

## R. ERIC COLLINS, PH.D.

Assistant Professor & Canada Research Chair in Arctic Marine Microbial Ecosystem Services  
Centre for Earth Observation Science & Department of Environment and Geography  
Riddell Faculty of Environment, Earth, and Resources  
University of Manitoba  
eric.collins@umanitoba.ca  
204-272-1576

---

### EDUCATION AND RESEARCH EXPERIENCE

**Canada Research Chair (Tier II) in Arctic Marine Microbial Ecosystem Services, Assistant Professor of Environment and Geography, University of Manitoba (2019–)**

**Arctic Marine Microbial Ecosystem Services:** I use long-read sequencing technologies and community based monitoring approaches to build local capacity for understanding the roles that microbes play in supporting and maintaining the health of people and communities.

**Assistant Professor of Biological Oceanography, University of Alaska Fairbanks (2013–2019)**

**Arctic Microbial Communities:** I combined Arctic field work with next-generation sequencing techniques to explore the diversity, function, and evolution of microorganisms in ice and ice-covered oceans.

**Postdoctoral Fellow in Astrobiology, McGill University (2012–2013)**

**Early Earth Genomics:** I used phylogenomic methods to search for genes specifically associated with sulfur isotope fractionation by sulfate reducing bacteria. PI: Dr. Boswell Wing

**Postdoctoral Fellow in Astrobiology, McMaster University (2009–2012)**

**Genome Evolution:** I researched the evolution of microbes by comparative genomics and mathematical modeling. PIs: Dr. Paul Higgs, Dr. Greg Slater

**Ph.D. Biological Oceanography, University of Washington (September 2009)**

**Microbial Evolution In Sea Ice—Communities To Genes:** I investigated the diversity of Bacterial and Archaeal communities in winter sea ice. Advisor: Dr. Jody W. Deming

**Certificate in Astrobiology, University of Washington (2009)**

**In vitro microsensor measurements of AOM:** I used microsensors to measure the rate of anaerobic oxidation of methane (AOM) in microbial mats from the Black Sea. Advisors: Dr. Dirk de Beer (MPI-Bremen), Dr. Antje Boetius (MPI-Bremen)

**M.S. Biological Oceanography, University of Washington (2006)**

**Microbial persistence over an Arctic winter season:** I investigated the abundances of bacteria, particles, and particulate extracellular polymeric substances (pEPS) in Arctic winter sea ice. Advisor: Dr. Jody W. Deming

**B.S. Biochemistry with Honors, Washington State University (2002)**

## TEACHING EXPERIENCE, AS INSTRUCTOR

*Fall 2020: GEOG3000 Aquatic Ecosystem Services:* Introduction to aquatic ecosystem services framework with an emphasis on the role of microbes in human well-being. Enrollment 9.

*Fall 2018: MSL492/692 Fisheries and Oceanography Seminar:* Departmental Seminar, includes organizing schedule and student mentorship. Enrollment 15.

*Spring 2018: BIOL342 General Microbiology:* An introduction to Microbiology covering environmental and human microbiology. Lab includes isolation, complete genome sequencing, and bioinformatics analysis of student-collected microbes. Enrollment 45. **Revised lab.**

*Autumn 2016: MSL692 Controversies in Microbial Science:* A graduate seminar centered around unresolved controversies in the literature in the fields of microbial ecology and evolution. Addresses both scientific and ethical questions about microbes and the potential for their use and misuse by society. Enrollment 4. **New course.**

*Autumn 2013–2019: MSL449/650 Biological Oceanography:* This stacked course for senior undergraduates and graduate students is an introduction to biological oceanography covering primary production, phytoplankton diversity, the microbial loop, marine food webs, secondary production, zooplankton diversity, ecological modeling, and global biomes. Co-instructed with Russ Hopcroft. Enrollment 10-15. **Revised course.**

*Spring 2016, 2018: MSL493 Ecological and Evolutionary Genomics:* A hands-on bioinformatics course to develop skills in working with next-generation DNA sequencing data using modern computational tools. Targeted towards senior undergraduates and graduate students in the biological and natural sciences. Enrollment 6. **New course.**

*Autumn 2015: MSL699 Sea Ice Ecology:* A seminar designed to introduce graduate students to the full diversity of life associated with sea ice and ice-covered waters by reading contemporary scientific literature and interacting directly with the authors of the papers to better understand the process of science. Enrollment 6. **Redesigned course.**

*Spring 2015–2017: MSL294 Astrobiology:* An introduction to science for non-science majors, this course touches on cosmology, astronomy, planetary science, geology, chemistry, biology, oceanography, and philosophy during a wide-ranging investigation into what scientists have learned while asking the question ‘Are We Alone?’. Enrollment 6-10. **New course.**

*Spring 2013: MSL649 Field Techniques in Interdisciplinary Sea Ice Research:* Instructor for 10-day field course in Barrow, Alaska, included participants from the US, Japan, Korea, Switzerland, Austria, Germany, and New Zealand. Topics included sea ice biology, chemistry, geophysics, remote sensing. Co-instructed with Hajo Eicken, Rolf Gradinger and others. Enrollment 22.

## OTHER TEACHING EXPERIENCE

*Summer 2014: AB-330 Ecosystems in Ice Covered Waters:* Guest lecturer at the University Centre in Svalbard in a course to study the structure and dynamics of ecosystems with the sea-ice system as a model unit. Instructor Janne Sørreide. Enrollment 30.

*Winter 2011: Environmental Genomics Workshop:* Designed and delivered two-day workshops on Web-Enabled Environmental Genomics and Metagenomics at McGill University in Montreal, Canada. Course participants included students, postdocs, and faculty from microbiology, geochemistry, and oceanography. Course wiki: [http://openwetware.org/wiki/User:R.\\_Eric\\_Collins/GenomicsTutorial](http://openwetware.org/wiki/User:R._Eric_Collins/GenomicsTutorial). Enrollment 16.

*2010–2011: Astrobiology Journal Club.* Organizer of a bi-weekly meeting of undergraduates, graduate students, postdocs and faculty members on topics as diverse as the bioenergetic control of microbial genome size to the presence of methane on Mars. Guest lecturer in ‘Life in the Universe’ course. Enrollment 8.

*Autumn 2008: Oceanography 430: Senior undergraduate core course in Biological Oceanography.* Teaching Assistantship. Led weekly review sessions and gave lectures. Assisted in adaptation of curriculum towards discovery-based learning approaches. Enrollment 20.

*Winter/Spring 2008: Oceanography 443/444: Senior undergraduate thesis course.* Teaching Assistantship. Mentored students in the development and execution of individual research projects which were then carried out aboard the R/V Thomas G. Thompson in March 2008. Enrollment 20.

*Spring 2007: Communicating Ocean Sciences outreach course.* Constructed and presented pre-planned kits for science outreach to 2nd grade classroom, then designed, constructed, presented, and evaluated implementation of a new kit with a team member.

*Autumn 2005: Astrobiology Exchange Workshop* at Friday Harbor Labs. Planning and execution of 4-day hands-on scientific workshop involving ~20 students and faculty from the Astrobiology programs at the University of Washington and the University of Arizona.

*Spring 2004: Oceanography 101: Introduction to Oceanography.* Teaching Assistantship. Lectured and taught lab sections for non-majors, culminating in a research cruise in Puget Sound. Enrollment 45.

## FUNDING

*Pending: Co-PI* (Co-PI: Gary Stern). Reimagining Monitored Natural Attenuation for the Remediation of Oil Spilled in Ice-covered Waters. 2021–2025. \$6,000,000. Genome Canada LSARP.

*EOI Pending: Co-I* (PI: Gary Stern). Kivalliq Community Based Monitoring Program. 2020–2023. \$1,500,000. CanNor.

*LOI Pending: Co-I* (PI: Feiyue Wang). TransArctic: Community acceptable and accessible policies and technologies to reduce, detect, and mitigate marine transportation-related hazards in a rapidly opening Arctic. 2020–2023. \$6,000,000. NSERC NFRF-Transformation.

*Awarded: PI* (Co-I: Gary Stern). Arctic coastal community-based prediction of oil biodegradation potential using real-time DNA sequencing and machine learning. 2020–2022. \$250,000. NSERC NFRF-Exploration. Support for 2 students.

*Awarded: PI.* Canada Research Chair in Arctic Marine Microbial Ecosystem Services. 2019–2024. \$500,000. NSERC. Support for 3 students.

*Awarded: PI.* Biospatial Mapping of Arctic Marine Microbial Communities. 2020–2021. 300 core years. Compute Canada.

*Awarded: PI.* Water is Life/Water is Alive. 2019–2021. \$20,000. North Pacific Research Board.

*Awarded: PI.* Hot spots of activity in the cold ocean: Ecological characterization of size-fractionated microbial communities. 2018–2020. \$175,000. North Pacific Research Board. Support for 1 MS.

*Awarded: PI.* Advancing Machine Learning in Biological Oceanography Through Interdisciplinary Collaborations. 2018–2020. \$187,000. NSF EPSCoR. Support for 1 MS.

*Awarded: PI* (Co-I: Katrin Iken). The Chukchi Borderlands – Navigating the Hidden Microbial Network in Sea Ice. NOAA Ocean Exploration and Research. 2015–2018. \$150,000. NOAA Ocean Exploration and Research. Support for 1 technician.

*Awarded: PI* (Co-I: Anne-Lise Ducluzeau). PhArcO: Pharmacopoeia of the Arctic Ocean. INBRE Bioinformatics Award. 2015–2016. \$6,000.

*Awarded: Co-PI* (Co-PIs: Russ Hopcroft, Katrin Iken). Request for support of US participation in CBMP Expert Networks. NOAA/CIFAR. 2015–2017. \$30,000.

*Awarded: Co-I* (PI: Katrin Iken). Arctic Marine Biodiversity Observing Network. National Ocean Partnership Program (NOAA, BOEM, Shell). 2015–2020. \$4,242,000. Support for 1 PhD.

*Awarded: PI* (Co-Is: Rolf Gradinger, Hajo Eicken). Crude Oil Infiltration and Movement in First Year Sea Ice: Impacts on Ice-Associated Biota and Physical Constraints. Coastal Marine Institute/BOEM. 2014–2017. \$596,000. Support for 1 MS, 1 PhD.

*Awarded: PI* (Co-I: Sarah Hardy). Mapping the Uncharted Diversity of Arctic Marine Microbes. NOAA Ocean Exploration and Research. 2014–2017. \$289,000. Support for 1 MS.

*Inherited: PI* (Co-I: Rolf Gradinger). The Diversity, Seasonality, and Function of Parasitic Fungi in Arctic Sea Ice. NSF Arctic Natural Sciences. 2014–2018. \$550,000. Support for 1 MS, 1 PhD, 1 postdoc.

*Awarded: PI* (Co-PI: Jody Deming). Collaborative Research: Seasonal Synergy Between Bacterial Osmoprotection and Algal Production in Sea Ice. NSF Arctic Natural Sciences. 2012–2016. \$230,000. Support for 1 postdoc.

*Awarded: Co-I* (PI: Mary Beth Leigh). Bringing Next-Generation Sequencing Technology to the University of Alaska. Murdock Foundation. 2014–2016. \$110,000.

*Awarded: PI* (Co-I: Mary Beth Leigh). Bringing Next Generation DNA Sequencing Technology to UAF. UAF Technology Advisory Board. 2014–2015. \$50,000.

*Awarded: PI* (Co-I: Anne-Lise Ducluzeau). Potential for quinone regulation of membrane fluidity in marine microbes. Gordon and Betty Moore Foundation. 2014–2016. \$15,000.

*Awarded: PI* (Co-I: Boswell Wing). Unraveling the genetic basis of an ancient geochemical biomarker. DOE Joint Genome Institute. 2011–2016. In-kind sequencing.

*Recommended for Funding: PI.* Microbial Community Monitoring in the Pacific Arctic. NOAA Arctic Research Program. 2015. \$492,000 request not awarded due to budget cuts.

## PUBLICATIONS

- Bowman KL, **Collins RE**, Agather AM, Lamborg CH, Hammerschmidt CR, Kaul D, Dupont CL, Christensen GA, Elias DA (2019) Distribution of mercury-cycling genes in the Arctic and equatorial Pacific Oceans and their relationship to mercury speciation. *Limnology and Oceanography* 65:S310-S320.
- Kasanke C, **Collins RE**, Leigh MB (2019) Identification and Characterization of a Dominant Sulfolane-Degrading *Rhodospirillum rubrum* Strain via Stable Isotope Probing Combined with Metagenomics. *Scientific Reports* 9:1-9.
- Ducluzeau AL, Tyson JR, **Collins RE**, Snutch TP, Hassett BT (2018) Genome Sequencing of Sub-Arctic Mesomycetozoean *Sphaeroforma sirinka* Strain B5, Performed with the Oxford Nanopore minION and Illumina HiSeq Systems. *Microbiology Resource Announcements* 7:e00848-18.
- Bluhm BA, Hop H, Melnikov IA, Poulin M, Vihtakari M, **Collins RE**, Gradinger R, Juul-Pedersen T, von Quillfeldt C (2017) **Chapter 3.1 Sea Ice Biota**. In *State of the Arctic Marine Biodiversity Report*. Conservation of Arctic Flora and Fauna.
- Fuchsman CA, **Collins RE**, Rocap G, Brazelton WJ (2017) **Effect of the environment on horizontal gene transfer between bacteria and archaea**. *PeerJ* 5, e3865. doi:10.7717/peerj.3865
- Deming JW, **Collins RE** (2017) **Sea Ice as a Habitat for Bacteria, Archaea and Viruses**. In *Sea Ice, 3rd Edition*, D Thomas Ed.. John Wiley & Sons, Ltd.
- Moyer CL, **Collins RE**, Morita RY (2017) **Psychrophiles and Psychrotrophs**. *Encyclopedia of Life Sciences*. doi:10.1016/B978-0-12-809633-8.02282-2
- Hassett BT, Ducluzeau AL, **Collins RE**, Gradinger R (2017) **Spatial distribution of aquatic marine fungi across the western Arctic and sub-Arctic**. *Environmental Microbiology* 19:475–484. doi:10.1111/1462-2920.13371
- Firth E, Carpenter SD, Sørensen HL, **Collins RE**, Deming JW (2016). **Bacterial use of choline to tolerate salinity shifts in sea-ice brines**. *Elementa: Oceans. Open Access*. doi:10.12952/journal.elementa.000120
- Collins RE** (2016) **Microbial Evolution in the Cryosphere**. In *Microbial Evolution Under Extreme Conditions*, C Bakermans Ed. De Gruyter, Berlin. doi:10.1515/9783110340716.31
- Kopf A, Bicak M, and 148 co-authors including **Collins RE** (2015) **The ocean sampling day consortium**. *GigaScience* 4:1–5. *Open Access*. doi:10.1186/s13742-015-0066-5
- Eicken H, Bluhm BA, **Collins RE**, Gradinger RR, Haas C, Ingham M, Mahoney A, Nicolaus M, Perovich D (2015) **Field Techniques in Sea-Ice Research**. In *UNESCO Encyclopedia of Life Support Systems*. Cold Regions Science and Marine Technology.
- Miller LA, Fripiat F, Else BGT, Bowman JS, Brown KA, **Collins RE**, Ewert M, Fransson A, Gosselin M, Lannuzel D, Meiners KM, Michel C, Nishioka J, Nomura D, Papadimitriou S, Russell LM, Sørensen LL, Thomas DN, Tison J-L, van Leeuwe MA, Vancoppenolle M, Wolff EW, Zhou J (2015) **Methods for biogeochemical studies of sea ice: The state of the art, caveats, and recommendations**. *Elementa: Oceans* 3:000038. *Open Access*. doi:10.12952/journal.elementa.000038

- Collins RE, Deming JW (2013) **An inter-Order horizontal gene transfer event enables the catabolism of compatible solutes by *Colwellia psychrerythraea* 34H.** *Extremophiles* 17:601–610. *Open Access*. doi:10.1007/s00792-013-0543-7
- Collins RE, Higgs PG (2012) **Testing the Infinitely Many Genes model for the bacterial core genome and pangenome.** *Molecular Biology and Evolution* 29:3413–3425. *Open Access*. doi:10.1093/molbev/mss163
- Collins RE, Higgs PG (2011) **Origin and Evolution of Gene Families in Bacteria and Archaea.** *BMC Bioinformatics* 12(Suppl 9):S14. *Open Access*. doi:10.1186/1471-2105-12-S9-S14
- Collins RE, Deming JW (2011) **Abundant dissolved genetic material in Arctic sea ice, Part I: Extracellular DNA.** *Polar Biology* 34:1819–1830. doi:10.1007/s00300-011-1041-y
- Collins RE, Deming JW (2011) **Abundant dissolved genetic material in Arctic sea ice, Part II: Viral dynamics during autumn freeze-up.** *Polar Biology* 34:1831–1841. doi:10.1007/s00300-011-1008-z
- Miller LA, Papakyriakou TN, Collins RE, Deming JW, Ehn, JK, Macdonald RW, Mucci A, Owens O, Raudsepp M, and N Sutherland (2011) **Carbon dynamics in sea ice: A winter flux time series.** *Journal of Geophysical Research* 116:C02028. doi:10.1029/2009JC006058
- Collins RE, Rocap G, Deming JW (2010) **Persistence of bacterial and archaeal communities in sea ice through an Arctic winter.** *Environmental Microbiology* 7:1828–1841. *Open Access*. doi:10.1111/j.1462-2920.2010.02179.x
- Collins RE, Carpenter S, Deming JW (2008) **Spatial and temporal dynamics of particles, bacteria, and extracellular polymeric substances in Arctic winter sea ice.** *Journal of Marine Systems* 74:902–917. doi:10.1016/j.jmarsys.2007.09.005
- Collins RE, Rocap G (2007) **REPK: an analytical web server to select restriction endonucleases for terminal restriction fragment length polymorphism analysis.** *Nucleic Acids Research* 35 (Database issue): W58–W62. *Open Access*. doi:10.1093/nar/gkm384
- Ehlmann BL, Chowdhury J, Marzullo TC, Collins RE, Litzenberger J, Ibsen S, Krauser WR, DeKock B, Hannon M, Kinnevan J, Shepard R, Grant FD (2005) **Humans to Mars: a feasibility and cost-benefit analysis.** *Acta Astronautica* 56:851. doi:10.1016/j.actaastro.2005.01.010
- Costa MA, Collins RE, Anterola AM, Cochrane FC, Davin LB, Lewis NG (2003) **An in silico assessment of gene function and organization of the phenylpropanoid pathway metabolic networks in *Arabidopsis thaliana* and limitations thereof.** *Phytochemistry* 64:1097-1112. doi:10.1016/S0031-9422(03)00517-X

## PRESENTATIONS

2018

- Eronen-Rasimus E, Collins RE (2018) Polar Microbes Symposium, Tvarminne, Finland. **Conference Organizer.**

Bowman J, Corsaro M, Deming JW, **Collins RE**, Dinasquet J, Tutino L (2018) BE-3 Polar perspectives on microbial evolution, adaptation, and ecological function. POLAR 2018, Davos, Switzerland. **Session Organizer**.

Eronen-Rasimus E, **Collins RE**, Karkman A, Hultman J, Autio R, Rintala J-M, Kaartokallio, H (2018) Biogeography of sea-ice bacteria. ISME 2018, Leipzig, Germany. **Poster**.

**Collins RE** (2018) SEDNA: A Google Earth for Microbes. ISME 2018, Leipzig, Germany. **Poster**.

**Collins RE** (2018) Mapping the Uncharted Diversity of Arctic Marine Microbes. Polar Microbes Symposium, Tvarminne, Finland. **Oral**.

Lekanoff RM, O'Daley S, Collins RE, McDonnell AMP (2018) Characterizing particle-associated and free-living microbes and their roles in the carbon cycle of the Bering and Chukchi seas. Alaska Marine Science Symposium 2018, Anchorage, AK. **Poster**.

Weaver T, Berger J, Biddle J, **Collins RE**, Cooper Z, Deming JW (2018) Sonification of Deep Ocean Microbial Ecology (soniDOME). POLAR 2018, Davos, Switzerland. **Poster**.

Lekanoff RM, O'Daley S, Collins RE, McDonnell AMP (2018) Characterizing particle-associated and free-living microbes and their roles in the carbon cycle of the Bering and Chukchi seas. Ocean Sciences Meeting 2018, Portland, OR. **Poster**.

**Collins RE** (2017) SEDNA: A Visual Framework for the Analysis of Microbial Diversity and Phenotypes. Ocean Sciences Meeting 2018, Portland, OR. **Poster**.

Morton P, Twining B, Rauschenberg S, **Collins RE** (2018) Influence of Brine Release and Sea Ice Melt on Particulate Trace Element Biogeochemistry. Ocean Sciences Meeting 2018, Portland, OR. **Poster**.

## 2017

Ulaski B, **Collins RE** (2017) A Molecular Assessment of Marine Bacterial and Protist Communities Within Two Gateways to the Arctic Ocean. Aquatic Sciences Meeting 2017, Honolulu, HI. **Poster**.

Ducluzeau AL, Hassett BT, Herriott IC, **Collins RE** (2017) The genome of the Sea Ice Flavobacterium *Polaribacter* sp. 11 emphasizes the bioenergetic diversity of the *Polaribacter* genus. Aquatic Sciences Meeting 2017, Honolulu, HI. **Poster**.

Collins RE, Weisen R, Dilliplaine K, Morton P (2017) Microbe-metal interactions in the central Arctic Ocean. Aquatic Sciences Meeting 2017, Honolulu, HI. **Poster**.

Hassett BT, Ducluzeau AL, **Collins RE**, Gradinger R (2017) Fungi: A missing link to Arctic marine carbon cycling. Aquatic Sciences Meeting 2017, Honolulu, HI. **Poster**.

Ulaski B, **Collins RE** (2017) A molecular assessment of marine bacterial and protist communities within two gateways to the Arctic Ocean. Alaska Marine Science Symposium, Anchorage, AK. **Poster**.

## 2016

Collins RE (2016) Redrawing the Map of Arctic Marine Microbes. American Society for Microbiology Alaska Branch, Fairbanks, AK. **Speaker**.

Ducluzeau AL, Hassett BT, Herriott IC, **Collins RE** (2017) The genome of the Sea Ice Flavobacterium Polaribacter sp. 11 emphasizes the bioenergetic diversity of the Polaribacter genus. American Society for Microbial Alaska Branch, Fairbanks, AK. **Poster**.

**Collins RE** (2016) Evolution and metabolism in heterotrophic sea ice bacteria. Workshop on the Biogeochemistry of Sea Ice, With a Focus on the Arctic, Gothenburg, Sweden. **Invited Speaker**.

**Collins RE** (2016) Adaptive Changes in the Inferred Proteomes of Dominant Bacterial Clades in the Global Ocean. Ocean Sciences Meeting, New Orleans, LA. **Poster**.

**Collins RE**, Dilliplaine K, Oggier M, Bluhm B, Gradinger R, Eicken H (2016) Crude oil infiltration and movement in first-year sea ice: Impacts on ice-associated biota and physical constraints. Coastal Marine Institute Annual Meeting, Anchorage, AK. **Speaker**.

Iken K, Danielson S, **Collins RE**, Cooper LW, Grebmeier JM, Stafford K, Mueter F, Hopcroft R, Kuletz K, Bluhm BA, Moore SE, Bochenek R (2016) AMBON – the Arctic Marine Biodiversity Observing Network. **Poster**.

Dilliplaine\* K, Oggier M, **Collins RE**, Eicken H, Bluhm B, Gradinger G (2016) Biological Influence and Impact of Oil Spills in Ice Covered Waters. Alaska Marine Science Symposium, Anchorage, AK. **\*Speaker**.

Oggier M, Dilliplaine K, Eicken H, Bluhm B, Gradinger R, **Collins RE** (2016) Oil in ice: Evolution of pore space geometry occupied by crude oil. Alaska Marine Science Symposium, Anchorage, AK. **Poster**.

## 2015

**Collins RE** and Ducluzeau AD (2015) Phylogenomics of Cold Adaptation. Polar Marine Science Gordon Research Conference, Lucca, Italy. **Poster**.

**Collins RE** (2015) Greenland Ice Microbiome Project. Northwest Glaciologists Meeting. Fairbanks, Alaska. **Speaker**.

**Collins RE**, Dilliplaine K, Oggier M, Bluhm B, Gradinger R, Eicken H (2015) Crude oil infiltration and movement in first-year sea ice: Impacts on ice-associated biota and physical constraints. Coastal Marine Institute Annual Meeting, Anchorage, AK. **Speaker**.

Dilliplaine K, Oggier M, Eicken H, Bluhm B, Gradinger R, **Collins RE** (2015) Preliminary Findings of an Oil-in-Ice Mesocosm Experiment. Alaska Marine Science Symposium, Anchorage, AK. **Poster**.

## 2014

**Collins RE** (2014) Oil biodegradation potential of sea ice microbial communities. Alaska Oil Spill Technology Symposium, Fairbanks, AK. **Speaker**.

**Collins RE** (2014) Winter sea ice biology: the role of bacteria. Big Black Box Workshop: Marine ecological processes during the polar night. Fairbanks, Alaska. **Speaker**.



**Collins RE** (2014) Extremophilic -omics. The Origins and Evolution of Bacterial Genomes, Canadian Mathematical Society. Hamilton, Ontario. **Speaker.**

**Collins RE** (2014) Life on Ice: Microbial Evolution in the Cryosphere. AAAS Arctic Science Conference, Fairbanks, AK. **Speaker.**

Ducluzeau AL, Green JJ, **Collins RE** (2014) Some like it cold: towards cold adaptation. International Society for Microbial Ecology Meeting, Seoul, South Korea. **Poster.**

2013 and earlier

Firth E, Carpenter SD, **Collins RE**, Deming JW (2013) Bacterial survival in sea ice brines: salinity shifts and the cellular fate of compatible solutes. Polar and Alpine Microbiology Meeting, Big Sky, MT. **Poster.**

**Collins RE**, Amato P, and R Morgan-Kiss (2013) Session: Evolution of Psychrophilic Microorganisms. Polar and Alpine Microbiology Conference, Big Sky, Montana. **Session Organizer.**

**Collins RE**, Bradley A, and Wing B (2012) Session: The Molecular Foundations of Geochemical and Microbial Co-evolution. Goldschmidt Conference, Montreal, Canada. **Session Organizer.**

**Collins RE**, Deming JW (2012) hima : a meta-database of genomes and metagenomes from low- temperature environments. International Polar Year Science Conference, Oslo, Norway. **Speaker.**

**Collins RE**, Higgs P (2012) Testing the Infinitely Many Genes Model for the Evolution of the Bacterial Core Genome and Pangenome. Astrobiology Science Conference, Atlanta, GA. **Poster.**

**Collins RE** (2012) Hima: A Meta-Database for Genomes, Metagenomes, and Phenotypes from Cold Environments. Astrobiology Science Conference, Atlanta, GA. **Poster.**

**Collins RE**, Wing B (2012) Unraveling the Genetic Basis of an Ancient Geochemical Biomarker. Astrobiology Science Conference, Atlanta, GA. **Speaker.**

**Collins RE**, Wing B (2012) Unraveling the Genetic Basis of an Ancient Geochemical Biomarker: Sulfur Isotope Fractionation. Goldschmidt Conference, Montreal, Canada. **Speaker.**

**Collins RE** (2012) ddmp: a digital database of microbial phenotypes. Ocean Sciences Meeting, Salt Lake City, UT. **Poster.**

**Collins RE** and JW Deming (2010) Microbial evolution and the potential for horizontal gene transfer in sea ice. International Polar Year Science Conference, Oslo, Norway. **Speaker.**

**Collins RE** (2010) Proposal for an education and public outreach curriculum linking polar climate change and astrobiology. International Polar Year Science Conference, Oslo, Norway. **Poster.**

**Collins RE** (2010) Astrobiology and Bioinformatics: Past, Present, and Future. McGill University, Montreal, Canada. **Speaker.**

**Collins RE** (2010) Astrobiology and Bioinformatics. Computational Astrobiology Summer School, Honolulu, Hawaii. **Speaker.**

**Collins RE**, Merz H, and P Higgs (2010) Modeling Microbial Genome Evolution. Sharcnet Research Conference. York University, Toronto, Canada. **Poster**.

**Collins RE** and JW Deming (2008) Icy Evolution: Lateral gene transfer in the Arctic? Polar and Alpine Microbiology Meeting, Banff, Alberta, Canada. **Speaker**.

Anderson RA, Brazelton WJ, **Collins RE**, Ewert Sarmiento M, Fuchsman CA, Goldman AD, Harnmeijer JP, Lin M, Opatkiewicz AD, Som SM, and E Stueeken (2008) A course in the origin of life as a model for meeting the goals of an astrobiology curriculum. Astrobiology Science Conference, Santa Clara, California. **Poster**.

Som S, **Collins RE**, Schreiber BC, Montgomery DR (2008) Salts on Mars: New perspectives in planetary geomorphology and astrobiological implications. 59th International Astronautical Congress, Paper IAC-08-A1.6.12, Glasgow, Scotland. **Paper**.

Fuchsman CA, Brazelton WJ, **Collins RE**, Horner-Devine MC, Rocap G (2007) Vertical descent or lateral transfer? Unravelling the large number of whole-genome reciprocal BLAST hits between anaerobic, thermophilic Bacteria and Archaea. American Society for Microbiology General Meeting, Toronto, Canada. **Poster**.

**Collins RE** and JW Deming (2007) Lateral gene transfer in Arctic sea ice? Polar Marine Science Gordon Research Conference, Ventura, California. **Poster**.

**Collins RE** and JW Deming (2006) Persistence of Archaea in sea ice. Astrobiology Science Conference, Washington, DC. **Poster**.

**Collins RE** (2006) Sea ice algae of Saroma-ko Lagoon, Hokkaido, during winter. International Symposium on Okhotsk Sea and Sea Ice, Monbetsu, Hokkaido, Japan. **Speaker**.

**Collins RE** and JW Deming (2006) Archaea in Arctic Winter Sea Ice. American Society for Microbiology Northwest Meeting, Seattle, Washington. **Speaker**.

**Collins RE**, Carpenter S, Deming JW (2005) Microbial communities at very low temperatures in natural saline ice formations. NASA Astrobiology Institute General Meeting, Boulder, Colorado. **Poster**.

**Collins RE** and JW Deming (2005) Microbial abundance and community structure in the winter sea ice of Franklin Bay, NWT. International CASES Workshop, Winnipeg, Canada. **Poster**.

Miller L, Owens O, Papakyriakou T, Sutherland N, **Collins RE**, Mucci A, Deming JW (2005) A time series of the carbon budget in first-year sea ice. International CASES Workshop, Winnipeg, Canada. **Poster**.

**Collins RE** and JW Deming (2004) Potential changes in sea-ice microbial community composition during an Arctic winter. International Conference on Arctic Microbiology, Rovaniemi, Finland. **Poster**.

**Collins RE** and JW Deming (2003) Changes in sea-ice microbial community composition during an Arctic winter. Study of Environmental Arctic Change Open Science Meeting, Seattle, Washington. **Poster**.

Chowdhury J, **Collins E**, DeKock B, Ehlmann B, Grant D, Hannon M, Ibsen S, Kinnevan J, Krauser W, Litzenberger J, Marzullo T, and B Shepard (2003) Humans to Mars: the political initiative and technical expertise needed for human exploration of the red planet. NASA Astrobiology Institute General Meeting, Tempe, Arizona. **Poster**.

## **FIELD EXPERIENCE**

I've spent more than 12 months in the field for various projects—mostly in the Arctic or other cold regions, including a 6 week ski traverse of Greenland, 3 months in the Northwest Territories during fall and winter, and several weeks in Barrow, Alaska and Hokkaido, Japan during winter.

**Summer 2019:** 2 weeks. NOAA Explorations, R/V Sikuliaq, Gulf of Alaska.

**Summer 2018:** 4 weeks. ASGARD, R/V Sikuliaq, Chukchi Sea, Alaska.

**Summer 2017:** 3 weeks. DBO-NCIS, CGC Healy, Chukchi Sea, Alaska.

**Summer 2017:** 3 weeks. AMBON, R/V Norseman II, Chukchi Sea, Alaska.

**Summer 2016:** 6 weeks. Hidden Oceans III, CGC Healy, Chukchi Borderlands, Arctic Ocean.

**Winter 2016:** 1 week. UNOLS Chief Scientist Training Cruise, R/V Thomas G. Thompson, San Diego, CA.

**Summer 2015:** 1 week. ARCTREX, R/V Norseman II, Chukchi Sea, Alaska.

**Summer 2015:** 5 weeks. AMBON, R/V Norseman II, Chukchi Sea, Alaska.

**Summer 2014:** 3 weeks. Arctic Science Partnership, Daneborg Marine Station, NE Greenland.

**Summer 2014:** 2 weeks. University Center in Svalbard, Longyearbyen, Svalbard.

**Spring 2014:** 6 weeks. Greenland Ice Microbiome Project, ski traverse of Greenland.

**Spring 2014:** 3 weeks. Greenland Climate Research Center, Nuuk, Greenland.

**Winter 2014:** 1 week. Barrow Arctic Research Center, Barrow, Alaska.

**Spring 2013:** 2 weeks. Barrow Arctic Research Center, Barrow, Alaska.

**Summer 2010:** 1 week. MARSLIFE, Pavilion Lake Research Station, British Columbia, Canada.

**Spring 2008:** 2 weeks. UW Oceanography, R/V Thomas G. Thompson, Glacier Bay National Park, Alaska.

**Autumn 2007:** 6 weeks. Circumpolar Flaw Lead Systems Study, CCGS Amundsen, Beaufort Sea, Canada.

**Summer 2007:** 1 week. Ocean Inquiry Project, Puget Sound, Washington.

**Winter 2006:** 2 weeks. Sea ice field course, Saroma-ko lagoon, Hokkaido, Japan.

**Spring 2004:** 1 week. UW Oceanography 101, R/V Barnes, Puget Sound, Washington.

**Winter 2004:** 6 weeks. Canadian Arctic Shelf Exchange Study, CCGS Amundsen, Beaufort Sea, Canada.

**Summer 2003:** 2 weeks. Chinese National Arctic/Antarctic Research Expedition, R/V Xuelong, Chukchi Sea.

**Winter 2003:** 1 week. NASA Astrobiology Institute Europa Focus Group, Barrow, Alaska.

**Autumn 2002-2009:** UW Astrobiology Workshops at Easton Glacier on Mt. Baker, the Mojave Desert Research Station, Mount St. Helens, San Juan Islands, Yellowstone National Park, University of Arizona Kitt Peak Observatory, and the Channeled Scablands.

## PROFESSIONAL DEVELOPMENT

**iTeach Online Learning**, University of Alaska Fairbanks (Fall 2017)  
Participated in semester-long training modules to advance skills in online pedagogy.

**UNOLS Chief Scientist Training Cruise**, Thomas G. Thompson (February 2016)  
Participated in 1-week research cruise to gain applied knowledge in running a research cruise.  
Chief Scientists: Al Devol, Evelyn Lessard

**Workshop on Molecular Evolution**, Marine Biological Laboratory (July 2011)  
Participated in 10-day workshop on molecular phylogenetics and evolution. Director: Mitch Sogin

**Computational Astrobiology Summer School**, University of Hawai'i (August 2010)  
Participated in 2-week workshop on computational modeling from the perspective of Astrobiology.  
Director: Kim Binsted

**Field Techniques in Interdisciplinary Sea-ice Research**, Saroma-ko, Japan (March 2006)  
Participated in 10-day field course on sea ice research, followed by a presentation at an international sea ice symposium. Instructors: Hajo Eicken (UAF), Rolf Gradinger (UAF), Kunio Shirasawa (Hokkaido University).

**NASA Ames Astrobiology Academy**, Ames Research Center, California (Summer 2002)  
Participated in a summer research and leadership academy. Director: Douglas O'Handley.

## PROFESSIONAL SERVICE

President of the American Society for Microbiology Alaska Branch (2017–2018)

US representative of the Circumpolar Biodiversity Monitoring Project (CBMP) Sea Ice Biota Expert Network, a function of the Arctic Council's Conservation of Arctic Flora and Fauna (CAFF) working group.

Member of the Association of Polar Early Career Scientists (APECS), and Research Activities Committee organizer for the APECS Polar Microbial Ecology Research Group (2010–2015).

Referee for quality journals in polar ecology, environmental microbiology, and molecular evolution: FEMS Microbiology Ecology, Environmental Microbiology, Aquatic Microbial Ecology, Marine Ecology Progress Series, Journal of Marine Systems, Aquatic Sciences, Polar Biology, BMC Genomics, Molecular Biology and Evolution, PLoS ONE.

Proposal referee for NSF Division of Polar Programs and NASA Exobiology.

## PUBLIC OUTREACH

I consider science outreach an important part of my scientific development and have dedicated time to a variety of outreach activities, including giving demonstrations at museums and open houses, inside K-12 classrooms, and at sea. I have judged for science fairs and mentored ‘at-risk’ high school students conducting a science fair project. In partnership with the Centers for Ocean Sciences Educational Excellence–Ocean Learning Communities (COSEE-OLC), a fellow student and I designed and implemented an ocean sciences curriculum with a local grade school teacher, and I participated in workshops to improve my ability to communicate with citizen scientists. I developed a website to allow engaged amateurs to report and track crows banded by Dr. John Marzluff in the College of Forest Resources at the University of Washington. I have also written articles and shared photographs for publication in non-technical science forums, one of which was subsequently translated and published in Catalan.

Public outreach via web and social media:

Collins Lab Website, <http://cryomics.org>, 10,000 visits/year

Cryomics Twitter, <http://twitter.com/cryomics>, 213 followers

Collins Twitter, <http://twitter.com/rec3141>, 183 followers

Cryomics Lab Google+ channel, 2500 visits/year

Cryomics Lab YouTube channel, 850 views/year

## COMPUTATIONAL PROFICIENCIES

**General:** Perl, Javascript, PHP, HTML, XML, L<sup>A</sup>T<sub>E</sub>X, MySQL, Linux sysadmin, high-performance computing on large datasets, cloud computing on Amazon Web Services

**Bioinformatics and Statistics:** R, PRIMER, MATLAB, blast, BioPerl, Galaxy, KEGG, IMG, ARB, PHYLIP, PhyML, AMPHORA, MrBayes, fastDNAm1, MUSCLE, mothur, DADA2, BaseSpace, DIAMOND, kraken, SPAdes, RAST, MG-RAST, BioLinux distribution

### Web-accessible Software Products

All of the analytical software written in the Collins lab is freely released under open source licenses to be shared, modified, and re-used by the scientific community.

<http://github.com/rec3141> [20 repositories]

An award-winning visualization framework for microbial diversity and phenotypes

SEDNA: <http://cryomics.org/sedna>

Two experimental web-accessible databases provide access to information on cold-adapted microbes. HIMA is a phylogenetic-based meta-database of genomes and metagenomes from low-temperature environments. DDMP is a MySQL database of phenotypic information for cold-adapted bacterial species data-mined from Bergey’s Manual of Systematic Bacteriology.

hima: <http://cryomics.org/work/hima>

ddmp: <http://cryomics.org/work/ddmp>

Two web-accessible programs were written to aid in fingerprinting analyses of complex microbial communities, gaining frequent use both within the Center for Environmental Genomics and by external users.

REPK: <http://rocaplab.ocean.washington.edu/tools/repk>

Dakster: <http://rocaplab.ocean.washington.edu/cgi/dakster/index.html>

Two interactive web-accessible databases were engineered to facilitate data-sharing both among scientists and between scientists and the public. The Lab Sampling Database will make information about my sampling efforts easily accessible to the public and to other scientists with whom collaborations might be initiated.

Collins Lab Sampling Database: <http://cryomics.org/grimp/tracker>

Seattle Crow Project: <http://depts.washington.edu/uwcrows>