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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 (current) 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 (<i>Ixodes scapularis</i>) 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, <i>Yersinia entomophaga</i> .”
2014	MSc in Biology, University of Victoria, Victoria, B.C. (Canada)
	• Thesis: “The microbial associates and putative venoms of seed chalcid wasps (Hymenoptera: Torymid: <i>Megastigmus</i>).”
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	<i>Declined</i> – Alexander Graham Bell Canada Graduate Scholarships ¹
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
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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., Lougheed, 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.