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RESEARCH PROFILE

Geneticist and molecular microbiologist specializing in RNA biology, transcriptomics, and host-pathogen interactions. I lead and originated research on *epigenetic interference*, a framework describing how non-canonical and small RNAs regulate virulence, infection, and immune responses in viral and bacterial systems. My work integrates computational genomics with comparative transcriptomic and evolutionary analysis. I advance RNA-based research to support pandemic preparedness and understanding of zoonotic pathogen emergence.

POSTDOCTORAL APPOINTMENTS

- 2023 – 2025 Jeffrey Joy Lab, Faculty of Medicine, University of British Columbia (B.C.); B.C. Centre for Excellence in HIV/ AIDS (Vancouver, B.C., Canada)
 - Evolution of epigenetic interference in SARS-CoV-2.
- 2020 – 2021 Robert Colautti Lab, Biology Department, Queen's University (Kingston, Ontario, Canada)
 - Black-legged tick (*Ixodes scapularis*) microbiome and meta-transcriptome analysis, demonstrating salivary gland and midgut tissue-specific concentration of pathogenic bacteria (e.g., Lyme).

ACADEMIC DEGREES

- 2020 PhD in Genetics, Massey University, Auckland (New Zealand)
 - **Thesis:** "Temperature- and host-dependent regulation of virulence factors in an insect pathogenic bacterium, *Yersinia entomophaga*."
- 2014 MSc in Biology, University of Victoria, Victoria, B.C. (Canada)
 - **Thesis:** "The microbial associates and putative venoms of seed chalcid wasps (Hymenoptera: Torymid: *Megastigmus*)."
- 2007 BSc in Biology, Vancouver Island University, Nanaimo, B.C. (Canada)

SCHOLARSHIPS & AWARDS

Postdoctoral

- 2023-2025 Michael Smith Labs – B.C. Health Research Training Fellowship
- 2020 Hack-seq RNA – Second prize, best participant feedback

Doctoral

- 2016-2019 Universities New Zealand – Commonwealth Scholarship and Fellowship Plan
- 2015 *Declined* – Alexander Graham Bell Canada Graduate Scholarships¹
- 2015-2018 Natural Science and Engineering Research Council of Canada – Postgraduate Scholarship

Masters

- 2012 University of Victoria – M.C. Melburn Award
- 2011 University of Victoria – Amelia Leith Memorial Fellowship

Undergraduate

- 2007 National Science and Engineering Research Council of Canada – Undergraduate Research Award

¹ Awarded to the top-ranked PhD students in Natural Sciences & Engineering by the Natural Science and Engineering Research Council of Canada.

PROFESSIONAL EXPERIENCE

- 2013 – 2015; Environmental Assessment Office, B.C. Ministry of Environment and Parks
- 2020 – present • **Project Assessment Officer**, administer environmental assessment of major projects
- 2011 Aquaculture Resource Management, Fisheries and Oceans Canada
- **Aquaculture Management Coordinator**, fisheries aquaculture management
- 2007 – 2011 McNaughton Environmental Consultants
- **Fisheries Field Biologist**, fisheries stock assessments, environmental monitoring
- 2005; 2006 Mount Arrowsmith Biosphere Foundation
- **Seasonal Field Assistant**, biodiversity studies, climate change and alpine environments

TEACHING, MENTORING, OUTREACH

- 2025 **Flash talk:** *Functional insights from virus-derived RNA fragments identifies epigenetic interference mechanism in SARS-CoV-2.*
- Vancouver RNA Club Research Symposium, University of B.C.
- 2025 **Talk:** *Sequencing analysis for functional insights from virus-derived RNA fragments identifies epigenetic interference mechanism in SARS-CoV-2.*
- Toronto RNA Enthusiasts' Day (TRENd) 2025, virtual event.
- 2024 **Accredited Training Seminar:** *The RNA Revolution: From dark matter to major therapeutic breakthroughs.*
- B.C. Centre for Excellence in HIV/ AIDS, Learning Series Webinar², Cullen Family Lecture Theatre, St. Paul's Hospital/ virtual event.
- 2022 **Talk:** *Exploring the inner world of important Lyme disease vector *Ixodes scapularis*.*
- Edge of Lyme hack-a-thon event, Queen's University (Kingston Ontario), virtual event.
- 2021 **Workshop:** *Bioinformatics approaches for data analysis of short-read sequence data.*
- Queen's Bioinformatics Advanced R Workshop, Queen's University (Kingston Ontario), virtual event.
- 2020 **Trainee Series Webinar:** *Tools for Bioinformatics Short-Read Sequence Data Processing*
- Canadian Lyme Disease Research Network, virtual event.
- 2020 **Project Leader:** *Modelling potential microRNA interactions in SARS-CoV-2³*
- HackSeq RNA, COVID-19 Ultra-hackathon, , virtual event.
- 2012-2013 **Laboratory Instructor:** General Biology 190A/Biology 190B, Biology Department, University of Victoria
- 2013-2015 **Lead Coordinator:** Canadian Association for Girls in Science, Victoria B.C. Chapter
- 2006 **Laboratory Instructor:** Entomology Biology 492, Biology Department, Vancouver Island University

TALKS AND PRESENTATIONS

- 2025 **Flash talk & poster:** *Sequencing analysis for functional insights from virus-derived RNA fragments identifies epigenetic interference mechanism in SARS-CoV-2.*
- Annual General Meeting, American Society for Virology⁴; Montreal, Quebec (Canada)
- 2025 **Talk:** *Exploring small viral RNA-mediated epigenetic interference as an evolutionary driver in SARS-CoV-related viruses using sequencing analysis.*
- EVO-WIBO; Semiahmoo, Washington (U.S.A.)

² Accredited by the College of Family Physicians of Canada and the B.C. Chapter (up to 1 Mainpro+ credit).

³ A short video was produced by the team <https://youtu.be/pxTEwiW6TJU>

⁴ Travel award from American Society for Virology 2025

- 2024 **Talk:** *Small viral RNA evolution and the origin of SARS-CoV-2: Insights from functional genomics.*
- International Dynamics and Evolution of Human Viruses; Squamish, B.C. (Canada)
- 2022 **Invited talk:** *Multi-omics analysis identifies symbionts and pathogens of blacklegged ticks (*Ixodes scapularis*) from a Lyme disease hotspot in southeastern Ontario, Canada.*
- B.C. Centre for Disease Control, Tick-borne and Climate Change - 3 West quarterly check-in; virtual.
- 2020 **Invited symposium:** *Unbiased metagenomic analysis of *Ixodes scapularis* microbiomes in the Kingston Frontenac region.*
- Annual General Meeting, Canadian Lyme Disease Research Network; virtual.
- 2020 **Invited seminar:** From venoms to virulence factors, transcriptomics provides insights into challenging systems.
- Agriculture and Agri-Food Canada; Agassiz, B.C. (Canada)
- 2018 **Talk:** *Exploring the potential role of cold-shock proteins as regulators of virulence in the insect pathogenic bacteria, *Yersinia entomophaga*.*
- New Zealand Microbiological Society Conference; Dunedin, New Zealand
- 2018 **Talk:** *The in vivo transcriptome of the insect pathogen, *Yersinia entomophaga*.*
- Australian Society for Microbiology Conference⁵; Brisbane, Australia
- 2018 **Poster:** The *in vivo* transcriptome of the insect pathogen, *Yersinia entomophaga*.
- American Society for Microbiology Conference; Atlanta, Georgia
- 2017 **Invited symposium:** *From venoms to virulence factors – Revealing ecological and evolutionary insights with RNA-seq.*
- Entomological Society of America, Denver, Colorado (U.S.A.)
- 2017 **Talk:** The *in vivo* transcriptome of the insect pathogen, *Yersinia entomophaga*.
- New Zealand Microbiological Society Conference⁶, Auckland, New Zealand
- 2016 **Talk:** *In vivo RNA-seq – in a pinch.*
- New Zealand Microbiological Society Conference, Christchurch, New Zealand

PUBLICATIONS

- Paulson, A.R.**, Montoya, V. & Joy, J.B. (In prep). Functional genomic analysis reveals mechanisms of epigenetic interference in SARS-CoV-1 and SARS-CoV-2.
- Paulson, A.R.**, O’Callaghan, M., Zhang, X.-X., Naren, N., Schoof, M., and Hurst, M.R.H. 2025. Two transcription factors and one antisense RNA underlie the thermoregulated insect pathogenicity of *Yersinia entomophaga* MH96. *Gene*, 149955. doi.org/10.1016/j.gene.2025.149955
- Schoof, M., O’Callaghan, M., Hefer, C., Glare, T.R., **Paulson, A.R.**, and Hurst, M.R.H. (2023). Lysis cassette-mediated exoprotein release in *Yersinia entomophaga* is controlled by a PhoB-like regulator. *Micro. Spectrum*, 11(2), e00364-23. doi.org/10.1128/spectrum.00364-23
- Paulson, A. R.**, Loughheed, S.C., Huang, D., and Colautti, R.I. (2023). Multiomics reveals symbionts, pathogens, and tissue-specific microbiome of blacklegged ticks (*Ixodes scapularis*) from a Lyme disease hot spot in southeastern Ontario, Canada. *Microbiology Spectrum*, 11(3), e01404-23. doi.org/10.1128/spectrum.01404-23
- Paulson, A.R.**, O’Callaghan, M., Zhang, X.-X., Rainey, P.B, and Hurst, M.R.H. (2021). *In vivo* transcriptome analysis provides insights into host-dependent expression of virulence factors by *Yersinia entomophaga* MH96,

⁵ Travel Award New Zealand Microbiological Society

⁶ Best Student Talk Award New Zealand Microbiological Society

during infection of *Galleria mellonella*. G3: Genes, Genomes, Genetics: 11(1) 1-12.
doi.org/10.1093/g3journal/jkaa024

Paulson, A.R., Ehlting, J., von Aderkas, P., and Perlman, S.J. (2020). Whole-body transcriptome of seed-parasitic wasp, *Megastigmus spermotrophus*, reveals ecological and evolutionary insights, in Shelomi, M. (ed.) *Transcriptomics in Entomological Research*. CAB International, pp. 113-135.
doi.org/10.1079/9781789243130.0113

Paulson, A.R., Le, C., Dickson, J., Ehlting, J., von Aderkas, P., and Perlman, S.J. 2016. Transcriptome analysis provides insight into venom evolution in a seed-parasitic wasp, *Megastigmus spermotrophus*. *Insect Molecular Biology*: 25(5) 604-616. doi.org/10.1111/imb.12247

Paulson, A.R., von Aderkas, P., and Perlman, S.J. 2014. Bacterial Associates of Seed-Parasitic Wasps (Torymidae: *Megastigmus*). *BMC Microbiology* 14.1: 224. doi.org/10.1186/s12866-014-0224-4

Epelbaum, A., Therriault, T.W., **Paulson, A.R.**, and Pearce, C.M. 2009. Botryllid tunicates: Culture techniques and experimental procedures. *Aquatic Invasions*. 4(1): 111-120.

Epelbaum, A., Pearce, C.M., Barker, D.J., **Paulson, A.R.**, and Therriault, T.W. 2009. Susceptibility of four non-indigenous Ascidian species in British Columbia (Canada) to invertebrate predation. *Marine Biology*. 156(6): 1311-1320.

PEER REVIEWER

- BMC Biology, BMC Genomics, Environmental Entomology, Insect Science, Molecular Ecology, and Tick and Tick-borne Diseases.

PROFESSIONAL MEMBERSHIPS

- The RNA Society
- Vancouver RNA Club
- Canadian Society of Microbiologists
- American Society for Virology

References available on request.