

# CURRICULUM VITAE

## VINCENT TABARD-COSSA



**DATE OF BIRTH:** DECEMBER 6<sup>TH</sup> 1977

**PLACE OF BIRTH:** RIMOUSKI (QUÉBEC)

**COUNTRY OF CITIZENSHIP:** CANADA, FRANCE

**LANGUAGES:** FRANÇAIS, ENGLISH

**DEPARTMENT OF PHYSICS**

**UNIVERSITY OF OTTAWA**

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### DEGREES:

Ph.D. Physics, McGill University, Canada, 2006.

B.Sc. Physics, McGill University, Canada, 2000.

### EMPLOYMENT HISTORY:

2022-present	Full Professor, Department of Physics, University of Ottawa.
2022-present	Cross-appointed, Department of Chemistry and Biomolecular Sciences, University of Ottawa.
2021-present	Member of the Ottawa-Carleton Institute of Biomedical Engineering.
2020-2023	Co-founder and Chief Scientific Officer (part-time), Northern Nanopore Instruments.
2015-2022	Associate Professor, Department of Physics, University of Ottawa.
2017-2022	Cross-appointed, School of Electrical Engineering and Computer Science, University of Ottawa.
2016-2020	Adjunct Professor, Department of Physics, McGill University.
2010-2015	Assistant Professor, Department of Physics, University of Ottawa.
2010-2010	Visiting Scholar, Physics Department, McGill University.
2010-2010	Consultant, Stratos Genomics.
2008-2010	Postdoctoral Fellow, Department of Electrical Engineering and Biochemistry, Stanford Genome Technology Center, Stanford University.
2006-2008	Postdoctoral Fellow, Department of Physics and Astronomy, University of British Columbia.

### ACADEMIC HONOURS:

- Department of Physics Faculty Award for Excellence in Mentorship 2023.

- University Research Chair in Nanoscale Biophysics and Nanopore Science 2022-2027.
- Canadian Association of Physicists (CAP) Industrial and Applied Physics Medal 2021.
- Member of the Royal Society of Canada's College of New Scholars, Artists and Scientists, 2019.
- University of Ottawa Young Researcher of the Year Award, 2017-2018.
- Ontario Early Researcher Award, 2016.
- Rising Young Investigator Award, Genome Technology Magazine, 2009.

#### **Referee, Editorial and Event Administration Activities:**

- Member of the Executive Committee of the Biophysical Society of Canada, 2022-present.
- Subject Editor (2020-2023), Editorial Board Member, FACETS - Canada's first multidisciplinary and interdisciplinary open access science journal.
- Member of National Human Genome Research Institute (NHGRI) special emphasis panel for their Advanced Nucleic Acid Sequencing Technology 2018, 2019, 2020 and 2021 competition.
- Organizing Committee, 2022 BSC Conference (Biophysical Society of Canada) May 2022
- Program committee, ICN+T 2020/2021 in Vancouver (International Conference on Nanoscience and Technology, Conference, 2021/7 - 2021/7
- Organizing Committee, 2016 CAP Congress (Canadian Association of Physicists), Conference, 2016/6 - 2016/6
- Member of the NSERC Research Tools and Instrumentations (RTI) Review Committee (Physics - 1605) for the 2016-2017 competition.

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#### **PUBLICATIONS:**

1) Life-time summary:	
- Papers in <u>refereed</u> journal.....	59
- Papers in <u>refereed</u> conference proceedings .....	3
- Book Chapters .....	2
- Patents .....	5
2) Details for past 8 years:	
- Papers in <u>refereed</u> journal.....	32
- Book Chapters .....	1
- Patents .....	4

#### **Non-Refereed Publications & Book Chapters**

[3] K Briggs, M Waugh, V Tabard-Cossa – Chapter 1: “Fabricating Solid-State Nanopores for Single-Molecule Sensing” in Solid State Nanopores: From Fabrication to Biosensing, pages 1-33, Springer International Publishing (2023)

[2] Ying, YL; Ivanov, A.P.; Tabard-Cossa, V. “*No small matter*”, Nature Chemistry 13, 216–217 (2021). [Invited meeting report]

[1] Tabard-Cossa, V. “*Engineered Nanopores for Bioanalytical Applications - Chapter 3: Instrumentation for Low-Noise High-Bandwidth Nanopore Recording*” pages 59-88 editors: Edel, J. B. and Albrecht, T.; Elsevier

(2013)

**Refereed Publications** (HQPs underlined):

[59] Z Roelen, V Tabard-Cossa "Synthesis of length-tunable DNA carriers for nanopore sensing" Plos One 18 (8), e0290559 (2023)

[58] Mohamed Yassine Bouhamidi, Dmytro Lomovtsev, Gengyang Mu, Martin Charron, Matthew Waugh, Vincent Tabard-Cossa "Characterizing Surface Charge Density of Solid-State Nanopore Sensors for Improved Biosensing Applications" IEEE Sensors Applications Symposium (SAS), 1-5 (2023)

[57] Z Roelen, K Briggs, V Tabard-Cossa "Analysis of nanopore data: classification strategies for an unbiased curation of single-molecule events from DNA nanostructures" ACS sensors 8 (7), 2809-2823 (2023)

[56] Liqun He, Martin Charron, Philipp Mensing, Kyle Briggs, Jonathan Adams, Hendrick de Haan, Vincent Tabard-Cossa "DNA origami characterized via a solid-state nanopore: insights into nanostructure dimensions, rigidity and yield" Nanoscale 15 (34), 14043-14054 (2023)

[55] Charron, M.; Philipp, L.; He L.; Tabard-Cossa, V. "Elucidating the Dynamics of Polymer Transport through Nanopores using Asymmetric Salt Concentrations." Nano Research 15, 9943–9953 (2022).

[54] Aoife Reilly, Marc-Olivier Deguise, Ariane Beauvais, Rebecca Yaworski, Simon Thebault, Daniel R. Tessier, Vincent Tabard-Cossa, Niko Hensel, Bernard L. Schneider & Rashmi Kothary "Central and peripheral delivered AAV9-SMN are both efficient but target different pathomechanisms in a mouse model of spinal muscular atrophy" Gene Therapy (2022).

[53] King, S.; Briggs, K.; Slinger, R.; Tabard-Cossa, V. "Screening for Group A Streptococcal disease via Solid-State Nanopore Detection of PCR Amplicons." ACS Sensors 7, 1, 207-214 (2022).

[52] Carlsen, A.; Tabard Cossa, V. "Mapping shifts in nanopore signal to changes in protein and protein-DNA conformation", Proteomics 22, 5-6 (2022) – Special Issue: Protein detection and characterization with nanopore sensors

[51] Briggs, K.; Bouhamidi, M.Y.; He, L.; Tabard-Cossa, V. "Efficient simulation of arbitrary multi-component first-order binding kinetics for improved assay design and molecular assembly". ACS Measurement Science Au 2, 2, 139-146 (2022); webapp at: <https://bindingassay.herokuapp.com/>

[50] He, L.; Tessier, D.; Briggs, K.; Tsangaris, M.; Charron, M.; Lomovtsev, D.; McConnell, E.; Tabard-Cossa, V. "Digital Immunoassay for Biomarker Concentration Quantification using Solid-State Nanopores" Nature Communications 12, 5348 (2021).

[49] Chelsea Leung, Kyle Briggs, Marie-Pier Laberge, Smile Peng, Matthew Waugh, and Vincent Tabard-Cossa "Mechanisms of solid-state nanopore enlargement under electrical stress" Nanotechnology 31(44) (2020) – 1 citation.

[48] Thebault S, Abdoli M, Fereshtehnejad SM, Tessier D, Tabard-Cossa V, Freedman MS. "Serum neurofilament light chain predicts long term clinical outcomes in multiple sclerosis." Scientific Reports 10(1): 1-11 (2020) – 18 citations.

[47] Eric Beamish, Vincent Tabard-Cossa and Michel Godin. "Digital Counting of Nucleic Acid Targets using Solid-State Nanopores." Nanoscale 12(34): 17833-17840 (2020) – 1 citation.

[46] Sohi A, Beamish E, Tabard-Cossa V, Godin M. "DNA Capture by Nanopore Sensors under Flow." Analytical Chemistry. 92(12): 8108-8116. (2020) – 5 citations.

[45] Thebault S, Lee H, Tessier D, Bose G Bowman M, Bar-Or A, Arnold D, Atkins H, Tabard-Cossa V. Freedman MS. "Neurotoxicity after haematopoietic stem cell transplant for multiple sclerosis". Annals of

Clinical and Translational Neurology 7(5): 767-775 (2020) – 6 citations.

[44] Waugh, M.; Briggs, K.; Gunn, D.; Gibeault, M.; King, S.; Ingram, Q.; Jimenez, A. M.; Berryman, S.; Lomovtsev, D.; Pregliasco, G.; Andrzejewski, L.; Tabard-Cossa, V. “Solid-State Nanopore Fabrication by Automated Controlled Breakdown” Nature Protocols 15, 122–143 (2020) – received media coverage: <https://www.altmetric.com/details/72800793>, and an **animated video** explaining the results was produced: <https://media.uottawa.ca/news/uottawa-tool-democratize-nanopore-research> **40 citations**.

[43] Michelle H Lam, Kyle Briggs, Konstantinos Kastritis, Martin Magill, Gregory R Madejski, James L McGrath, Hendrick W de Haan, Vincent Tabard-Cossa. “Entropic Trapping of DNA with a Nanofiltered Nanopore.” ACS Applied Nano Materials. 23(8): 4773-4781 (2019) – 15 citations.

[42] Liqun He, Philipp Karau, Vincent Tabard-Cossa “Fast capture and multiplexed detection of short multi-arm DNA stars in solid-state nanopores.” Nanoscale. 11(35): 16342-16350 (2019) – 11 citations.

[41] Eric Beamish, Vincent Tabard-Cossa, Michel Godin. “Programmable DNA Nanoswitch Sensing with Solid-State Nanopores”. ACS Sensors. 4(9): 2458-2464 (2019) – 8 citations.

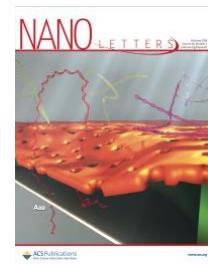
[40] Martin Charron, Kyle Briggs, Simon King, Matthew Waugh, Vincent Tabard-Cossa “Precise DNA Concentration Measurements with Nanopores by Controlled Counting”. Analytical Chemistry. 91(19): 12228-12237 (2019) – 16 citations.

[39] Madejski, G. R., Briggs, K., DesOrmeaux, J.-P., Miller, J. J., Roussie, J. A., Tabard-Cossa, V., McGrath, J. L., “Monolithic Fabrication of NPN/SiNx Dual Membrane Cavity for Nanopore-Based DNA Sensing” Adv. Mater. Interfaces 1900684, (2019) – 7 citations.

[38] Simon Thebault, Daniel Tessier, Hyunwoo Lee, Marjorie Bowman, Amit Bar-Or, Douglas Arnold, Harold Atkins, Vincent Tabard-Cossa, and Mark S Freedman “High Serum Neurofilament Light Chain normalises after Haematopoietic Stem Cell Transplant for MS” Neurology: Neuroimmunology & Neuroinflammation 6, 5, e598 (2019) – 21 citations.

[37] Karau, P.; Tabard-Cossa, V.; “Capture and Translocation Characteristics of Short Branched DNA Labels through Solid-State Nanopores” ACS Sensor 3, 7, 1308-1315 (2018) – 18 citations.

[36] Briggs, K.; Madejski, G.; Magill, M.; Kastritis, K.; de Haan, H.W.; McGrath, J.L.; Tabard-Cossa, V.; “DNA Translocations Through Nanopores Under Nanoscale Pre-Confinement” Nano Letters 18, 2, 660-668 (2018) – **Featured on the cover of the February 2018 issue and received significant media coverage (<https://acs.altmetric.com/details/30126833#score>) in particular from Materials Today.** A video, describing the operation of the nanofiltered nanopore device, is available at: <http://tcossalab.net/wp-content/uploads/Nanomembrane-Prefilter-Explained.mp4> - **48 citations**



[35] Roelen, R.; Bustamante, A. J.; Carlsen, A.; Baker-Murray, A.; Tabard-Cossa, V.; “Instrumentation for Low Noise Nanopore-based Ionic Current Recording under Laser Illumination” Review of Scientific Instruments, 89, 015007 (2018) – 15 citations.

[34] Beamish, E.; Tabard-Cossa, V.; Godin, M.; “Identifying Structure in short DNA scaffolds using solid-state nanopores” ACS Sensors 2 (12) 1814-1820 (2017) – 26 citations.

[33] Tabard-Cossa, V.; Briggs, K.; Carlsen, A.; Charron, M.; Karau, P.; Roelen, Z.; Waugh, M. "Nanopores: electronic tools for single-molecule biophysics and bio-nanotechnologies" **invited featured article** in special issue on Nanoscale Approaches to Biological Systems in Physics in Canada 73(2) (2017)

[32] Carlsen, A. T.; Briggs, K.; Hall, A. R.; Tabard-Cossa, V. "Solid-state nanopore localization by controlled breakdown of selectively thinned membranes" Nanotechnology 28 085304 (2017) – **selected to be part of the annual Highlights of 2017**, showcasing some of the best research of 2017 published in Nanotechnology – **41 citations**

[31] Tahvildari, R.; Beamish, E.; Briggs, K.; Chagnon-Lessard, S.; Najafi Sohi, A.; Han, S.; Watts, B.; Tabard-Cossa, V.; Godin, M. "Manipulating Electrical and Fluidic Access in Integrated Nanopore-Microfluidic Arrays Using Microvalves" Small 13, 1602601 (2017) – **Selected as a Frontpiece** – 26 citations.



[30] Forstater, J.H.; Briggs, K.; Robertson, J.W.F.; Ettedgui, J.; Marie-Rose, O.; Vaz, C.; Kasianowicz, J.J.; Tabard-Cossa, V.; Balijepalli, A. "MOSAIC: A Modular Single Molecule Analysis Interface for Decoding Multi-state Nanopore Data" Analytical Chemistry 88(23), 11900-11907 (2016) – **62 citations**

[29] Emaminejad, S.; Paik, K.; Tabard-Cossa, V.; Javanmard, M. "Portable cytometry using microscale electronic sensing" Sensors and Actuators B: Chemical 224, 275-281 (2016) – 18 citations.

[28] Morin, TJ; Shropshire, T.; Liu, X.; Briggs, K.; Huynh, C.; Tabard-Cossa, V.; Wang, H.; Dunbar, WB. "Nanopore-Based Target Sequence Detection" PLoS ONE. 11(5):e0154426 (2016) – 38 citations.

[27] Waugh, M.; Carlsen, A.; Sean, D.; Slater, G.; Briggs, K.; Kwok, H.; and Tabard-Cossa, V. "Interfacing Solid-State Nanopores with Gel Media to Slow DNA Translocations". Electrophoresis 36: 1759–1767 (2015) doi: 10.1002/elps.201400488 – 34 citations.

[26] Tahvildari, R.; Beamish, E.; Tabard-Cossa, V.; and Godin, M.; "Integrating nanopore sensors within microfluidic channel arrays using controlled breakdown" – Lab Chip 15, 1407-1411 (2015) – **66 citations**

[25] Briggs, K.; Charron, M.; Kwok, H.; Le T.; Chahal, S.; Bustamante, J.; Waugh, M.; and Tabard-Cossa, V. "Kinetics of Nanopore Fabrication by Controlled Breakdown of Dielectric Membranes in Solution". Nanotechnology 26 084004 (2015) – **79 citations**

[24] Kwok, H.; Waugh, M.; Bustamante, J.; Briggs and Tabard-Cossa, V.; "Long Passage Times of Short ssDNA Molecules through Metallized Nanopores Fabricated by Dielectric Breakdown" – Advanced Functional Materials, 24: 7745-7753 (2014) – 29 citations.

[23] Briggs, K.; Kwok, H.; and Tabard-Cossa, V.; "Automated Fabrication of 2-nm solid-state nanopore for nucleic acid analysis" – Small doi: 10.1002/smll.201303602 (2014) **Media coverage: featured in Sequence Genomeweb and Materials Views news article** – **128 citations**

[22] Kwok, H.; Briggs, K.; and Tabard-Cossa, V.; "Nanopore Fabrication by Controlled Dielectric Breakdown" – PLoS ONE 9(3): e92880. doi: 10.1371/journal.pone.0092880 (2014) – **297 citations**

[21] Beamish, E.; Kwok, H.; Tabard-Cossa, V.; and Godin, M.; "Fine-Tuning the Size and Minimizing the Noise of Solid-State Nanopores" – JOVE - J. Vis. Exp. (80), e51081, doi:10.3791/51081 (2013) – 23 citations.

[20] Beamish, E.; Kwok, K.; Tabard-Cossa, V.; and Godin, M.; "Precise control of the size and noise of solid-state nanopores using high electric fields" - Nanotechnology 23, 405301 (2012) – **90 citations**

[19] Paik, K. H.; Liu, Y.; Tabard-Cossa, V.; Waugh, M. J.; Huber, D. E.; Provine, J; Howe, R. T.; Dutton, R. W.; and Davis, R. W., "Control of DNA Capture by Nanofluidic Transistors" ACS Nano 6, 6767–6775 (2012) – **78 citations**

- [18] Jetha N. N., Feehan C., Wiggin M., Tabard-Cossa V., Marziali A., "Long dwell time passage of DNA through nanometer-scale pores: Kinetics and sequence dependence of motion" Biophysical Journal 100, 12, 2974-2980 (2011) – 12 citations.
- [17] Paik, K. H.; Liu, Y.; Tabard-Cossa, V.; Huber, D. E.; Provine, J.; Howe, R. T.; Dutton, R. W.; Davis, R. W. "Experimental Demonstration and Analysis of DNA Passage in Nanopore-based Nanofluidic Transistors" Conference Proceedings of the IEEE International Electron Devices Meeting (IEDM), Washington, USA (2011)
- [16] Paik, K. H.; Liu, Y.; Tabard-Cossa, V.; Huber, D. E.; Provine, J.; Howe, R. T.; Dutton, R. W.; Davis, R. W. "Efficient Control of DNA Motion and Translocation in Nanopore-based Nanofluidic Transistors" Conference Proceeding at the 15th Int. Conf. on Miniaturized Systems for Chemistry and Life Sciences ( $\mu$ TAS 2011) Seattle, USA, (2011)
- [15] Liu Y., Huber D., Tabard-Cossa V., Dutton R. W., "Descreening of field effect in electrically gated nanopores" Applied Physics Letters 97, 143109, 3 pages, (2010) – **44 citations**
- [14] Godin M.\*; Tabard-Cossa V.\*; Miyahara Y.; Monga T.; Williams P. J.; Beaulieu L. Y.; Lennox R. B.; Grütter P.; "Cantilever-Based Sensing: Origin of the Surface Stress and Optimization Strategies" Nanotechnology 21, 075501, 8 pages, (2010) \*These authors contributed equally to this work – **160 citations**
- [13] Tabard-Cossa V., Wiggin M., Trivedi D., Jetha N. N., Dwyer J. R., Marziali A., "Single-Molecule Bonds Characterized by Solid-State Nanopore Force Spectroscopy" ACS Nano 3 (10), 3009-3014 (2009) - **83 citations**
- [12] Branton D., Deamer D. W., Marziali A., Bayley H., Benner S. A., Butler T., Di Ventra M., Garaj S., Hibbs A., Huang X., Jovanovich S. B., Krstic P. S., Lindsay S., Ling X. S., Mastrangelo C. H., Meller A., Oliver J. S., Pershin Y. V., Ramsey J. M., Riehn R., Soni G. V., Tabard-Cossa V., Wanunu M., Wiggin M. & Schloss J. A.; "The potential and challenges of nanopore sequencing" Nature Biotechnology 26, 1146-1153 (2008) - **2638 citations**
- [11] Wiggin M.; Tropini C.; Tabard-Cossa V.; and Marziali A.; "Non-exponential kinetics of DNA escape from alpha-Hemolysin nanopores" Biophysical Journal 95, 5317–5323 (2008) - **59 citations**
- [10] Tabard-Cossa, V.; Godin, M.; Burgess, I.; Monga, T.; Lennox, R. B.; Grütter, P.; "Microcantilever-based Sensors: Effect of Morphology, Adhesion and Cleanliness of the Sensing Substrate on Surface Stress" Analytical Chemistry 79, 8136 -8143, (2007) - **81 citations**
- [9] Tabard-Cossa, V.; Trivedi, D.; Wiggin, M.; Jetha, N.; Marziali, A.; "Noise Analysis and Reduction in Solid-State Nanopores" Nanotechnology 18, 305505 (2007) - **307 citations**
- [8] Beaulieu L.Y.; Godin M.; Laroche O.; Tabard-Cossa V.; and Grütter P., "A complete analysis of the laser beam deflection systems used in cantilever-based systems" Ultramicroscopy 107, 422-430 (2007) – **60 citations**.
- [7] Beaulieu, L.Y.; Godin, M.; Laroche, O.; Tabard-Cossa, V.; Grütter, P.; "Calibrating Laser Beam Deflection Systems for use in Atomic Force Microscopes and Cantilever Sensors" Applied Physics Letters 88, 083108 (2006) – 36 citations.
- [6] Tabard-Cossa, V.; Godin, M.; Burgess, I.; Lennox, R. B.; Grütter, P.; "Redox-induced Surface Stress of Polypyrrole-based actuators" Journal of Physical Chemistry B 109 (37), 17531-17537 (2005) – **49 citations**.

[5] Tabard-Cossa, V.; Godin, M.; Beaulieu, L.Y.; Grütter, P.; "A Differential Microcantilever-Based System for Measuring Surface Stress Changes Induced by Electrochemical Reactions" Sensors and Actuators B 107, 233-241 (2005)– Erratum: Sensors and Actuators B 119, 352-354 (2006) – **82 citations**

[4] Godin, M.; Williams, P.J.; Tabard-Cossa, V.; Laroche, O.; Beaulieu, L.Y.; Lennox, R. B.; Grütter, P.; "Surface Stress, Kinetics, and Structure of Alkanethiol Self-Assembled Monolayers" Langmuir 20, 7090 (2004) – **Featured on the Langmuir journal cover - 226 citations**



[3] Quist, F.; Tabard-Cossa, V.; Badia, A. "Nanomechanical Cantilever Motion Generated by a Surface-Confining Redox Reaction" Journal of Physical Chemistry B 107, 10691-10695 (2003) – **49 citations**.

[2] Godin, M.; Laroche, O.; Tabard-Cossa, V.; Beaulieu, L.Y.; Grütter, P.; Williams, P.J.; "Combined in situ Micromechanical Cantilever-Based Sensing and Ellipsometry" Review of Scientific Instruments 74, 4902 (2003) – **50 citations**.

[1] Godin, M.; Tabard-Cossa, V.; Grütter, P.; Williams, P.; "Quantitative Surface Stress Measurements using a Microcantilever" Applied Physics Letter 79, 551 (2001) - **130 citations**.

### Intellectual Property:

[5] "Localizing Nanopore Fabrication on a Membrane by Laser Illumination during Controlled Breakdown" Publication number: WO2016135656A1 Application number: PCT/IB2016/051017 Inventors: Jose Bustamante, Kyle Briggs, Vincent Tabard-Cossa. Priority date: Feb 24, 2015. Patent Pending **Licensed**

[4] "Nanopore Fabrication within Microfluidic Channels". PCT/IB2015/059799. Inventors: Radin Tahvildari, Eric Beamish, Michel Godin, Vincent Tabard-Cossa. Priority date: Dec 19, 2014. **Issued and Licensed**

[3] "Fabrication of nanopores using high electric fields". Publication number: WO2013167955 A1. Application number: PCT/IB2013/000891. Inventors: Harold Kwok, Vincent Tabard-Cossa, Kyle Briggs. Priority date: May 7, 2012. **Issued and Licensed**

[2] "Method for controlling the size of solid-state nanopores". Publication number: WO2013167952 A1. Application number: PCT/IB2013/000884. Inventors: Michel Godin, Eric Beamish, Vincent Tabard-Cossa, Harold Kwok. Priority date: May 7, 2012. **Issued and Licensed**

[1] "Flow control method and apparatuses". Publication number: US20140090981 A1. Application number: US 14/043,710. Inventors: Kee-Hyun Paik, Yang Liu, Vincent Tabard-Cossa, Robert W. Dutton. Priority date: Oct 1, 2012. **Issued and Licensed**

DATE: May 27<sup>th</sup>, 2024