

THE UNIVERSITY OF BRITISH COLUMBIA

Curriculum Vitae for Faculty Members

Date: 25 May 2025

Initials: TBJW

1. **SURNAME :** Williams

FIRST NAME : Thomas

MIDDLE NAMES : Benedict Joachim

2. **DEPARTMENT/SCHOOL :** Mathematics

3. **FACULTY :** Science

4. **PRESENT RANK :** Associate Professor

SINCE : 1 July 2021

5. **POST-SECONDARY EDUCATION**

(a) *Degrees:*

University or Institution	Degree	Subject Area	Dates
Stanford University	PhD	Mathematics	2005–2010
University College Dublin	MSc	Mathematics	2003–2004
University College Dublin	BA	Mathematics & English	2000–2003

(b) *Title of Dissertation and Name of Supervisor:*

The equivariant motivic cohomology of varieties of long exact sequences.

PhD thesis, Stanford University,

Supervisor: Prof. Gunnar Carlsson.

(c) *Special Professional Qualifications:*

6. **EMPLOYMENT RECORD**

(a) *Prior to coming to UBC:*

University, Company or Organization	Rank or Title	Dates
University of Southern California	Assistant Professor (Non Tenure-Track)	2010–2013

(b) *At UBC:*

Rank or Title	Dates
Postdoctoral Fellow	September 2013–2015
Assistant Professor	2015–2021
Associate Professor	2021–present

(c) *Date of granting of tenure at UBC:* 1 July, 2021.

7. LEAVES OF ABSENCE

- Parental leave 2025-02-02 until present.

8. TEACHING

- *Teaching Statement:*

My principles of teaching mathematics are: first, that learning mathematics is an active process; second, that mathematics is often daunting for students but third, that it can be a joy to learn.

Based on the first principle, I put a high value on examples and problems in my classes, so that I encourage students to teach themselves mathematics with my guidance. Based on the second, I put a great deal of emphasis on being well-prepared in lectures, to smooth the way for the students to teach themselves. I strive to be understanding of all students, and am attentive to what they find difficult. Nevertheless I push students to achieve what they are capable of. My task is to present the topics succinctly and clearly, then to support the students' own learning with examples and exercises that range from the elementary to the very challenging.

(a) *Areas of special interest and accomplishments:*

(b) *Courses taught at UBC:*

Session	Course number	Scheduled hours	Class size	Hours taught			
				Lectures	Tutorials	Labs	Other
W1 2013	Math221	3	116	3			
S1 2014	Math221	6	139	6			
W1 2014	Math184	3	101	3			
W2 2014	Math342	3	44	3			
W1 2015	Math308	3	86	3			
W1 2015	Math427/527	3	13	3			
W1 2016	Math426	3	6	3			
W2 2016	Math603D	3	6	3			
W1 2017	Math426	3	7	3			
W1 2017	Math603D	3	4	3			
W2 2017	Math427/527	3	4	3			
W1 2018	Math603D	3	12	3			
W1 2018	Math221	3	187	3			
W2 2018	Math427/527	3	7	3			
W1 2019	Math221	3	137	3			
W1 2019	Math426	3	4	3			
W2 2019	Math603D	3	11	3			
W1 2020	Math221	3	177	3			
W1 2020	Math426	3	12	3			
W2 2020	Math220	3	63	3			
W1 2021	Math221	3	173	3			
W1 2021	Math426	3	10	3			
W2 2021	Math105	3	358	3			
W1 2022	Math221	3	64	3			

W1 2022	Math 426	3	7	3			
W2 2023	Math 220	3	77	3			
W2 2023	Math 221	3	215	3			
S1 2024	Math 221	6	130	6			

(c) *Graduate/undergraduate students supervised and/or co-supervised:*

Student name	Program	Dates	Principal supervisor	Co-supervisor(s)
Niny Arcila Maya	PhD	2015–2021	Ben Williams	Alejandro Adem
W Sebastian Gant	MSc	2018–2020	Ben Williams	
Benjamin Garbuz	MSc	2019–2021	Liam Watson	Ben Williams
W Sebastian Gant	PhD	2021–	Ben Williams	
Molly Blackburn	MSc	2023–	Ben Williams	
Peilin Li	MSc	2023–	Ben Williams	

(d) *Continuing education activities:*

(e) *Visiting lecturer (indicate university/organization and dates):*

(f) *Course development:*

(g) *Employees supervised:*

Employee	Type	Dates	Co-supervisor(s)
Uriya First	PDF	2015–2017	Zinovy Reichstein
Marc Stephan	PDF	2016–2018	Alejandro Adem
Krishanu Sankar	PDF	2017–2020	Alejandro Adem
Kevin Casto	PDF	2018–2020	Alejandro Adem
Taeuk Nam	USRA	Summer 2019	
Cindy Tan	USRA	Summer 2019	
Nicholas Rouse	PDF	2022–2024	Liam Watson
Keegan Boyle	PDF	2022–2024	Liam Watson
Justin Lawrence	USRA	Summer 2023	Nicholas Rouse

RA—research assistant, USRA—Undergraduate Student Research Awards, PDF—postdoctoral fellow.

(h) *Other:*

(i) **SCHOLARLY AND PROFESSIONAL ACTIVITIES**

1. *Areas of special interest and accomplishments*

I apply topology to solve problems in algebra. That is, I study algebraic equations geometrically, concentrating on features that do not change after continuous deformation. Using the topology of symmetries of square matrices, I settled fifty-year-old questions about twisted forms of matrix algebras (i.e., all $n \times n$ matrices): showing decomposition results over fields do not extend to general settings. I also described what kinds of generalizations of matrix-transpose can appear. Currently, I am investigating the size of minimal sets of generators.

I studied the A^1 -homotopy groups of spheres, which count functions between algebraic “spheres”. These “spheres” have not-fully-understood connections with K -theory, which is important in algebra and number theory. We have a settled specific case ($n = 5$) of a conjecture from 1982. I am working on the general case (all n).

2. *Research or equivalent grants (indicate under COMP whether grants were obtained competitively (C) or non-competitively (NC)):*

Granting agency	Subject	COMP	\$ per year	Dates	Principal investigator
NSERC	Mathematics*	C	\$27,000	2016–2021	Ben Williams Liam Watson,
PIMS	Mathematics [†]	C	\$66,667	2020–2024	Ben Williams, Robert Lipshitz, Ryan Budney.
NSERC	Mathematics [‡]	C	\$21,000	2021–2026	Ben Williams Martin Frankland, Angélica Osorno,
PIMS	Mathematics [§]	C	\$80,000	2025-2028	John Palmieri, Don Stanley, Paul Tsopméné, Ben Williams.

*Title: The topology, geometry and algebra of projective linear groups.

[†]Title: Novel techniques in low dimension: Interactions between Floer homology, representation theory, and algebraic topology.

[‡]Title: Classical and A^1 -homotopy theory of linear algebraic groups.

[§]Title: Diagram categories in homotopy theory.

3. *Research or equivalent contracts (indicate under COMP whether grants were obtained competitively (C) or non-competitively (NC)):*

4. *Invited presentations (Since 2007):*

- **University of Georgia, summer school in Topological Methods in Algebra:** Athens, Georgia (USA); August 2016.[†]
- **University of Münster, summer school in unstable A^1 -homotopy theory:** Münster, Germany; June 2016.[†]

5. *Contributed presentations (since 2000):*

- **Algebraic Topology and Topological Data Analysis: A Conference in Honor of Gunnar Carlsson:** Minneapolis, Minnesota; August 2022.[†]
- **Séminaire itinérant « Géométrie et Physique » :** Vancouver, BC; May 2022.*
- **Chico Topology Seminar:** Chico, California; April 2022.[†]

- **Quadratic forms, linear algebraic groups and beyond:** Online seminar; July 2020.*
- **Canadian Mathematical Society summer meeting, special session on topology:** Regina, Saskatchewan; June 2019.
- **Algebro-geometric and homotopical methods:** Institut Mittag–Leffler, Stockholm, Sweden; May 2019.[†]
- **Israeli national algebra & number theory day:** Haifa, Israel; June 2018.[†]
- **American Mathematical Society sectional meeting, special session on motivic homotopy theory:** Portland, Oregon; April 2018.
- **Semester on algebro-geometric and homotopical methods:** Institut Mittag–Leffler, Stockholm, Sweden; February 2017.[†]
- **Alberta–BC algebra workshop:** Edmonton, Alberta; November 2016.[†]
- **Motivic homotopy of spheres:** Essen, Germany; June 2016.[†]
- **Cascade topology seminar:** Portland, Oregon; November 2015.[†]
- **Workshop on the use of linear algebraic groups in geometry and number theory:** BIRS, Banff, Alberta; September 2015.[†]
- **Meeting on cohomology of finite groups: interactions and applications:** Oberwolfach, Germany; May 2015.[†]
- **Workshop on the A^1 -homotopy of spheres:** Essen, Germany; June 2014.[†]
- **American Institute of Mathematics workshop on A^1 -homotopy and projective modules:** AIM, Palo Alto, California; May 2014.[†]
- **Midwest topology seminar:** IUPUI, Indianapolis, Indiana; April 2014.[†]
- **Bellingham algebraic geometry seminar:** Bellingham, Washington; April 2014.
- **Joint mathematics meetings:** San Diego, California; January 2013.*
- **Southern California algebraic geometry symposium:** California Institute of Technology, Pasadena, California; November 2012.*
- **American Mathematical Society, special session on homotopy theory:** Riverside, California; November 2009.
- **Cascade topology seminar:** Eugene, Oregon; October 2009.[†]

The following are all invited talks at departmental seminars or similar.[‡]

- **The Ohio State University:** Columbus, Ohio; February 2024.
- **PIMS distinguished lecture, University of Regina:** Regina, Saskatchewan; October 2023.
- **Topology seminar, University of Regina:** Regina, Saskatchewan; October 2023.
- **Westlake University:** Hangzhou, China; August 2023.
- **University of Louisiana, Lafayette:** Lafayette, Louisiana; April 2021.*[‡]
- **University of Melbourne:** Melbourne, Australia; March 2021.*[‡]

*In these cases, I had no substantial travel costs.

[†]In these cases, the host institution bore my travel costs in full or in part

[‡]In all cases, the host department paid all my travel expenses with the exception of the talks at University College Dublin, where I was already present, and the April 2014 talk in Wayne State University, where I was already present in Detroit (the host institution paid my hotel cost, and my flight cost was borne by the Midwest Topology Seminar).

[‡]Due to the COVID-19 pandemic, this talk was held online

- **Reed College:** Portland, Oregon; October 2017.
- **The University of Calgary:** Calgary, Alberta; September 2017.
- **The University of Western Ontario:** London, Ontario; March 2016.
- **The University of Illinois, Urbana–Champaign:** Illinois; February 2016.
- **University College Dublin:** Dublin, Ireland; January 2016.
- **The University of Victoria:** Victoria, BC; April 2015.
- **The University of Melbourne:** Melbourne, Australia; December 2014.
- **Purdue University:** West Lafayette, Indiana; November 2014.
- **Wayne State University:** Detroit, Michigan; April 2014.
- **The Ohio State University:** Columbus, Ohio; April 2014.
- **The University of British Columbia:** Vancouver, BC; October 2012.[§]
- **The University of Southern California:** Los Angeles, California; September 2012.
- **California Institute of Technology:** Pasadena, California; November 2011.
- **Universität Osnabrück:** Osnabrück, Germany; July 2011.
- **The University of Southern California:** Los Angeles; September 2010.
- **The University of Chicago:** Chicago, Illinois; May 2010.
- **The University of Kansas:** Lawrence, Kansas; April 2010.
- **Wayne State University:** Detroit, Michigan; March 2010.

The following are invited talks I have given at UBC while employed at UBC.

- **The University of British Columbia:** Vancouver, BC; February 2023.
- **Department Colloquium: The University of British Columbia:** Vancouver, BC; October 2020.
- **Special PIMS–UBC Math prize colloquium, University of British Columbia:** Vancouver, BC; October 2018.
- **The University of British Columbia:** Vancouver, BC; November 2017.
- **The University of British Columbia:** Vancouver, BC; March 2016.
- **The University of British Columbia:** Vancouver, BC; January 2014.

6. *Other:*

7. *Conference organization:*

- 58th Cascade Topology Seminar, UBC, April 2023: weekend conference.
- New Trends in Algebra, Geometry and Homotopy Theory (a conference in honor of Alejandro Adem’s 60th birthday), Universidad Autónoma de Yucatán, Mérida, Mexico, November–December 2022: week-long hybrid conference with approximately 80 attendees.
- The Second Canadian Geometry & Topology Seminar, UQAM, Montreal, November 2022: three-day in-person conference with approximately 25 attendees.
- Séminaire de Mathématiques Supérieures 2022: Floer Homotopy Theory, UBC, July 2022: two-week in-person summer school with over 70 attendees.
- 65th Cascade Topology Seminar, UBC, September 2020: weekend conference, held online due to the Covid–19 pandemic.

[§]This was an invited talk, since I was at the University of Southern California at the time.

- Graph Complexes, Configuration Spaces and Manifold Calculus, UBC, May 2018, week-long workshop.
 - Mathematical Congress of the Americas, special session on group cohomology, Montreal, July 2017.
 - 58th Cascade Topology Seminar, UBC, May 2017: weekend conference.
8. *Other:* (e.g. visitors)

(j) **AWARDS AND DISTINCTIONS**

1. *Awards for Teaching (indicate name of award, awarding organizations, date)*
2. *Awards for Scholarship (indicate name of award, awarding organizations, date)*
 - UBC Mathematics and Pacific Institute for the Mathematical Sciences Faculty Award, 2017–2018.
3. *Awards for Service (indicate name of award, awarding organizations, date)*
4. *Other Awards*

(k) **OTHER RELEVANT INFORMATION** (Maximum One Page)

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Publications Record

Date: 25 May 2025

Initials: TBJW

SURNAME : Williams

FIRST NAME : Thomas

MIDDLE NAMES : Benedict Joachim

ORCID: <https://orcid.org/0000-0001-9688-2471>

Notes:

My best five papers are indicated with “★”.

Underlined coauthors were students or postdoctoral fellows at UBC during some or all of the term of the research.

In all cases, authors are listed alphabetically.

Coauthors have, on average, made equal contributions to the work.

(a) **REFEREED PUBLICATIONS**

1. Journals

- A. W. S. Gant and Ben Williams: *Free summands of stably free modules*. To appear in Forum of Mathematics, Sigma, 2025.
- B. Luis Eduardo García-Hernández and Ben Williams: *Linear and smooth oriented equivalence of orthogonal representations of finite groups*, Topology and its Applications, **367** (2025), online.
- C. W. S. Gant and Ben Williams: *Spaces of generators for the 2×2 complex matrix algebra*, New York Journal of Mathematics, **30** (2024), 756–773.
- D. T. Nam, C. Tan and B. Williams: *Spaces of generators for matrix algebras with involution* published online in Linear and Multilinear Algebra, 1407–1430.
- E. B. Antieau and B. Williams: *The topological period–index conjecture*, Mathematical Research Letters, **28** (2022), 1307–1317.
- F. U. First, Z. Reichstein and B. Williams: *On the number of generators of an algebra over a commutative ring*, Transactions of the American Mathematical Society, **375** (2022), 7277–7321.
- G. A. K. Shukla and B. Williams: *Classifying spaces for étale algebras with generators*, Canadian Journal of Mathematics, **73** (2021), 854–874.
- H. ★ U. First and B. Williams: *Involutions of Azumaya algebras*, Documenta Mathematica, **25** (2020), 527–633.
- I. C. Okay and B. Williams: *On the mod- ℓ homology of the classifying space for commutativity*, Algebraic & Geometric Topology, **20** (2020), 883–923.
- J. ★ A. Asok, J. Fasel and B. Williams: *Motivic spheres and the image of Suslin’s Hurewicz map*, Inventiones Mathematicae, **219** (2020), 39–73.
- K. ★ K. Wickelgren and B. Williams: *The simplicial EHP sequence in \mathbb{A}^1 -algebraic topology*, Geometry & Topology, **23** (2019), 1691–1777.
- L. ★ A. Auel, U. First and B. Williams: *Azumaya algebras without involution*, Journal of the European Mathematical Society, **21** (2019), 897–921.

- M. A. Asok, K. Wickelgren and B. Williams: *The simplicial suspension sequence in \mathbb{A}^1 -homotopy*, *Geometry & Topology*, **21** (2017), 2093–2160.
- N. B. Antieau and B. Williams: *Prime decomposition for the index of a Brauer class*, *Annali della scuola normale superiore di Pisa–classe di scienze*, **XVII** (2017), 277–285.
- O. B. Antieau and B. Williams: *Topology and purity for torsors*, *Documenta Mathematica*, **20** (2015), 333–355.
- P. B. Antieau and B. Williams: *The prime divisors of the period and index of a Brauer class*, *the Journal of Pure and Applied Algebra*, **219** (2015), 2218–2224.
- Q. B. Antieau and B. Williams: *The period–index problem for twisted topological K–theory*, *Geometry & Topology*, **18** (2014), 1115–1148.
- R. ★ B. Antieau and B. Williams: *Unramified division algebras do not always contain Azumaya maximal orders*, *Inventiones Mathematicae*, **197** (2014), 47–56.
- S. B. Williams: *The \mathbb{G}_m -Equivariant motivic cohomology of Stiefel varieties*, *Algebraic & Geometric Topology*, **13** (2013), 747–793.
- T. B. Antieau and B. Williams: *Godeaux–Serre varieties and the étale index*, *Journal of K–theory*, **11** (2013), 283–295.
- U. B. Antieau and B. Williams: *The topological period–index problem over 6–complexes*, *Journal of Topology*, **7** (2014), 617–640.
- V. B. Antieau and B. Williams: *On the classification of oriented 3–plane bundles over a 6–complex*, *Topology and its Applications*, **173** (2014), 91–93.
- W. B. Williams: *The motivic cohomology of Stiefel varieties*, *Journal of K–theory*, **10** (2012), 141–163.

2. Conference Proceedings (Refereed)

(b) **NON-REFEREED PUBLICATIONS**

(c) **BOOKS**

1. Chapters

- K. Wickelgren, B. Williams “Unstable motivic homotopy theory” 42pp. in *Handbook of homotopy theory*, Haynes Miller ed.; CRC Press, New York, 2020, 990pp.

(d) **PATENTS**

(e) **SPECIAL COPYRIGHTS**

(f) **ARTISTIC WORKS, PERFORMANCES, DESIGNS**

(g) **OTHER WORKS**

(h) **WORK SUBMITTED (including publisher and date of submission)**

1. U. First and Ben Williams: *Counterexamples in Involutions of Azumaya Algebras*
Submitted June 2024, 16pp.

(i) **WORK IN PROGRESS (including degree of completion)**

- (j) K. Boyle, N. Rouse and B. Williams: *A classification of the symmetries of knots* (95% complete), 46pp.