

## Curriculum Vitae

Date: July 20, 2023

- SURNAME:** Charles **FIRST NAME:** Christopher  
**MIDDLE NAME(S):** Rudra John
- INSTITUTE/LABORATORY:** **TRIUMF**  
Canada's National Laboratory for Particle and Nuclear Physics  
4004 Wesbrook Mall, Vancouver, BC, V6T 2A3, Canada  
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[ccharles@triumf.ca](mailto:ccharles@triumf.ca)
- DIVISION/GROUP:** Accelerator Division, Beam Delivery & Developments Group
- PRESENT RANK:** Physicist **SINCE:** January 2019

### 5. POST-SECONDARY EDUCATION

University or Institution	Degree	Subject Area	Dates
University of Toronto, Department of Earth Sciences	Ph.D.*	Physics and Geology	2013
University of Toronto, Department of Geology	M.Sc.	Physics and Geology	2005
University of Toronto, Department of Physics	Hon.B.Sc.	Astrophysics	2004

### \* Title of Ph.D. Dissertation and Name of Ph.D. Supervisor

*Pb-Pb Isotopic and X-Ray Tomographic Constraints on the Origin of Chondrules.* Prof. Donald W. Davis.

### Special Professional Training and Qualifications

- (2023) Adjunct Professor, Simon Fraser University, Department of Chemistry (Burnaby, BC). Awaiting official confirmation letter (as of March 27, 2023).
- (2022) Facility Coordinator for the Off-Line Ion Sources (OLIS), TRIUMF (Vancouver, BC). Stable isotope beam setup and delivery to all TRIUMF accelerators and experimental facilities from three ion sources: surface, microwave, and multi-charge (ECR). Conferred Spring 2022.
- (2021) Associate Member, School of Graduate and Postdoctoral Studies, The University of Western Ontario (London, ON). Conferred 2021-7-09.
- (2020) Adjunct Professor, The University of Western Ontario, Department of Earth Sciences (London, ON). Conferred 2020-7-15, 4 year appointment.
- (2020) Commercialization Internship. TRIUMF Innovations (Vancouver, BC). Fall 2019 – Spring 2021.
- (2020) Overhead Crane Operator. Fulford Certification (Vancouver, BC). February 2020. Certification #FOC-OT-00148, expiry 2023.

- (2019) Advanced radiation protection training and Canadian Nuclear Energy Worker (NEW) designation. TRIUMF (Vancouver, BC). Summer 2019.
- (2018) Certificate in GEANT4 Simulations. University of Texas MD Anderson Cancer Center and Stanford Linear Accelerator Centre (SLAC), (Houston, TX). June 2018.
- (2017) Certificate in Isotope Ratio Mass Spectrometry (IRMS) for Elemental Analysis (EA), Mass Spectrometry (MS) and Gas Chromatography (GC). Professional training course (8 days) by Isomass Scientific Inc. (Calgary, AB) and the University of Ottawa (Ottawa, ON). February 2017.
- (2016) Priority Management for Scientists. Andrew Sherwood & Associates (Toronto, ON). October 2016.

## 6. EMPLOYMENT RECORD

### (a) *Prior to TRIUMF*

University, Company or Organization	Rank or Title	Dates
University of Toronto, Department of Earth Sciences, Stable Isotope Laboratory (SIL)	Post-Doctoral Fellow & Laboratory Manager	2016 – 2019
University of Ottawa, Andre E. Lalonde Accelerator Mass Spectrometry Laboratory (AEL-AMS), and University of Toronto, IsoTrace AMS Laboratory	MITACS Post-Doctoral Fellow	2013 – 2016
University of Toronto, Department of Earth Sciences	Sessional Lecturer I	2013 Fall
University of Toronto at Mississauga, Department of Chemical and Physical Sciences	Sessional Lecturer I	2013 Spring

### (b) *At TRIUMF*

Rank or Title	Dates
Associate Research Scientist	June 2023 – **
Ion Source Physicist & Facility Coordinator, Off-Line Ion Sources (OLIS)	February 2022 – June 2023*
Ion Source Physicist	January 2019 – continuing*

\* *Date of granting of permanent employment:* July 25, 2019.

\*\* Tenure-Track BAE position (Board Appointed Employee).

## 7. LEAVES OF ABSENCE

University, Company or Organization at which Leave was taken	Type of Leave	Dates

## 8. TEACHING

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

My teaching interests aligns with my diverse research on radioactive and stable isotopes, atomic physics, ion sources, mass spectrometry (many types), numerical simulations, radioisotopes in the deep Earth, and Early Solar System chronometry. I designed and taught my own “special topics” undergraduate course (ESS381) at the

University of Toronto on the Early Solar System that included the injection of stellar isotopes (i.e.  $^{26}\text{Al}$ , others) into the protoplanetary disk, and radioisotope chronometers in meteorites. My first teaching position was an introductory course (ERS120) delivered to over 320 students.

### Teaching Philosophy

My teaching philosophy is grounded in openness, collaboration, and clear dialogue. I understand the value of diverse cultures and epistemologies, where I promote self-directed learning derived through the individual strengths of students. I treat assignments as opportunities to develop and strengthen bridging knowledge by applying theoretical and practical problems to real world scenarios. I am a champion of equity, diversity and inclusion (EDI) in Canadian natural sciences and engineering (NSE) by creating and delivering innovative STEAM initiatives to increase representation and community participation.

### (b) Courses Taught at the University of Toronto

#### (b1) Department of Astronomy and Astrophysics, St. George Campus

- PLN425H Research in Planetary Science (Honours Astrophysics Thesis course, 0.5 credits).
- PLN420H Interdisciplinary Seminar in Astrophysics (0.5 credits).

#### (b2) Department of Earth Sciences, St. George Campus

- ESS381H Special Topics: Solar System Geology (0.5 credits).

#### (b3) Department of Chemical and Physical Sciences, Mississauga Campus

- ERS120H Planet Earth (Introductory Earth Sciences, 0.5 credits).

#### (b4) Summary

Session	Course Number	Scheduled Hours	Class Size	Hours Taught			Additional Information
				Lectures	Tutorials	Labs	
2013/14 II	PLN425H	5/week	1	(thesis)	5/week		flexible meetings
2013 I	PLN420H	7/week	1	(seminar)	7/week		
2013 I	ESS381H	6/week	14	3/week	2/week	1/week	new designed course
2012/13 II	ERS120H	6/week	320	2/week	1/week	3/week	

### (c) Graduate and Undergraduate Research Student (NSERC HQP) Supervision at TRIUMF

Total # of distinct NSERC HQP: **n = 34**.

School	Student Name	Program Type	Year		Supervisory Role (supervisor, co-supervisor, committee member)
			Start	Finish	
Simon Fraser U. (BC, Canada)	Devon Joseph	M.Sc. Degree.	2023 Fall	2025 Fall	Co-Supervisor w/ C. Andreoiu.
Univ. of Waterloo (ON, Canada)	Ariana Pearson	Hon.B.Sc., Physics (TRIUMF Co-op Job # JR100805).	2023 Fall	2023 Winter	Supervisor.

BCIT (BC, Canada)	7 students TBD.	Industry Sponsored Student Program (ISSP), in Computer Information Technology (CIT), project #TBD.	2023 Fall	2023 Winter	Supervisor
Univ. of Manitoba (MB, Canada)	Devon Joseph	Hon.B.Sc., Physics (TRIUMF Co-op Job # JR100686).	2023 Spring	2023 Summer	Supervisor.
Western (ON, Canada)	Bianca Currie	Hon.B.Sc., Earth Sci. (completed). NSERC DG research student.	2023 Spring	2023 Summer	Supervisor
Western (ON, Canada)	Bianca Currie	Hon.B.Sc., 4 <sup>th</sup> Year Thesis. Fluka subsurface modeling.	2022 Fall	2023 Spring	Co-Supervisor (R. Flemming & A. Laxdal)
Univ. of Waterloo (ON, Canada)	Paige Harford	Hon.B.Sc., Physics (completed). NSERC DG research student.	2022 Fall	2023 Summer	Supervisor
BCIT (BC, Canada)	Robert Charlton Chris Earis Desmond Ho Elijah Krieger SJ Park Richard Wang Clinton Wong	Industry Sponsored Student Program (ISSP), in Computer Information Technology (CIT), project #442.	2022 Fall	2022 Winter	Supervisor
BCIT (BC, Canada)	Arshia Aryanfar Uluc Birol Van Boi Hnem Rahadian Irman Jake Martin Ajay Sahota Jeff Wang	Industry Sponsored Student Program (ISSP), in Computer Information Technology (CIT), project #435.	2022 Fall	2022 Winter	Supervisor
Western (ON, Canada)	Bianca Currie	Hon.B.Sc., Earth Sciences (NSERC DG student).	2022 Summer	2022 Fall	Supervisor
Univ. of Victoria (BC, Canada)	Maia Pysklywec	Hon.B.Sc., Physics & Engineering (Co-op Job #JR100177).	2022 Summer	2022 Fall	Supervisor
BCIT (BC, Canada)	Mattias Henders Ethan Sadowski Chris Spooner Bryan Xing	Computer Systems Technology (CST), Diploma Thesis, full-time.	2022 Spring	2022 Summer	Supervisor
BCIT (BC, Canada)	Mattias Henders Ethan Sadowski Chris Spooner Bryan Xing	Industry Sponsored Student Program (ISSP), project #314.	2022 Winter	2022 Spring	Supervisor
Univ. of Waterloo (ON, Canada)	Cameron Peters	Hon.B.Sc., Physics (Co-op Job #TR-21-3-6).	2021 Fall	2021 Winter	Supervisor
BCIT (BC, Canada)	Mike Wait	Industry Sponsored Student Program (ISSP), Mech. Eng. Diploma Program.	2021 Summer	2021 Fall	Supervisor
Western (ON, Canada)	Fengke Cao	Ph.D. Meteorite Physics.	2020 Fall	ongoing	Committee Member

Univ. of Waterloo (ON, Canada)	Paige Harford	Hon.B.Sc., Physics (Co-op Job #TR-21-1-6).	2021 Winter	2021 Summer	Supervisor
Univ. of Waterloo (ON, Canada)	Paige Harford	Hon.B.Sc., Physics (Co-op Job #TR-20-2-4).	2020 Spring	2020 Fall	Supervisor (project delayed due to COVID-19).
St. Mary's (HX, Canada)	Mathieu Cavenaille	Ph.D. Physics.	2019 Winter	ongoing	Advisor (non-committee member)
Univ. of Waterloo (ON, Canada)	Paige Harford	Hon.B.Sc., Physics (Co-op Job #TR-19-3-3).	2019 Summer	2019 Winter	Supervisor

**(d) Post-Doctoral Fellows, Graduate, and Undergraduate Students Mentored (non-NSERC HQP)**Total # of distinct non-NSERC HQP: **n = 48**.

School or Institute	Student Name	Program Type	Year (of my interaction)		Involvement
			Start	Finish	
TRIUMF, BC	Joseph Adegun	PDF	2023 Summer	ongoing	Very High
TRIUMF, BC	Andrew Weaver	PDF	2023 Summer	ongoing	Low
U. Manitoba, MB	Sakshi Kakkar	Ph.D.	2023 Spring	ongoing	Low
MPIK, Germany	Philipp Justus	M.Sc.	2023 March	2023 May	Very High
U. Waterloo, ON	Defne Tayner	Hon.B.Sc.	2023 March	2023 Summer	High
UBC, BC	David Wang	Hon.B.Sc.	2023 March	2023 Summer	High
TRIUMF, BC	Ivana Belosevic	PDF	2022 Fall	ongoing	Medium
UBC, BC	Rane Simpson	Ph.D.	2022 Fall	ongoing	Medium
McGill, QC	Louis Croquette	M.Sc.	2022 Fall	ongoing	Medium
U. Manitoba, MB	Jaime Cardona	Ph.D.	2022 Fall	ongoing	Low
TRIUMF, BC	F. Maldonado	PDF	2022 Fall	ongoing	Low
U. Calgary, AB	Birk Haertel	PDF	2022 Fall	ongoing	Low
Liverpool, UK	Aurelia Laxdal	Ph.D.	2021 Summer	ongoing	High
UVIC, BC	Susan Beale	Hon.B.Sc.	2022 Summer	2022 Summer	Low
Queens, ON	Claire Hamilton	Hon.B.Sc.	2022 Summer	2022 Summer	Low
UVIC, BC	Kayle Majic	Hon.B.Sc.	2022 Summer	2022 Summer	Low
UBC, BC	Yilin Wang	Ph.D.	2022 Summer	2022 Summer	Low
U. Ottawa, ON	Erin Flannigan	Ph.D.	2021 Spring	2022 Spring	Low
Western, ON	Lindsay Deng	Hon.B.Sc.	2017 Fall	2018 Summer	High
U. Toronto, ON	Joanna West	M.Sc.	2017 Fall	2018 Summer	High
U. Toronto, ON	Ann Sullivan-Ojeda	PDF	2018 Summer	2018 Fall	Medium
U. Toronto, ON	Camille Malcolm	M.Sc.	2017 Fall	2018 Summer	High
U. Toronto, ON	Tetyana Gilevska	PDF	2016 Fall	2018 Fall	High
U. Toronto, ON	Oliver Warr	PDF	2016 Fall	2018 Fall	High
U. Toronto, ON	Thomas Giunta	PDF	2016 Fall	2018 Fall	Medium
U. Toronto, ON	Alexs Mloszewski	PDF	2016 Fall	2018 Fall	High
U. Toronto, ON	Masha Shayan	PDF	2016 Fall	2018 Fall	Medium
U. Toronto, ON	Elizabeth Phillips	Ph.D.	2016 Fall	2018 Fall	High
U. Toronto, ON	Kristina DaSilva	M.Sc.	2017 Spring	2017 Fall	High
U. Toronto, ON	Jesse Manna	M.Sc.	2016 Fall	2017 Fall	Medium
U. Ottawa, ON	Jennifer Lee	Hon.B.Sc.	2016 Summer	2016 Fall	High

U. Ottawa, ON	Colin Tiessen	M.Sc.	2015 Fall	2016 Summer	Medium
U. Ottawa, ON	Mo Chamma	Hon.B.Sc.	2015 Summer	2016 Spring	High
U. Ottawa, ON	Mathew Herod	Ph.D.	2015 Spring	2015 Summer	Low
U. Ottawa, ON	Maria Stefanescu	M.Sc.	2015 Spring	2015 Summer	Low
U. Ottawa, ON	Daniel Sauve	M.Sc.	2015 Spring	2015 Fall	Low
U. Toronto, ON	Allison Enright	Ph.D.	2014 Fall	2015 Spring	High
Polytech Clermont-Ferrand, FR	C. Champeau	M.Sc.	2014 Summer	2014 Fall	Medium
Polytech Clermont-Ferrand, FR	J. Ricard	B.Sc.	2014 Summer	2014 Fall	Medium
Yale, CT	Micheal Lemansky	Hon.B.Sc.	2013 Fall	2014 Spring	Low
Polytech Clermont-Ferrand, FR	S. Naanani	B.Sc.	2013 Summer	2013 Fall	Medium
Polytech Clermont-Ferrand, FR	G. Sauvegrain	B.Sc.	2013 Summer	2013 Fall	Medium
U. Ottawa, ON	Cole MacDonald	M.Sc.	2013 Spring	2013 Winter	High
U. Ottawa, ON	Adam Sookdeo	M.Sc.	2013 Spring	2013 Fall	High
U. Toronto, ON	Guillaume Barlet	Ph.D.	2012 Fall	2013 Spring	Medium
U. Toronto, ON	Levke Koop	M.Sc.	2012 Fall	2013 Winter	High
U. Toronto, ON	Abin Das	Ph.D.	2012 Fall	2013 Spring	Low
U. Toronto, ON	Katrina VanDroglen	Ph.D.	2012 Summer	2013 Spring	Low
Western, ON	Monika Haring	M.Sc.	2011 Summer	2011 Summer	High

**(e) Continuing Education Activities**

- (2012) [Attended]: THE500 (Teaching in Higher Education). Completed this academic teaching and techniques course exclusively for PDF's and senior Ph.D. candidates with expressed interest in university teaching. Given by Woodsworth College, University of Toronto, Toronto, ON, Fall-Winter 2012.
- (2011) [Taught]: C. Charles., speaker on novel classroom assignments and laboratory demonstrations, Ontario Secondary Schools Teachers Federation (OSSTF) Professional Development Workshop in Earth and Space Sciences, Toronto, ON, Summer 2012.

**(f) Visiting or Invited Lecturer**

- (2023) Charles, C., Radioactive isotopes & age-dating the Solar System. Lecturer for *ESS3312B: Genesis of Meteorites & Planetary Materials (R. Flemming)*, Western University, January, 26, 2023.
- (2021) Charles, C., Fundamental Physics with AMO Techniques. Speaker at *TRIUMF Science Week*, Vancouver, BC, August 16-20, 2021.
- (2021) Charles, C., Radioactive isotopes & age-dating the Solar System. Lecturer for *ESS3312B: Genesis of Meteorites & Planetary Materials (R. Flemming)*, Western University, January 28, 2021.
- (2013) Charles, C., Radiogenic isotopes and Early Solar System processes. Instructor at *Astromaterials Training and Research Opportunities (ASTRO) Short Course 2013*, at Western University, May 13-15, 2013.
- (2011) Charles, C., *3D Computed-Tomography of Chondrules in NWA 801*. Geophysics Research Group, University of British Columbia, Vancouver, BC, February 18, 2011.
- (2010) Charles, C., Two presentations on meteorite age-dating using short-lived and long-lived radiogenic systems, and general meteorite cosmochemistry. Centre for Planetary Science and Exploration, Graduate Training Workshop, University of Western Ontario, London, ON, November 19, 2010.

## 9. SCHOLARLY AND PROFESSIONAL ACTIVITIES

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

I focus on ion sources and creating new varieties of beams (mostly stable isotopes, and molecular beams) for fundamental physics research. This includes (1) beam development, preparation and transport, (2) new ion sources and beam instruments for atomic, nuclear, and particle physics, and (3) simulations.

I also have an active interdisciplinary interest in Physics applied to Planetary sciences. This includes: (A) using mass spectrometry and simulations to understand radioisotopes in Early Solar System chronometry, deep natural subsurface environments, and anthropogenic systems, and (B) 3D X-ray computed tomography (CT) of planetary materials to understand early Solar nebula (ca. 4.5 Ga) processes.

Techniques include ion sources (many types), novel beam preparation instruments, numerical simulations, mass spectrometry (i.e. ID-TIMS, AMS, GC-IRMS, MC-ICP-MS), radiochemistry (i.e., ultra-clean column chromatography, sample preparations), and 3D X-ray CT. I am leading two experimental projects at TRIUMF:

- (1) P-514: a gas-filled radiofrequency quadrupole (RFQ) ion guide facility to produce rare radioactive molecules for fundamental Beyond-Standard Model (BSM) physics searches and interdisciplinary studies, and
- (2) a 0.5-8 MeV/u sample irradiation facility, with applications to fission track dating of geologic minerals and irradiations of other materials with stable or radioactive beams.

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

Granting Agency	Subject	COMP	\$CDN Per Year	Year	Principal Investigator	Co-Investigator(s)

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

Granting Agency	Subject	COMP	\$CDN Value	Year	Principal Investigator	Co-Investigator(s)
Telus Friendly Future Foundation	New community-based EDI / STEM initiative at TRIUMF (Pathfinders)	C	\$175,000	2024 In-progress	C.R.J. Charles M. Stachaura	
NSERC	Radioactive molecule production in an Ion Reaction Cell (IRC). <i>Request for Tools &amp; Instruments (RTI)</i>	C	\$435,000	2024 Submitted	C.R.J. Charles	
Alfred P. Sloan Foundation	Radioactive molecule production in an Ion Reaction Cell (IRC). <i>Small-Scale Fund. Physics Experiments</i>	C	\$1.2 M	2022 Unsuccessful	C.R.J. Charles	F. Ames P. Kunz J. Lassen

NSERC	Radioactive molecule production in an Ion Reaction Cell (IRC). <u>Discovery Grant</u> . <u>Subatomic Physics Individual (SAP-IN)</u>	C	\$165,000	2022-2027 Awarded	C.R.J. Charles	
NSERC	RadMol: New Probes for New Physics. <u>Discovery Grant</u> . <u>Subatomic Physics Project (SAP-P)</u>	C	\$1.3 M	2022  Awarded \$160k for 2023-2024 and advised to re-apply	S. Malbrunot	J. Behr F. Buchinger <u>C.R.J. Charles</u> G. Gwinner A. Jamison A. Kwiatkowski K. Madison T. Momose A. Stollow A. Vutha
Innovative Solutions Canada (ISC)	IRC acquisition for radioactive molecule production	C	\$560,000	In-progress	J.F. Alary	<u>C.R.J. Charles</u> Z. Mester
NSERC	Isotope ratio mass spectrometry	NC	\$60,000/y	2016-2018 Awarded	B. Sherwood-Lollar	
MITACS	Accelerator mass spectrometry (Isobar removal using gas-filled RFQ ion guides)	C	\$45,000/y	2013-2016 Awarded	W.E. Kieser	J.F. Alary J. Cornett A.E. Litherland

**(d) Invited Presentations**

- (2021) Charles, C., *Production and Applications of Radioactive Isotopes*. Attendance 60, delivered virtually during COVID-19. Spectrum Alternative School, Toronto District School Board (TDSB), Toronto, ON, June 18, 2021 (Local).
- (2021) Charles, C., *Electric Paper Circuits* (60 students; hands-on electronics STEM activity delivered virtually during COVID-19). Spectrum Alternative School, TDSB, Toronto, ON, May 25, 2021 (Local).
- (2021) Charles, C., *Colliding Particles Together: How we do it*. Attendance 25, delivered virtually during COVID-19. Paul Pena Jewish Dayschool, TDSB, Toronto, ON, May 14, 2021 (Local).
- (2021) Charles, C., *Colliding Particles Together: How we do it*. Attendance 80, delivered virtually during COVID-19. STEM Fellowship (<https://stemfellowship.org/>), May 12, 2021 (National).
- (2020) Charles, C., *EBIS at CANREB: Update and Progress*. Attendance 150, TRIUMF, Accelerator Division All-Hands Meeting, Vancouver, BC, February 18, 2020 (Local).
- (2019) Charles, C., *Introduction to SIMION – a “Hands-on” Tutorial*. Attendance 5, TRIUMF, student training presentation, Vancouver, BC, September 20, 2019 (Local).
- (2015) Charles, C., *Career Paths in Science*. Attendance 250, Glenforest High School, STEM outreach event, Mississauga, ON, May 29, 2015 (Local).
- (2013) Charles, C., general public talk on meteorites and age-dating. Attendance >1000. North York Astronomical Association, Starfest, Ayton, ON, August 10, 2013 (National).



- (2013) Charles, C., public talk on meteorite cosmochemistry and age-dating. Attendance 30, Toronto Public Library, Our Planet in Focus Series, Toronto, ON, May 22, 2013 (Local).
- (2013) Charles, C., general talk on meteorites and age-dating. Attendance 80, Royal Astronomical Society of Canada, Mississauga Branch, Mississauga, ON, February 22, 2013 (Local).
- (2012) Charles, C., general public talk on meteorites and age-dating. Attendance >1000. North York Astronomical Association, Starfest, Ayton, ON, August 18, 2012 (National).
- (2010/11) Charles, C., invited speaker for grades 10-12 mathematics. Attendance 40, Danforth Collegiate and Technical Institute, Toronto, ON, multiple dates over Spring-Fall 2010/11 (Local).
- (2007) Charles, C., invited speaker for grade 9 science. Attendance 35, Malvern Collegiate Institute, Toronto, ON, multiple dates in Spring 2007 (Local).
- (2007) Charles, C., *Age of CAI's, Chondrules and Meteorites*. Attendance 50, Walker Mineralogy Club (c/o the Royal Ontario Museum), September 30, 2007 (Local).

**(e) Other Presentations**

- (2021) Charles, C., *Physics Masterclass* (45 students; hands-on electronics STEM activity delivered virtually during COVID-19). Emerging Indigenous Scholars Summer Camp (EISSC) organized by the Pacific Institute for Mathematical Sciences (PIMS) and Langara College, Vancouver, BC, August 2, 2021 (Local). Postponed due to COVID-19 complications.

**(f) Conference Presentations**

*Student presenters or co-presenters under my supervision or mentorship are underlined.*

- (2023) Cavenaile, M., Schultz, B., Ames, F., **Charles, C. R. J.**, Kester, O., Kanungo, R. *Pulse Stretching Out of the CANREB EBIS*. 20th International Conference on Ion Sources (ICIS 2023), Victoria, Canada, in-person Poster Presentation, Victoria, BC, September 2023 (International).
- (2023) Jayamanna, K., Adegun, J., Ames, F., Angus, T., **Charles, C. R. J.**, Kiy, S., Lovera, M., Minato, B., Saminathan, S., Schultz, B. *Dual Frequency Enhancement of the SuperNanogan Multi-Charged Ion Source at TRIUMF ISAC Facility*. 20th International Conference on Ion Sources (ICIS 2023), Victoria, Canada, in-person Poster Presentation, Victoria, BC, September 2023 (International).
- (2023) **Charles, C. R. J.**, Cavenaile, M., Ames, F., Kester, O., Schultz, B. *Discharge in the Trumpet Regions of the CANREB EBIS*. 20th International Conference on Ion Sources (ICIS 2023), Victoria, Canada, in-person Poster Presentation, Victoria, BC, September 2023 (International).
- (2023) **Charles, C. R. J.**, Lovera, M., Hamilton, C., Currie, B., Pysklywec, M., Shelbaya, O., Jayamanna, K., Ames, F., Kiy, S., Angus, T., Minato, B. *Multi-Charged Phosphorus and Cesium Beams at the OLIS Facility at TRIUMF*. 20th International Conference on Ion Sources (ICIS 2023), Victoria, Canada, in-person Poster Presentation, Victoria, BC, September 2023 (International).
- (2023) Justus, P., **Charles, C. R. J.**, Malbrunot, S., Jayamanna, K., Ames, F. *Creation and Characterisation of Multi-Charged Cerium Beams at the TRIUMF OLIS Facility*. 20th International Conference on Ion Sources (ICIS 2023), Victoria, Canada, in-person Poster Presentation, Victoria, BC, September 2023 (International).
- (2023) Saminathan, S., Marchetto, M., Schultz, B., Lovera, M., Wager, D., Jayamanna, K., Ames, F., **Charles, C. R. J.**, Baartman, R., Cho, J., Hruskovec, T., Dirksen, P., Angus, T., Minato, B. *Design and commissioning of a versatile surface ion source*. 20th International Conference on Ion Sources (ICIS

2023), Victoria, Canada, in-person Poster Presentation, Victoria, BC, September 2023 (International).

- (2023) Schultz, B., Kester, O., Ames, F., **Charles, C. R. J.**, Cavenaile, M. Status of the CANREB EBIS at TRIUMF. 20th International Conference on Ion Sources (ICIS 2023), Victoria, Canada, in-person Poster Presentation, Victoria, BC, September 2023 (International).
- (2022) **Charles, C. R. J.**, Cavenaile, M., Ames, F., Schultz, B. *Simulations of the CANREB EBIS: Where might the issue(s) be?* 14<sup>th</sup> International Symposium of EBIS/T (EBIST2022), in-person Oral Presentation, Whistler, BC, June 2022 (International).
- (2022) Schultz, B., **Charles, C. R. J.**, Ames, F., Cavenaile, M., Beale, S., Schultz, B., Kester, O. *Status of the CANREB EBIS at TRIUMF.* 14<sup>th</sup> International Symposium of EBIS/T (EBIST2022), in-person Oral Presentation, Whistler, BC, June 2022 (International).
- (2022) Cavenaile, M., Ames, F., Kanungo, R., **Charles, C. R. J.**, Schultz, B., Kester, O. *Pulse Stretching out of the CANREB EBIS.* 14<sup>th</sup> International Symposium of EBIS/T (EBIST2022), in-person Oral Presentation, Whistler, BC, June 2022 (International).
- (2022) Laxdal, A., Joseph, D., Kunz, P., Pearson, M.R., Cheal, B., Wolski, A., **Charles, C. R. J.**, Ames, F., Lassen, J. *Development of direct on-line temperature measurements of ISAC targets at TRIUMF.* 19<sup>th</sup> International Conference on Electromagnetic Isotope Separators and Related Topics (EMIS 2022 at RAON), in-person Oral Presentation, Daejeon, South Korea, October 2022 (International).
- (2021) Cavenaile, M., Ames, F., Kanungo, R., **Charles, C. R. J.**, Schultz, B., Kester, O. *Pulse Stretching out of the CANREB EBIS.* 19<sup>th</sup> International Conference on Ion Sources – ICIS'21, online due to COVID-19, September 2021 (International).
- (2021) **Charles, C. R. J.**, Cavenaile, M., Harford, P., Schultz, B., Ames, F., Kester, O. *Simulations of the Electron Beam Ion Source (EBIS) at CANREB.* 19<sup>th</sup> International Conference on Ion Sources – ICIS'21, online due to COVID-19, September 2021 (International).
- (2021) **Charles, C. R. J.**, Malbrunot, S., Ames, F., Kester, O., Flannigan, E., Alary, J.-F., Laxdal, A., Kunz, P., McCausland, P.J.A., Flemming, R., Teigelhoefer, A. *Production of Radioactive Molecular Ions in a Radiofrequency Quadrupole Gas-Reaction Cell.* 19<sup>th</sup> International Conference on Ion Sources – ICIS'21, online due to COVID-19, September 2021 (International).
- (2021) Schultz, B., **Charles, C. R. J.**, Cavenaile, M., Ames, F., Kester, O., Kanungo, R., *CANREB EBIS Commissioning at TRIUMF.* 19<sup>th</sup> International Conference on Ion Sources – ICIS'21, online due to COVID-19, September 2021 (International).
- (2021) Alary, J.F., Cousins, L.M., Javahery, R., Kieser, W.E., Flannigan, E.L., **Charles, C. R. J.** *Dynamics and reactivity of thermalized ions in a radiofrequency quadrupole gas reaction cell used for the production of radioactive molecular ions.* 19<sup>th</sup> International Conference on Ion Sources – ICIS'21, online due to COVID-19, September 2021 (International).
- (2021) Harford, P., Cavenaile, M., **Charles, C. R. J.**, Schutz, B., Ames, F., Kester, O. *Particle Motion inside the CANREB radiofrequency quadrupole cooler-buncher.* 12<sup>th</sup> International Particle Accelerator Conference – IPAC21, online due to COVID-19, June 2021 (International).
- (2021) Cavenaile, M., Ames, F., Kanungo, R., **Charles, C. R. J.**, Schultz, B., Kester, O. *Pulse Stretching out of the CANREB EBIS.* 19<sup>th</sup> International Conference on Ion Sources – ICIS'21, online due to COVID-19, September 2021 (International).

- (2019) Harford, P. and **Charles, C. R. J.**, *Repair and Re-Design of the CANREB Electron Beam Ion Source (EBIS)*. Oral Presentation. 7<sup>th</sup> Annual TRIUMF Fall Student Symposium, Vancouver, Canada, December 2019 (National).
- (2019) **Charles, C. R. J.**, Cavenaile, M., Schultz, B., Ames, F. *Simulation versus performance of the CANREB RFQ cooler-buncher*. Oral Presentation. 13<sup>th</sup> International Conference on Stopping and Manipulation of Ions and Related Topics, Montreal, Canada, July 2019 (International).
- (2016) **Charles, C. R. J.**, Kazi, Z., Cornett, J., Zhao, X.L., Kieser, W.E. *Measurement of Curium Fluoride Anions by Accelerator Mass Spectrometry*. Poster Presentation. Canadian Association of Physicists (CAP), Ottawa, Canada, June 2016 (National).
- (2016) **Charles, C. R. J.**, Kazi, Z., Cornett, J., MacDonald, C., Francisco, B., Grinter, M., Zhao, X.L., Rowan, D. *Measurement of  $^{236}\text{U}$  in Biota by accelerator mass spectrometry*. Oral Presentation. Canadian Association of Physicists (CAP), Ottawa, Canada, June 2016 (National).
- (2016) **Charles, C. R. J.**, Zhao, X.L., Litherland, A.E. *45-degree Ion Motion in an RFQ: a Study of SIMION 8.1 for Modeling Isobar Separation Beam Dynamics in AMS*. Poster Presentation. Canadian Association of Physicists (CAP), Ottawa, Canada, June 2016 (National).
- (2016) Francisco, B., **Charles, C. R. J.**, Kazi, Z., MacDonald, C., Rowan, D., Cornett, J. *Optimization of a methodology to determine  $^{90}\text{Sr}$  in biota and water samples by ICP-MS QQQ and LSC*. Oral Presentation. Canadian Association of Physicists (CAP), Ottawa, Canada, June 2016 (National).
- (2016) Kieser, W.E., Zhao, X.L., **Charles, C. R. J.** and St.-Jean, N. *The new Research Injection Line at the Andre E. Lalonde Laboratory, University of Ottawa*. Oral Presentation. Canadian Association of Physicists (CAP), Ottawa, Canada, June 2016 (National).
- (2016) Cornett, J., Kazi, Z., Zhao, X.L., **Charles, C. R. J.**, Kieser, W.E. *The Measurement of Actinides by Accelerator Mass Spectrometry*. Oral Presentation. Canadian Association of Physicists (CAP), Ottawa, Canada, June 2016 (National).
- (2016) Zhao, X.L., MacDonald, C., Cornett, J., Kieser, W.E., **Charles, C. R. J.**  *$\text{CaF}_3/\text{KF}_3$  on-line separation methods and the present  $^{41}\text{Ca}/\text{Ca}$  sensitivity at AEL-AMS*. Oral Presentation. Canadian Association of Physicists (CAP), Ottawa, Canada, June 2016 (National).
- (2016) Kazi, Z., Zhao, X.L., Cornett, J., **Charles, C. R. J.**, Kieser, L. *Measurements of  $^{236}\text{U}$  by Accelerator Mass Spectrometry*. Oral Presentation. Canadian Association of Physicists (CAP), Ottawa, Canada, June 2016 (National).
- (2015) **Charles, C. R. J.**, Davis, D.W., McCausland, P.J.A. and Robin, P.Y. *Nebular Conditions in the Early Solar System from the 3D Tomography of Chondrules*. Oral Presentation. Joint Annual Meeting of the Geological Association of Canada and Mineralogical Association of Canada (GAC-MAC), Montreal, May 2015 (National).
- (2014) **Charles, C. R. J.**, Zhao, X.L., Cornett, J., Herod, M., Kieser W.E. and Litherland, A.E. *I/Te separation in an RFQ gas cell and the potential use of  $^{125}\text{I}$  as a spike for AMS analysis of  $^{129}\text{I}$  at low levels*. Oral Presentation. AMS-13, Aix en Provence, France, August 2014 (International).
- (2014) Sookdeo, A., Cornett, J., Zhao, X.L., **Charles, C. R. J.**, Kieser, W.E. *Determining  $^{210}\text{Pb}$  by accelerator mass spectrometry*. Oral Presentation. AMS-13, Aix en Provence, France, August 2014 (International).
- (2014) Cornett, R.J., Kazi, Z., Zhao, X.L., Chartrand, M., **Charles, C. R. J.**, Kieser, W.E. and Litherland, A.E. *Actinide Measurements by AMS and AS using Fluoride Matrices*. AMS-13, Aix en Provence, France, August 2014 (International).

- (2014) Alary, J.-F., Javahery, G., Kieser, W.E., Zhao, X.L., Litherland, A.E., Cousins, L. and **Charles, C. R. J.**. *Isobar Separator for Anions: Current Status*. Oral Presentation. AMS-13, Aix en Province, France, August 2014 (International).
- (2014) MacDonald, C., **Charles, C. R. J.**, Zhao, X.L., Kieser, W.E. and Cornett, R.J. *The Measurement of Cs isotopes by Accelerator Mass Spectrometry*. Canadian Association of Physicists (CAP), Sudbury, ON, Canada, June 2014 (National).
- (2012) **Charles, C. R. J.**, McCausland, P.J.A., Flemming, R.L. and Davis, D.W. *Pb IC of Troilite in 'Lovina'*. Poster Presentation. Goldschmidt, Montreal, QC, June 2012 (International).
- (2011) Davis, D. W., Matzner, C., Barlet, G. and **Charles, C.** *Can the early Solar System be explained with present cosmochemical data?* Poster Presentation. Workshop on the Chronology of Meteorites and the Early Solar System, Kauai, HI, November 2011 (International).
- (2011) **Charles, C. R. J.**, McCausland, P. J. A., Umoh, J., Holdsworth, D., Davis, D. W., Gregory, D., Tait, K., and Nicklin, I., *Compositions of Single Chondrules in the CR2 Chondrite NWA801 by Medical X-ray Micro-Computed Tomography*. Oral Presentation. 74<sup>th</sup> Annual Meeting of the Meteoritical Society, Greenwich, UK, August 2011 (International).
- (2011) **Charles, C. R. J.**, McCausland, P. J. A., Umoh, J., Holdsworth, D., Davis, D. W., Gregory, D., Tait, K., and Nicklin, I., *Textures of Single Chondrules in the CR2 Chondrite NWA801 by Medical X-ray Micro-Computed Tomography*. Poster Presentation. 74<sup>th</sup> Annual Meeting of the Meteoritical Society, Greenwich, UK, August 2011 (International).
- (2010) **Charles, C. R. J.** and Davis, D. W. *207Pb/206Pb ID-TIMS Ages NWA801 Chondrules and Mokoia CAIs by a Progressive Stepwise Dissolution*. Oral Presentation. 73<sup>rd</sup> Annual Meeting of the Meteoritical Society, New York, NY, July 2010 (International).
- (2010) **Charles, C. R. J.** and Davis, D. W. *Lead Isotope Age of Chondrules in the CR2 Chondrite NWA801 by Progressive Stepwise Dissolution*. Oral Presentation. GeoCanada - Working with the Earth, Calgary, AB, April 2010 (International).
- (2010) **Charles, C. R. J.** and Davis, D. W. *Lead Isotope Investigation of the Tagish Lake Carbonaceous Chondrite*. Poster Presentation. GeoCanada - Working with the Earth, Calgary, AB, April 2010 (International).
- (2009) **Charles, C. R. J.** and Davis, D. W. *Novel approaches to isotopic analyses of meteorites*. Oral Presentation. Planetary Science Research Symposium, Astromaterials Discipline Working Group, Canadian Space Agency, Toronto, ON, October 2009 (International).
- (2009) **Charles, C. R. J.** and Davis, D. W. *Lead Isotope Investigation of the Tagish Lake Carbonaceous Chondrite*. Poster Presentation. Joint Annual Meeting of the Geological Association of Canada and Mineralogical Association of Canada (GAC-MAC), Toronto, ON, May 2009 (National).
- (2007) **Charles, C. R. J.** and Davis, D. W. *A New Approach to Pb Dating of Whole Meteoritic Phases by Thermal Extraction and Thermal Ionization in Silica Melt*. Poster Presentation. Workshop on the Chronology of Meteorites and the Early Solar System, Kauai, HI, November 2007 (International).
- (2007) **Charles, C. R. J.** and Davis, D. W. *A new approach to precise Pb dating of CAI's by thermal extraction and thermal ionization in a silica melt*. Oral Presentation. Goldschmidt, Cologne, Germany, August 2007 (International).

- (2007) **Charles, C. R. J.**, McCausland, P. J. A., Nicklin, I., Flemming, R. W., Davis, D. W. *A micro-XRD survey of potential CAIs in the Tagish Lake Chondrite (P2 ROM)*. Poster Presentation. Kobe International School of Planetary Science, Kobe, Japan, July 2007 (International).
- (2005) Faber, D., Persaud, R., Marra, C., **Charles, C.** *Ground-Truthing Regolith Composition of the Lunar South Pole Using Small Penetrators*. International Lunar Conference, Toronto, ON, September 2005 (International).
- (2004) **Charles, C. R. J.**, Khan, Z. S., Morris, S. W. *Pattern scaling in axial segregation*. Oral Presentation. American Physical Society, Montreal, QC, March 2004 (International).

## 10. **SERVICE TO TRIUMF**

### (a) ***Project Leadership***

- (2022) **Project# P-514** (Production of Radioactive Molecules in an RFQ Gas-Cell). PI and Spokesperson. Now in Gate 2 design and simulations stage.
- (2022) Spokesperson for a new **TRIUMF Project/Collaboration** with the University of Calgary (PI: E. Enkelmann) on fission track dating enhancements using a new sample irradiation facility.

### (b) ***Areas of special interest and accomplishments***

- (2022) Scientific collaboration with the National Research Council (NRC) Metrology Group (Ottawa, ON), Isobarex Corp. (Vaughan, ON) and Public Services and Procurement Canada (PSPC) through an **Innovative Solutions Canada (ISC) Testing Stream Grant** for radioactive molecules.
- (2021) Founder of "***InventorLabs***". Educational outreach and EDI initiative in collaboration with TRIUMF. Delivering hands-on high-quality STEAM activities for electronics, physics and chemistry to underrepresented youth and teens, and Indigenous youth, in the Greater Vancouver Area, and for youth/teens across Canada (Local and National).
- (2020) Creator of the Electron Beam Ion Source (EBIS) reading group. Promote open discussions for all staff and students targeting the physics, theoretical modeling and operation of EBIS/T devices and their use as charge breeders. March 2020–ongoing.
- (2019) Acquisition of 880 kg (1940 lbs) of mu-metal 1-2 mm thick sheets (total value CDN\$227k) for use by the SRF, e-Linac and other magnetic sensitive projects. Acquired via the Paleomagnetic Laboratory at the University of Toronto at Mississauga, Mississauga, ON, April 2019.

### (c) ***Memberships on committees***

- (2023) Member, Equity Diveristy and Inclusion (EDI) Committee. Internal to TRIUMF (Local). Ongoing.
- (2022) Member, Beam Delivery Planning Meetings. Internal to TRIUMF (Local, National, International). Ongoing.
- (2022/23) Presentations Manager & Exhibitors and Sponsors Coordinator, Local Organizing Committee, 20<sup>th</sup> International Conference on Ion Sources (ICIS'23). Conference hosted by TRIUMF, Victoria, BC, September T.B.D., 2023 (International).

(2021/22) Presentations Manager & Exhibitors and Sponsors Coordinator, Local Organizing Committee, 14<sup>th</sup> International Symposium of EBIS/T (EBIST2022). Conference hosted by TRIUMF, Vancouver, BC, June 14-17, 2022 (International).

(2020/21) Exhibitors and Sponsors Coordinator, Local Organizing Committee, 19<sup>th</sup> International Conference on Ion Sources (ICIS'21). Conference hosted by TRIUMF, Vancouver, BC, September 20-24, 2021 (International).

(2020) Contributor, On-Line Ion Source I2 Project (commitment #372), Cyclotron Refurbishment Program.

**(d) Other service to the laboratory**

(2022) STEAM outreach volunteer, Community STEM Event, TRIUMF and Britannia Community Centre. For public education and outreach about TRIUMF, Vancouver, BC, September 17, 2022.

(2022) STEAM outreach volunteer, Science Rendezvous, TRIUMF and University of British Columbia. For public education and outreach about TRIUMF, Vancouver, BC, May 7, 2022.

(2019) STEAM outreach volunteer, Neighbours Day, University Neighbours Association (UNA) at UBC. For public education and outreach about TRIUMF, Vancouver, BC, September 7, 2019.

**11. SERVICE TO THE COMMUNITY**

**(a) Memberships on scholarly societies**

(2011/16) Member, Meteoritical Society.

**(b) Memberships on committees**

(2018/17) Meeting Secretary, Canadian Institute of Advanced Research (CIFAR), Deep Subsurface Science Theme, Toronto, ON, November 2018 and 2017 (International).

(2011) Co-chair for "Looking Inside" 3D Structure of Meteorites Revealed" special session, 74<sup>th</sup> meeting of the Meteoritical Society, Greenwich, UK, August 2011 (International).

(2010) Co-chair for the "Comparative Planetary Geology, Meteorites, Impacts and More" session at the GeoCanada 2010 meeting, Calgary, AB, May 2010 (International).

**(c) Memberships on other community committees**

(2022) Judge, Vancouver District Science Fair (VDSF), Vancouver, BC, February 28.

(2020) Judge, Vancouver District Science Fair (VDSF), Vancouver, BC, February 28.

**(c1) University of Toronto**

Concluded

Treasurer, University of Toronto Rock Climbing Club (2011/12)

Treasurer, Graduate Students Union, CFS Local 19 (2008/9)

Director, Finance Committee, Graduate Students Union, CFS Local 19 (2008/9)

Graduate Advisor, Office of the Assistant Vice-President Student Life (2008/9)  
Graduate Liason, Office of Accessibility Services (2008/9)  
Board of Stewards, Hart House, voting member (2008/9)  
Finance Committee, Hart House, voting member (2008/9)  
Council on Student Services (COSS), voting member (2008/9)  
Council on Athletics and Recreation (CAR), voting member (2008/9)  
Finance Committee, Graduate Students Union, CFS Local 19 (2007/8)  
Graduate Representative, Ad-Hoc Working Group on Planetary Science, Office of the Dean, Faculty of Arts & Science (2007/8)  
Council Member, Graduate Students Union, CFS Local 19 (2007/8)

**(c2) Department of Earth Sciences, University of Toronto**

Concluded

Treasurer, Association of Geology Graduate Students (fall 2007/9)  
Graduate and Academic Affairs Committee (2007/8)  
Graduate Representative, Faculty Council (2006/8)  
Health and Safety Committee (2004/8)  
Seminars and Planning Committee (2005/8)  
President, Association of Geology Graduate Students (2006/7)  
Special Events Committee (2005/7)  
Director of "Rockfest" department colloquium (2005/6)  
Social Committee, Association of Geology Graduate Students (2005/6)  
Social Planning Committee (2004/5)

**(d) Reviewer**

(2014) Nuclear Instruments and Methods in Physics Research B (NIM-B).

(2011) Reviews of Scientific Instruments (RSI).

**(e) Consultant**

(2015) Invited columnist, Canadian Federation of Earth Scientists, May 2015.

**(f) Other service to the community**

(2021) Police information checked, vulnerable sector (PIC-VS), Vancouver Police Department, 2021-01-30, certificate #VA5393.

**12. AWARDS AND DISTINCTIONS**

**(a) Awards for Teaching**

(2011) Lawrence Curtis Teaching Award, University of Toronto, Department of Earth Sciences, May 2011.

**(b) Awards for Scholarship**

(2009/12) Ontario Graduate Scholarship in Science and Technology (OGSST), Province of Ontario and the University of Toronto, September 2009 – Summer 2012.

### 13. **OTHER RELEVANT INFORMATION**

#### (a) **Fieldwork**

(2017/18) Kidd Creek Mine, Timmins, ON. Collection of ~2 Gyr-old water and gas samples at extreme depth (7850 ft) for isotopic and chemical analysis (GC-IRMS, ICP-MS, and AMS).

(2015) Joint Ocean Ice Studies (JOIS) cruise, Canada Basin, Beaufort Sea, Arctic Ocean. Seven-week expedition aboard the heavy ice-breaker *CCGS Louis S. St.-Laurent*. Collection of seawater depth samples (0-4000 m) and ice core (new, multi-year) for AMS analysis of  $^{10}\text{Be}$ ,  $^{129}\text{I}$ ,  $^{135}\text{Cs}$ ,  $^{236}\text{U}$ ,  $^{244}\text{Pu}$ . On-ship chemistry to extract U, Pu, Cs from seawater for AMS analysis. Other science activities.

#### (b) **Specialized Software Training**

- GEANT4 – modeling isotope production by spontaneous U/Th fission and neutron capture
- FLUKA – additional Monte Carlo modeling of radionuclide production/decay
- I-GUN / E-GUN – precise field modeling of electrodes with space charge
- LORENTZ-2E – sputter-ion source modeling (no magnetic fields)
- MATLAB – general purpose data analysis and calculations
- SIMION – charged particle optics in RF and DC electric fields
- SOLIDWORKS – for 3D CAD design
- SRIM/TRIM – ion interactions with matter
- TRAK/OMNITRAK – 2D/3D particle beam modelling software with space charge

#### (c) **Specialized Skills**

- 3D X-ray Computed Tomography (CT); micro-CT techniques.
- Radioactive and stable beam production, transport.
- Particle accelerator systems.
- Accelerator mass spectrometry (AMS) for rare atom counting.
- Mass spectrometry (AMS, ID-TIMS, MC-ICP-MS [solutions, laser ablation], ICP-OES, GCxGC-IRMS).
- Ion sources (many types) including Electron Beam Ion Sources (EBIS) charge breeders.
- Custom-built mass spectrometry systems, e.g. for radioactive molecules, isobar separation.
- Gas-filled radiofrequency quadrupole (RFQ) ion guides.
- Column chromatography for radiochemical separation/purification of lanthanides, actinides.
- Cleanroom techniques (class 100) for high-precision isotope chemistry.
- Numerical simulations of particles in time dependent/independent electric and magnetic fields.
- Mechanical design for accelerator systems; machining.
- Superconducting systems; cryogenics.
- Electronics; technical issues with accelerator and mass spectrometry systems.
- Project, time management and group skills at a major Canadian National Laboratory (TRIUMF).
- Teaching, mentorship, outreach and EDI/STEAM activities.



### Publications Record

**SURNAME:** Charles

**FIRST NAME:** Christopher

**Initials:** CRJ

**MIDDLE NAME(S):** Rudra John

**Date:** July 20, 2023

#### 1. REFEREED PUBLICATIONS

##### (a) *In-Press*

Student co-authors under my supervision or mentorship are underlined.

(2023) Athanasakis-Kaklamanakis, M., Au, M., Ballof, J., Berger, R., Borschevsky, A., Breier, A., Budker, D., Caldwell, L., Charles, C. R. J., Cirigliano, V., de Vries, J., DeMille, D., Dickel, T., Dobaczewski, J., Düllmann, C., Eliav, E., Engel, J., Fan, M., Flambaum, V., Flanagan Alyssa Gaiser, K., Garcia-Ruiz, R., Gaul, K., Giesen, T., Ginges, J., Gottberg, A., Gwinner, G., Heinke, R., Hoekstra, R., Holt, J., Hutzler, N., Jayich, A., Karthein, J., Malbrunot-Ettenauer, S., Miyagi, T., Moore, I., Navrátil, P., Nazarewicz, W., Neyens, G., Norrgard, E., Nusgart, N., Pašteka, L., Plass, W., Ready, R., Pascal Reiter, M., Reponen, M., Rothe, S., Safronova, M., Scheidenberger, C., Shindler, A., Singh, J., Skripnikov, L., Udrescu, S., Wilkins, S. *Opportunities for Fundamental Physics Research with Radioactive Molecules*. **Submitted to Reports on Progress in Physics**. Uploaded to: [arXiv:2302.02165](https://arxiv.org/abs/2302.02165) [nucl-ex].

(2023) Laxdal, A., Joseph, D.R., Ames, F., Babcock, C., **Charles, C. R. J.**, Cheal, B., Day Goodacre, T., Hamilton, C.C., Gottberg, A., Kunz, P., Lassen, J., Pearson, M.R., Raymonds, K., Schmidt, A., Wolsky, A. Development of an Optical Method for Temperature Measurements of the ISAC Targets at TRIUMF. **Submitted to Elsevier NIM-B**.

##### (b) *Journals*

Student co-authors under my supervision or mentorship are underlined.

(2020) **Charles, C. R. J.**, McCausland, P.J.A., Davis, D.W. LA-ICP-MS Pb isotope test of meteorite provenance: A Terrestrial Origin for Lovina. *Meteoritics and Planetary Science*. *Meteoritics and Planetary Science* 55(5), 1093-1102.

(2019) Kazi, Z.H., **Charles, C. R. J.**, Zhao, X.L., Cornett, R.J., Kieser, W.E. Ion beam enhancement in <sup>236</sup>UO measurement by AMS using Si powder as the binder. *Nuclear Instruments and Methods in Physics Research B* 456, 218-221.

(2018) **Charles, C. R. J.**, Robin, P.Y., McCausland, P.J.A., Davis, D.W. Shapes of Chondrules Determined from the Petrofabric of the CR2 chondrite NWA 801. *Meteoritics and Planetary Science* 53, 935-951.

(2016) Xhao, X.-L., **Charles, C. R. J.**, Cornett, R.J., Kieser, W.E., MacDonald, C., Kazi, Z., St.-Jean, N. An exploratory study of recycled sputtering and CsF<sub>2</sub> current enhancement for AMS. *Nuclear Instruments and Methods in Physics Research B* 366(1), 96-103.

(2016) Sookdeo, A., Cornett, J., Zhao, X.L., **Charles, C. R. J.**, Kieser, W.E. Quantifying <sup>210</sup>Pb by Accelerator Mass Spectrometry: A study of molecular and isobaric interferences of <sup>204</sup>,<sup>205</sup>,<sup>208</sup>Pb and <sup>210</sup>Pb. *Rapid Communications in Mass Spectrometry* 30(7), 867-872.

(2015) **Charles, C. R. J.**, Cornett, R.J., Zhao, X.-L., Litherland, A.E., Kieser, W.E. On-line I<sup>-</sup>/Te<sup>-</sup> separation for the AMS analysis of <sup>125</sup>I. *Nuclear Instruments and Methods in Physics Research B* 361, 189-192.

(2015) MacDonald, C., **Charles, C. R. J.**, Cornett, J., Zhao, X.L., Kieser, W.E., Litherland, A.E. Detection of <sup>135</sup>Cs by Accelerator Mass Spectrometry. *Rapid Communications in Mass Spectrometry* 29, 115-8.

(2015) Robin, P.Y. and **Charles, C. R. J.** Quantifying the three-dimensional shapes of spheroidal objects in rocks imaged by tomography. *Journal of Structural Geology* 77, 1-10.

- (2015) Cornett, R.J., Kazi, Z.H., Zhao, X.-L., Chartrand, M.G. **Charles, C. R. J.**, and Kieser, W.E. Actinide measurements by AMS using fluoride matrices. *Nuclear Instruments and Methods in Physics Research B* 361, 317-321.
- (2015) Alary, J.F., Gholamreza, J., Kieser, W.E., Zhao, X.-L., Litherland, A.E., Cousins, L. and **Charles, C. R. J.** Isobar Separator for Anions: Current Status. *Nuclear Instruments and Methods in Physics Research B* 361, 197-200.
- (2013) Zhao, X.L., Eliades, J., Litherland, A.E., Kieser, W.E., Cornett, J., **Charles, C. R. J.** On-line HfF5/WF5 separation in an O2-filled RFQ gas cell. *Rapid Communications in Mass Spectrometry* 27(24), 2818-2822.
- (2011) **Charles, C. R. J.** Disaggregating Meteorites by Automated Freeze Thaw. *Review of Scientific Instruments* 82(6), 1-6.
- (2006) **Charles, C. R. J.**, Khan, Z.S. and Morris, S.W. Pattern Scaling in Axial Segregation. *Granular Matter* 8(1), 1-3.

(b) **Conference Proceedings**

(c) **Other**

2. **NON-REFEREED PUBLICATIONS**

(a) **Journals**

(b) **Conference Proceedings**

(c) **Other**

- (2020) **Charles, C. R. J.**, Ames, F., Jayamanna, K., Kunz, P., Lassen, J., Pearson, M., Schultz, B., Teigelhoefer, A., Behr, J., Dilling, J., Kwiatowski, A., Alary, J.-F., Cousins, L., Javahery, R., Kieser, W.E., Litherland, A.E., McCausland, P.J.A., Flemming, R.L., Douglas, D. Production of radioactive molecules (RAM) in an RFQ ion guide and gas-reaction cell. TRIUMF Project Initiation Sheet (PRIS) for radioactive molecule project.
- (2020) **Charles, C. R. J.**, Jayamanna, K., Minato, B. and Lovera M. Stable Ion Sources User Manual. Internal TRIUMF Document #161910, July 2019-ongoing.
- (2011) Anders, D., **Charles, C.**, Das, A., Dobson, A., Olsen, K., and Ye, Q. Proposal for the NEAR- IEX Asteroid Sample Return Mission. *Paper for the Planetary Science Short Course* at University of Western Ontario, London, ON, September 30, 2011.
- (2006) **Charles, C. R. J.** On the Fractionation of Odd versus Even Uranium Isotopes. *Report for completion of the Master of Science Degree*, Department of Geology, University of Toronto, January 2006.

3. **BOOKS**

(a) **Authored**

(b) **Edited**

(c) **Chapters**

4. **PATENTS**

5. **SPECIAL COPYRIGHTS**

6. **ARTISTIC WORKS, PERFORMANCES, DESIGNS**

7. **OTHER WORKS**

8. **WORK IN PROGRESS (including degree of completion)**

*Student co-authors under my supervision or mentorship are underlined.*

**Charles, C. R. J.**, Shelbaya, Ames, F., O., Kester, O. A New Sample Irradiation Facility at TRIUMF ISAC. To be submitted to *Nuclear Instruments and Methods in Physics Research A or B* (30% completion).

**Charles, C. R. J.**, et al (authors to be determined). <sup>31</sup>P and <sup>133</sup>Cs Beams from the TRIUMF Off-Line Ion Source for Nuclear Astrophysics Studies. To be submitted to *Nuclear Instruments and Methods in Physics Research A or B* (5% completion).

**Charles, C. R. J.**, Peters, C., Pysklywec, M., Harford P., Ames, F., Lassen, J., Kunz, P., Alary, J.F., Kester, O. A Radiofrequency Quadrupole Gas-Cell for the Production of Radioactive Molecules. To be submitted to *Nuclear Instruments and Methods in Physics Research A or B* (20% completion).

**Charles, C. R. J.**, Kazi, Z., Cornett, J., Zhao, X.L., Kieser, W.E. Measurement of Curium Fluoride Anions by Accelerator Mass Spectrometry. To be submitted to *Nuclear Instruments and Methods in Physics Research B* (60% completion).

**Charles, C. R. J.**, Kazi, Z., Cornett, J., MacDonald, C., Francisco, B., Grinter, M., Zhao, X.L., Rowan, D. Measurement of <sup>236</sup>U in Biota by accelerator mass spectrometry. To be submitted to *Rapid Communications in Mass Spectrometry* (70% completion).

**Charles, C. R. J.**, Ames, F., Cavenaile, M., Schultz, B., Kester, O. Electron Motion Simulations in the CANREB EBIS: Understanding the Issues of Chronic Discharge. To be submitted to *Nuclear Instruments and Methods in Physics Research A or B* (10% completion).

**Charles, C. R. J.** and Davis, D.W. Adjustment of the Initial Mg Composition from <sup>26</sup>Al Systematics in the Solar Nebula from <sup>207</sup>Pb/<sup>206</sup>Pb Chronometry of CAIs and Chondrules. To be submitted to *Meteoritics & Planetary Sciences* (90% completion).

Currie, B., Charles, C. R. J., Laxdal, A., Flemming, R., et al (to be finalized). Simulations of <sup>36</sup>Cl, <sup>129</sup>I and <sup>236</sup>U Systematics in Deep Subsurface Waters. Possible submission to *Geochemica et Cosmochemica Acta* (10% completion).

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