

CURRICULUM VITAE

Mr. Paul Henderson

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EDUCATION:

B.S., Biology, Bowling Green State University, Bowling Green, OH, 1997.

Graduate Courses Taken:

University of Massachusetts, Dartmouth, MA (School for Marine Science and Technology) -
Contaminant Groundwater Hydrogeology, Marine Microbiology, Marine Chemistry,
Biological Oceanography, Physical Oceanography, Statistics, Case Study of estuarine
dynamics

Professional Experience:

Oct 2006-Present, Research Associate II, Woods Hole Oceanographic Institution

- Operation of Nutrient Cost Center including maintenance, cleaning, and repair of the Lachat QuickChem 8000 nutrient auto-analyzer and associated equipment (balances, water purification system, etc) for both internal and external projects (Eddies, Vertigo, Anammox, Gulf of Maine, AMLR, Waquoit Bay, Pamet River, Quonochontaug Pond, Florida USGS, St. John's).
- Communicate with clients to ensure nutrient data delivery in a timely manner.
- Maintain chemical online inventory and conduct proper waste disposal.
- Prepare monthly billing for the Nutrient cost center.
- Created and compared Nitrogen loading Models for Quonochontaug Pond, Rhode Island and included results to help compose the Morris mid year report.
- Constructed contour plots of nutrient and isotope field data collected.
- Testing new fiber optic spectrometer as a more cost effective alternative for automated seepage meters to quantify groundwater discharge within the coastal zone.
- Learned and Utilized Th²³⁴ technique to quantify carbon export within the southern ocean.
- Performed chemical purification of ²³⁴Th samples for determination of ²³⁰Th yield tracer via the WHOI ICP facility.
- Collected and analyzed surface water for short lived radium isotopes in the southern ocean using Alpha Scintillation counters.
- Modified Nutrient Monitor from Envirotech (NAS 2E) to sample surface waters in rapid succession in order to conduct high-resolution nitrate mapping in the coastal zone.
- Data reduction, interpretation, and report writing for Charette Lab funding annual and bi-annual reports.
- Testing new fiber optic spectrometer as a more cost effective alternative for automated seepage meters to quantify groundwater discharge within the coastal zone.
- Collected and analyzed surface water for long lived radium isotopes for internal projects using Canaberra and Ortec Gamma counters.
- Operation of the Varian AAS including calibration, alignment, and method development of barium samples.

- Reconfigured the Lachat nutrient analyzer to have the capability to analyze for Bromide expanding the services provided by the nutrient cost center.
- Operation of the Varian Atomic Absorption Spectrometer (AAS) including calibration, alignment, and method development of barium and beryllium samples.
- Adapted the beryllium method and used current radioisotope methods in a subfreezing remote region of Greenland at the base of a glacier.
- Conducted groundwater study at the Liquid Jungle Laboratory in Panama.
- Learned new procedure for quantifying radium isotopes using the Manganese oxide co-precipitation and ICP-MS method.
- Worked on large volume measurement for the groundwater tracer ^{222}Rn .
- Created and measured gamma spectrometry standards to calibrate Canberra detectors.
- Separated and calibrated ^{228}Ra from ^{232}Th to use as a calibration spike for the analysis of ^{226}Ra using the ICP-MS.
- Prepared and packed equipment for multiple groundwater studies (Chile, Florida (Naples), Florida (Miami), and Guam)
- Provide analytical and logistical support for visiting Chinese student (Qian Liu).
- Trained visiting post-doc, Erika Bousserez, from Dalhousie University on the radium delayed coincidence counter (Radecc).
- Provided support for the manager of the radioanalytical facility.
- Manufactured extraction line to determine the activity of ^{226}Ra through the measurement of its daughter product ^{222}Rn .
- Working on a model to determine the volumetric groundwater discharge within the Caloosahatchee Estuary using continuous ^{222}Rn measurements.
- Prepared and packed equipment for groundwater and open ocean studies aboard research vessels (Florida, Waquoit Bay, Massachusetts, NW Atlantic Slope, and GEOTRACES N Atlantic ocean section).
- Provided analytical and logistical support for guest student Qian Liu (Xaimen University, China).

June 2007-Present, Diver, Woods Hole Oceanographic Institution AAUS scientific diver

- 50 scientific dives performed in Rhode Island, Florida, South Carolina, Mexico, and Guam.
- Dive Tasks included instrumentation deployment/retrieval (ADCP, nutrient analyzer, temperature loggers), coral head staining, seep sampling, and well sampling.

July 2004-2006, Research Assistant III, Woods Hole Oceanographic Institution, Woods Hole, MA

- Operation of Nutrient Cost Center including maintenance, cleaning, and repair of the Lachat QuickChem 8000 nutrient auto-analyzer and associated equipment (balances, water purification system, etc) for both internal and external projects
- Maintain Nutrient Cost Center Website and online Chemical inventory
- Conducted a blind internal nutrient calibration with an outside laboratory
- Prepare monthly billing and report results to clients (approximately 15 internal and 6 external)
- Calibrate and deploy two In-situ Nutrient Analyzers (Ecolab and NAS)
- Supervise part time workers throughout the year to help complete cost center business

- Programmed and deployed well pumping and nutrient analysis system off Myrtle Beach, South Carolina (joint w/ W.S. Moore, Univ. South Carolina) and Waquoit Bay
- Testing new fiber optic spectrometers as a more cost effective alternative for automated seepage meters to quantify groundwater discharge within the coastal zone
- Created and compared Nitrogen loading Models for Quonochontaug Pond, Rhode Island and included results to help compose the Morris mid-year report
- Performed chemical purification of ²³⁴Th samples for determination of ²³⁰Th yield tracer via the WHOI ICP facility
- Modified Nutrient Monitor from Envirotech (NAS 2E) to sample surface waters in rapid succession to conduct high-resolution nitrate mapping in the coastal zone
- Helped to construct, operate, and troubleshoot the Radon Mapping system
- Participation in the Antarctic Marine Living Resources (AMLR) project with NOAA scientists based out of Punta Arenas, Chile. A remote laboratory was setup for processing water samples collected aboard the R/V Yuzhmogeologia. Forty-one days were spent at sea conducting a survey studying carbon export and tracking different water masses using thorium and radium as tracers in the southern ocean near the Shetland Islands
- Prepared sampling supplies and analytical instrumentation for laboratory setup aboard the R/V Palmer in Punta Arenas, Chile. Trained two students (WHOI, UCSD) on the techniques of Thorium and Radium collection and analysis to be performed at sea
- Participation in the Eddies project with Ken Buessler's laboratory based out of St. Georges, Bermuda. Ten days were spent at sea conducting a survey studying particle loading using the Thorium technique aboard the R/V Weatherbird II
- Conducted a remote field collection and analysis of groundwater using a peizometer retractotip sampling system and deployment of surface water radon analyzer in the Liquid Jungle laboratory in Panama
- Collected groundwater samples around Plum Island, Quonochontaug Pond, Pamet River, Waquoit Bay and operated the Limilus while conducting Radon and nitrogen mapping of these watersheds
- Modified flow cell for YSI to be able to collect physical data along with sub-sampling and running in-situ nitrate. The instruments were deployed in Waquoit to study groundwater nutrient concentrations as part of a pilot coastal groundwater observatory

May 1998-2004, Research Technician, Coastal Systems Group, University of Massachusetts, Dartmouth, New Bedford, MA

- Collected and analyzed fresh and salt water column samples to help determine phosphorus/nitrogen sensitivity through quantitative TMDL's
- Analyzed inorganic nutrients following Environmental Protection Agency approved methods
- Responsible for tracking, analyzing, and reporting approximately eight thousand samples per year from state organizations, consulting firms, internal research, and citizens monitoring groups
- Responsible for maintenance, operation, and calibration of laboratory and field instrumentation

- Hired and supervised approximately ten technicians and students per year.
- Obtained 40 hour certification for Hazardous Waste Operations and Emergency Response Training
- Processed purchase orders on the University of Mass, Dartmouth People Soft computerized purchasing system
- Obtained power boat experience up to twenty-three feet. Navigated throughout coastal waterways of southeastern Massachusetts, Cape Cod, Nantucket, and Martha's Vineyard

March 1999-2004, Diver, Coastal Systems Group University of Massachusetts, Dartmouth, New Bedford, MA

- 150 scientific dives in various locations year round including low visibility rivers, deep kettle ponds, and coastal embayments
- Dive Tasks included instrumentation deployment/retrieval and sediment collection and analysis for organic and inorganic nutrient flux

PUBLICATIONS

- Crusius, J., D. Koopmans, J. Bratton, M.A. Charette, K. Kroeger, P. Henderson, L. Ryckman, K. Halloran, and J.A. Coleman. (2005) Submarine groundwater discharge to a small estuary estimated from radon and salinity measurements and a box model. *Biogeosciences*, **2**, 141-157.
- Acknowledged in Kroeger, K.D., Swarzenski, P.W., Reich, C., Blake-Collins, B, and Greenwood, J. In press. Submarine groundwater discharge and associated nitrogen, phosphorus, and silica fluxes to Tampa Bay, Florida. *Marine Chemistry*.
- Acknowledged in Swarzenski, P.W., Reich, C., Kroeger, K.D., and Baskaran, M. In press. Ra and Rn as natural tracers of submarine groundwater discharge in Tampa Bay, Florida. *Marine Chemistry*.
- Acknowledged in Anderson, D.M., Keafer, B.A., McGillicuddy, D.J., Mickelson, M.J., Keay, K.E., Libby, P.S., Manning, J.P., Mayo, C.A., Whittaker, D.K., Hickey, J.M., He, R., Lynch, D.R., Smith, K.W., 2005. Initial observations of the 2005 Alexandrium fundyense bloom in southern New England: General patterns and mechanisms. *Deep Sea Research II*, **52**, 2856-2876.
- Acknowledged in Charette, M.A. (2006) Hydrologic forcing of submarine groundwater discharge: insight from a seasonal study of radium isotopes in a groundwater dominated salt marsh estuary. *Limnology and Oceanography*, in press.
- Acknowledged in Bone, S.E., M.E. Gonneea, and M.A. Charette. (2006) Geochemical cycling of arsenic in a coastal aquifer. *Environmental Science and Technology*, **40**, 3273-3278
- Acknowledged in Dennis J. McGillicuddy, Jr., Laurence A. Anderson, Nicholas R. Bates, Thomas Bibby, Ken O. Buesseler, Craig A. Carlson, Cabell S. Davis, Courtney Ewart, Paul G. Falkowski, Sarah A. Goldthwait, Dennis A. Hansell, William J. Jenkins, Rodney Johnson, Valery K. Kosnyrev, James R. Ledwell, Qian P. Li, David A. Siegel, Deborah K. Steinberg. Eddy/Wind Interactions Stimulate Extraordinary Mid-Ocean Plankton Blooms. *Science* May 18, 2007. vol. 316 no. 5827, pgs 1021-1026.
- Acknowledged in Charette, Matt A. Assessment of Nutrient Loading in Quonochontaug Pond, Rhode Island. November 1, 2006.
- Acknowledged in Kroeger, K.D., Swarzenski, P.W., Greenwood, J., and Reich, C. 2007. Submarine groundwater discharge to Tampa Bay: Nutrient fluxes and biogeochemistry of the coastal aquifer. *Marine Chemistry* 104:85-97.

- Acknowledged in Garrison, V., Kroeger, K.D., Fenner, D., and Craig, P. 2007. Identifying nutrient sources to three lagoons at Ofu and Olosega, American Samoa using $\delta^{15}\text{N}$ of benthic macroalgae. *Marine Pollution Bulletin*, in press.
- H. Dulaiova, M. E. Gonnea, M. A. Charette, and P. B. Henderson. Radon variability in the subterranean estuary. *Geochimica et Cosmochimica Acta*
- H. Dulaiova, M.E. Gonnea, P.B. Henderson, M.A. Charette Geochemical and physical sources of radon variation in a subterranean estuary — Implications for groundwater radon activities in submarine groundwater discharge studies. *Marine Chemistry*, Volume 110, Issues 1-2, 16 May 2008, Pages 120-127
- Dulaiova, H., P. Henderson, M.V. Ardelan, and M.A. Charette. (2008) Shelf-derived iron inputs drive biological productivity in the Scotia Sea. *Global Biogeochemical Cycles*, submitted.
- Acknowledged in Buesseler, K.O., C. Lamborg, P. Cai, R. Escoube, R. Johnson, S. Pike, P. Masque, D. McGillicuddy and E. Verdeny (2008). Particle fluxes associated with mesoscale eddies in the Sargasso Sea. *Deep-Sea Research II*, 55: 1426-1444.
- Acknowledged in Buesseler, K.O., T.W. Trull, D.K. Steinberg, M.W. Silver, D.A. Siegel, S.-I. Saitoh, C.H. Lamborg, P.J. Lam, D.M. Karl, N.Z. Jiao, M.C. Honda, M. Elskens, F. Dehairs, S.L. Brown, P.W. Boyd, J.K.B. Bishop and R.R. Bidigare (2008b). VERTIGO (VERTical Transport in the Global Ocean): a study of particle sources and flux attenuation in the North Pacific. *Deep-Sea Research II*, 55(14-15): 1522-1539.
- Acknowledged in Meagan Eagle Gonnea, Paul J. Morris, Henrieta Dulaiova and Matthew A. Charette. New perspectives on radium behavior within a subterranean estuary. *Marine Chemistry*, Volume 109, Issues 3-4, 16 April 2008, Pages 250-26.
- Acknowledged in Mann, E. L., Biller, K., and J. Fox. (2008) Picophytoplankton community structure in anthropogenically impacted and relatively pristine estuaries in the Southeastern USA. *Mar. Ecol. Prog. Ser.* In Review.
- Dulaiova, H., P. Henderson, M.V. Ardelan, and M.A. Charette. (2008) Shelf-derived iron inputs drive biological productivity in the Scotia Sea. *Global Biogeochemical Cycles*, in press.
- Dulaiova, H., R. Camilli, P. Henderson, and M.A. Charette. (2009) Coupled Radon, methane, and nitrate sensors for large scale assessment of groundwater discharge and non-point source pollution to coastal waters. *Journal of Environmental Radioactivity*, submitted.
- Report: Charette, M.A., Henderson, P.B., Breier, C.F. A link between submarine groundwater discharge and red tide in southwest florida? The Cove Point Foundation Mid-Year Report, June 2009.
- Report: Charette, M.A., Henderson, P.B., Rao, A. A link between submarine groundwater discharge and red tide in southwest florida? The Cove Point Foundation Year End Report, Nov 2008.
- Report: Charette, M.A., Henderson, P.B. Water Quality Assessment of the Quonochontaug Pond Watershed. The Cove Point Foundation Year End Report, Nov 2008
- Dulaiova, H., R. Camilli, P. Henderson, and M.A. Charette. (2010) Coupled radon, methane and nitrate sensors for large-scale assessment of groundwater discharge and non-point source pollution to coastal waters. *Journal of Environmental Radioactivity*, 101: 553-563.
- Report: Charette, M.A., Henderson, P.B., Breier, C.F. A link between submarine groundwater discharge and red tide in southwest Florida? The Cove Point Foundation Mid-Year Report, June 2010.
- Report: Charette, M.A., Henderson, P.B., Rao, A. A link between submarine groundwater discharge and red tide in southwest Florida? The Cove Point Foundation Year End Report, Nov 2009.
- Acknowledged in: Bhatia, M.P., S.B. Das, K. Longnecker, M.A. Charette, and E.B. Kujawinski. (2010) Molecular characterization of dissolved organic matter associated with the Greenland ice sheet, *Geochimica Cosmochimica et Acta*, 74: 3768-3784.

- Acknowledged in: Longnecker, K., Da Costa, A., Bhatia, M., and Kujawinski, E. (2009) Effect of carbon addition and predation on acetate-assimilating bacterial cells in groundwater.
- Acknowledged in: Swarzenski, P.W., Izbicki, J.A., Grossman, E.E., Glenn, C.R., Plath, C.A., and J.L. Kelly. 2009. A multiproxy tracer approach to submarine groundwater discharge studies: Examples from Santa Barbara, CA and Maunaloa Bay, Oahu HI. *Geochimica Cosmochimica Acta* 73: A1299-A1299.

PROFESSIONAL PRESENTATIONS

- Morris, P.J., M. Charette, M. Gonneea, H. Dulaiova, P. Henderson, and G. Rago. Radium isotopes as tracers of coastal submarine groundwater discharge - A biogeochemical perspective. Postgraduate Research in Marine Earth Sciences, Oxford, United Kingdom, September 2006
- Morris, P.J., M. Charette, M. Gonneea, H. Dulaiova, P. Henderson, and G. Rago. Radium isotopes as tracers of coastal submarine groundwater discharge - A biogeochemical perspective. Challenger Conference for Marine Science, Oban, Scotland, September 2006
- James Sáenz, Ellen Hopmans, Paul Henderson, Matt Charette, Karen Casciotti, Stefan Schouten, Jaap Sinninghe Damsté, and Timothy Eglinton. Biomarker Evidence for Anammox in the Waquoit Bay Subterranean Estuary. Gordon Conference on Organic Geochemistry, Holderness School, Portsmouth, NH, June 2006
- Charette, M., A. Gonneea, M. E. Henderson, P. B. A Two-Year Time-Series of Trace Metals and Nutrients in a Coastal Aquifer. ASLO 2007 Winter ASLO Meeting, Santa Fe, NM.
- Dulaiova, H.; Charette, M. A.; Mitchell, G.B.; Measures, C.; Henderson, P.; Supcharoen, R.; Biller, D. Natural iron fertilization in the Southern Ocean: investigating horizontal iron transport and vertical carbon flux using radium isotopes and thorium-234. 2007 Winter ASLO Meeting, Santa Fe, NM.
- Sáenz, J. E. Hopmans, P. Henderson, M. Charette, K. Casciotti, S. Schouten, J.S. Damsté, and T. Eglinton. Biomarker Evidence for Anammox in the Waquoit Bay Subterranean Estuary. International Meeting on Organic Geochemistry (IMOG), Torquay, England, September 2007.
- Dennett, M. A. Microbial Diversity Survey of a Sewage and Thermally Impacted Estuary: Mt. Hope Bay, Massachusetts. Woods Hole Center for Oceans and Human Health (April 2007)
- Attended the National Groundwater Association Conference in Las Vegas, Nevada (Dec 2006).
- Attended in situ Chemical and Biological Sensors meeting (June, July 2007) Woods Hole, Ma
- Henderson, P.B. and Charette, M.A. A Multi-year Biogeochemical Study of Quonochontaug Pond (Presentation to funding source Sept 2008)
- Henderson, P.B., Gonneea, M., and Charette, M.A. Nitrogen Loading to Quonochontaug Pond: The use of computer generated models (Poster Presentation to Estuarine Research Federation Conference Nov 2007)

- Kroeger, K.D., Charette, M.A., Casciotti, K., Eagle-Gonneea, M., Henderson, P. Rogers, D., Baldwin, S., and Edwards, K. Nitrogen transformations in submarine groundwater discharge zones: Insights from isotope pairing experiments. (ASLO March 2008)
- Dulaiova, H, Chung, E, Gonneea, M E, Henderson, P B, Charette, M A. Pore Water Exchange and Nutrient and Trace Metals Fluxes In a New England Salt Marsh. 2008 GSA Meeting, Houston, Texas.
- Dulaiova, H, Chung, E, Gonneea, M E, Henderson, P B, Charette, M A. Multitudinal Pathways of Groundwater Advection and Associated Nutrient Fluxes in Salt Marsh Estuaries. 2008 AGU/ASLO Ocean Sciences Meeting, Orlando, Florida.
- Rao, A F, Gonneea, M E, Henderson, P B, Fitzsimmons, J, Morales, S, Herrera-Silveira, J, Charette, M A. Nutrient Biogeochemistry of a Karst Aquifer System and its Influence on the Coastal Ocean in the Northern Yucatán Peninsula, México. 2008 AGU/ASLO Ocean Sciences Meeting, Orlando, Florida.
- Dulaiova, H., M. Charette, W. Burnett, M. Gonneea, and P. Henderson. Groundwater Seepage from Subterranean to Surface Estuaries – Examples from Geochemical Tracer Surveys. Estuarine Research Federation Meeting, Providence, Rhode Island, November, 2007.
- Gonneea, M., P. Henderson, A. Mulligan, M. Charette. Submarine Groundwater Discharge and Associated Transport of Nutrients to the Coastal Ocean Along Southwest Florida. Estuarine Research Federation Meeting, Providence, Rhode Island, November, 2007.

PROFESSIONAL SERVICE

- Public Presentation of a demonstration of groundwater quantification techniques and consequences of nitrogen loading. Open house Waquoit Bay National Estuarine Reserve, Waquoit, MA, August 2006