2015.
- Workshop 'Positive curvature and index theory', National University of Singapore, 20 November 2014.
- Workshop 'Advanced index theory and K-theory', Kyoto University, 9 October 2014.
- Second China–Japan conference on noncommutative geometry and K-theory, Okinawa, 4 October 2014.
- Workshop on operator algebras, University of Wollongong, 24 April 2014.
- Conference 'Qdays in Barcelona', Centre de Recerca Matemàtica Barcelona, 17 October 2013.
- Workshop 'Geometry of supermanifolds', University of Adelaide, 16 October 2012.

Lecture series

- Representation theory of semisimple Lie groups, London Mathematical Society–Bath symposium on representation theory and K-theory, 10–14 July 2021.
- Introduction to index theory, National University of Singapore, 21–25 June 2021.
- C^*-algebras of reductive Lie groups, East China Normal University, Shanghai, 30 October – 3 November 2017.
- Lectures on geometric quantisation, University Paderborn, 3–4 December 2015.

Seminars and colloquia

- Oberseminar Globale Analysis, Regensburg University, 1 July 2020.
- Functional analysis seminar, Texas A&M University, 20 November 2019.
- Geometry and topology seminar, Washington University in St. Louis, 8 November 2019.
- Geometry seminar, Radboud University, Nijmegen, 24 October 2018.
- Mathematical colloquium, Washington University in St. Louis, 12 April 2018.
- Geometry seminar, Radboud University, Nijmegen, 6 June 2017.
- Lie groups seminar, Massachusetts Institute of Technology, Cambridge, MA, 23 November 2016.
- Analysis and geometry seminar, Northeastern University, Boston, 18 November 2016.
- Functional analysis seminar, Dartmouth College, Hanover, NH, 15 November 2016.
- Operator algebras seminar, University of Münster, 31 May 2016.
- Mathematical colloquium, University of Amsterdam, 4 May 2016.
- Geometry and analysis seminar, Utrecht University, 12 April 2016.
- Oberseminar Analysis und theoretische Physik, Leibniz University Hanover, 20 October 2015 .
- Algebra and topology seminar, Australian National University, Canberra, 5 May 2015.
- Symplectic geometry seminar, University of Toronto, 15 August 2014.

- Operator algebra seminar, University of Wollongong, 14 November 2013.
- Oberseminar Lie Theorie, University of Paderborn, 6 December 2012.
- Oberseminar Analysis und theoretische Physik, Leibniz University Hanover, 5 July 2012.