

Michael Sekatchev

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BACKGROUND & EDUCATION

Place of Birth: Vancouver, BC, Canada

Citizenship: Canadian

University of British Columbia (UBC)

Masters of Science in Physics

Vancouver, BC, Canada

September 2023

University of British Columbia (UBC)

Bachelor of Science in Honours Physics with Minor in Arts in French

- Graduated with distinction. Dean's Honour List, all terms.

Vancouver, BC, Canada

September 2019 - April 2023

Sir Winston Churchill Secondary School

Secondary school grade 12

- Graduated with honours.

Vancouver, BC, Canada

September 2018 - June 2019

Ecole Internationale Provence-Alpes-Côte d'Azur

Secondary school grades 4-11, European Baccalaureate program

- Moved from Vancouver, Canada to Manosque, France, in 2010, for 8 years.

Manosque, France

September 2010 - July 2018

Kerrisdale Annex Elementary School

Primary school grades 1-3

Vancouver, BC, Canada

September 2007 - June 2010

RESEARCH WORK EXPERIENCE

Research Assistant

UBC Department of Physics and Astronomy (PHAS)

Ariel Zhitnitsky, Professor, PHAS UBC

Ludovic Van Waerberke, Professor, PHAS UBC

- Working on annihilation interaction within the Axion Quark Nugget (AQN) model, a candidate for dark matter.
- Creating sky maps of the far-ultraviolet (FUV) and radio emissions from simulating the baryon annihilation with Axion Quark (anti-)Nuggets in the Milky Way. The sky maps will be compared to real observations of the FUV background (data from the GALEX telescope) and radio excess (data from WMAP spacecraft) to check if the observed excesses in radiation can be attributed to this annihilation interaction.

April 2022 - **Current**

(10 months)

Research Assistant

TRIUMF, Hyper-Kamiokande (Hyper-K) Collaboration

Patrick de Perio, Assistant Professor, Kavli IPMU

Akira Konaka, Adjunct Professor, University of Victoria

- Worked in Hyper-K's Canadian group at TRIUMF, in collaboration with the experiment located in Japan.
- Member of the photogrammetry group working on geometrical calibration of Hyper-K's water Cherenkov detectors.
- Automated identification and matching of photomultiplier tubes from a drone image survey of the Super-K detector.
- Performed Camera calibration, light propagation studies, and simulations for built-in photogrammetry in the upcoming Water Cherenkov Test Experiment (WCTE) and Intermediate Water Cherenkov Detector (IWCD) detectors.
- Designed, constructed and tested an underwater camera housing for built-in photogrammetry in the WCTE detector.

May 2020 - August 2022

(2 years 4 months)

Mechanics Problem Developer – Open Education Resource (OER) Project

UBC Department of Mechanical Engineering (MECH)

Agnes d'Entremont, Associate Professor of Teaching, MECH UBC

Jennifer Kirkey, Professor, Douglas College

- Developed mechanics problems using the WeBWorK system, for the adoption of an open-source textbook as a required course textbook in second-year mechanical engineering dynamics (MECH 221) at UBC and in first-year engineering across Canada.

March 2021 - May 2023

(2 years 2 months)

Research Assistant

UBC Department of Materials Engineering (MTRL)

Daan Maijer, Professor, Department Head, MTRL UBC

- Assisted with electron beam additive manufacturing research, with a group developing a 3D printer based on an electron beam welder. Created SolidWorks designs for 3D printed parts of the system. Designed and assembled a custom motorized steel z stage for the machine. Obtained machine shop training.

September 2019 - April 2020

(8 months)

Young Engineers and Scientists (YES!) Fellow

TRIUMF, Hyper-Kamiokande (Hyper-K) Collaboration

Patrick de Perio, Research Scientist, TRIUMF

July 2019 - August 2019

(1.5 months)

- **Winner of the Young Engineers and Scientists (YES!) fellowship**, which offers summer research experiences to high school students. One of five fellows chosen from 80 applicants across BC, nominated by their schools.
- Joined TRIUMF's Hyper-K Canada photogrammetry group, working on investigating geometrical uncertainties in the positioning of photomultiplier tubes (PMTs) in the T2K long-baseline neutrino water Cherenkov experiments. Performed camera calibration studies for underwater photogrammetry.

Research Trainee

September 2018 - April 2019
(8 months)

UBC Department of Materials Engineering (MTRL)

Daan Maijer, Professor, Department Head, MTRL UBC

- Learned about Electron Beam Welding and Scanning Electron Microscopy. Prepared and analyzed titanium powder samples using a scanning electron microscope. Created SolidWorks designs for 3D printing.

Vacuum and Cryogenic Engineering Trainee

July 2018 - August 2018
(2 months)

TRIUMF, Vacuum and Cryogenics Group

Dimo Yosifov, Vacuum Group Leader, TRIUMF

Alexey Koveshnikov, Cryogenics Group Leader, TRIUMF

Geoff Hodgson, Engineer, TRIUMF

- Vacuum system Helium Leak detection, outgassing spectrum studies using a Residual Gas Analyser (RGA). Experimented with indium and PEEK seals vacuum seals, labelled, and assembled vacuum lines for the Advanced Rare Isotope Laboratory (ARIEL). Documented TRIUMF's Isotope Separator and Accelerator (ISAC) Vacuum system controls interlocks. Assisted with operation of helium liquefiers.

Vacuum Engineering Trainee

June 2016
(1 month)

ITER International Organization, France

Robert Pearce, Section Leader, ITER

- Practical experience in vacuum technology—assembly of vacuum flanges, leak detection (with certification), outgassing tests, and editing of ITER's materials database. Experience working in a large international (35 nations) collaboration.

TEACHING EXPERIENCE

Teaching Assistant, UBC

PHYS 131, Energy and Waves

May 2023 - June 2023
(1 term – 2 months)

Amali Priyanka Jambuge, Lecturer, PHAS UBC

- Course covering fluids, harmonic oscillators, waves, sound, and interference of light waves, including diffraction.

PHYS 229, Intermediate Experimental Physics II

January 2023 - April 2023
(1 term – 4 months)

Douglas Bonn, Professor, PHAS UBC

- Second year lab course for physics students covering a variety of modern physics experiments, with a focus on data analysis.

PHYS 157, Introductory Physics for Engineers I

September 2022 - December 2022
(1 term – 4 months)

Robert Raußendorf, Professor, PHAS UBC

- Course for first year engineering students covering heat, thermodynamics, oscillations, waves, and sound.

CPSC 110, Computation, Programs, and Programming

September 2022 - December 2022
(1 term – 4 months)

Gregor Kiczales, Professor, CS UBC

- Foundational course on systematic program design, taught in the Racket programming language.

CPSC 100, Computational Thinking

July 2022 - August 2022
(1 term – 2 months)

Rik Blok, Sessional Lecturer, CS UBC

- Course teaching computational thinking and its application to problem solving, testing and debugging.

PHYS 159, Introductory Physics Laboratory for Engineers

January 2022 - April 2022
(1 term – 4 months)

William McCutcheon, Professor Emeritus, PHAS UBC

- A laboratory course with a focus on experimental design, measurement, analysis techniques, and uncertainty estimation.

APSC 160, an Introduction to Computation in Engineering Design

September 2021 - April 2022
(2 terms – 8 months)

Cristian Sorin Grecu, Professor, Electrical Engineering UBC

- Programming in C, with applications to analysis and simulation and laboratory data acquisition and processing.

Tutor

Independent Physics Tutor

March 2022 - August 2022
(6 months)

- Referral-based individual private tutoring for UBC students. Tutored two students in first-year physics.

Math Tutor Network

March 2021 - August 2022
(1 year 6 months)

Henry Chow, Director, Math Tutor Network

- Privately tutored 10 individual students grades 8-12 in high school mathematics.

PUBLICATIONS

- M. Sekatchev, F. Majidi, L. Van Waerbeke, A. Zhitnitsky. *Axion Quark Nugget Annihilation With Baryon Gas Versus Observed Excess Diffuse Ultraviolet Radiation*. To be published in Monthly Notices of the Royal Astronomical Society (MNRAS), in progress.
- M. Sekatchev. *An explanation of the observed excess emissions in our galaxy using the Axion Quark Nugget dark matter model*. Undergraduate honours thesis.
- M. Sekatchev. *Chaotic Dynamics of a Dripping Water Faucet*, December 2022. Completed during Phys 409, Experimental Physics, University of British Columbia. To be published on the ArXiv.
- M. Sekatchev, G. Dockrill, A.G. d'Entremont. *Impact of student problem creation on self-reported confidence in mechanics*. 2022 *American Society for Engineering Education (ASEE) Zone IV Conference*, April 2022.

PRESENTATIONS

- M. Sekatchev. *Exploring Dark Energy Models*. Astr 403, Cosmology, UBC, April 2023. **Best poster award**.
- M. Sekatchev. *Angular Dependence of Cosmic Ray Muon Flux*. Phys 409, Experimental Physics, UBC, November 2022.
- M. Sekatchev. *Axion Quark Nugget Annihilation With Baryon Gas Versus Observed Excess Diffuse Ultraviolet Radiation*. 2022 *Canadian Astro-Particle Physics Summer Student Talk Competition (CASST)*, August 2022.
- M. Sekatchev. *Simulations and Imaging Hardware Optimization for Photogrammetry in the Water Cherenkov Test Experiment (WCTE) and Hyper-Kamiokande (Hyper-K) Detectors*. 6th *Hyper-K Collaboration Meeting*, June 2022. **Best poster award**.
- M. Sekatchev. *Automated Feature Detection and Camera R&D for Photogrammetry in Super-K and Future Water Cherenkov Neutrino Detectors*. 2021 *Canadian Association of Physicists (CAP) Congress*, June 2021.
- M. Sekatchev. *Photogrammetry in Super-K and Future Water Cherenkov Neutrino Detectors*. 49th *Advisory Committee on TRIUMF (ACOT)*, April 2021.
- M. Sekatchev. *Photogrammetry in Super-K and Future Water Cherenkov Neutrino Detectors*. 2021 *Multidisciplinary Undergraduate Research Conference (MURC)*, March 2021.
- M. Sekatchev. *HK-IWCD-SK Geometrical Calibration Camera System for Monitoring Photomultiplier Detector Vessels in the T2K Long Baseline Neutrino Water Cherenkov Experiments*. *YES! Fellowship Program Poster Session*, August 2019.

EXTRACURRICULAR EXPERIENCE

- Brownies and Girl Scouts Physics Demonstrations Volunteer** January 2023 - April 2023
◦ Lead [physics demonstrations and presentations for several Brownies and Girl Guide groups](#) in Vancouver. (4 months)
Organized through the UBC Physics & Astronomy outreach department.
- Sparked an interest in physics in Girl Guide groups of 20-30, ages 7-11.
- Cypress Mountain Slope Safety** November 2022 - April 2023
◦ Weekly volunteer supporting ski patrol on Cypress Mountain. Patrolling ski trails and enforcing speed limits. (6 months)
- UBC ThunderBikes Engineering Student Design Team** September 2019 - May 2022
◦ Gained experience heading groups of students and solving real-world engineering design problems. (2 years 9 months)
◦ **Team Captain for Campus Commuter Challenge**, a project to design and build an electric bicycle for UBC president Santa Ono. Lead a team of 15 undergraduate engineering students through all stages of the design and construction process.
◦ **Lead for LMK4 Mechanical Subteam**, a custom performance electric bicycle project.
◦ **Lead for SS1 Aerodynamics and Composites Subteam**, a project to build a racing electric motorcycle.
- Yearbook Club, Ecole Internationale Provence-Alpes-Côte d'Azur, France** September 2013 - June 2018
◦ Helped organize and create the structure of the school's yearbook. Assisted in selling and distribution. (4 years 9 months)
◦ **Student director of club** (2017-2018). Organised the club's activities and milestones, publishing and selling over 600 copies.

SKILLS

Languages: Fluent in English, French and Russian. Basic knowledge of Spanish.

Programming Languages: C, C++, Python, MATLAB, ROOT, HTML, CSS, JavaScript, SQL, R, \LaTeX .

Software: SolidWorks, Blender, Unity, Jupyter Notebook, ImageJ, GIMP, Adobe Photoshop, PrusaSlicer, Git

ACADEMIC ACCOMPLISHMENTS

Sir Winston Churchill Secondary School, Vancouver, Canada

September 2018 - June 2019

- BC Achievement Scholarship Award
- Churchill Scholar Award
- English Oratorical Award
- English Poetry in Voice Award
- 2019 UBC Physics Olympics – Earned first place in “Fermilab” competition, out of 75 participating schools. Represented Churchill, ranked 15th overall.
- PhysicsBowl Contest

Ecole Internationale Provence-Alpes-Côte D’Azur, Manosque, France

September 2010 - July 2018

- International General Certificate of Secondary Education (IGCSE) in four subjects: Physics, ICT, Mathematics, French. Received A* in all four subjects.
- International English Language Testing System (IELTS) exam in 2019
- Kangourou des Mathes – Mathematics contest in 2014
- English Poetry in Voice Award
- Diplôme d’études en langue française (DEL F) A2 Level in 2011

EXTRACURRICULAR ACCOMPLISHMENTS

- Rowing at Aviron Club de Manosque, France. Two silver and one gold medals (2015-2014).
- Tennis at Tennis Club de Manosque, France. Four cups and two medals (2012-2018).
- Ballroom dancing at Vancouver Ballroom Dance Club. 1 gold, 5 silver, and 4 bronze medals (2006-2009).