

# Ilse Fischer

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Born on June 29, 1975, in Klagenfurt, Austria.

## Education

2006 **Habilitation in Mathematics**, *Universität Wien*.

Thesis A polynomial method for the enumeration of plane partitions and alternating sign matrices

2000 **Dr. rer. nat in Mathematics**, *Universität Wien*, summa cum laude.

Thesis Enumeration of perfect matchings: Rhombus tilings and Pfaffian graphs

Supervisors Christian Krattenthaler and Franz Rendl

1998 **Mag. rer. nat in Mathematics**, *Universität Wien*, summa cum laude.

Thesis Der Satz von Skolem, Mahler, Lech – ein Ergebnis über die Nullstellen linearer Rekursionsfolgen

Supervisor Johann Cigler

1993 – 1998 **Studies of Mathematics**, *Universität Wien*.

## Academic Employment

since 2017 **Full Professor**, *Universität Wien*.

2011-2017 **Associate Professor**, *Universität Wien*.

2007 and 2009 **Visiting Professor**, *Alpen-Adria-Universität Klagenfurt*.

2004-2011 **Universitätsassistentin**, *Universität Wien*, permanent position since 2008.

2002 **Visiting Researcher**, *Universität Wien*.

1999-2004 **Universitätsassistentin**, *Alpen-Adria-Universität Klagenfurt*.

1995-1999 **Teaching Assistant**, *Universität Wien*.

## Awards

2009 **START Award**, *Austrian Federal Ministry of Science and Research / Austrian Science Fund FWF*.

## Research Grants

- 2017 – 2021 **Principal Investigator in the SFB (Special Research Area) “Algorithmic and Enumerative Combinatorics”**, *Project part: “Alternating sign arrays of triangular shapes”*, Austrian Science Fund (FWF), € 364.875.
- 2010 – 2018 **Principal Investigator of the START project**, “Compact enumeration formulas for generalized partitions”, Austrian Science Fund (FWF), € 1.1 Mill.
- 2006 – 2011 **Co-Investigator of the National Research Network “Analytic Combinatorics and Probabilistic Number Theory”**, “Combinatorics of generalized partitions and hypergeometrics series”, Austrian Science Fund (FWF), € 564.000.
- 2002 – 2005 **Co-Investigator of the European Research Network “Algebraic Combinatorics in Europe”**, *European Commission*.

## Publications

- [1] **I. Fischer, Enumeration of perfect matchings: Rhombus tilings and Pfaffian graphs**, *Dissertation, Vienna 2000*.
- [2] **I. Fischer, Enumeration of rhombus tilings which contain a fixed rhombus in the centre**, *J. Combin. Theory Ser. A* **96** (2001), 31–88.
- [3] **C.H.C. Little, F. Rendl and I. Fischer, Towards a characterisation of Pfaffian near bipartite graphs**, *Discrete Math.* **244** (2002), 279–297.
- [4] **I. Fischer and C.H.C. Little, A characterisation of Pfaffian near bipartite graphs**, *J. Combin. Theory Ser. B* **82** (2001), 175–222.
- [5] **I. Fischer, Moments of inertia associated with the lozenge tilings of a hexagon**, *Sém. Lothar. Combin.* **45** (2000/01), Art. B45f, 14 pp.
- [6] **I. Fischer, A symmetry theorem on a modified jeu de taquin**, *European J. Combin.* **23** (2002), 929–936.
- [7] **I. Fischer and C.H.C. Little, Even circuits of prescribed clockwise parity**, *Electron. J. Combin.* **10** (2003), Article # R 45, 20 pages.
- [8] **I. Fischer, A method for proving polynomial enumeration formulas**, *J. Combin. Theory Ser. A* **111** (2005), 37 – 58.
- [8a] **I. Fischer, A method for proving polynomial enumeration formulas (extend abstract)**, *Proceedings of FPSAC 03 (talk)*.
- [9] **I. Fischer, A polynomial method for the enumeration of plane partitions and alternating sign matrices**, *Habilitation thesis, Vienna 2005*.
- [10] **I. Fischer, G. Gruber, F. Rendl and R. Sotirov, Computational experience with a bundle approach for semidefinite cutting plane relaxations of Max-Cut and Equipartition**, *Math. Program. Ser. B.* **105** (2006), 451 – 469.
- [11] **I. Fischer, Another refinement of the Bender-Knuth (ex-)Conjecture**, *European J. Combin.* **27** (2006), 290 – 321.
- [12] **I. Fischer, The number of monotone triangles with prescribed bottom row**, *Adv. Appl. Math.* **37** (2006), 249 – 267.
- [12a] **I. Fischer, The number of monotone triangles with prescribed bottom row (extended abstract)**, *Proceedings of FPSAC 05 (poster), DMTCS proceedings*.

- [13] **I. Fischer, A new proof of the refined alternating sign matrix theorem**, *J. Combin. Theory Ser. A.* **114** (2007), 253 – 264.
- [14] **I. Fischer, An operator formula for the number of halved monotone triangles with prescribed bottom row**, *J. Combin. Theory Ser. A.* **116** (2009), 515 – 538.
- [15] **I. Fischer and D. Romik, More refined enumerations of alternating sign matrices**, *Adv. Math.* **222** (2009), 2004 – 2035.
- [16] **I. Fischer, The operator formula for monotone triangle – simplified proof and three generalizations**, *J. Combin. Theory Ser. A.* **117** (2010), 1143 – 1157.
- [17] **I. Fischer, Refined enumerations of alternating sign matrices: monotone  $(d, m)$ -trapezoids with prescribed top and bottom row**, *J. Alg. Combin.* **33** (2011), 239 – 257.
- [18] **I. Fischer, Linear relations of refined enumerations of alternating sign matrices**, *J. Combin. Theory Ser. A.* **119** (2012), 556 – 578.
- [19] **I. Fischer, Sequences of labeled trees related to Gelfand-Tsetlin patterns**, *Adv. Appl. Math.* **49** (2012), 165 – 195.
- [20] **M. Ciucu and I. Fischer, A triangular gap of size two in a sea of dimers in a 60 degree angle**, *J. Phys. A.* **45** (Special Issue, 2012).
- [21] **I. Fischer and L. Riegler, Combinatorial reciprocity for monotone triangles**, *J. Combin. Theory Ser. A* **120** (2013), 1372 – 1393.
- [21a] **I. Fischer and L. Riegler, Combinatorial reciprocity for monotone triangles (extended abstract)**, *Proceedings of FPSAC 12 (talk), DMTCS proceedings.*
- [22] **I. Fischer and M. Kubitzke, Spectra and eigenvectors of the Segre transformation**, *Adv. Appl. Math.* **56** (2014), 64 – 118.
- [23] **I. Fischer and P. Nadeau, Fully Packed Loops in a triangle: matchings, paths and puzzles**, *J. Combin. Theory Ser. A* **130** (2015), 64 – 118.
- [24] **M. Ciucu and I. Fischer, Proof of two conjectures of Ciucu and Krattenthaler on the enumeration of lozenge tilings of hexagons with cut off corners**, *J. Combin. Theory Ser. A* **133** (2015), 228 – 250.
- [25] **I. Fischer and L. Riegler, Vertically symmetric alternating sign matrices and a multivariate Laurent polynomial identity**, *Elect. J. Combin.* **22** (2015), 32 pages.
- [26] **S. Beil, I. Fischer and P. Nadeau, Wieland gyration for triangular fully packed loop configurations**, *Elect. J. Combin.* **22** (2015), 17 pages.
- [27] **M. Ciucu and I. Fischer, Lozenge tilings of hexagons with arbitrary dents**, *Adv. Appl. Math.* **73** (2016), 1-22.
- [28] **I. Fischer, Counting integer points in polytopes associated with directed graphs**, *Adv. Appl. Math.* **79** (2016), 125 –153.
- [29] **R. Behrend, I. Fischer and Matjaž Konvalinka, Diagonally and antidiagonally symmetric alternating sign matrices of odd order (extended abstract)**, *Proceedings of FPSAC 16, DMTCS proceedings.*
- [30] **I. Fischer, Short proof of the ASM theorem avoiding the six-vertex model**, *J. Combin. Theory Ser. A* **144** (2016), 139–150, *Special Issue 50<sup>th</sup> anniversary of JCT-A.*

- [31] **R. Behrend, I. Fischer and Matjaž Konvalinka, Diagonally and antidiagonally symmetric alternating sign matrices of odd order, *Adv. Math.* **315** (2017), 324–365.**
- [32] **I. Fischer, Constant term formulas for refined enumerations of Gog and Magog trapezoids, *J. Combin. Theory Ser. A* **158** (2018), 560–604.**
- [33] **I. Fischer, Enumeration of alternating sign triangles using a constant term approach, *accepted by Transactions of the AMS* .**

## Preprints

- [34] **I. Fischer, A bijective proof of the hook-length formula for shifted standard tableaux, *preprint, 47 pages, math.CO/0112261*.**
- [35] **A. Ayyer, R. Behrend and I. Fischer, Extreme diagonally and antidiagonally symmetric alternating sign matrices of odd order, *submitted, arXiv:1611.03823*.**
- [36] **I. Fischer, Enumeration of alternating sign trapezoids and a constant term approach, *submitted, arXiv:1804.08681*.**

## Selected Talks

- June 2000 **10<sup>th</sup> SIAM Conference on Discrete Mathematics, Minneapolis.**
- October 2001 **Combinatorics Seminar, Georgia Institute of Technology, invited talk.**
- December 2001 **Combinatorics Seminar, Michigan State University, invited talk.**
- June 2003 **15<sup>th</sup> Conference on Formal Power Series and Algebraic Combinatorics, Linköping University.**
- September 2003 **European Conference on Combinatorics, Graph Theory and Applications, Prague.**
- May 2004 **Mathematisches Kolloquium, Universität Wien, invited talk.**
- June 2005 **Second Joint Meeting of AMS, DMV and ÖMG, Mainz, invited talk.**
- November 2005 **ZAIK Seminar, Universität zu Köln, invited talk.**
- December 2005 **Colloquium on Discrete Mathematics, Graz University of Technology, invited talk.**
- March 2006 **Symposium Diskrete Mathematik 2006, Technische Universität Berlin, invited talk.**
- April 2008 **Hearing for a W2/W3 professorship, Freie Universität Berlin.**
- May 2009 **CentER Seminar, Tilburg University, invited talk.**
- January 2010 **Joint Mathematical Conference CSASC 2010, Prague, plenary talk.**
- June 2011 **23rd Annual International Conference on Formal Power Series and Algebraic Combinatorics, Reykjavík, plenary talk.**
- June 2013 **Joint Mathematical Conference CSASC 2013, Koper, invited talk.**
- November 2013 **Kolloquium über Kombinatorik, Ilmenau, plenary talk.**
- December 2013 **Workshop on Combinatorial Physics, Cardiff University, invited talk.**
- March 2014 **Workshop “Enumerative Combinatorics”, Oberwolfach, invited talk.**
- June 2014 **Workshop on “2D-Quantum Gravity and Statistical Mechanics”, ESI Vienna, invited talk.**

- June 2015 **2015 International Meeting AMS/EMS/SPM**, *Porto, invited talk.*
- October 2015 **Opening of the second phase of the doctoral school in Graz**, *Graz University of Technology, keynote speaker.*
- January 2016 **Mathematisches Kolloquium**, *Universität Wien, invited talk.*
- March 2016 **Colloquium talk**, *Indiana University, Bloomington, invited talk.*
- May 2016 **Seminar talk**, *Lyon 1, invited talk.*
- July 2016 **Conference on Formal Power Series and Algebraic Combinatorics**, *Simon Fraser University, Vancouver.*
- July 2017 **SIAM conference on Applied Algebraic Geometry**, *Georgia Institute of Technology, Atlanta.*
- September 2018 **European Women in Mathematics**, *University of Graz, Graz.*

## Supervision of Students and PostDocs

### Bachelor students

since 2009 **Supervision of 15 bachelor theses.**

### Diploma students

- 2009 **Liselotte Tschepen**, *“Counting integral points in polytopes”.*
- 2010 **Thomas Glatz**, *“Charakterisierung Pfaff’scher Graphen mittels verbotener Teilgraphen”.*
- 2018 **Josef Küstner**, *“Alternierende Vorzeichenmatrizen und Ebenenpartitionen: Eine Polytop-, Poset- und Pyramidenperspektive”.*
- 2018 **Arabella Denk**, *in progress.*

### Master students

- 2015 **Christof Ender**, *“Fully packed loop configurations: The Razumov-Stroganov-Cantini-Sportiello theorem”.*
- 2017 **Hans Höngesberg**, *“ Refined enumeration formulae related to halved monotone triangles”.*
- 2018 **Stefan Strobl**, *in progress.*
- 2018 **Kim Won Hyok**, *in progress.*

### Doctoral students

- 2010-2014 **Lukas Riegler**, *“Simple enumeration formulae related to Alternating Sign Matrices, Monotone Triangles and standard Young tableaux”*, *Promotio sub auspiciis Praesidentis rei publicae.*
- 2012-2016 **Sabine Beil**, *“Triangular fully packed loop configurations: Wieland drift, configurations of small excess and a generalisation”*, *Summa cum laude.*
- since 2015 **Florian Aigner**, *in progress.*
- since 2015 **Manjil Saikia**, *in progress.*

since 2017 **Hans Höngesberg**, *in progress*.

### Postdoctoral fellows

2010 – 2011 **Matthieu Josuat-Vergès**, *now tenured CNRS researcher at Marne-la-Vallée*.

2010 – 2012 **Martina Kubitzke**, *now Juniorprofessor at the University of Osnabrück*.

2015 – 2016 **Yvonne Kemper**, *now scientific writer at IST Austria*.

2017 – 2018 **Zhicong Lin**, *now researcher at Jimei University*.

2017 – 2018 **Gaurav Bhatnagar**.

2017 – 2018 **Nishad Kothari**, *now postdoc at UFMS, Campo Grande, Brazil*.

2017 – 2018 **Roger E. Behrend**, *now senior lecturer at Cardiff University*.

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### Selected other activities

since 2000 **Referee for Advances in Mathematics, Proceedings of the AMS, Transactions of the AMS, Journal of Combinatorial Theory Ser. A, SIAM Journal on Discrete Mathematics, Combinatorica, Advances in Applied Mathematics, Electronic Journal of Combinatorics, Discrete Mathematics and Theoretical Computer Science, Discrete Mathematics, FPSAC, etc.**

2002 **Member of the organizing committee of the International Conference on Operations Research 2002**, *Alpen-Adria Universität Klagenfurt*, approx. 400 participants.

2003 – 2009 **Deputy secretary of the Austrian Mathematical Society ÖMG**.

2005 **Member of the organizing committee of the ACE Summer School on Geometric Combinatorics**, *Universität Wien*.

since 2004 **Member of several administrative committees: Fakultätskonferenz, Studienkonferenz, Senat (Ersatzmitglied), several hiring committees and habilitation committees**, *Universität Wien*.

2006-2010 **Several activities for the advancement of women in mathematics**.

since 2017 **Landesvorsitzende (Wien) of the Austrian Mathematical Society ÖMG**.

since 2018 **Associate editor of Monatshefte für Mathematik**.

2018 **Member of the evaluation panel of the Swedisch Research Council**.