Thomas Bitoun

Curriculum Vitae

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A. IDENTIFICATION

Name : Thomas Bitoun

Address : Department of Mathematics and Statistics
612 Campus Place N.W.
University of Calgary
2500 University Drive NW
Calgary, Alberta, Canada, T2N 1N4

Telephone : 1-(403) 220-3941

Email : thomas.bitoun@ucalgary.ca

Homepage : https ://profiles.ucalgary.ca/thomas-bitoun

Citizenship : Belgium

Languages : English, French

B. EDUCATION

2010 Ph.D. (Mathematics)
Université Paris-Sud XI, Orsay, France
Title : Lagrangianité de cycles associés à un D-module holonôme.
Committee : Prof. Pierre Berthelot (Rennes ; Referee), Prof. Roman Bezrukavnikov (MIT ; Referee), Prof. Luc Illusie (Orsay ; President), Prof. Maxim Kontsevich (IHES ; Advisor), Prof. Gérard Laumon (Orsay), Prof. Michel van den Bergh (Hasselt)

2006 M.Sc. (M2 Algèbre et Géométrie)
Université Pierre et Marie Curie, Paris, France

2004 B.Sc. (Licence en sciences mathématiques)
Université Libre de Bruxelles, Brussels, Belgium

C. **ACADEMIC POSITIONS**

July 2024 - present	Associate Professor with tenure, Department of Mathematics and Statistics, University of Calgary, Canada
September 2019 - June 2024	Assistant Professor, Department of Mathematics and Statistics, University of Calgary, Canada • Parental Leave : Winter 2024 • Parental Leave : Summer 2021
Spring 2019	Visiting scientist Weizmann Institute of Science, Rehovot, Israel
Fall 2018	Visiting Faculty University of Toronto, Canada
2015 - 2018	Postdoctoral research assistant, Mathematical Institute, University of Oxford, United Kingdom
2014 - 2015	Research Fellow, Higher School of Economics, Moscow, Russia
2011 - 2014	C.L.E. Moore Instructor, Massachusetts Institute of Technology, Cambridge MA, USA
2010	Mathematician, Institut des Hautes Etudes Scientifiques, Bure-sur-Yvette, France
2005 - 2006	ENIGMA graduate fellow, Ecole Normale Supérieure, Paris, France
2002 - 2003	étudiant-assistant (student TA), Université Libre de Bruxelles, Brussels, Belgium

D. **RESEARCH**

PERSONAL RESEARCH GRANTS

1. Natural Sciences and Engineering Research Council (NSERC) Discovery Grant (2020 - 2025) - 130,000 CAD
   D-modules and Arithmetic
   Bitoun, Thomas (PI)
2. Natural Sciences and Engineering Research Council (NSERC) Early Career Researcher Discovery Launch Supplement (2020 - 2021) - 12,500 CAD
   D-modules and Arithmetic
   Bitoun, Thomas (PI)
3. Natural Sciences and Engineering Research Council (NSERC) Discovery Grant COVID-19 Supplement (2020) - 4,160 CAD
   D-modules and Arithmetic
   Bitoun, Thomas (PI)
4. University of Calgary Teaching and Learning Grant (2024 - 2026) - 14,934.54 CAD
   Advancing Proof-Based Mathematics Education : AI-Enhanced Problem Solving in Group Theory
   Bitoun, Thomas (PI)

ORGANIZATIONAL/COMMUNAL ACADEMIC GRANTS

1. Pacific Institute for the Mathematical Sciences (PIMS) Seminar Award (2020-2022) for the *Calgary Algebra and Number Theory Seminar*, jointly with D.-K. Nguyen - 6,000 CAD

2. Pacific Institute for the Mathematical Sciences (PIMS) postdoctoral fellowship (2021-2023) awarded to Daniel Bath under my supervision - 50,000 CAD

3. Centre de recherches mathématiques (CRM) at the Université de Montréal, Montréal, Canada, funding in support of the conference D-modules, Local Systems and Applications (September 16-20, 2024) jointly with T.H. Chen of the University of Minnesota and M. Groechenig of the University of Toronto - 25, 000 CAD (CRM) + 15, 000 USD (NSF)

PUBLICATIONS

PEER REVIEWED JOURNAL PAPERS

1. Bitoun, T. (2024). On the $\mathcal{D}$-module of an isolated singularity ; accepted for publication in *Algebra & Number Theory.*
2. Bitoun, T., Desrochers, J (2023). On centralizers in Azumaya domains ; *International Mathematics Research Notices*, Volume 2023, Issue 11, June 2023, pp 9795-9798.
3. Bitoun, T., Bode, A (2021). Extending meromorphic connections to coadmissible $\mathcal{D}$-modules ; *Journal für die reine und angewandte Mathematik (Crelles Journal)*, Volume 2021, no. 778, 2021, pp 97-118.
4. Bitoun, T. (2020). Length of local cohomology in positive characteristic and ordinarity ; *International Mathematics Research Notices*, Volume 2020, Issue 7, April 2020, pp 1921-1932.
5. Bitoun, T. (2019). On the p-supports of a holonomic $\mathcal{D}$-module ; *Inventiones Mathematicae* March 2019, Volume 215, Issue 3, pp 779-818.
6. Bitoun, T., Bogner, C., Klausen, R, Panzer, E (2019). Feynman integral relations from parametric annihilators ; *Letters in Mathematical Physics*, Volume 109, Issue 3, March 2019, pp 497-564.
7. Bitoun, T., Schedler, T (2018). On $\mathcal{D}$-modules related to the b-function and Hamiltonian flow ; *Compositio Mathematica*, Volume 154, Issue 11, November 2018, pp 2426-2440.
8. Bitoun, T (2018). On a theory of the b-function in positive characteristic ; *Selecta Mathematica*, September 2018, Volume 24, Issue 4, pp 3501-3528

PAPERS SUBMITTED TO PEER REVIEWED JOURNALS

9. Bitoun, T., Quinlan-Gallego, E (2024). Bernstein-Sato theory modulo p^m; arXiv :2401.07082

PAPERS IN PREPARATION

1. Bitoun, T., Boixeda Alvarez, P. (2024). On central distributions of SL_2

CONFERENCE PROCEEDINGS

2. Bitoun, T., Bogner, C., Klausen, R, Panzer, E (2019). The number of master integrals as Euler characteristic ; Loops and Legs in Quantum Field Theory (LL2018), St. Goar (Germany) ; arXiv :1809.03399

SELECTED INVITED PRESENTATIONS

1. Seminário das sextas, Pontifical Catholic University of Rio de Janeiro, Rio de Janeiro, Brazil, July 2024, "On the D-module of an isolated singularity".

2. Sixth Canada-Mexico-US conference in Representation theory, Noncommutative Algebra, and Categorification, Instituto de Matematicás, Universidad Nacional Autónoma de México, Mexico City, Mexico, June 2024, "On centralizers in Azumaya domains".
3. Harvard-MIT Algebraic Geometry Seminar, Massachusetts Institute of Technology, Cambridge, MA, USA, May 2023, "On the D-module of an isolated singularity".
4. Infinite Dimensional Algebra Seminar, Massachusetts Institute of Technology, Cambridge, MA, USA, May 2023, "On the D-module of an isolated singularity".
5. Algebra and Geometry Seminar, California Institute of Technology, Pasadena, CA, USA, February 2023, "On the D-module of an isolated singularity".
6. Algebra Seminar, Mathematical Institute, University of Oxford, Oxford, England, May 2022, "On centralizers in Azumaya domains".
7. Séminaire d'algèbre, Institut Henri Poincaré, Paris, France, May 2022, "On centralizers in Azumaya domains".
8. Mathematical congress of the Americas, special session "Differential operators in algebraic geometry and commutative algebra", Buenos Aires, Argentina, July 2021,"The length of $D\frac{1}{f}$".
9. Colloquium, University of Calgary Department of Mathematics and Statistics, Calgary, Canada, October 2020, "Commuting differential operators in positive characteristic".
10. Commutative Algebra Seminar, University of Minnesota, Minneapolis, MN, USA, March 2019, "Bernstein-Sato polynomials in positive characteristics and Hodge theory".
11. The Mathematics of Linear Relations between Feynman Integrals Workshop, Mainz Institute for Theoretical Physics, Mainz, Germany, March 2019, "The algebraic Mellin transform, after Loeser and Sabbah".
12. Geometric Representation Theory Seminar, University of Toronto, Toronto, Canada, November 2018, "Bernstein-Sato polynomials in positive characteristic and Hodge theory".
13. Special Seminar, Mathematical institute, University of Oxford, Oxford, England, May 2017, "Counting master integrals with D-modules".
14. Special Day in Motivic Integration and Non-Archimedean Geometry, University of Lille I, Lille, France, October 2016, "Des b-fonctions en caractéristique positive".
15. Algebra Seminar, University of Cambridge, Cambridge, England, February 2016, "A theory of the b-function in positive characteristic".
16. Séminaire d'Analyse Algébrique, University of Paris VI, Paris, France, June 2015, "Sur une théorie de la b-fonction en caractéristique positive".
17. Algebraic Geometry and Number Theory Seminar, University of Padova, Padova, Italy, May 2015, "D-modules and arithmetic : a theory of the b-function in positive characteristic".
18. Séminaire de Géométrie Arithmétique, University of Rennes, Rennes, France, May 2015, "Sur une théorie de la b-fonction en caractéristique positive".
19. Algebra Seminar, Mathematical Institute, University of Oxford, Oxford, England, April 2015, "D-modules and arithmetic : a theory of the b-function in positive characteristic".
20. Algebraic Geometry and Number Theory Seminar, University of Leuven, Leuven, Belgium, February 2015, "D-modules and arithmetic : a theory of the b-function in positive characteristic".
21. Mathematics-String Theory Seminar, Tokyo Kavli Institute for Physics and Mathematics of the Universe (IPMU), Tokyo, Japan, December 2014, "D-modules and arithmetic : a theory of the b-function in positive characteristic".
22. Algebra, Number Theory and Combinatorics Seminar, University of Texas at Austin, Austin, TX, USA, December 2014, "D-modules and arithmetic : a theory of the b-function in positive characteristic".
23. Algebraic Geometry Seminar, Higher School of Economics, Moscow, Russia, September 2014, "On a theory of the b-function in positive characteristic".

24. Geometry/Physics seminar, Northwestern University, Evanston, IL, USA, May 2011, "D-modules mod p and microlocalization".
25. Geometric Langlands Seminar, University of Chicago, Chicago, IL, USA, May 2011, "D-modules mod p and microlocalization".
26. Harvard-MIT Algebraic Geometry Seminar, Massachusetts Institute of Technology, Cambridge, MA, USA, April 2011, "D-modules mod p".
27. Algebraic Geometry Seminar, University of Michigan, Ann Arbor, MI, USA, March 2011, "Holonomic D-modules mod p".
28. Oberseminar, University of Duisburg-Essen, Essen, Germany, December 2010, "Holonomic D-modules and positive characteristic".
29. Séminaire Arithmétique et Géométrie Algébrique, Institut de recherche mathématique avancée (IRMA), Starsbourg, France, December 2010, "D-modules holonômes et caractéristique positive".

E. TEACHING

LIST OF COURSES TAUGHT

University of Calgary

1. MATH 211 (Linear Methods I)

   Winter 2020 (105 students)

   Fall 2021 (2 sections out of 1249 students)

   Fall 2022 (2 sections out of 1313 students)

   MATH 211 is a service linear algebra course for first-year students in engineering and science. It was lecture-based in Winter 2020. However, after Winter 2020, the course was redesigned to use active learning as the main teaching approach.

2. MATH 315 (Algebra I)

   Winter 2020 (46 students)

   Winter 2021 (44 students)

   Winter 2022 (44 students)

   Winter 2023 (44 students)

   MATH 315 is a first course in abstract algebra destined mostly for mathematics majors. The nature of MATH315 is different from other 300-level math courses. In previous courses, students have mostly been using algorithms and procedures to solve problems. In MATH315, students are expected to understand the underlying mathematical concepts and to use a proof-based approach to solving problems. This means that they are expected to be able to justify their solutions using mathematical proofs. It marks a milestone in students' mathematical maturity.

3. MATH 499 (Special Topics : Lie Algebras)

   Fall 2024 (6 students)

   MATH 499 is a Special Topics course. The topic varies from year-to-year. This course is typically offered as required to provide the opportunity for students to engage in additional topics in Mathematics. In this case, it was a trial run for a new course on Lie algebras at the 400-level that I developed.

4. MATH 511, MATH 607 (Algebra III)

   Fall 2020 (4 undergraduate students and 1 graduate student)
   Fall 2021 (6 undergraduate students and 5 graduate students)
   Fall 2022 (4 undergraduate students and 4 graduate students)
   Fall 2023 (1 undergraduate and 6 graduate students)
   Fall 2024 (8 undergraduates and 5 graduate students)

MATH 511-607 is a joint undergraduate/graduate advanced course in algebra.

University of Oxford

1. C2.5 (Non-commutative rings)

   Hilary 2017

Massachusetts Institute of Technology

1. 18.821 (Project Laboratory in Mathematics)

   Fall 2012

OTHER TEACHING EXPERIENCE

1. At the University of Calgary : Organizer of the Riemann-Hilbert learning seminar for graduate students (Winter 2021).
2. At the Graham and Parks School in Cambridge, MA, USA : Mentor in afternoon community school program, after-school math class (Fall 2012).

STUDENT SUPERVISION

CURRENT GRADUATE STUDENTS

1 *Mohamed Tlili (MSc - Thesis Based, 2023 - present).*
Awards : Winter 2024 Graduate Assistant Teaching Excellence Award.

2 *Peiling Liu (MSc - Thesis Based, 2022 - present).*

PAST GRADUATE STUDENTS

3 *Saleh Ahmed (MSc - Thesis Based, 2021 - 2024).*
"Fréchet Localization of Commutative Algebras"
Saleh Ahmed is now a Ph.D. student in mathematics at Western University.

4 *Aash Makwana (PhD, 2023 ; co-supervised with D.-K. Nguyen).*
Aash Makwana transfered to a course-based MSc in mathematics after 1 year as a PhD student.

5 *Justin Desrochers (MSc - Thesis Based, 2021 - 2023).*
"Commuting differential operators in positive characteristic"
Awards : Alberta Graduate Excellence Scholarship, Graduate Assistant Teaching Excellence Award.
Justin Desrochers is now a Ph.D. student in mathematics at the Université de Sherbrooke.

6 *James Steele (MSc - Thesis Based, 2020 - 2021) ; co-supervised with C. Cunningham*
James Steele transferred successfully to a Ph.D. in our department under the supervision of C.Cunningham.

UNDERGRADUATE STUDENTS

1. *Mohamed Tlili, Honours Thesis, Winter 2023 ; "Modules over the Weyl algebra and the Bernstein-Sato polynomial".*
2. *Benjamin Frey (University of Calgary - NSERC USRA), May - August 2022 ; "Coinvariants of the adjoint representation in positive characteristic".*
3. *Saleh Ahmed, Honours Thesis, Winter 2021 ; "Construction of the Milnor fiber of a hypersurface".*
4. *Justin Desrochers, Honours Thesis, Winter 2021 ; "Affine group schemes".*
5. *Justin Desrochers (University of Calgary - NSERC USRA), May - August 2020 ; "Alegbras of commuting differential operators".*

POSTDOCTORAL TRAINEES

1 *Dr. Andreas Bode, September 2021 - December 2022.*

2 *Dr. Samprit Ghosh, September 2023 - July 2025 ; co-supervised with D-K Ngyuen.*

RESEARCH GRANT TEAM

1 *Dr. Anna Funk (Postdoctoral Fellow, University of Calgary, July 2024 - present)*
Project : Advancing Proof-Based Mathematics Education : AI-Enhanced Problem Solving in Group Theory
Responsibilities : Main project collaborator

2 *Shanna Hollingworth (Graduate Research Assistant, September 2024 - present)*
Project : Advancing Proof-Based Mathematics Education : AI-Enhanced Problem Solving in Group Theory
Responsibilities : Developing study protocols, assisting with ethics applications, and preparing study materials

3 *Aidan Dempsey-MacKillop (Undergraduate Research Assistant, July 2024 - present)*
Project : Advancing Proof-Based Mathematics Education : AI-Enhanced Problem Solving in Group Theory
Responsibilities : Refining and testing the AI-powered tutoring system

4 *Taha Hedayat (Undergraduate Research Assistant, July 2024 - present)*
Project : Advancing Proof-Based Mathematics Education : AI-Enhanced Problem Solving in Group Theory
Responsibilities : Refining and testing the AI-powered tutoring system

RESEARCH ASSISTANT SUPERVISION

1. *Justin Desrochers (February 2021 - March 2021) : working on maximal commutative subalgebras of differential operators.*

THESIS EXAMINER

1. Benjamin MacAdam, December 2021, Ph.D. defence - internal examiner, University of Calgary, Calgary, Canada.
2. Victor Ibrahim Santos El Adji, July 2024, Ph.D. Qualification examiner, Pontifical Catholic University of Rio de Janeiro, Rio de Janeiro, Brazil.

PROFESSIONAL LEARNING AND DEVELOPMENT

1. Setting Up Online Discussions in D2L, Taylor Institute for Teaching and Learning, 1 hour lecture (April 2020).
2. Online Student Assessment, Taylor Institute for Teaching and Learning, 1 hour lecture (April 2020).

3. Teaching Online Program - Special Edition, Taylor Institute for Teaching and Learning, 2 weeks long course (May - June 2020).
4. Understanding Microaggressions : Strategies for the Classroom, Taylor Institute for Teaching and Learning, 2 hours workshop (January 2022).
5. Blended and Online Learning Pedagogy and Practice, Taylor Institute for Teaching and Learning, term-long course, obtained a digital badge from the Taylor Institute (Fall 2022).

F. **SERVICE**

EDUCATIONAL LEADERSHIP

COMMITTEE MEMBERSHIP

1. PDF Committee, Department of Mathematics and Statistics, University of Calgary, September 2020 - August 2021 (member), then September 2021- July 2022 (chair).
2. Undergraduate Programs and Curriculum Committee, Department of Mathematics and Statistics, University of Calgary, September 2021 - present.
3. Curriculum Review Committee, Department of Mathematics and Statistics, University of Calgary, September 2022 - July 2023.
4. Graduate Committee, Department of Mathematics and Statistics, University of Calgary : September 2022 - present.

NEUTRAL CHAIR

1. Xiang Li, MSc oral examination, "Optimal Portfolios of Natural Gas Futures," January 2021.
2. Fatemeh Mahmoudi, PhD candidacy examination, December 2021.
3. Sudeesha Arachchige, MSc oral examination, "Stochastic Modeling of Wind Derivatives with Applications to the Alberta Energy Market," August 2024.

REASEARCH LEADERSHIP

SEMINARS AND CONFERENCES ORGANIZER

1. Calgary Algebra and Number Theory Seminar, co-organizer with D.-K. Nguyen since September 2019, website : https ://sites.google.com/view/calgaryants.
2. Co-organizer of the D-modules, Local Systems and Applications conference at the Centre de recherches mathématiques (CRM) at the Université de Montréal, Montréal, Canada, September 16-20, 2024.

JOURNAL REVIEWER

Proceedings of the American Mathematical Society

Advances in Mathematics

Bulletin of the London Mathematical Society

Crelles journal

Journal of Algebra

International Mathematics Research Notices

GRANTS AND AWARDS REVIEWER

1 Natural Sciences and Engineering Research Council of Canada (NSERC Discovery Grant, 2021 - present).

2 Program for undergraduate research experience, University of Calgary (PURE awards, 2019 - present).