

R. ERIC COLLINS
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EDUCATION AND RESEARCH EXPERIENCE

Ph.D. Biological Oceanography, University of Washington (expected Summer 2009)

Sea ice as a hotspot for horizontal gene transfer: I investigated the diversity of Bacterial and Archaeal communities in winter sea ice with fragment analysis, utilizing software I wrote for this project to aid in fingerprinting analyses of environmental communities. I found Archaea and Bacteria from seawater and possibly other environments were found to persist through the winter season with no change in richness and limited changes in the structure of either community. During the Circumpolar Flaw Lead Systems Study I measured the abundances of parameters relevant to the frequency of horizontal gene transfer in newly formed sea ice. I am currently performing in silico analyses of genome sequences for evidence of horizontal gene transfer, including that of a model psychrophile, *Colwellia psychrerythraea* strain 34H. Advisor: Dr. Jody W. Deming.

Certificate in Astrobiology, University of Washington (expected Summer 2009)

In vitro microsensor measurements of anaerobic oxidation of methane: While conducting my research rotation at the Max Planck Institute for Marine Microbiology in Bremen, Germany, I used pH and sulfide microsensors to measure the rate of anaerobic oxidation of methane (AOM) in samples of a microbial mat from the Crimean Shelf of the Black Sea. This study confirmed expectations from stable and radioactive isotope analyses that AOM occurs primarily in the surface layer of the mats, where ANME-1 Archaea dominate the microbial community. Advisors: Dr. Dirk de Beer, Dr. Antje Boetius.

M.S. Biological Oceanography, University of Washington (2005)

Microbial persistence over an Arctic winter season: I investigated the abundances of microorganisms, particles, and particulate extracellular polymeric substances (pEPS) in Arctic winter sea ice during the Canadian Arctic Shelf Exchange study. Although a significant decline in microorganismal abundance was observed in the coldest ice, there was also significant production of pEPS in all of the ice measured, indicating microbial adaptation to this extremely cold and salty environment. Advisor: Dr. Jody W. Deming.

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

I performed research on the biochemistry and molecular biology of the phenylpropanoid pathway in vascular plants. Advisor: Dr. Norman G. Lewis.

FIELD EXPERIENCE

I've spent a total of 20 weeks in the field for various projects—most were in the Arctic or other cold regions, including 3 months in the Northwest Territories during fall and winter, and several weeks in Barrow, Alaska and Hokkaido, Japan during winter.

Autumn 2007: Six-week cruise in the Beaufort Sea aboard the CCGS Amundsen as part of the Circumpolar Flaw Lead Systems Study(CFL).

Winter 2004: Six-week overwintering cruise in Franklin Bay, Northwest Territories aboard the CCGS Amundsen as part of the Canadian Arctic Shelf Exchange Study (CASES).

Winter 2006: Two-week sea ice field course in Hokkaido, Japan through the University of Alaska–Fairbanks.

Summer 2003: Two-week cruise in the Chukchi Sea on the R/V Xuelong with the Chinese National Arctic/Antarctic Research Expedition (CHINARE) program.

Winter 2003: One-week workshop with the NASA Astrobiology Institute Europa Focus Group in Barrow, Alaska.

Spring 2008: Two-week cruise to Glacier Bay National Park, Alaska, aboard the R/V Thomas G. Thompson while TA'ing the UW Oceanography Senior Thesis course.

Spring 2004: One week of daily student cruises in Puget Sound aboard the R/V Barnes while TA'ing Oceanography 101.

Summer 2007: One-day student cruise with the Ocean Inquiry Project in Puget Sound.

Autumn 2002-2008: UW Astrobiology Workshops at Easton Glacier on Mt. Baker, Mount St. Helens, Yellowstone National Park, University of Arizona Kitt Peak Observatory, and the Channeled Scablands.

COMPUTER PROFICIENCIES

Applied experience with PAUP*, ARB, Matlab, R, PRIMER-E, Perl, Javascript, PHP, HTML, XML, L^AT_EX, MySQL database administration, and Linux system administration.

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 calculates the best enzymes for use with T-RFLP given a user-inputted sequence file; Dakster performs binning of electropherogram peaks given a user-inputted fragment list.

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 Deming Lab Sampling Database will make information about our lab's sampling efforts easily accessible to the public and to other scientists with whom collaborations might be initiated. The Seattle Crow Project collects cultural and scientific evidence for the extensive interactions between humans and our corvid neighbors.

Deming Lab Sampling Database: <http://staff.washington.edu/rec3141/deminglab/>

Seattle Crow Project: <http://staff.washington.edu/rec3141/crows/>

PROFESSIONAL SERVICE

Student representative to the UW Astrobiology Steering Group (2006) and UW Oceanography Faculty Search Committee (2007).

PUBLIC OUTREACH

I consider science outreach an important part of my scientific development and have volunteered my time to a variety of outreach activities, including dozens of hours giving demonstrations at Polar Science Weekend at the Seattle Science Center, the annual School of Oceanography Open House, inside K-6 classrooms, and at sea with the Ocean Inquiry 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 an event to improve my ability to communicate with citizen scientists, a goal shared by another project I developed to allow engaged amateurs to report and track crows banded by Dr. John Marzluff in the College of Forest Resources. I have also written articles and shared photographs for publication in non-technical forums, one of which was subsequently translated and published in Catalan.

TEACHING EXPERIENCE

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

Winter/Spring 2008: Teaching Assistantship, Oceanography 443/444: Senior undergraduate thesis course. 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.

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. Assisted in 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: Teaching Assistantship, Oceanography 101: Introduction to Oceanography for non-majors. Lectured and taught 3 lab sections of 15 students each, culminating in a research cruise in Puget Sound.

PUBLICATIONS

Collins RE, Deming JW (in preparation) Arctic sea ice brines contain high concentrations of dissolved DNA.

Collins RE, Deming JW (in preparation) Growth of psychrophilic *Colwellia* spp. on sarcosine, a derivative of the compatible solute glycine betaine.

Fuchsman CA, Brazelton WJ, **Collins RE**, Horner-Devine MC, Rocap G (in preparation) Vertical descent or lateral transfer? Unravelling the large number of whole-genome reciprocal BLAST hits between anaerobic, thermophilic Bacteria and Archaea.

Som S, **Collins RE**, Schreiber BC, Montgomery DR (in preparation) Salts on Mars: New perspectives in planetary geomorphology and astrobiological implications.

Collins RE, Rocap G, Deming JW (submitted) Persistence of Bacterial and Archaeal communities in sea ice through an Arctic winter.

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. 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.

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.

PRESENTATIONS

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

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. 2008.

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. Poster, American Society for Microbiology General Meeting, Toronto, Canada.

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

Collins RE and JW Deming (2006) Persistence of Archaea in sea ice. *Astrobiology* 6: 174-221. doi:10.1089/ast.2006.6.174. Poster, Astrobiology Science Conference, Washington, DC.

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

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

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

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

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. Poster, International CASES Workshop, Winnipeg, Canada.

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

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

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. Poster, NASA Astrobiology Institute General Meeting, Tempe, Arizona.