

## **Gary S. Dwyer - Senior Research Scientist**

Division of Earth and Climate Sciences, Nicholas School of the Environment  
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### **Education**

Ph.D. Geology, Duke University, Durham, NC, 1996  
M.S. Geology, Duke University, Durham, NC, 1991  
B.S. Geology, University of Maryland, College Park, MD, 1987  
A.A. Montgomery College, Rockville, MD, 1985

### **Appointments**

2010-Present **Senior Research Scientist**, Division of Earth and Ocean Sciences, Nicholas School of the Environment, Duke University.  
1997-2010 **Research Scientist**, Division of Earth and Ocean Sciences, Nicholas School of the Environment, Duke University.  
1996-1997 **Postdoctoral Scientist**, Department of Geology, Duke University.  
1990-1996 **Research Assistant**, Department of Geology, Duke University.  
1988/1990 **Geologist**, ARCO Production Research Center, Plano, TX (summers).  
1987-1990 **Teaching Assistant**, Department of Geology, Duke University.  
1986-1987 **Undergraduate Res. Asst.**, Dept. of Geology, University of Maryland.

### **Teaching**

EOS/ENV226S - Field Methods in Earth and Environmental Science  
EOS410S - Senior Capstone Experience - Ireland: Geology, Climate, Environment  
EOS410S - Senior Capstone Experience - Florida-Bahamas: Geology, Climate, Environment  
EOS404S - Geology of Tropical Marine Environments  
EOS393 - Research Independent Study  
EOS187S - Marine Geology of South Florida  
EOS113/213 - Modern and Ancient Oceanic Environments

### **Analytical Facilities Management (Operation, Training, Maintenance and Repairs)**

2008 - Present Thermal Ionization Mass Spectrometry Lab (TI-MS)  
2004 - Present Inductively Coupled Plasma Mass Spectrometry Lab (ICP-MS)  
2004 - Present Optical Emission Spectrometry Lab (DCP-OES)  
2004 - Present General and Clean Geochemistry Labs  
2006 - 2008 Gamma-Ray Spectrometry Lab

### **Grant History**

\$150,000 - *US Geological Survey*, Arctic Ocean ostracode magnesium/calcium geochemical analyses and paleotemperature reconstruction, 2014-2020  
\$188,000 - *US Geological Survey*, Late Quaternary paleoceanography of the Arctic Ocean, 2009-2013.  
\$470,000 - *NSF – Paleo Perspectives on Climate Change*, Collaborative research: Reconstruction of a continuous, high-resolution record of late Quaternary paleohydrology and paleoclimate of the Amazon basin, (Co-PI with Paul A. Baker), 2008-2012.  
\$104,000 - NSF Earth Sciences, Environmental Effects of the Coal Ash Spill and Remediation at Kingston Tennessee (Co-PI with Avner Vengosh, Paul A. Baker, and Helen Hsu-Kim) 2009-2010  
\$44,350 - *US Geological Survey*, (a) Pliocene sea-surface temperature records; (b) Temperature record for the last 2000 years, eastern North America, 2007-2009.

- \$480,831 - *NSF – Atmospheric Sciences*, Collaborative Research: Mid-Pliocene Global Warming: Analysis of 3-D Digital Data Sets and Coupled Ocean-Atmosphere Modeling Studies, (Co-PI with Mark Chandler, Columbia Univ/NASA-GISS), 2003-2009.
- \$322,000 - *NSF - Ocean Sciences*, Development of Environmental Proxies for Coastal Environments, (Co-PI with Bruce Corliss), 2003-2007.
- \$51,181 - *NSF – Earth System History*, Collaborative Research: High Northern Latitude Amplifiers of Centennial to Millennial Climate Forcing During the Holocene, (Co-PI with Gerard Bond, LDEO-Columbia University), 2003-2006.
- \$36,800 - *US Geological Survey*, Ecosystem History of Biscayne Bay, Florida, based on microfossil shell chemistry, 2003-2004.
- \$73,792 - *NSF - Office of Polar Programs*, Ostracode Mg/Ca paleothermometry in the Arctic Ocean: A Calibration Study, 2002-2004.
- \$124,500 - *US Geological Survey - Ecosystem History Program*, Salinity history of the Florida Bay-Everglades ecosystem over the last 200 years using ostracode shell chemistry 1997-2003.
- \$97,667 - *NSF - Office of Polar Programs*, Collaborative Research: Paleoceanographic Records of Western Arctic Shelf-Basin Interactions (9 Co-PI's at 6 institutions), 1999-2001.
- \$30,350 - *US Geological Survey - Climate Program*, The effects of temperature and salinity on the shell chemistry of estuarine ostracodes, 1998-2000.
- \$49,900 - *NSF - Ocean Sciences Program*, SGER Project: Calibration of a Deep-sea Ostracode Paleothermometer (w/P.A. Baker and T.M. Cronin), 1997-1998.
- \$34,223 - *US Geological Survey - Global Change and Climate History Program*, Deep-Ocean Temperature and Climate Change Over the Last 200,000 Years (w/P.A. Baker), 1996-1997.
- \$64,847 - *NSF - Arctic System Science, Ocean-Atmosphere-Ice Interactions*, Geochemical Analysis of Ostracodes from the Arctic Ocean: Last Glacial Maximum to Present (w/P.A. Baker and T.M. Cronin, USGS), 1994-1996.
- \$19,981 - *US Geological Survey - Global Change Program*, Development and Application of a New Paleoceanographic Tool: The Shell Chemistry of Marine Ostracodes (w/P.A. Baker), 1993-1994.
- \$50,000 - *ARCO Oil and Gas Company*, The Origin of Ordovician dolostones, Black Warrior Basin, Mississippi Subsurface (w/R.D. Perkins), 1990-1993.

## Publications

71. Sandes, A., Silva, C.G., Kern, A., Baker, P.A., Chiessi, C.M., Ferreira, F., Albuquerque, A.L., Dwyer, G.S., and Rigsby, C.R., 2021, The role of the South Atlantic Ocean in the tropical South American hydrologic cycle over the last 1.7 Ma (*Paleoceanography and Paleoclimatology*, in coauthor review).
70. Cronin, T.M., Dwyer, G.S., Keller, K.C., Gemery, L., and Farmer, J., 2021, Mg/Ca ratios in ostracode genera *Sarscytheridea* and *Paracyprideis*: a potential paleotemperature proxy for Arctic and subarctic continental shelf and slope waters, *Marine Micropaleontology*, (in press).
69. Wang, Z., Coyte, R.M., Cowan, E.A., Stapleton, H., Dwyer, G.S., and Vengosh, A., 2021, Evaluation and integration of geochemical indicators for detecting coal fly ash in soils, *Environmental Science and Technology Letters*, v. 55, p. 10387-10397.
68. Ferreira, F., Silva, C.G., Sandes, A., Chiessi, C.M., Kern, A., Baker, P.A., Dwyer, G.S., Rigsby, C.A., Huang, E., Tian, J., 2021, Biochronostratigraphy of the western equatorial Atlantic for the last 1.93Ma, *Quaternary International*, (in press).
67. Wang, Z., Coyte, R.M., Dwyer, G.S., Ruhl, L.S., Hsu-Kim, H., Hower, J.C., and Vengosh, A., 2020, Distinction of strontium isotope ratios between water-soluble and bulk coal fly ash in the United States, *Journal of Coal Geology*, v. 222, 103464.
66. Coyte, R.M., McKinley, K.L., Karr, J., Dwyer, G.S., Keyworth, A.J., Davis, C.C., Kondash, A.J., Jiang, S., Vengosh, A., 2020, Occurrence and distribution of hexavalent chromium in groundwater from North Carolina, USA, *Science of the Total Environment*, v. 711, 135135.

65. Cronin, T.M., Keller, K.J., Farmer, J.R., Schaller, M.F., O'Regan, M., Poirier, R., Coxall, H., Dwyer, G.S., Bauch, H., Kindstedt, I., Jakobsson, M., Marzen, R., Santin, E., 2019, Interglacial paleoclimate in the Arctic, *Paleoceanography and Paleoclimatology*, v. 34, p. 1959-1979.
64. Wang, Z., Dwyer, G.S., Coleman, D.S., and Vengosh, A., 2019, Lead isotopes as a new tracer of coal ash in the environment, *Environmental Science and Technology Letters*, v. 6, p. 714-719.
63. Vengosh, A., Cowan, E.A., Coyte, R.M., Kondash, A.J., Wang, Z., Brandt, J.E., and Dwyer, G.S., 2019, Evidence for unmonitored coal ash spills in Sutton Lake, North Carolina: Implications for contamination of lake ecosystems, *Science of the Total Environment*, v. 686, p. 1090-1103.
62. Yashura, M., de Menocal, P.B., Dwyer, G.S., Cronin, T.M., Okahashi, H., Huang, H.M., 2019 North Atlantic Intermediate Water variability over the last 20,000 years, *Geology*, v. 47, p. 659-663.
61. Ni, Y., C Zou, H Cui, J Li, NE Lauer, JS Harkness, AJ Kondash, RM Coyte, GS Dwyer, D Liu, D Dong, F Liao, A Vengosh, 2018, Origin of flowback and produced waters from Sichuan Basin, China, *Environmental Science & Technology* 52, 14519-14527.
60. Vinson, D.S., Lundy, J.R., Dwyer, G.S., and Vengosh, A., 2018, Radium response to aquifer storage and recovery in a sandstone aquifer, *Applied Geochemistry*, v. 91, p. 54-63.
59. Cronin, T.M., Dwyer, G.S., Caverly, E.K., Farmer, J., DeNinno, L.H., Rodriguez-Lazaro, J., and Gemery, L., 2018, Enhanced Arctic amplification began during the Mid-Bruhnes event ~400,000 years ago, *Scientific Reports* 7 ([nature.com/srep/](https://doi.org/10.1038/s41598-018-28475-4)), Article number: 14475.
58. Brandt, J.E., Bernhardt, E.S., Dwyer, G.S., and Di Giulio, R.T., 2017, Selenium ecotoxicology in freshwater lakes receiving coal combustion residual effluents: A North Carolina example, *Environmental Science & Technology* v. 51, p. 2418-2426.
57. Taggart, R.K., Hower, J.C., Dwyer, G.S., and Hsu-Kim, Heileen, 2016, Trends in the rare earth element content of U.S.-based coal combustion fly ashes, *Environmental Science and Technology*, v. 50, p. 5919-5926.
56. Harkness, J.S., Dwyer, G.S., Warner, N.R., Parker, K.M., Mitch, W.A., and Vengosh, A., 2015, Iodide, bromide, and ammonium in hydraulic fracturing and oil and gas wastewaters: environmental implications, *Environmental Science and Technology*, v. 49, p. 1955-1963.
55. Nir, O., Vengosh, A., Harkness, J., Dwyer, G.S., and Lahav, O., 2015, Direct measurement of the boron isotope fractionation factor: reducing the uncertainty in reconstructing ocean paleo-pH, *Earth and Planetary Science Letters*, v. 414, p. 1-5.
54. Ruhl, L.S., Vengosh, A., Dwyer, G.S., Hsu-Kim, H., Schwartz, G., Romanski, A., and Smith, S.D., 2012, The impact of coal combustion residual effluent on water resources: A North Carolina example, *Environmental Sciences and Technology*, v. 46, p. 12226-12233.
53. Saltzman, M.R., Edwards, C.T., Leslie, S.A., Dwyer, G.S., Bauer, J.A., Repetski, J.E., Harris, A.G., and Bergström, S.M., 2014, Calibration of a conodont apatite-based Ordovician <sup>87</sup>Sr/<sup>86</sup>Sr curve to biostratigraphy and geochronology: Implications for stratigraphic resolution, *Geological Society of America Bulletin*, v. 126, p. 1551-1568.
52. Vengosh, A., Hirschfeld, D., Vinson, D., Dwyer, G., Raanan, H., Marie, A., Zaarur, S., and Ganor, J., 2014, Response to Comment on "High Naturally Occurring Radioactivity in Fossil Groundwater from the Middle East, *Environmental Science and Technology*, v. 48, p. 9946-9947.
51. Nace, T.E., Baker, P.A., Dwyer, G.S., Silva, C.G., Rigsby, C.A., Burns, S.J., Giosan, L., Otto-Bliesner, B., Liu, Z., and Zhu, J., 2014, The role of North Brazil Current transport in the paleoclimate of the Brazilian Nordeste margin and paleoceanography of the western tropical Atlantic during the late Quaternary, *Palaeogeography, Palaeoclimatology, Palaeoecology*, v. 415, p. 3-13.
50. Vinson, D.S., Tagma, T., Bouchaou, L., Dwyer, G.S., Warner, N.R., and Vengosh, A., 2013, Occurrence and mobilization of radium in fresh to saline coastal groundwater inferred from geochemical and isotopic tracers (Sr, S, O, H, Ra, Rn), *Applied Geochemistry*, v. 38, p. 161-175.
49. Vengosh, A., Lindberg, T., Merola, B.R., Ruhl, L.R., Warner, N.R., White, A., Dwyer, G.S., and Di Giulio, R.T., 2013, Isotopic imprints of mountaintop mining contaminants, *Environmental Science and Technology*, v. 47, p. 10041-10048.
48. Foster, G.L., Hönisch, B., Paris, G., Dwyer, G.S., Rae, J.W.B., Elliott, T., Gallairdet, J., Hemming, N.G., Louvat, P., and Vengosh, A., 2013, Interlaboratory comparison of boron isotopes by MC-

- ICPMS and N-TIMS, *Chemical Geology*, v. 358, p. 1-14.
47. Rango, T., Vengosh, A., Dwyer, G., and Bianchini, G., 2013, Mobilization of arsenic and other naturally occurring contaminants in groundwater of the Main Ethiopian Rift aquifers, *Water Research*, v. 47, p. 5801-5818.
  46. Cronin, T.M., Dwyer, G.S., Farmer, J.R., Bauch, H., Spielhagen, R., Jakobsson, M., Briggs, W.M., and Stepanova, A., 2012, Deep Arctic Ocean warming during the last glacial cycle, *Nature Geoscience*, v. 5, p. 631-634.
  45. Farmer, J.R., Cronin, T.M., and Dwyer, G.S., 2012, Ostracode Mg/Ca paleothermometry in the North Atlantic and Arctic oceans: Evaluation of a carbonate ion effect, *Paleoceanography*, v. 27, PA2212, doi:10.1029/2012PA002305.
  44. Dettman, D.L., and Dwyer, G.S., 2012, The calibration of environmental controls on elemental ratios in ostracod shell calcite: a critical assessment, in Horne, D., et al., eds., *Ostracoda as Proxies for Quaternary Climate Change, Developments in Quaternary Science 17*, p. 145-163, Elsevier.
  43. Dwyer, G.S., and Repetski, J.R., 2012, The Middle Ordovician Knox Unconformity in the Black Warrior Basin, in Derby, J., et al., eds. *The Great American Carbonate Bank: The Geology and Economic Resources of The Cambro-Ordovician Sauk Sequence of Laurentia, American Association of Petroleum Geologists Memoir 98*, p. 345-356.
  42. Vinson D.S., Lundy, J.R., Dwyer, G.S., and Vengosh, A., 2012, Implications of carbonate-like signatures in a sandstone aquifer: radium and strontium isotopes in the Cambrian Jordan aquifer (Minnesota, USA), *Chemical Geology*, v. 334, p. 280-294.
  41. Farmer, J.R., Cronin, T.M., de Vernal, A., Dwyer, G.S., Keigwin, L.D., and Thunell, R.C., 2011, Western Arctic Ocean temperature variability during the last 8000 years, *Geophysical Research Letters*, v. 38, 6 pgs., L24602, doi:10.1029/2011GL049714.
  40. Vinson, D.S., McIntosh, J.C., Dwyer, G.S., and Vengosh, A., 2011, Arsenic and other oxyanion-forming natural trace elements in an alluvial basin aquifer: Evaluating sources and mobilization by isotopic tracers (Sr, B, S, O, H, Ra): *Applied Geochemistry*, v. 26, p. 1364-1376, doi: 10.1016/j.apgeochem.2011.05.010.
  39. Ruhl, L., Vengosh, A., Dwyer, G.S., Hsu-Kim, H., and Deonarine, A., 2010, The environmental impacts of the coal ash spill in Kingston, Tennessee: An eighteen-month survey, *Environmental Science and Technology*.
  38. Cronin, T.M., Wingard, G.L., Dwyer, G.S., Swart, P.K., Willard, D.A., and Albiets, J., 2012, Climate variability during the Medieval Climate Anomaly and Little Ice Age based on ostracode faunas and shell chemistry from Biscayne Bay, Florida, in Horne, D., et al., eds., *Ostracoda as Proxies for Quaternary Climate Change, Developments in Quaternary Science 17*, p. 241-262, Elsevier.
  37. Vinson, D.S., Lundy, J.R., Dwyer, G.S., and Vengosh, A., 2010, Sr isotopes, hydrogeologic setting, and water-rock interaction in the Mt. Simon sandstone (Minnesota, USA), in *Water Rock Interaction: Proceedings of the 13th International Conference on Water-rock Interaction WRI-13, Guanajuato, Mexico, 16-20 August 2010*, ed. P. Birkle and I.S. Torres-Alvarado. Boca Raton, FL: CRC Press, p. 111-114.
  36. Cronin, T.M., Hayo, K., Thunnell, R.M., Dwyer, G.S., Saenger, C., and Willard, D.A., 2010, The Medieval Climate Anomaly and Little Ice Age in Chesapeake Bay and the North Atlantic, *Palaeogeography, Palaeoclimatology, Palaeoecology*, v. 297, p. 299-310.
  35. Vinson, D.S., Schwartz, H.G., Dwyer, G.S., and Vengosh, A., 2011, Evaluating salinity sources of groundwater and implications for sustainable reverse osmosis desalination in coastal North Carolina, USA: *Hydrogeology Journal*, v. 19, p. 981-994, doi: 10.1007/s10040-011-0738-x.
  34. Pratson, E., Vengosh, A., Dwyer, G., Pratson, L., and Klein, E., 2010, The effectiveness of arsenic removal from groundwater in a private home, *Ground Water Monitoring and Remediation*, V. 30, p. 85-91.
  33. Ruhl, L., Vengosh, A., Dwyer, G.S., Deonarine, A., Hsu-Kim, H., Bergin, M., and Kravchenko, J., 2009, A preliminary investigation of the environmental and health effects of the coal ash spill at Kingston, Tennessee, *Environmental Science and Technology*, v. 43, p. 6326-6333.

32. Vengosh, A., Hirschfeld, D., Vinson, D., Dwyer, G., Raanan, H., Rimawi, O., Al-Zoubi, A., Akkawi, E., Marie, A., Haquin, G., Zaarur, S., and Ganor, J., 2009, High naturally occurring radioactivity in fossil groundwater from the Middle East, *Environmental Science and Technology*, v. 43, p. 1769-1775.
31. Vengosh, A., Dwyer, G.S., Kloppmann, W., Rapagila, J., and Zaggia, L. (submitted, in revision), Modeling the salinity and pH effects on boron species and isotopic distributions in estuarine environments: A potential new proxy for paleosalinity, *Geochimica et Cosmochimica Acta*.
30. Dwyer, G.S., and Chandler, M.A., 2009, Mid-Pliocene sea level and continental ice volume based on coupled benthic Mg/Ca palaeotemperatures and oxygen isotopes, *Philosophical Transactions of the Royal Society A*, v. 367, p. 157-168.
29. Vinson, D.S., Hirschfeld, D., Dwyer, G.S., and Vengosh, A., 2009, Relationships between radium and radon occurrence and hydrochemistry in freshwater from fractured crystalline rocks, North Carolina (USA), *Chemical Geology*, v. 260, p. 159-171.
28. Robinson, M.M., Dowsett, H.J., Dwyer, G.S., and Lawrence, K.T., (2008), Re-evaluation of mid-Pliocene North Atlantic sea-surface temperatures, for submission to *Paleoceanography*. v. 23, PA3213, doi:10.1029/2008PA001608.
27. Dowsett, H., Robinson, M., Dwyer, G., Chandler, M. and Cronin, T., 2006. PRISM3 DOT1 Atlantic basin reconstruction. *U.S. Geological Survey Data Series*, 189.
26. Bergue, C.T., Costa, K.B., Dwyer, G.S., and Moura, C.A.V., 2006, Bathyal ostracode diversity in the Santos Basin, Brazilian southeast margin; response to late Quaternary climate changes, *Revista Brasileira de Paleontologia*, v. 9, p. 201-210.
25. Cronin, T.M., Thunell, R., Dwyer, G.S., Saenger, C., Mann, M.E., Vann, C., and Seal, R.R., 2005, Multiproxy evidence of Holocene climate variability from estuarine sediments, eastern North America, *Paleoceanography*, v. 20, Art. No. PA4006.
24. Dowsett, H.J., Chandler, M.A., Cronin, T.M., and Dwyer, G.S., 2005, Middle Pliocene sea surface temperature variability, *Paleoceanography*, v. 20, Art. No. PA2014.
23. Cronin, T.M., Kamiya, T., Dwyer, G.S., Belkin, H., Vann, C.D., Schwede, S., Wagner, R., 2005, Ecology and shell chemistry of *Loxococoncha matagordensis*, *Palaeogeography, Palaeoclimatology, Palaeoecology*, v. 225, p. 14-67.
22. Cronin, T.M., Dowsett, H.J., Dwyer, G.S., Baker, P.A., and Chandler, M.A., 2005, Mid-Pliocene deep-sea bottom-water temperatures based on ostracode Mg/Ca ratios, *Marine Micropaleontology*, v. 54, p. 249-261.
21. Wingard, G.L., Cronin, T.C., Holmes, C.H., Willard, D.A., Dwyer, G.S., and 10 others, 2004, Ecosystem History of Southern and Central Biscayne Bay: Summary Report on Sediment Core Analyses - Year Two: *U.S. Geological Survey Open File Report 2004-1312*.
20. Vann, C.D., Cronin, T.M., and Dwyer, G.S., 2004, Population ecology and shell chemistry of a phytal ostracode species (*Loxococoncha matagordensis*) in the Chesapeake Bay watershed, *Marine Micropaleontology*, v. 53, p. 261-277.
19. Rosenthal, Y., and 26 others, 2004, Interlaboratory comparison of Mg/Ca and Sr/Ca measurements in planktonic foraminifera for paleoceanographic research, *Geochemistry, Geophysics, Geosystems*, v. 5, Art. No. Q04D09.
18. Fritz, S.C., Baker, P.A., Lowenstein, T.K., Seltzer, G.O., Rigsby, C.A., Dwyer, G.S., Tapia, P.M., Arnold, K.M., Ku, T.L., and Luo, S.D., 2003, A 160,000-year record of tropical climate variability from Salar de Uyuni, Bolivia, *Quaternary Research*.
17. Cronin, T.M., Dwyer, G.S., Kamiya, T., Schwede, S., and Willard, D.A., 2003, Medieval Warm Period, Little Ice Age, and 20<sup>th</sup> Century temperature variability from Chesapeake Bay, *Global and Planetary Change*, v. 36, p. 17-29.
16. Dwyer, G.S., Cronin, T.M., and Baker, P.A., 2002, Trace elements in marine ostracodes, in Holmes, J.A., and Chivas, A.R., eds., *American Geophysical Union Monograph 131, The Ostracoda: Applications in Quaternary Research*, p. 205-225.
15. Cronin, T.M., and Dwyer, G.S., 2003, Deep sea ostracodes and climate change, Park, L.E. and Smith, A.J.. eds. *Paleontological Society Papers*, v. 9, p. 247-263.

14. Cronin, T.M., Boomer, I., Dwyer, G.S., and Rodriguez-Lazaro, J., 2002, Ostracoda and paleoceanography, Holmes, J.A., and Chivas, A., eds., *American Geophysical Union Monograph 131, The Ostracoda: Applications in Quaternary Research*, p. 99-119.
13. Dwyer G.S., and Cronin, T.M., 2002, Ostracode shell chemistry as a paleosalinity proxy in Florida Bay, in, B. Wardlaw, ed., *Paleoecological Studies of South Florida, Bulletins of American Paleontology*, no. 361, p. 249-276.
12. Cronin, T.M., Dwyer, G.S., Schwede, S.B., and Dowsett, H.J., 2002, Climate variability from Florida Bay sedimentary record: possible teleconnections to ENSO, PNA, and CNP, *Climate Research*, v. 19, p. 233-245.
11. Darby, D., Bischof, J., Cutter, G., de Vernal, A., Hillaire-Marcel, C., Dwyer, G., McManus, J., Polyak, L., Osterman, L. and Poore, R., 2001, New record shows pronounced changes in Arctic Ocean circulation and climate, *EOS, Transactions, American Geophysical Union* (cover article), v. 82, p. 601, 607.
10. Dwyer, G.S., Cronin, T.M., Baker, P.A., and Rodriguez-Lazaro, J., 2000, Changes in North Atlantic deep-sea temperature during climatic fluctuations of the last 25,000 years based on ostracode Mg/Ca ratios, *Geochemistry, Geophysics, Geosystems*. (American Geophysical Union electronic journal: <http://g-cubed.org/>).
9. Cronin, T.M., Dwyer, G.S., Baker, P.A., Rodriguez-Lazaro, J., and DeMartino, D.M., 2000, Orbital and suborbital variability in deep North Atlantic bottom water temperature obtained from deep-sea ostracod Mg/Ca ratios, *Palaeogeography, Palaeoclimatology, Palaeoecology*, v. 162, p. 45-57.
8. Dwyer, G.S., 2000, Perspective: Unraveling the signals of global climate change, *Science*, v. 287, p. 246-247.
7. Cronin, T.M., DeMartino, D.M., Dwyer, G.S., and Rodriguez-Lazaro, J., 1999, Deep-sea ostracode biodiversity response to late Quaternary climate change, *Marine Micropaleontology*, v. 37, p. 231-249.
6. Majoran, S. Agrenius, S., and Dwyer, G.S., 1999, The effect of temperature on the geochemical composition of the valves of the ostracod species *Krithe praetexta praetexta*, Proceedings of the 4<sup>th</sup> European Ostracodologists Meeting, *Geosund*, v. 35, p. 93-113.
5. Bralower, T.J., Fullagar, P.D., Paull, C.K., Dwyer, G.S., and Leckie, R.M., 1997, Mid Cretaceous strontium-isotope stratigraphy from deep-sea sections, *Geological Society of America Bulletin*, v. 109, p. 1421-1442.
4. Cronin, T.M., Dwyer, G.S., Baker, P.A., Rodriguez-Lazaro, J., and Briggs, W.M., 1996, Deep-sea ostracode shell chemistry (Mg/Ca ratios) and late Quaternary Arctic Ocean history, in, J. Andrews et al., eds., *Late Glacial Paleoceanography of the North Atlantic Margins*, Geological Society Special Publication 111, p. 117-134.
3. Dwyer, G.S., Cronin, T.M., Baker, P.A., Raymo, M.E., Buzas, J.S., and Corregge, T., 1995, North Atlantic deep-water temperature change during late Pliocene and late Quaternary climatic cycles, *Science*, v. 270, p. 1347-1351.
2. Perkins, R., Dwyer, G.S., Rosoff, D., Fuller, J., Baker, P. and Lloyd, R., 1994. Salina sedimentation and diagenesis: West Caicos Island, British West Indies, in, *Studies of the Origin of Dolomite, Special Publication of the International Association of Sedimentologists*, v. 21, p. 37-54.
1. Dwyer, G.S., and Teeter, J.W., 1991, Salinity history of a coastal salina, West Caicos, British West Indies, in, R.J. Bain, ed., *Proceedings of the Fifth Symposium on the Geology of the Bahamas*, p. 65-73.

## Abstracts

Dwyer, Gary S., Cronin, Thomas M., Keller, Katherine, and Gemery, Laura, 2019, Mg/Ca ratios in ostracode genera *Sarsicytheridea* and *Paracyprideis*: a potential paleotemperature proxy for Arctic and sub-Arctic continental shelf and slope waters, AGU Fall Meeting, San Francisco, Dec 9-14.

Sandes, A.S., Silva, C.G., Kern, A., Baker, P.A., Chiessi, C.M., Ferrieira, F., Albuquerque, A.L., Dwyer, G.S., and Rigsby, C.A., 2019, The role of the South Atlantic Ocean in the tropical

- South American hydrological cycle over the past 1.7ka, AGU Fall Meeting, San Francisco, Dec 9-14.
- Vengosh, A., Cowan, E.A., Coyte, R., Kondash, A., Wang, Z., Brandt, J., and Dwyer, G.S., 2019, Tracing unmonitored coal ash spills in the environment, AGU Fall Meeting, San Francisco, Dec 9-14.
- Wang, Z., Dwyer, G.S., Coleman, D.S., and Vengosh, A., 2019, Lead isotopes in coal combustion residuals from the United States: Characterization and application, AGU Fall Meeting, San Francisco, Dec 9-14.
- Coyte, R.M., McKinley, K.L., Karr, J., Dwyer, G.S., Keyworth, A.J., Davis, C.C., Kondash, A.J., Vengosh, A., 2019, Hexavalent chromium distribution and co-occurrence with other health relevant oxyanions in groundwater from the Piedmont region of North Carolina, Geological Society of America Annual Meeting, Phoenix, Arizona.
- Wang, Z., Dwyer, G.S., and Vengosh, A., 2019, The strontium isotope fingerprint of coal combustion residuals from the United States: A distinction between the isotope ratios of bulk and water-soluble strontium, Geological Society of America Annual Meeting, Phoenix, Arizona.
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- Dwyer, G.S., Cronin, T.M., and Baker, P.A., 1999, Trace elements in marine ostracodes, AGU Pre-meeting Workshop: Ostracode Biology, Ecology and Shell Chemistry. May, Boston, MA. (Invited)
- Dwyer, G.S., Cronin, T.M., and Baker, P.A., 1999, (Invited) Mg/Ca ratios in marine ostracodes, AGU Spring Meeting, Boston, MA, *Supplement, EOS, Transactions*, p. 172.
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- Cronin, T.M., Willard, D., Karlson, A., McGeehin, J., Kerhin, R.T., Holmes, C., Dwyer, G.S., and Slattery, M., 1998, Late Holocene paleoclimate variability from the Chesapeake Bay estuary, eastern United States, 6th International Conference on Paleoceanography, Lisbon, Portugal
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### Technical Reports, Theses:

- Dwyer, G.S., 1998, Salinity of Florida Bay over the last 180 years from ostracode shell chemistry, *unpublished U.S. Geological Survey Technical Report*, 25 pgs.
- Dwyer, G.S., 1997, Deep-ocean temperature and climate change over the last 200,000 years, *unpublished U.S. Geological Survey Technical Report*, 20 pgs.
- Dwyer, G.S., 1996, The origin of the Upper Dolostone (Upper Knox Group, Middle Ordovician), Black Warrior Basin, Subsurface Mississippi, USA, *unpublished Ph.D. Dissertation*, Duke University, Durham, NC, 208 pp.
- Dwyer, G.S., 1991, Depositional and diagenetic evolution of a Holocene salina, West Caicos Island, British West Indies, *unpublished M.S. Thesis*, Duke University, Durham, NC, 131 pp.

### Field and Research Cruise Experience

- 1997-Present: Modern/living estuarine calcareous microfaunal sampling, water sampling, temperature/salinity measurements, Florida and Biscayne Bays, FL; Chesapeake Bay, VA; Bogue, Core, Pamlico Sounds, Newport River Estuary, NC. (numerous trips, either solo or in collaboration with USGS or Duke colleagues).
- 2010 Piston, box, and multi-coring, including extra-long (30m) piston cores, Amazon Fan slope system to recover high-resolution South American climate history, *R/V Knorr*.
- 1999 Box coring (Multicorer), giant gravity coring, CTD-hydrocasts, 3.5 kHz surveying, outer shelf and upper slope off S. Carolina/Georgia, *R/V Cape Hatteras* (G. Dwyer, Chief Scientist).
- 1998 Box coring (Multicorer), western North Atlantic, *R/V Cape Hatteras* (L. Keigwin, WHOI, Chief Scientist).
- 1997 Gravity coring, Chesapeake Bay, MD, *R/V Discovery* (T. Cronin, USGS, Chief Scientist).
- 1997 Piston coring (modified Livingstone corer), Pamlico River (S. Cooper, Duke, Chief Scientist).
- 1997 Grab sampling, hand-held push coring, water sampling, Core Sound, North Carolina (G.Dwyer, Chief Scientist).
- 1994 Box coring on outer shelf and slope off South Carolina for live foraminifers and ostracodes, *R/V Cape Hatteras* (B. Corliss, Duke, Chief Scientist)
- 1992 Box and piston coring, northwest Nicaraguan Rise, *R/V Cape Hatteras* (P. Baker/S. Cross, Duke, Co-Chiefs)

- 1989 Ground water/tidal monitoring, West Caicos Island, British West Indies (G. Dwyer/D. Rosoff, Duke, Co-Chiefs).
- 1988 Piston and rock coring, and collection of sediment pore waters for geochemical analysis, West Caicos Island, British West Indies (R. Perkins/G. Dwyer/D. Rosoff, Duke, Co-Chiefs)
- 1986-1987 Detailed structural mapping and collection of oriented samples for strain analysis, Pinto, Maryland (G. Dwyer, Univ. of MD, senior thesis).

### **Academic Honors**

**Duke University** - AMOCO Foundation Fellowship

**University of Maryland** -Valedictorian - College of Computer, Math, and Physical Sciences; Magna Cum Laude; Geology Academic Award; Senior Research Award, Geology; Certificate of Scholarship - Outstanding Academic Achievement; Geology; Field Camp Scholarship; Dean's List  
**Montgomery College** - Dean's List

### **Graduate Advisor**

Ronald D. Perkins, Duke University.

### **Organizations/Affiliations**

American Geophysical Union, Geological Society of America, Geochemical Society

### **Service**

Editorial Board: *Global and Planetary Change*

Reviewer: *Geology; Science; Marine Geology; Palaeogeography, Palaeoclimatology, Palaeoecology; Geochimica et Cosmochimica Acta, Sedimentology, Global and Planetary Change*

Proposal Reviewer: NSF - Earth Sciences Program, Ocean Sciences Program, Paleoclimate Program, Office of Polar Programs; American Chemical Society-Petroleum Research Fund

Proposal Review Panelist: NSF - Earth System History Program

AGU Program Committee (Ocean Sciences) – 1999 Spring Meeting, Boston, MA.

Laboratory Committee – Nicholas School Building Renovations

AGU Session Chair, Paleoceanography and Paleoclimatology Gen. Contributions (2002, 2006)

Udall Scholarship Committee (2017/2018)

Nicholas School Undergraduate Strategic Planning Committee (2017/2018)

### **Student Advising and Training**

#### ***Doctoral Committees:***

Zhen Wang (2021)

Rachel Coyte (2020)

Andrew Kondash (2019)

Fabricio Ferreira (2020, Universidad Federal Fluminense, Brazil)

Alexander Wheatly (2019)

Wout Salebein (2018)

Nancy Lauer (2018)

Ross Taggart (2018, CEE-Pratt)

Jennifer Harkness (2017)

Allan Sandes (2016, Universidad Federal Fluminense, Brazil)

Brittany Merola (2014)

Nathaniel Warner (2013)

Alana Belcon (2012)

Andrew Nunnery (2012)

Laura Ruhl (2012)  
Trevor Nace (2012)  
David Vinson (2011)  
Hadas Rannan (2011)  
Hillary Jenkins (2009)  
Junhua Liu (2008)  
Stephen Obrochta (2008)  
Xichun Sun (2006)  
Mathew Grove (2000)

***Undergraduate Honors Students:***

Lucila Houttuijn Bloemendaal  
Jennifer Walker  
Jenny McGuire  
Teresa Christopher  
Sarah Eagle

***Undergraduate Research Independent Study Advisor:***

Hans Lie-Nielsen  
Ben Kratzer  
Reuben Manning  
Amy Stopford  
Brian Stuart  
Erica Williams  
Annie Zaino  
Rebecca Rodriguez

***EOS/ENV Undergraduate Research Assistants Trained and Supervised:***

Jennifer Imm  
Cortney Cameron  
Jennifer Walker  
Alexandra Putnam  
Paul Schisa  
Katelyn Barzee  
Elizabeth Bramble  
Wesley Brooks  
Sarah Eagle  
Carey Dawn Lowe  
Alexa Ramirez  
Rebecca Rodriguez  
Cameron Setzer  
Philip Weiser

***Masters Committees:***

Valerie Peterson  
Laura Pyle  
Nicole Mich-Stewart

**General Statement on Synergistic Activities and Contribution to Education:** As a senior research scientist and instructor in the Division of Earth and Ocean Sciences (EOS), my primary pursuit is original research in the fields of paleoclimatology, paleoceanography, and environmental change. In addition, and as part of this effort, I also play an important role in teaching, training, advising, and supervising undergraduate and graduate students and laboratory technicians as manager of operations and training in the ICP-MS, DCP-OES, and TIMS laboratories and

supporting geochemistry labs within EOS. Over the last twenty years I have advised, co-advised, supervised or trained over fifty students, interns, and/or technicians from institutions including Duke University, University of North Carolina-Chapel Hill, East Carolina University, University of Massachusetts-Amherst, University of Wales-Bangor, Penn State and the US Geological Survey, among others. In collaboration with Paul Baker, Bruce Corliss (URI), Emily Klein, Avner Vengosh, and others at Duke Earth and Ocean Sciences, I have maintained and fostered an open lab, welcoming students, faculty, and scientists from Duke University and other institutions for collaborative projects, training, and use of our analytical laboratories and instrumentation in the pursuit of education, research, and service to society.