

Thomas Gerber

Personal information

Date of birth 14 December 1987
Place of birth Besançon, France
Citizenship Swiss, French
Email address gerber@math.univ-lyon1.fr
Languages French (native)
English (fluent)
German (fluent)

Education

- 2011–2014** PhD in Mathematics, Université de Tours, France.
Thesis title: *Decomposition Matrices of Ariki-Koike algebras and crystal isomorphisms in Fock spaces*.
Supervisors: Cédric Lecouvey and Nicolas Jacon.
Examiners: Iain Gordon and David Hernandez.
Jury: Jean-Philippe Anker, Iain Gordon, Jérémie Guilhot, David Hernandez, Gerhard Hiss, Nicolas Jacon, Cédric Lecouvey, Peng Shan.
- 2008–2011** MSc in Mathematics, Université de Besançon, France.
Thesis title: *Cellular algebras*.
Supervisor: Nicolas Jacon
- 2005–2008** BSc in Mathematics, University of Wales Swansea, UK and Université de Besançon, France.

Employment history

- 2024–...** Associate professor (*Maître de Conférences*), Université Lyon 1, France.
2024 Lecturer, EPFL Lausanne, Switzerland.
- 2023–2024** Postdoc, Ruhr University Bochum, Germany.
Research assistant at Lehrstuhl VI (Röhrle group).
- 2019–2023** Postdoc, EPFL, Lausanne, Switzerland.
SNSF *Ambizione* fellowship (Testerman group).
- 2014–2019** Postdoc, RWTH Aachen, Germany.
Research assistant at Lehrstuhl D für Mathematik (Hiss group).

2011–2014 PhD student, Université de Tours, France.
Under the supervision of Cédric Lecouvey and Nicolas Jacon.

Research papers

- [14] **Generalised core partitions and Diophantine equations** (with O. Brunat and N. Chapelier-Laget).
2024. arXiv:2403.11191.
- [13] **Atomic length on Weyl groups** (with N. Chapelier-Laget).
2022. arXiv:2211.12359.
- [12] **Generalised Howe duality and injectivity of induction: the symplectic case** (with J. Guilhot and C. Lecouvey).
Combinatorial Theory 2 (2) (2022), #12.
- [11] **Duality and bicrystals on infinite binary matrices** (with C. Lecouvey).
A paraître dans *Annales de l'Institut Henri Poincaré D (Combinatorics, Physics and their Interactions)*, 2020.
- [10] **A positive combinatorial formula for symplectic Kostka-Foulkes polynomials I: Rows** (with M. Dołęga and J. Torres).
Journal of Algebra 560 (2020), 1253-1296.
- [9] **Generalized Mullineux involution and perverse equivalences** (with Nicolas Jacon and Emily Norton).
Pacific Journal of Mathematics 306 (2020), N°2, 487-517.
- [8] **Cylindric multipartitions and level-rank duality.**
2018. arXiv:1809.09519. Notes not intended for publication.
- [7] **The \mathfrak{sl}_∞ -crystal combinatorics of higher level Fock spaces** (with E. Norton).
Journal of Combinatorial Algebra 2 (2018), 103-145.
- [6] **Heisenberg algebra, wedges and crystals.**
Journal of Algebraic Combinatorics 49 (2019), 99-124.
- [5] **Triple crystal action in Fock spaces.**
Advances in Mathematics 329 (2018), 916-954.
- [4] **Branching graphs for finite unitary groups in non-defining characteristic** (with G. Hiss).
Communications in Algebra 45 (2016), 561-574.
- [3] **Harish-Chandra series in finite unitary groups and crystal graphs** (with G. Hiss and N. Jacon).
International Mathematics Research Notices 22 (2015), 12206-12250.
- [2] **Crystal isomorphisms in Fock spaces and Schensted correspondence in affine type A.**
Algebras and Representation Theory 18 (2015), 1009-1046.
- [1] **Generalised canonical basic sets for Ariki-Koike algebras.**
Journal of Algebra 413 (2014), 364-401.

Grants

2019–2023 Principal investigator of the SNSF Ambizione project PZ00P2_180120, total awarded amount of 540'360 CHF. EPFL, Lausanne, Switzerland.

Selected conference talks

- 2024** *The Mullineux involution: a modern approach*, Groups and Representation Theory in Lausanne, Lausanne, 19-21 November 2024.
- 2023** *Defect zero blocks for cyclotomic Hecke algebras*, Hecke algebras and applications, Spetses, 16-21 July 2023.
- 2022** *Atomic length on Weyl groups*, 12th Combinatorics Days, Aveiro, 20-21 October 2022.
- Generalised cores and atomic length*, Character theory and categorification, Oberwolfach, 28 August - 3 September 2022.
- RSK correspondence, duality and multicrystals*, 85th Séminaire Lotharingien de Combinatoire, Domaine de la Barollière, Saint-Paul-en-Jarez, 3-6 April 2022.
- Injectivity of induction in Lie theory*, 11th Combinatorics days, Lisbon, 21-22 January 2022.
- 2021** *Combinatorial Howe duality*, Nikolaus conference, Aachen, 7-9 December 2021.
- 2019** *Kostka-Foulkes polynomials and type C charge*, Groups and Representations in Amiens and Paris, Amiens, 18-19 September 2019.
- 2018** *Generalized Mullineux involution and cyclotomic wall-crossings*, Representations in Lie Theory and Interactions, CIRM (Luminy), 4-9 September 2018.
- Heisenberg crystals and applications*, Algebraic Combinatorics in Ancona, Università Politecnica delle Marche, Ancona, 13-15 June 2018.
- Cylindric multipartitions and level-rank duality*, 80th Séminaire Lotharigien de Combinatoire, Lyon, 25-28 March 2018.
- Representations of cyclotomic Cherednik algebras and crystals*, Colloque tournant du GDR Théorie de Lie algébrique et géométrique, Université de Versailles, 7-9 February 2018.
- 2016** *Triple crystal structure for Fock spaces*, Algebraic Combinatorics and Representation Theory, CIRM, Marseille, 29 August–2 September 2016.
- Heisenberg crystal for the Fock space and applications*, Representation Theory in Samos, Samos, 4-8 July 2016.
- 2015** *Harish-Chandra series for finite unitary groups*, Rotating colloquium of the GDR Théorie de Lie algébrique et géométrique, Université Paris-Sud, Orsay, 7-9 January 2015.
- 2014** *Basic sets for $G(\ell, 1, n)$* , Young Algebraists' Conference, Lausanne, 9-13 June 2014.
- Ariki's theorem*, ARTY 2, Erlangen, 8-10 May 2014.

An analogue of the bumping algorithm in affine type A, 72nd Séminaire Lotharingien de Combinatoire, Lyon, 23-26 March 2014.

2013 *Crystal isomorphisms in Fock spaces*, Nikolaus conference, Aachen, 2-4 December 2013.

Decomposition matrices of Ariki-Koike algebras, Young Researchers in Representation Theory, Wuppertal, 7-10 October 2013.

Basic sets for Ariki-Koike algebras, ARTY, Erlangen, 23-25 May 2013.

Selected seminar talks

2024 GT *CombAlg* workshop, Université Lyon 1, October 2024.

Algebra and geometry seminar, Université de Caen, March 2024.

ANR CORTIPOM workshop, Université Paris 6, January 2024.

2023 Combinatorics and number theory seminar, Université Lyon 1, November 2023.

Arrangements and symmetries seminar, Ruhr University Bochum, April 2023.

Séminaire quantique, Université de Strasbourg, February 2023.

2022 Algebra seminar, Universität zu Köln, April 2022.

Algebra and geometry seminar, Université de Versailles, avril 2022.

Arithmetic geometry seminar, Université de Rennes, février 2022.

Algebra and combinatorics seminar, Universidade de Coimbra, October 2022.

Algebra seminar, Universität zu Köln, April 2022.

Algebra seminar, Université de Versailles, April 2022.

Arithmetic geometry seminar, Université de Rennes, February 2022.

Algebra and combinatorics seminar, Universidade de Coimbra, January 2022.

ANR CORTIPOM workshop, Université de Tours, January 2022.

2020 GAAO seminar, Université de Clermont, December 2020.

Algebra seminar, EPFL, Lausanne, December 2020.

Algebra oberseminar, RWTH Aachen, July 2020.

Algebra seminar, TU Kaiserslautern, February 2020.

2019 AGATA seminar, Université de Montpellier, February 2019.

LBfM oberseminar, RWTH Aachen, January 2019.

2018 Graduate school colloquium, RWTH Aachen, October 2018.

Algebra and geometry seminar, Karlsruhe Institute of Technology, July 2018.

Algebra seminar, Vrije Universiteit Brussel, April 2018.

Quantum seminar, Université de Strasbourg, March 2018.

Groups and quantization seminar, Université de Reims, February 2018.

2017 Algebra and geometry seminar, Université de Caen, November 2017.

Group theory seminar, Université d'Amiens, November 2017.

Algebra seminar, Université de Lyon, April 2016.

2016 Algebra and geometry seminar, Université de Versailles, April 2016.

- LDfM oberseminar, RWTH Aachen, April 2016.
Algebraic geometry seminar, Université de Montpellier, March 2016.
Algebra and geometry seminar, Université de Caen, March 2016.
- 2015** Algebra seminar, Université de Reims, June 2015.
Algebra seminar, TU Kaiserslautern, June 2015.
Séminaire Chevalley, Université Paris Diderot, March 2015.
Algebra oberseminar, Universität Stuttgart, February 2015.
- 2014** Group theory seminar, EPFL, Lausanne, November 2014.
Graduate school colloquium, RWTH Aachen, October 2014.
Representation theory seminar *CCCP*, Université Paris Diderot, May 2014.
LDfM oberseminar, RWTH Aachen, January 2014.
- 2013** Algebra oberseminar, Universität zu Köln, December 2013.
Algebra and number theory seminar, Université de Besançon, May 2013.
PhD students seminar, Université de Tours, April 2012.

Programming

I have written a few programs in Sage and GAP in the framework of my research, notably for:

- computing affine type A crystals (realisation by multipartitions) and certain crystal isomorphisms,
- computing the Heisenberg crystal and the generalised Mullineux involution,
- implementing the atomic length on Weyl groups.

Don't hesitate to write me for any particular request.

Students supervision

PhD students

2024–2027 Anthony Masson (Université de Reims). *Mullineux involution for Hecke algebras and level-rank duality*. Co-supervised with Nicolas Jacon.

Undergraduate students

2022–2023 Amandine Favre (EPFL Lausanne). *Distribution of the atomic length*. Masters thesis.

Amandine Favre (EPFL Lausanne). *Quiver representations*. Masters project.

2021–2022 Romane Cornali (EPFL Lausanne). *Lie algebras representations*. Summer in the Lab project.

Gaëtan Mancini (EPFL Lausanne). *Groupes de permutations: vers le théorème d'O'Nan-Scott*. Bachelor project.

2020–2021 Armelle Hours (EPFL Lausanne). *Correspondance de Robinson-Schensted-Knuth représentations de S_n et fonctions de Schur*. Bachelor project.

Teaching record

I have been teaching at all levels since 2011. Below is a detailed description of my teaching record.

Lecturer at EPFL (2024)

| Period | Course title | Semester | ECTS | Students | Language |
|-----------|----------------------------|------------|------|----------|----------|
| 2024–2025 | Probability and statistics | Bachelor 4 | 3 | 296 | French |

Assistant at Ruhr University Bochum (2023–2024)

| Period | Course title | Semester | ECTS | Students | Language |
|-----------|---|------------|------|----------|----------|
| 2023–2024 | Introduction to hyperplane arrangements (seminar) | Bachelor 5 | 3 | 4 | German |
| | Linear algebra | Bachelor 1 | 5 | 238 | German |
| 2022–2023 | Linear algebra (preparatory course) | - | 3 | 210 | German |
| | Number theory | Bachelor 2 | 5 | 32 | German |

Lecturer at EPFL (2019-2023)

| Period | Course title | Semester | ECTS | Students | Language |
|-----------|----------------------------------|-----------------|------|----------|-----------------|
| 2020–2021 | Galois theory | Bachelor 5 | 5 | 34 | French, English |
| 2019–2020 | Representation theory | Bachelor 6 | 5 | 38 | French, English |
| 2018–2019 | Quantum groups and crystal bases | Doctoral school | 3 | 4 | English |

Assistant at RWTH Aachen (2014-2019)

| Period | Course title | Semester | ECTS | Students | Language |
|-----------|-------------------------------|------------|------|----------|----------|
| 2018–2019 | Modular representation theory | Master 3 | 9 | 7 | German |
| 2017–2018 | Representation theory | Master 2 | 9 | 24 | German |
| | Linear algebra I | Bachelor 1 | 6 | 521 | German |
| 2016–2017 | Group theory | Bachelor 6 | 9 | 21 | German |
| | Begleitpraktikum II | Bachelor 2 | 4 | 12 | German |
| | Algebra | Bachelor 5 | 9 | 31 | German |
| 2015–2016 | Computational algebra | Bachelor 4 | 9 | 97 | German |
| | Linear algebra II | Bachelor 3 | 9 | 241 | German |
| 2014–2015 | Algebraic topology | Master 2 | 9 | 12 | German |
| | Topology | Master 1 | 9 | 27 | German |

Assistant at University of Tours (2011-2014)

| Period | Course title | Semester | ECTS | Students | Language |
|-----------|--------------|------------|------|----------|----------|
| 2013–2014 | Probability | Bachelor 2 | 4 | 14 | French |
| | Probability | Bachelor 2 | 4 | 15 | French |
| 2012–2013 | Probability | Bachelor 1 | 4 | 12 | French |
| | Probability | Bachelor 1 | 4 | 14 | French |
| 2011–2012 | Probability | Bachelor 2 | 4 | 15 | French |
| | Analysis II | Bachelor 2 | 5 | 21 | French |
| | Analysis I | Bachelor 1 | 5 | 29 | French |

Assistant at Université de Franche-Comté (2010-2011)

| Period | Course title | Semester | ECTS | Students | Language |
|-----------|-------------------|------------|------|----------|----------|
| 2010–2011 | Linear algebra II | Bachelor 4 | 5 | 30 | French |
| | Algebra and logic | Bachelor 2 | 5 | 25 | French |
| | Linear algebra I | Bachelor 3 | 5 | 35 | French |

Supply teacher (2010)

In spring 2010, I have been a supply teacher at high school level (Terminale S, Lycée Victor Hugo, Besançon, France).

Organisation of conferences

2024 *Formal Power Series and Algebraic Combinatorics 2024* (with G. Dorpalen-Barry, D. Kus, C. Stump and C. Thäle), Ruhr University Bochum, Bochum, Germany, 22-26 July 2024.

2021 *Combinatorics and Representation Theory in Lausanne*, EPFL, Lausanne, 13-17 September 2021 (in the context of my Ambizione project).

2013 *Journée des doctorants* (with V. Perrollaz), Université de Tours, 17 October 2013.
Combin'à Tours (with J. Guilhot and V. Beck), Université de Tours, 3-5 July 2013.

Responsibilities and collective tasks

2023–2024 Organiser of the seminar *Arrangements and symmetries*, Ruhr University Bochum.

2019–2020 Organiser of a working seminar on quiver Hecke algebras, EPFL Lausanne.

2014–2019 Tutors supervisor in the group of G. Hiss, Lehrstuhl D für Mathematik, RWTH Aachen.

2015–2016 Organiser of a working seminar on modular representations of finite groups, Lehrstuhl D für Mathematik, RWTH Aachen.

2014–2015 Organiser of a working seminar on categorification of quantum groups, Lehrstuhl D für Mathematik, RWTH Aachen.

2013–2014 Elected member of the laboratory committee, Laboratoire de Mathématiques et Physique Théorique, Université de Tours.

Outreach activities

- Organisation of and participation to the *EPFL open days*, Lausanne, 2019-2020.
- Organisation of and participation to the *Fête de la Science*, Tours, 2011-2014.
- Organisation of the *Journée des doctorants* (with V. Perrollaz), Université de Tours, 17 October 2013.
- Speaker at the *Journée des doctorants*, IUFM Blois, October 2012.