Antoine Belley | Curriculum Vitae

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Postdoctoral Fellow at the Massachusetts Institute of Technology.

Work Experience

- **Postdoctoral Fellow** — **MIT, USA**
  Supervisor: Prof. Ronald Fernando Garcia Ruiz — *Oct. 2024-*

Education

- **Doctor of Philosophy in Physics** — **Canada**
  University of British Columbia (UBC)/TRIUMF, Supervisor: Dr. Jason Holt — *2020-2024*
- **Bachelor of Science** — **Canada**
  McGill University — *2017-2020*
  First Class Honours in Mathematics and Physics with Distinction
- **Diplôme d'études collégiales** — **Canada**
  Collège Bois-de-Boulogne — *2015-2017*
  Pure and Applied Science

Publication summary

As of May 22, 2026:

- Principal author in high impact publications:
  - **Physical Review Letters** (3 published, 1 under review)
  - **Nature** (1 under review)
- **331 citations** on Google Scholar, h-index = 7, i10-index = 6
- **14 publications:**
  - 6 peer reviewed
  - 6 under review
  - 2 conference proceedings
  - **First author in 7 of these publications**
- Multiple publications in preparation including one with Review of Modern Physics

Community service

- **Referee for Nuclear Physics A, Physics Letter B, PRX and Nature**
- **Organizer** — **ECT*, Italy**
  Workshop on "Synergy between nuclear theory and quantum sensing experiments for fundamental physics" — *2027*
- **Organizer** — **ESNT, France**
  Workshop on "Theoretical and experimental developments for symmetry-violating nuclear properties" — *Jun. 2025*
- **VP Internal** — **McGill University, CA**
  McGill Society of Physics Students — *Sept. 2019 - May 2020*
- **VP Finance** — **McGill University, CA**
  Canadian Undergraduate Physics Conference 2019 (CUPC 2019) — *Oct. 2018 - Dec. 2019*

Supervision Experience

- Co-supervised 4 graduate students
- Co-supervised 11 undergraduate students

Teaching Experience

- **Teacher Assistant/Guest lecturer** — **TRIUMF, CA**
  UBC Phys505:Nuclear Physics — *Jan. 2023 - Apr. 2023*

Scholarships and Funding

- **NSERC Postdoctoral Fellowship [PDF]** — **MIT**
  $70,000/year — *2024-2026*
- **NSERC Alexander Graham Bell Canada Graduate Scholarships-Doctoral [CGSD]** — **UBC**
  $35,000/year — *2021-2024*
- **Four Year Doctoral Fellowship** — **UBC**
  Accepted in name only — *2021-2025*
- **Fonds de recherche du Québec - Bourses de maîtrise en recherche** — **UBC**
  $17,500/year, declined due to better funding — *2021-2022*
- **NSERC Alexander Graham Bell Canada Graduate Scholarships-Master's [CGSM]** — **UBC**
  $17,500/year — *2020-2021*
- **Undergraduate Research Scholarship - Canadian Institute of Nuclear Physics** — **TRIUMF**
  $4000 — *2019*
- **Fonds de recherche du Québec- Suppléments à la bourse BPC du CRSNG** — **McGill University**
  $2000 — *2018*
- **NSERC Undergraduate Student Research Awards [USRA]** — **McGill University**
  $4500 — *2018*

Awards and Distinctions

- **Carl H. Westcott Fellowship** — **TRIUMF**
  $11,000 — *2023*
  Yearly award given to one student affiliated to TRIUMF
- **Faculty of Science PhD Tuition Award** — **UBC**
  Tuition — *2021-2025*
- **President's Academic Excellence Initiative PhD Award** — **UBC**
  $1300/year — *2021-2025*
- **Best Presentation in Theoretical Physics** — **Winter Nuclear & Particle Physics Conference, Virtual**
  $500 — *2021*
- **First place - Physics Department Summer Student Poster Presentation** — **McGill University**
  $100 — *2019*
- **First prize in physical science** — **McGill Undergraduate Research Conference**
  $300 — *2018*
- **Second place - Physics Department Summer Student Poster Presentation** — **McGill University**
  $50 — *2018*

- **Travel Grant to CUPC 2018** — **Canadian Institute of Nuclear Physics**
  $500 — *2018*
- **Bourse persévérance et rayonnement** — **Collège Bois-de-Boulogne**
  $500 — *2017*
- **Prix Carolyne-Dion** — **Département de physique, Collège Bois-de-Boulogne**
  $100 — *2017*
  Awards chosen by the students for the volunteer help given to his peers

Presentations

Invited Seminars and Colloquia

- **Sun Yat-sen University Physics Seminars** — **Virtual**
  Applications of machine learning emulators in nuclear physics. — *May 6 2026*
- **Institute of Theoretical Physics Seminars** — **Ruhr-Universität Bochum, DE**
  Applications of machine learning emulators in nuclear physics. — *Jan. 29 2026*
- **Neutrinoless Double Beta Decay Hub @NDB Seminars** — **Virtual**
  Ab initio theory towards reliable neutrinoless double beta decay nuclear matrix elements. — *Dec. 5 2025*
- **Saint-Mary's University Physics Colloquium** — **Virtual**
  Using the atomic nucleus as a probe for BSM physics. — *May 26 2025*
- **Institute for Nuclear Theory - Rising Researcher Seminar** — **Virtual**
  Using the atomic nucleus as a probe for BSM physics. — *Feb. 11 2025*
- **Nuclear Physics Seminar** — **University of Notre Dame, USA**
  Using the atomic nucleus as a probe for BSM physics. — *Nov. 18 2024*
- **FRIB Seminar** — **FRIB, MSU, USA**
  Ab initio theory towards reliable neutrinoless double beta decay nuclear matrix elements. — *Dec. 7 2023*
- **HEP/Astro Results Forum** — **Virtual**
  Status of neutrinoless double-beta decay from ab initio nuclear theory. — *Sept. 28 2023*
- **Institut Für Kernphysik Seminars** — **TU Darmstadt, DE**
  The road towards reliable nuclear matrix elements for neutrinoless double beta decay. — *Jul. 5 2023*
- **Particle and Astroparticle Physics Seminars** — **McGill University, CA**
  The road towards reliable nuclear matrix elements for neutrinoless double beta decay. — *Sept. 19 2022*

Invited Conference Presentations

- **Nuclear Structure 2026 (Upcoming)** — **Simon Fraser University, CA**
  The Standard Model and Beyond from a Nuclear Structure Perspective. — *July 2026*
  Only postdoctoral researcher to be invited to speak.
- **XeSAT2026 (Upcoming)** — **TRIUMF, CA**
  Neutrinoless double beta decay matrix elements of ^{136}Xe. — *May 2026*
- **INT PROGRAM INT-26-1: Nuclear Hamiltonians for Advancing Nuclear Physics and Beyond** — **INT, USA**
  Connecting nuclear force parameters to nuclear observables via machine learning emulation — *April 28 2026*
- **Progress on ab initio nuclear theory** — **TRIUMF, CA**
  Violating Parity in the In Medium Similarity Renormalization Group — *Feb. 24 2026*
- **The search for double-β decay: experimental and theoretical challenges** — **ECT*, IT**
  Ab initio theory towards reliable neutrinoless double beta decay nuclear matrix elements. — *Feb. 3 2026*
  Keynote speaker.

- **Quantum Science and Artificial Intelligence for Fundamental Physics** — **Universidad Nacional de Colombia, CO**
  Global emulation of atomic nuclei. — *Dec. 18 2025*
- **IMSRG Flow and Tell Meeting** — **University of Notre Dame, USA**
  Global emulation of atomic nuclei in the IMSRG. — *Oct. 21 2025*
- **Standard Model EFT meets Chiral EFT** — **TRIUMF, CA**
  Violating Parity in the In Medium Similarity Renormalization Group — *Oct. 3 2025*
- **Theoretical and experimental developments for symmetry-violating nuclear properties** — **ESNT, FR**
  Parity Violating In Medium Similarity Renormalization Group — *Jun. 26 2025*
- **Conference at the Intersection of Particle and Nuclear Physics** — **University of Wisconsin-Madison, USA**
  Ab initio neutrinoless double beta decay matrix elements — *Jun. 12 2025*
- **Progress on ab initio nuclear theory** — **TRIUMF, CA**
  Attention everyone! I have gone completely BANNANE! — *Feb. 28 2025*
- **NME 2025: Theoretical and experimental approaches for NME of double-beta decay** — **RCNP, JPN**
  Using the atomic nucleus as a probe for BSM physics. — *Jan. 21 2025*
- **Fall Meeting of the APS Division of Nuclear Physics** — **MIT, USA**
  The road towards reliable neutrinoless double-beta decay NMEs. — *Oct. 7 2024*
- **Celebrating 75 Years of the Nuclear Shell Model and Maria Goeppert-Mayer** — **Argonne National Lab, USA**
  Ab initio theory towards reliable $0\nu\beta\beta$ nuclear matrix elements. — *Jul. 21 2024*
- **Progress on ab initio nuclear theory** — **TRIUMF, CA**
  Ab initio theory towards reliable $0\nu\beta\beta$ nuclear matrix elements. — *Feb. 28 2024*
- **INT PROGRAM INT-23-1B: New physics searches at the precision frontier** — **INT, USA**
  Towards reliable nuclear matrix elements for neutrinoless double beta decay. — *May 22 2023*
- **Progress on ab initio nuclear theory** — **TRIUMF, CA**
  The road towards reliable nuclear matrix elements for neutrinoless double beta decay. — *Mar. 2 2023*
- **2nd Joint Canada-APCTP Meeting** — **TRIUMF, CA**
  Constraining $0\nu\beta\beta$ decay matrix elements from ab initio nuclear theory. — *Aug. 10 2022*
- **MEDEX'22** — **CTU, Prague, CZE**
  Constraining $0\nu\beta\beta$ decay matrix elements from ab initio nuclear theory. — *Jun. 16 2022*

Contributed Conference Presentations

- **Fall Meeting of the APS Division of Nuclear Physics** — **Chicago, USA**
  Talk on "Global emulation of atomic nuclei." — *Oct. 19 2025*
- **IAIFI Summer Workshop** — **MIT, USA**
  Talk on "Emulating the atomic nucleus." — *Aug. 10 2025*
- **Workshop on Basic Computing Services in the Physics Department - subMIT** — **MIT, USA**
  Talk on "Emulating the atomic nucleus." — *Jan. 30 2025*
- **Fall Meeting of the APS Division of Nuclear Physics** — **MIT, USA**
  Talk on "Ab initio theory towards reliable neutrinoless double beta decay NMEs." — *Oct. 10 2024*
- **Fall Meeting of the APS Division of Nuclear Physics** — **MIT, USA, Virtual**
  Talk on "Ab initio neutrinoless double-beta decay matrix elements." — *Oct. 13 2021*
- **Winter Nuclear & Particle Physics Conference** — **Virtual**
  Talk on "Ab initio Double-Beta Decay Nuclear Matrix Elements." — *Feb. 10th 2021*
- **Progress in Ab Initio Techniques in Nuclear Physics** — **TRIUMF, CA**
  Talk and poster on "Ab initio Double-Beta Decay Nuclear Matrix Elements." — *Mar. 5 2020*

- **55th Canadian Undergraduate Physics Conference** — **McGill University, CA**
  Talk and poster on "Ab initio Double-Beta Decay Nuclear Matrix Elements." — *Nov. 8 2019*
- **McGill Physics Department Poster session** — **McGill University, CA**
  Poster on "Ab initio Double-Beta Decay Nuclear Matrix Elements." — *Sept. 6 2019*
- **TRIUMF User Group AGM Poster Slam! Session** — **TRIUMF, CA**
  Poster on "Ab initio Double-Beta Decay Nuclear Matrix Elements". — *Aug. 22 2019*
- **TRIUMF Student Symposium** — **TRIUMF, CA**
  Talk on "Ab initio Double-Beta Decay Nuclear Matrix Elements." — *Aug. 15 2019*
- **McGill Undergraduate Research Conference** — **McGill University, CA**
  Poster on the "Development of an electroluminescent light source." — *Oct. 4 2018*
- **McGill Physics Department Poster session** — **McGill University, CA**
  Poster on the "Development of an electroluminescent light source". — *Sept. 05 2018*

Evaluation Committee Meetings

- **The NRC's Peer Review Committee quinquennial evaluation** — **TRIUMF, CA**
  Poster on "Towards reliable nuclear matrix elements for neutrinoless double beta decay". — *Nov. 29 2022*
  1/2 of the appointed TRIUMF theory department representative
- **Biannual Advisory Committee of TRUMF (ACOT) meeting** — **TRIUMF, CA**
  Poster on "Towards reliable nuclear matrix elements for neutrinoless double beta decay". — *Oct. 25 2022*
  1/2 of the appointed TRIUMF theory department representative
- **Biannual Advisory Committee of TRUMF (ACOT) meeting** — **TRIUMF, CA**
  Talk on "Ab initio neutrinoless double beta decay nuclear matrix elements". — *Apr. 26 2022*
  1/2 of the appointed TRIUMF theory department representative

Journal Articles

[1] **A. Belley**, B. Romeo, J. Engel, D. Kekejian, T. Miyagi, S. Foster, P. Navratil, B. C. He, S. R. Stroberg, J. D. Holt, and R. F. G. Ruiz, "Ab initio calculation of symmetry-breaking observables," 2026, Submitted to Physcial Review Letters. arXiv: 2605.11353 [nucl-th].

[2] **A. Belley**, S. M. Udrescu, J. D. Holt, and R. F. G. Ruiz, "Probing the electroweak structure of nuclei with atoms and molecules," 2026, In preparation with Review of Modern Physics.

[3] A. Brinson, B. Rickey, P. Arthuis, **A. Belley**, S. Campbell, X. Chen, A. Dockery, S. Elhatisari, H. Erington, N. Gamage, R. F. G. Ruiz, M. Heinz, C. Ireland, C. Izzo, C. Jones, J. Karthein, K. König, D. Lee, Y.-Z. Ma, F. Maier, U.-G. MeiSSner, K. Minamisono, M. Moenter, J. Munoz, W. N"ortersh"auser, A. Ortiz-Cortes, M. J. Palmes, S. Papa, F. P. Cruz, R. Ringle, H. Sims, C. Sumithrarachchi, A. Vernon, T. Wang, S. Wilkins, R. Yadav, and S. Zhang, "Nuclear charge radii of aluminium isotopes at the proton drip line," 2026, Submitted to Nature Physics. arXiv: 2605.09139 [nucl-ex].

[4] D. Lange, D. Atanasov, M. Au, **A. Belley**, M. Benhatchi, K. Blaum, R. B. Cakirli, P. F. Giesel, A. Herlert, J. D. Holt, B. S. Hu, A. Jaries, C. Klink, Y. A. Litvinov, D. Lunney, V. Manea, F. Mehlhorn, T. Miyagi, M. Mougeot, S. Naimi, L. Nies, M. Schlaich, C. Schweiger, L. Schweikhard, T. Shickele, A. Todd, and W. Wojtaczka, "Constraining the trend of the $N = 50$ shell gap towards ^{100}sn with the masses of $^{96-98}$cd," 2026, Submitted to Physical Review Letters. arXiv: 2604.18287 [nucl-ex].

[5] J. M. Munoz, **A. Belley**, A. Ekström, G. Hagen, J. D. Holt, and R. F. G. Ruiz, "Linking electromagnetic moments to nuclear interactions with a global physics-driven machine-learning emulator," 2026, Submitted to Physical Review X. arXiv: 2603.26905 [nucl-th].

[6] A. Todd, T. Schickele, **A. Belley**, L. Jokiniemi, and J. D. Holt, "Heavy neutrino exchange and short-range operator contributions to ab initio neutrinoless double-beta decay matrix elements," 2026, Submitted to Physical Review Letters. arXiv: 2604.22727 [nucl-th].

[7] **A. Belley**, J. M. Munoz, and R. F. Garcia Ruiz, "Global framework for emulation of nuclear calculations," *Phys. Rev. Lett.*, vol. 136, p. 082 501, 8 Feb. 2026. DOI: 10.1103/mvc3-qdtc.

[8] **A. Belley**, J. Pitcher, T. Miyagi, S. R. Stroberg, and J. D. Holt, "Correlation of $0\nu\beta\beta$ decay nuclear matrix elements with nucleon-nucleon phase shifts," *Phys. Rev. C*, vol. 113, p. 014 319, 1 Jan. 2026. DOI: 10.1103/cg41-189t.

[9] T. Schickele, L. Jokiniemi, **A. Belley**, and J. D. Holt, "Global Ab initio Neutrino Mass Limits from Neutrinoless Double-Beta Decay," Nov. 2025, Submitted to Physical Review D.

[10] **A. Belley**, T. Miyagi, R. Stroberg, and J. D. Holt, "Constraining neutrinoless double beta decay matrix elements from ab initio nuclear theory," *AIP Conf. Proc.*, vol. 3143, no. 1, p. 020 002, Feb. 2025. DOI: 10.1063/5.0249855.

[11] **A. Belley**, J. M. Yao, B. Bally, J. Pitcher, J. Engel, H. Hergert, J. D. Holt, T. Miyagi, T. R. Rodríguez, A. M. Romero, S. R. Stroberg, and X. Zhang, "Ab Initio Uncertainty Quantification of Neutrinoless Double-Beta Decay in ^{76}Ge," *Phys. Rev. Lett.*, vol. 132, p. 182 502, 18 Apr. 2024. DOI: 10.1103/PhysRevLett.132.182502.

[12] **A. Belley**, T. Miyagi, S. R. Stroberg, and J. D. Holt, "Ab initio calculations of neutrinoless $\beta\beta$ decay refine neutrino mass limits," Jul. 2023, Under review in Nature. arXiv: 2307.15156 [nucl-th].

[13] J. M. Yao, I. Ginnett, **A. Belley**, T. Miyagi, R. Wirth, S. Bogner, J. Engel, H. Hergert, J. D. Holt, and S. R. Stroberg, "Ab initio studies of the double–Gamow-Teller transition and its correlation with neutrinoless double-β decay," *Phys. Rev. C*, vol. 106, p. 014 315, 1 Jul. 2022. DOI: 10.1103/PhysRevC.106.014315.

[14] **A. Belley**, C. G. Payne, S. R. Stroberg, T. Miyagi, and J. D. Holt, "Ab Initio Neutrinoless Double-Beta Decay Matrix Elements for ^{48}Ca, ^{76}Ge, and ^{82}Se," *Phys. Rev. Lett.*, vol. 126, p. 042 502, 4 Jan. 2021. DOI: 10.1103/PhysRevLett.126.042502.

[15] J. M. Yao, **A. Belley**, R. Wirth, T. Miyagi, C. G. Payne, S. R. Stroberg, H. Hergert, and J. D. Holt, "Ab initio benchmarks of neutrinoless double-β decay in light nuclei with a chiral Hamiltonian," *Phys. Rev. C*, vol. 103, p. 014 315, 1 Jan. 2021. DOI: 10.1103/PhysRevC.103.014315.

[16] **A. Belley**, "Development on an electroluminescent light source to characterize SiPMs for the nEXO collaboration," *Journal of Undergraduate Science and Technology Research*, vol. 1, no. 1, 2019.