

**THE UNIVERSITY OF BRITISH COLUMBIA***Curriculum Vitae for Faculty Members***Date:** August 25, 2020    **Initials:** PAST

1. **SURNAME:** Songhafou Tsopméné                      **FIRST NAME:** Paul Arnaud
2. **DEPARTMENT/SCHOOL:** Department of Computer Science, Mathematics, Physics and Statistics
3. **FACULTY:** Irving K. Barber Faculty of Science
4. **PRESENT RANK:** Assistant Professor of Teaching    **SINCE:** Sept. 2020

**5. POST-SECONDARY EDUCATION**(a) *Degrees:*

University or Institution	Degree	Subject Area	Dates
Université catholique de Louvain	Ph.D.	Mathematics, Algebraic Topology	2010 – 2014
University of Yaoundé I	M.Sc.	Mathematics, Geometry	2006 – 2008
University of Dschang	B.Sc.	Mathematics	2003 – 2006

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

Ph.D. Thesis: “Gerstenhaber Algebras and the Homology of Spaces of Long Knots and Long Links”  
 Supervisor: Pascal Lambrechts

(c) *Certificates:*

University of Regina	Teaching Certificate in Teaching and Learning	Winter 2020
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**6. EMPLOYMENT RECORD**

(a) Prior to coming to UBC:

University, Company or Organization	Rank or Title	Dates
University of Regina	Postdoctoral Fellow	Sept. 2018 – April 2020
University of Regina	PIMS Postdoctoral Fellow	Sept. 2016 – Aug. 2018
Université catholique de Louvain	Teaching Assistant	Dec. 2009 – June 2016

(b) At UBC:

Rank or Title	Dates
Assistant Professor of Teaching	Sept. 2020 –

**7. TEACHING AND SUPERVISION**(a) *Areas of special interest and accomplishments*

**Teaching Interests.** My primary teaching interests lie in Calculus, (Linear) Algebra, Mathematical Analysis and Topology. I am also interested in Statistics and Probability.

**Accomplishments.** While teaching Calculus at the University of Regina from the winter of 2018 to the winter of 2020, I wrote three solutions manuals for Calculus I (108 pages), Calculus II (139 pages) and Applied Calculus I (102 pages). These include:

- A wide variety of practice problems organized in such a way that students can learn gradually.
- Complete solutions to practice problems. These are well explained step by step so that students can easily understand what is going on.

- A review of the theory. The theory related to every concept is briefly reviewed along the way (and at the right moment), the idea being not only to show to students how to apply it but also to facilitate the understanding of solutions.

(b) *Instructor, UBC*

Session	Course number	Course name	Hours/wk	Class size
W 2020 T2	MATH 116	Calculus I	3	116
W 2020 T2	MATH 142	Calculus II	3	80
W 2020 T1	MATH 116	Calculus I	3	225
W 2020 T1	MATH 221	Matrix Algebra	3	100

(c) *Instructor, University of Regina*

Session	Course number	Course name	Hours/wk	Class size	Student evaluation
Winter 2020	MATH 111	Calculus II	2.5	56	3.8/4
Fall 2019	MATH 103	Applied Calculus I	2.5	35	3.7/4
Winter 2019	MATH 842	Algebraic Topology	2.5	4	n/a
Fall 2018	MATH 110	Calculus I	2.5	105	3.6/4
Winter 2018	MATH 110	Calculus I	2.5	102	3.7/4
Winter 2018	MATH 305	Introductory Mathematical Analysis	2.5	16	3.8/4
Winter 2017	MATH 842	Algebraic Topology	2.5	5	n/a
Fall 2016	MATH 122	Linear Algebra I	2.5	98	3/4

(d) *Instructor, African Institute for Mathematical Sciences (AIMS)–Cameroon*

I taught the following course with Donald Stanley for three weeks.

Session	Course number	Course name	Hours/wk	Class size	Student evaluation
Nov. 2017	n/a	Algebraic Topology	10	22	n/a

(e) *Teaching Assistant, Université catholique de Louvain (UCL)*

Below is the list of courses taught (in average six hours per week) as a TA at UCL. Also **co-author of certain notes** for summer courses delivered during the period of 2011–2014.

Session	Course number	Course name
Winter-Spring 2016	MQANT 1221	Statistical Inference Louvain School of Management (LSM)
Winter-Spring 2016	MQANT 1113	Probability and Statistics I (LSM)
Winter-Spring 2016	MMETH 1109	Statistics with Probability for Political and Social Sciences (LSM)
Fall 2015	LBIR1100	General Mathematics I - Analysis <sup>1</sup>
Winter 2011 – 2015	LMAT1161	Mathematical Methods for Classical Mechanic
Fall 2011–2014	LMAT 2110	Differential Geometry (for graduate students)
Fall 2010–2014	LECGE 1112	Mathematics in Economics and Management
Fall 2011, 2012	LFSAB 1109	Introduction to Geometry for engineers
Winter 2010, 2011	LMAT 1111	General Mathematics - Algebra
Fall 2010	LMAT 1111	General Mathematics - Analysis
Fall 2010	LINGE 1121	Algebra and Matrices
Winter 2010	LFSAB 1102	Mathematics II for engineers

<sup>1</sup>This was a special course as my duties were two-fold: (1) identify and fix mathematical issues most often encountered by students and (2) propose new pedagogical approaches.

(f) *Other Teaching Experiences*

- **PreCalculus (volunteer)**, University of Regina, Sept. 2018.
- **Teaching Assistant (unofficial)**, Algebraic Topology, University of Yaoundé I, Feb. 2009 – June 2009.
- **Founded the Epsilon Institute** in October 2007, Yaoundé, Cameroon.
  - Taught a wide variety of mathematics courses there (most of them in the math major) from October 2007 to November 2009.
  - Courses taught: Calculus I, II & III, Linear Algebra I & II, Abstract Algebra, Analysis I, Vector Geometry, Logic, Euclidean Geometry, Differential Equations, Probability and Statistics, Partial Differential Equations, General Topology, etc.
  - The institute stopped working in 2010 due to my departure to Belgium.
- **Private Tutoring**, Dschang and Yaoundé, Cameroon, Oct. 2005 – Nov. 2009.  
Courses taught: College Algebra, Trigonometry, PreCalculus, Calculus I & II, Linear Algebra I, General Statistics and Probability, General Chemistry, Introductory General Physics, etc.

(g) *Supervision*

The following is the list of students I supervised at AIMS-Cameroon (it was remotely).

Student name	Program type	Start	Finish	Supervisory role
P. K. Tiotsop Kadzue	Master I Mathematics	April 2019	June 2019	Supervisor
I. Aderogba Mustapha	Master I Mathematics	April 2018	June 2018	Co-supervisor
A. Ngopnang Ngompé	Master I Mathematics	April 2018	June 2018	Co-supervisor

8. **SCHOLARLY AND PROFESSIONAL ACTIVITIES**(a) *Areas of special interest and accomplishments*

My research interests lie in algebraic topology, with a focus on embeddings. I have been applying manifold calculus to study various spaces of embeddings, including spaces of knots and links. I have also been developing the general theory of manifold calculus of functors. Manifold calculus is a branch of a more general theory called calculus of functors. The basic idea in this theory is to take a functor between suitable categories and replace it by its Taylor tower, which converges to the original functor in good cases, much like the approximation of a function  $f: \mathbb{R} \rightarrow \mathbb{R}$  by its Taylor series. Manifold calculus specializes in the study of functors from the poset  $\mathcal{O}(M)$  of open subsets of a manifold  $M$  to the category of topological spaces.

Keywords: spaces of embeddings, knots, links, operads, calculus of functors, manifold calculus, homotopy theory, graph complexes.

(b) *Research or equivalent grants*

- COMP indicates whether grants were competitive (C) or non-competitive (NC)
- All values in CAD and represent total value over entire funding period.

Granting agency	Title	COMP	Value (CAD)	Dates	Principal investigator(s)	Co-investigator(s)
UBC	Startup funds	NC	\$10,000	Sept. 2020 –	Tsopméné	
PIMS workshop	Arithmetic topology	NC	\$750	June 2019	Tsopméné	
PIMS conference	Topology	NC	\$1264	June 2019	Frankland	Stanley, Tsopméné
PIMS	Postdoctoral Scholarship	C	\$20,000	Sept 2017 – Aug 2018	Tsopméné	Stanley
PIMS	Postdoctoral Scholarship	C	\$20,000	Sept 2016 – Aug 2017	Tsopméné	Stanley
F.R.S. - FNRS	Visitor	C	\$2030	Jan 2015	Tsopméné	

(c) *Invited presentations***Invited Conference presentations**

1. Connection between embeddings and combinatorics. Workshop on Polyhedral Products in Homotopy Theory, Fields Institute, Toronto, January 2020.

**Invited Seminars and Colloquia Presentations**

16. Connection between embeddings and combinatorics. Symplectic Seminar, University of Toronto, Jan. 2020.
15. Connection between embeddings and combinatorics, Colloquium, University of Regina, Jan. 2020.
14. Cosimplicial models for manifold calculus. Workshop on Functor Calculus, Ohio State University, March 2019.
13. Manifold calculus of functors. University of Louisiana at Lafayette Topology Seminar, Feb. 2019.
12. Cosimplicial models for manifold calculus. CMS Meeting, Topology session, Vancouver, Dec. 2018.
11. Manifold calculus. Kansas State University Topology Seminar, Nov. 2018.
10. Classification of very good homogeneous functors. University of Victoria Topology Seminar, April 2017.
9. Cosimplicial models for manifolds calculus. University of Oregon Topology Seminar, Feb. 2017.
8. Goodwillie-Weiss Manifold Calculus and Applications. Colloquium, University of Regina, Oct. 2016.
7.  $E_n$ -operads and spaces of embeddings. Mini Course, Summer School on Rational Homotopy Theory and its Interactions, University of Rabat, Morocco, July 2016.
6. Hodge decomposition in the homology of high string links. University of Paris 13 Topology Seminar, April 2015.
5. Gerstenhaber algebra structure in the homology of the space of long knots. Colloquium, Kansas State University, Jan. 2015.
4. Cosimplicial models for spaces of embeddings. University of Haifa Topology Seminar, Dec. 2014.
3. Goodwillie-Weiss calculus: spaces of embeddings. Mini Course, Hebrew University of Jerusalem, Dec. 2014.
2. Cosimplicial models for spaces of embeddings. EPFL Topology Seminar, Nov. 2014.
1. Multiplicative formality of the Kontsevich operad and Gerstenhaber algebras. University of Lille 1 Topology Seminar, June 2013.

(d) *Other presentations***Contributed Conference presentations**

10. Euler characteristics for spaces of string links and the modular envelope of  $\mathcal{L}_\infty$ . Workshop on Arithmetic Topology, University of British Columbia (UBC), June 2019.
9. Manifold calculus. Saskatchewan Topology Meeting, University of Regina, July 2018.

8. Classification of homogeneous functors in manifold calculus. Conference on Graph Complexes, Configuration Spaces and Manifold Calculus, UBC, May 2018.
7. Generalization of Goodwillie-Weiss manifold calculus. Galapagos Conference, Topology Ecuador 2017, Aug. 2017.
6. Very good homogeneous functors in manifold calculus. PIMS YRC, University of Saskatchewan, June 2017.
5. The rational homology of spaces of long links. Conference on Manifolds, K-Theory, and Related Topics, Dubrovnik, June 2014.
4. Formalité multiplicative de l'opérade de Kontsevich et structure d'algèbre de Gerstenhaber. Colloque 2013 du GDR 2875, Topologie Algébrique et Applications, University of Angers, Oct. 2013.
3. Sullivan's minimal model. Symposium on the rational homotopy theory, University of Nice and Sophia-Antipolis, Dec. 2012.
2. Multiplicative operads up to homotopy. Young Topologists Meeting, University of Copenhagen, July 2012.
1. Little  $n$ -cubes operads, Poisson algebra and long knots. Young Topologists Meeting, EPFL, June 2011.

### Contributed Seminars and Colloquia presentations

9. Homotopy limits and colimits. University of Regina Topology Seminar, Nov. 2019.
8. Simplicial model categories. University of Regina Topology Seminar, Oct. 2019.
7. Simplicial categories and the hammock localization. University of Regina Topology Seminar, Oct. 2019.
6. Derivatives of functors in manifold calculus. University of Regina Topology Seminar, April 2019.
5. Operads and chain rules for the calculus of functors, Part 2. University of Regina Topology Seminar, Feb. 2019.
4. Operads and chain rules for the calculus of functors. University of Regina Topology Seminar, Jan. 2019.
3. Cosimplicial models for manifold calculus. University of Regina Topology Seminar, Dec. 2018.
2. Bar constructions for topological operads and the Goodwillie derivatives of the identity, Part II. University of Regina Topology Seminar, Oct. 2018.
1. Bar Constructions for topological operads and the Goodwillie derivatives of the identity. University of Regina Topology Seminar, Oct. 2018.

#### (e) *Conferences, Seminars, Spring/Summer School and Workshops attended*

- 1st Canadian Geometry and Topology Seminar, Fields Institute, Toronto, March 2018.
- Conference, Topology of Manifold, Celebration of Micheal Weiss 60th Birthday, University of Lisbon, June 2016.
- Workshop, Functor Calculus, University of Munster, June 2015.
- Conference, Loop Spaces in Geometry and Topology, Université de Nantes, Sept. 2014.
- Summer School, Category Theory and Algebraic Topology, EPFL, Sept. 2014.
- Conference, Higher Algebras and Lie-Infinity Homotopy Theory, University of Luxembourg, June 2013.
- Conference, Homotopical Algebra and its Applications, a Celebration of Yves Félix 60th birthday, CIRM, Marseille, June 2012.
- Conference, Rational Homotopy Theory, Oberwolfach, April 2011.
- Spring School, Applied and Toric Topology, University of Malaga, May 2010.

## 9. SERVICE

- Co-organizer. Topology Mini-Conference, University of Regina, June 2019.
- Co-organizer. Topology Session at the CMS Summer Meeting, University of Regina, June 2019.

- Co-organizer. Conference on Graph Complexes, Configuration Spaces and Manifold Calculus University of British Columbia, May 2018.
- Judge. Regina Regional Science Fair, University of Regina, March 2018.
- Reviewer. AMS Mathematical Reviews reviewer for papers in: Tunisian Journal of Mathematics; Israel Journal of Mathematics; Annales de l'Institut Fourier; Journal of Topology, 2018 – Present.
- Member. Thesis Committee for one Graduate Student, University of Regina, June 2017.
- Referee. Referee for papers in: Quarterly Journal of Mathematics; J. Homotopy Relat. Struct (2 papers); Colloquium Mathematicum, 2016 – Present.
- Co-organizer. Algebraic Topology Seminar, Université catholique de Louvain (UCL), Fall 2015.
- Member. “Institut de Recherche en Mathématiques et Physique” (IRMP) Board, UCL, 2012 – 2014.
- Teaching Assistant Coordinator. UCL, 2014.

#### 10. **LANGUAGES**

- French (native)
- English (fluent)
- Spanish (basic)
- Balessing (vernacular)

**THE UNIVERSITY OF BRITISH COLUMBIA***Publications Record***Surname:** Songhafou Tsopméné**First Name:** Paul Arnaud**Initials:** PAST**Date:** August 25, 2020**REFEREED PUBLICATIONS**

8. P. A. Songhafou Tsopméné and D. Stanley. Very good homogeneous functors in manifold calculus. *Colloquium Mathematicum* 158 (2019), no. 2, 265–297.
7. P. A. Songhafou Tsopméné and D. Stanley. Polynomial functors in manifold calculus. *Topology Appl.* 248 (2018), 75–116.
6. P. A. Songhafou Tsopméné and V. Turchin. Rational homology and homotopy of high dimensional string links. *Forum Math.* 30 (2018), no. 5, 1209–1235.
5. P. A. Songhafou Tsopméné and V. Turchin. Euler characteristics for spaces of string links and the modular envelope of  $\mathcal{L}_\infty$ . *Homology Homotopy Appl.* 20 (2018), no. 2, 115–144.
4. P. A. Songhafou Tsopméné. Symmetric multiplicative formality of the Kontsevich operad. *J. Homotopy Relat. Struct.* 13 (2018), no. 1, 225–235.
3. P. A. Songhafou Tsopméné. The rational homology of spaces of long links. *Algebr. Geom. Topol.* 16 (2016), no. 2, 757–782.
2. P. A. Songhafou Tsopméné. McClure-Smith cosimplicial machinery and the cacti operad. *Topology Appl.* 193 (2015), 31–50.
1. P. A. Songhafou Tsopméné. Formality of Sinha’s cosimplicial model for long knots spaces and the Gerstenhaber algebra structure of homology. *Algebr. Geom. Topol.* 13 (2013), no. 4, 2193–2205.

**WORK SUBMITTED**

1. P. A. Songhafou Tsopméné and D. Stanley. Classification of homogeneous functors in manifold calculus. arXiv:1807.06120. (Submitted April 2020.)

**WORK IN PROGRESS**

5. P. A. Songhafou Tsopméné and D. Stanley. Classification of polynomial functors in manifold calculus. Part I, Preprint. 2019, arXiv:1903.06301. Work in Progress, 90% complete.
4. P. Boavida de Brito, P. Lambrechts, D. Pryor and P. A. Songhafou Tsopméné. Cosimplicial models for manifold calculus. Work in Progress, 90% complete.
3. P. A. Songhafou Tsopméné and D. Stanley. Classification of polynomial functors in manifold calculus, Part II. Work in Progress.
2. P. A. Songhafou Tsopméné and D. Stanley. Manifold calculus and triangulated categories. Work in Progress.
1. J. Ducoulombier and P. A. Songhafou Tsopméné. Swiss-Cheese algebra structure on the Hochschild homology of cosimplicial models for long knots and long links. Work in Progress.