

THE UNIVERSITY OF BRITISH COLUMBIA

Curriculum Vitae for Faculty Members

Date: 5th April 2020

Initials: TBJW

1. **SURNAME:** Williams

FIRST NAME : Thomas

MIDDLE NAME(S): Benedict Joachim

2. **DEPARTMENT/SCHOOL:** Mathematics

3. **FACULTY:** Science

4. **PRESENT RANK:** Assistant Professor

SINCE: 27 October 2015

5. **POST-SECONDARY EDUCATION**

(a) *Degrees:*

University or Institution	Degree	Subject Area	Dates
Stanford University	Ph.D.	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.

Ph.D. 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 (NTT)	2010–2013

(b) *At UBC:*

Rank or Title	Dates
Postdoctoral Fellow	September 2013–2015
Assistant Professor	2015–Present

(c) *Date of granting of tenure at UBC:*

7. LEAVES OF ABSENCE

8. TEACHING

• *Teaching Statement:*

In teaching, I always strive to listen to students and see the subject from their point of view. In teaching upper-class and graduate courses, in particular, I recall those points in the theory that I, or previous students, have found difficult in learning it, and I try to smooth the way of the students in those topics in particular. In lower-level courses, where my own experience of learning is more distant, I rely on the questions the students have asked me and prior experience as a guide instead.

As much as I can, I try to select problems and examples that bridge the gap between theory as might be presented in the ordinary course of lectures, and the practice which motivated the invention of the theory. By this means, I hope to explain and motivate, and ideally make understandable, the harder points of the theory.

(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	3	2	3			
W2 2017	Math527	3	2	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			

* I oversaw the administration at UBC of a course in Homotopy Theory given by video link from the University of Western Ontario, in 2016. * I acted as Instructor-in-Charge of Math 221 in W1 2018 and W1 2019. In this capacity I was twice responsible for coordinating 5 sections serving approximately 620 students.

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

Student name	Program type	Dates	Principal supervisor	Co-supervisor(s)
Niny Arcila Maya	PhD	2015–	Ben Williams	Alejandro Adem
W Sebastian Gant	MSc	2018–	Ben Williams	
Benjamin Garbuz	MSc	2019–	Liam Watson	Ben Williams

(d) *Student committees and thesis reading:*

Student name	Degree	Role	Department	Date
Bernardo Villareal Herrera	PhD	Oral exam committee member	Mathematics	July 2017

(e) *Continuing education activities:*

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

(g) *Course development:*

(h) *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–	Alejandro Adem
Kevin Casto	PDF	2018–	Alejandro Adem

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

(i) *Other:*

- Uriya First is now an assistant professor at the University of Haifa.

9. SCHOLARLY AND PROFESSIONAL ACTIVITIES

- *Research Statement:*

My research applies both the methods and the ideas of algebraic topology in order to solve problems in algebra or algebraic geometry. In a longstanding project with Ben Antieau, and lately with Uriya First and others, I have applied the study of the topology of the projective general linear group, and related spaces, to the study of Azumaya algebras, i.e., twisted forms of matrix algebras, over rings. In joint work with Kirsten Wickelgren and Aravind Asok, I have pursued the \mathbb{A}^1 homotopy groups of spheres, which are analogues of the usual homotopy groups of spheres, but where the maps considered are exclusively algebraic in nature. As classical homotopy theory has implications in the theory of manifolds, the \mathbb{A}^1 homotopy theory has implications in the theory of schemes, and therefore to arithmetic. In particular, I am currently studying applications to algebraic K -theory.

(a) *Areas of special interest and accomplishments*

- (b) *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	Co-investigator(s)
NSERC	Mathematics	C	\$27,000	2016–2021	Ben Williams	

* The title of the grant is “The Topology, Geometry and Algebra of Projective Linear Groups”.

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

- (d) *Invited presentations (Since 2007):*

- University of Münster, summer school in unstable \mathbb{A}^1 homotopy theory, June 2016.
- University of Georgia, summer school in Topological Methods in Algebra, August 2016.

- (e) *Contributed presentations (since 2000):*

- **Algebraic-Geometric and homotopical methods:** Institut Mittag–Leffler, Stockholm, Sweden, May 2019
- **Israeli National Algebra & Number Theory day:** Haifa, Israel, June 2018.
- **AMS Sectional Meeting, special session on motivic homotopy theory:** Portland, Oregon, April 2018.
- **Mittag–Leffler Institute, Semester on algebraic-geometric and homotopical methods:** Stockholm, Sweden, February 2017.
- **ABC Seminar:** Edmonton, Alberta, Canada, 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 \mathbb{A}^1 homotopy of spheres:** Essen, Germany, June 2014.
- **AIM workshop on \mathbb{A}^1 homotopy and projective modules:** AIM, Palo Alto, May 2014.
- **Midwest Topology Seminar:** IUPUI, Indianapolis, April 2014.
- **Joint Mathematics Meeting:** San Diego, January 2013.
- **Southern California Algebraic Geometry Symposium:** California Institute of Technology, Pasadena, California, November 2012.
- **AMS Special Session on Homotopy Theory:** Riverside, California, November 2009
- **Cascade Topology Seminar:** Eugene, Oregon, October 2009
Applying Motivic Cohomology to Problems in Commutative Algebra.

The following are all invited talks at departmental seminars or similar:

- **University of British Columbia,** – November 2017
- **Reed College, Portland, Oregon,** – October 2017

- **University of Calgary** – September 2017
- **University of British Columbia** – March 2016
- **University of Western Ontario** – March 2016
- **University of Illinois, Urbana–Champaign** – February 2016
- **University College Dublin**– January 2016
- **University of Victoria** – April 2015
- **University of Melbourne** – December 2014
- **Purdue University** – November 2014
- **Wayne State University** – Topology Seminar: April 2014
- **The Ohio State University** – K -theory Seminar: April 2014
- **The University of British Columbia** – Topology Seminar: October 2012, January 2014 (two occasions)
- **The University of Southern California** – Algebra Seminar: September 2012
On the Existence of Azumaya Maximal Orders
- **California Institute of Technology**: Pasadena, California, November 2011
The Tate-suspension of projective space and the higher Chow groups of GL_n .
- **Universität Osnabrück** – Joint Algebra & Topology Seminar: July 2011
Using the Bar Construction to Compute Algebraic Cohomology Theories
- **The University of Southern California** – Joint Algebra & Topology Seminar: September 2010
Motivic Cohomology and Problems in Commutative Algebra
- **The University of Chicago** — Topology Seminar: May 2010
Applying Motivic Cohomology to Problems in Commutative Algebra
- **The University of Kansas** — Algebra Seminar: April 2010
Applying Motivic Cohomology to Problems in Commutative Algebra
- **Wayne State University** — Topology Seminar: March 2010
The Motivic Cohomology of Spaces of Long Exact Sequences

(f) *Other:*

(g) *Conference organization:*

- 58th Cascade Topology Seminar, UBC, May 2017, Organizer of a weekend conference.
- Mathematical Congress of the Americas, Special Session on Group Cohomology, Organizer,

(h) *Other:* (e.g. visitors)

10. SERVICE TO THE UNIVERSITY

(a) *Memberships on committees, including offices held and dates*

- Member of Department of Mathematics Research Affairs Committee, 2015–present. Including membership of subcommittees on workloads (2016) and on CoI policy in hiring (2017).
- Member of Merit Committee, 2017.

(b) *Other service, including dates*

- Organizer of Topology and Related Topics Seminar 2015–

11. **SERVICE TO THE COMMUNITY**

- (a) *Memberships on scholarly societies, including offices held and dates*
- (b) *Memberships on other societies, including offices held and dates*
- (c) *Memberships on scholarly committees, including offices held and dates*
- (d) *Memberships on other committees, including offices held and dates*
- (e) *Editorships (list journal and dates)*
- (f) *Reviewer (journal, agency, etc. including dates) Journals:*
 - I am currently a reviewer for the AMS MathReviews.
- (g) *External examiner (indicate universities and dates)*
 - PhD (Mathematics, University of Illinois at Chicago) exam committee member for Xing Gu, June 2017.
- (h) *Consultant (indicate organization and dates)*
- (i) *Other service to the community*

12. **AWARDS AND DISTINCTIONS**

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

13. **OTHER RELEVANT INFORMATION** (Maximum One Page)

THE UNIVERSITY OF BRITISH COLUMBIA

Publications Record

Date: 5th April 2020

Initials: TBJW

Surname: Williams

First Name: Thomas

Middle Name(s): Benedict Joachim

Notes:

- Student authors are underlined.
- In mathematics authors are typically listed alphabetically.
- Coauthors have, on average, made equal contributions to the work.

1. **REFEREED PUBLICATIONS**

(a) Journals

1. U. First, B. Williams *Involutions of Azumaya Algebras*, to appear in Documenta Mathematica.
2. C. Okay, B. Williams *On the mod- ℓ homology of the classifying space for commutativity*, to appear in Algebraic & Geometric Topology.
3. A. K. Shukla, B. Williams *Classifying spaces for étale algebras with generators* (joint with Abhishek Kumar Shukla); Canadian Journal of Mathematics, published online March 2020.
4. A. Asok, J. Fasel, B. Williams *Motivic spheres and the image of Suslin's Hurewicz map*, Inventiones Mathematicae, **219** (2020) 39–73.
5. K. Wickelgren, B. Williams *The Simplicial EHP Sequence in \mathbb{A}^1 -Algebraic Topology*, Geometry & Topology **23** (2019) 1691–1777.
6. A. Auel, U. First, B. Williams: *Azumaya algebras without involution*, Journal of the European Mathematical Society **21** (2019) 897–921.
7. A. Asok, K. Wickelgren, B. Williams: *The Simplicial Suspension Sequence in \mathbb{A}^1 -homotopy*, Geometry & Topology **21** (2017) 2093–2160.
8. 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.
9. B. Antieau and B. Williams: *Topology and purity for torsors*, Documenta Mathematica, **20** (2015), 333–335.
10. 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.
11. B. Antieau and B. Williams: *The Period-Index Problem for Twisted Topological K-Theory*, Geometry & Topology **18** (2014) 1115–1148.
12. B. Antieau and B. Williams: *Unramified division algebras do not always contain Azumaya maximal orders*, Inventiones Mathematicae **197** (2014) 47–56.
13. B. Williams: *The \mathbb{G}_m -Equivariant Motivic Cohomology of Stiefel Varieties*; Algebraic & Geometric Topology **13** (2013) 747–793.

14. B. Antieau and B. Williams: *Godeaux–Serre Varieties and the Étale Index*, Journal of K -theory, **11** (02) April 2013, pp. 283–295.
15. B. Antieau and B. Williams: *The Topological Period–Index Problem over 6–Complexes*, Journal of Topology, **7** (2014) 617–640.
16. 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.
17. B. Williams: *The Motivic Cohomology of Stiefel Varieties*; Journal of K -theory **10**, 1 (2012), 141–163.

(b) Conference Proceedings (Refereed)

2. NON-REFEREED PUBLICATIONS

3. BOOKS

(a) Chapters

- K. Wickelgren, B. Williams
- Unstable motivic homotopy theory
- (42 pages out of 982 pages total)

4. PATENTS

5. SPECIAL COPYRIGHTS

6. ARTISTIC WORKS, PERFORMANCES, DESIGNS

7. OTHER WORKS

8. WORK SUBMITTED (including publisher and date of submission)

- (a) B. Antieau, B. Williams *The topological period-index conjecture*, submitted to International Mathematical Review Notices.

9. WORK IN PROGRESS (including degree of completion)

- (a) B. Williams *Bounding the minimal number of generators of an Azumaya algebra*, expected completion April 2020.
- (b) T. Nam, C. Tan, B. Williams *Spaces of generators for endomorphism algebras with involution*, expected completion April 2020.
- (c) A. Auel, U. First, B. Williams *Note on Norm Algebras*, expected completion Summer 2020.