Curriculum Vitae – Robert H. Byrne

Distinguished University Professor
College of Marine Science, University of South Florida
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Areas of Specialization

Chemical oceanography, physical chemistry, chemical interactions of dissolved seawater constituents, oxidation–reduction kinetics, dissolution kinetics, trace metal chemistry, carbonate system chemistry, in situ instrumental analysis

Employment

1995–Present	Distinguished University Professor College/Department of Marine Science, Univ. South Florida
1986–1995	Professor (Tenured) Dept. of Marine Science, Univ. South Florida
1982–1986	Associate Professor (Tenured) Dept. of Marine Science, Univ. South Florida
1979–1982	Assistant Professor Dept. of Marine Science, Univ. South Florida
1977–1979	Research Associate Dept. of Marine Science, Univ. South Florida
1974–1977	Research Associate Graduate School of Oceanography, Univ. Rhode Island

Education

Institution	Field of Study	Degree	Date
University of Rhode Island	Oceanography	PhD	1974
Boston University	Chemistry	MA	1971
DePaul University	Physics	MS	1967
University of Chicago	Physics	BS	1964

Awards and Recognitions

Environmental Science & Technology — Excellence in Review Award (2015)
Elected Fellow of the National Academy of Inventors (2014)
Elected Fellow of the AAAS (2013)
ARCS STEM Innovation & Research Award (2013)
Elected Fellow of the American Geophysical Union (2012)

USF Excellence in Innovation Award (2012)
National Academy of Inventors, charter member of founding chapter (2009)
USF Distinguished Research Professor designation (1995)
USF Sigma Xi Outstanding Faculty Research Award (1994)

Professional Society Activities

Chair, Joint Publications Committee of the Geochemical Society and the Meteoritical Society (2008–2009)
Chair, Geochemistry Division Medal Committee, American Chemical Society (2000–2004)
Chair, IUPAC Commission on Equilibrium Data, V.6 (2000–2002)
Chair, Geochemistry Division, American Chemical Society (1995)
Program Chair, Geochemistry Division, American Chemical Society (1994)

Associate Editor, *Geochimica et Cosmochimica Acta* (1993–present)
Associate Editor, *Limnology and Oceanography: Methods* (2003–2006)
Associate Editor, *Chemical Speciation and Bioavailability* (1993–1999)
Editorial Board Member, *Chemosensors* (2020 – present)

Secretary, International Union of Pure and Applied Chemistry (IUPAC) Commission on Equilibrium Data, V.6, (1998–2000)

Member, IUPAC Working Committee on Heavy Metal Speciation (2000–present)
Member, Joint Publications Committee of the Geochemical Society and the Meteroritical Society (2003–2007)
Member, Geochemistry Division Medal Committee, American Chemical Society (2004–2008)
Member, IUPAC Analytical Division Nomination Committee (Jan.-Mar., 2003)
Member, Division Committee, IUPAC Analytical Chemistry Division (2000–2001)
Member, Editorial Board, *Journal of Environmental Science and Health - Part A - Environmental Science and Engineering* (1997–1998)

Titular Member, IUPAC (1991-1997)

Member, American Association for the Advancement of Science
Member, American Chemical Society
Member, American Geophysical Union

Advisory Committee Service

International Advisory Committee Member for the Dongshan Marine Research Station of The State Key Lab of Marine Environmental Science (Xiamen University, 2014 – 2022)
Ocean Acidification Task Force of the U.S. Ocean Research & Resources Advisory Panel

(15 March 2010 – 31 March 2011)
National Science Foundation, Advisory Panel Member for Ocean Science Research – Chemical Oceanography (1987 – 1990, 1993, 2008, 2020)
Geosecs-II Planning Workshop, Toulouse, France (13–16 April,2003)
National Science Foundation, Advisory Panel Member for Small Business Innovation Research – Ocean Sciences (1996, 1997)
National Oceanic and Atmospheric Administration, Carbon Flux Working Group (1991–1997)
Office of Naval Research, Ocean Sciences Research Option Review Panel (1992)
National Research Council, Graduate Fellowship Evaluation Panels (1987, 1986)

Research Cruises

Eighteen cruises in the Pacific, Atlantic, Indian and Arctic Oceans, totaling 516 days at sea
Eight cruises in the Gulf of Mexico, totaling 48 days at sea

University, College, Departmental, and State University System Councils and Committees

Member, Executive Committee, USF Chapter, National Academy of Inventors (2020–present)
Member, College of Marine Science Dean Search Advisory Committee (2019–2020)

Chair, Tenure and Promotion Committee (co-Chair Pam Hallock Muller), College of Marine Science (2017–present)
Member, USF Institute for Advanced Discovery and Innovation, University of South Florida (2015–present)
Chair, Committee for Revision of Tenure and Promotion Guidelines, College of Marine Science (2016–2017)
Chair, Search Committee for chemical oceanography faculty position, College of Marine Science (2015–2016)
Member, Search Committee for two physical oceanography faculty positions, College of Marine Science (2014–2015)
Chair, Search Committee for two chemical oceanography faculty positions, College of Marine Science (2012–2013)
Chair, Search Committee for two faculty positions: global-scale ocean–atmosphere modeler and mesoscale ocean–atmosphere modeler, College of Marine Science (2008–2009)
Chair, Graduate Admissions and Awards Committee, Dept. of Marine Science (1980–1982)

Member, University Recommending Committee for Distinguished University Professors (2013–2015)
Member, Dean's Advisory Council, College of Marine Science (2013–2015)
Member, University Search Committee for Dean of the College of Marine Science (2009–2010)

Member, University Search Committee for St. Petersburg Downtown Progress – Peter R. Betzer Endowed Chair (2010)
Member, Curriculum Committee, College of Marine Science (2003–present)
Member, Safety Committee, Dept./College of Marine Science (1980–1983, 1998–present)
Member, Honors and Awards Committee, Dept./College of Marine Science (1988–present)
Member, Tenure and Promotion Committee, Dept./College of Marine Science (1983–present)
Member, Dean's Advisory Council, College of Marine Science (2003–2005)
Member, C.W. "Bill" Young Fellowship Committee (2000–2003)
Member, Student Recruiting Committee, Dept./College of Marine Science (1987–1989, 1998–2003)
Member, Executive Board of the Ethics Center (1996–1998)
Member, Articulation Committee of the USF College of Arts and Sciences and College of Education (1996)
Member, Seminar Committee, USF Dept. of Marine Science (1990–1994)
Member, USF Press Editorial Board (1987–1989)
Member, University Radiation Safety Committee (1978–1988)
Member, University Graduate Council (1983–1986)
Member, Admissions and Awards Committee, Dept. of Marine Science (1979–1983)
Member, Graduate Council, College of Natural Sciences (1981–1982)

Articles in Refereed Publications

(Key: *graduate students*, UNDERGRADUATE STUDENTS, and postdoctoral/research associates in Byrne labs)

224. *Schockman, Katelyn S.* and **Robert H. Byrne**. 2021 (accepted). Spectrophotometric Determination of the Bicarbonate Dissociation Constant in Seawater. *Geochimica et Cosmochimica Acta*

223. *Sharp, Jon. D.* and **Robert H. Byrne**. 2020. Interpreting measurements of total alkalinity in marine and estuarine waters in the presence of proton-binding organic matter. *Deep Sea Research Part I: Oceanographic Research Papers* 103338, 2020.

222. *Martell-Bonet, Loraine* and **Robert H. Byrne**. 2020. Characterization of the nonlinear salinity dependence of glass pH electrodes: A simplified spectrophotometric calibration procedure for potentiometric seawater pH measurements at 25 °C in marine and brackish waters: $0.5 \leq S \leq 36$. *Marine Chemistry* 103764. https://doi.org/10.1016/j.marchem.2020.103764

221. *Hudson-Heck, Ellie* and **Robert H. Byrne**. 2019. Purification and characterization of thymol blue for spectrophotometric pH measurements in rivers, estuaries, and oceans. *Analytica Chimica Acta* 1090: 91–99. https://doi.org/10.1016/j.aca.2019.09.009

220. Naviaux, J.D., Subhas, A.V., Dong, J., Rollins, N.E., Liu, X., **Byrne, R.H.**, Berelson, W.M. and Adkins, J.F. 2019. Calcite dissolution rates in seawater: Lab *vs. in-situ* measurements and inhibition by organic matter. *Marine Chemistry* 215: 103684. https://doi.org/10.1016/j.marchem.2019.103684

219. Ma, J., Shu.H., Yang, B., **Byrne, R.H.** and Yuan, D. 2019. Spectrophotometric determination of pH and carbonate ion concentrations in seawater: Choices, constraints and consequences. *Analytica Chimica Acta* 1081: 18–31. https://doi.org/10.1016/j.aca.2019.06.024

218. Beckwith, S.T., **Byrne, R.H.** and P. Hallock. 2019. Riverine calcium end-members improve coastal saturation state calculations and reveal regionally variable calcification potential. *Frontiers in Marine Science* 6: 169. https://doi.org/10.3389/fmars.2019.00169

217. Dong, S., Berelson, W.M., Rollins, N.E., Subhas, A.V.,Naviaux, J.D., Celestian, A.J., Liu, X., Turaga, N., Kemnitz, N.J., **Byrne, R.H**. and Adkins, J.F. 2019. Aragonite dissolution kinetics and calcite/aragonite ratios in sinking and suspended particles in the North Pacific. *Earth and Planetary Science Letters* 515: 1–12. https://doi.org/10.1016/j.epsl.2019.03.016

216. Shangguan, Q., H. Shu, P. Li, K. Lin, **R.H. Byrne**, Q. Li, D. Yuan, J. Ma. 2019. Automated Spectrophotometric Determination of Carbonate Ion Concentration in Seawater Using a Syringe Pump Based Analyzer, *Marine Chemistry* 209: 120-127. https://doi.org/10.1016/j.marchem.2019.01.007

215. *Sharp, J.D.* and **R.H. Byrne**. 2019. Carbonate Concentrations in Seawater: Spectrophotometric Determination at Ambient Temperatures and Evaluation of Propagated Calculation Uncertainties. *Marine Chemistry* 209: 70–80. https://doi.org/10.1016/j.marchem.2018.12.001

214. *Cuyler, E.E.* and **R.H. Byrne**. 2018. Spectrophotometric calibration procedures to enable calibration-free measurements of seawater calcium carbonate saturation states. *Analytica Chimica Acta* 1020: 95−103. https://doi.org/10.1016/j.aca.2018.02.071

213. *Breithaupt, Joshua*; Smoak, Joseph; **Byrne, Robert**; Waters, Matthew; Moyer, Ryan; Sanders, Christian. 2018. Avoiding timescale bias in assessments of coastal wetland vertical change. *Limnology and Oceanography* 63: S477−S495.

212. Feely, R.A., R.R.Okazaki, W.J. Cai, N. Bednarsek, S.R. Alin, **R.H. Byrne**, A. Fassbender. 2018. The Combined Effects of Acidification and Hypoxia on pH and Aragonite Saturation state in the Coastal Waters of the California Current Ecosystem and the northern Gulf of Mexico. *Continental Shelf Research* 152: 50–60. https://doi.org/10.1016/j.csr.2017.11.002

211. *Douglas, N.K.* and **R.H. Byrne**. 2017. Spectrophotometric pH measurements from river to sea: Calibration of mCP for 0≤ S≤ 40 and 278.15≤T ≤308.15 K. *Marine Chemistry* 197: 64–69. https://doi.org/10.1016/j.marchem.2017.10.001

210. *Sharp*, *J.D.*, **R.H. Byrne**, X. Liu, R.A. Feely, *E.E. Cuyler*, R. Wanninkhof and S. Alin. 2017. Spectrophotometric Determination of Carbonate Ion Concentrations: Elimination of Instrument-Dependent Offsets and Calculation of In Situ Saturation States. Environmental Science and Technology 51: 9127–9136. http://dx.doi.org/10.1021/acs.est.7b02266

209. Long, J.S., C. Hu, L.L. Robbins, **R.H. Byrne**, J.H. Paul, and J.L. Wolny. 2017. Optical and biochemical properties of a Florida whiting event. Estuarine, *Coastal and Shelf Science* 196: 258–268. https://doi.org/10.1016/j.ecss.2017.07.017

208. Chan, F., J. A. Barth, C. A. Blanchette, **R. H. Byrne**, F. Chavez, O. Cheriton, R. A. Feely, G. Friederich, B. Gaylord, T. Gouhier, S. Hacker, T. Hill, G. Hofmann, M. A. McManus, B. A. Menge1, K. J. Nielsen, A. Russell, E. Sanford, J. Sevadjian and L. Washburn. 2017. Persistent spatial structuring of coastal ocean acidification in the California Current System. *Scientific Reports* 7: 2526 | doi:10.1038/s41598-017-02777-y

207. Poirier., V, Schwartz, L.H., Eddy, D. Berman, R., Chacour, S. Cavanaugh, W., Martin, D.F., **Byrne, R.H.** and Sanberg, P.R. 2017. Thoughts on Improving Innovation: What are the Characteristics of Innovation and How do we Cultivate Them? *Technology and Innovation* 18: 319–330.

206. Soli A. and **R.H. Byrne**. 2017. Europium silicate complexation at 25 ºC and 0.7 molar ionic strength. *Marine Chemistry* 195: 138−142. https://doi.org/10.1016/j.marchem.2017.02.006

205. *Douglas, N.K.* and **R.H. Byrne**. 2017. Achieving accurate spectrophotometric pH measurements using unpurified meta-cresol purple. *Marine Chemistry* 190: 66–72. https://doi.org/10.1016/j.marchem.2017.02.004

204. *Patten, J.T.* and **R. H. Byrne**. 2017. Assessment of Fe(III) and Eu(III) Complexation by Silicate in Aqueous Solutions. *Geochemica et Cosmochemica Acta* 202: 361–373. http://dx.doi.org/10.1016/j.gca.2016.12.004

203. Fassbender, A.A., Alin, S., Feely, R.A., Sutton, A.J., Newton, J.A., and **Byrne R.H**. 2017. Estimating Total Alkalinity in the Washington State Coastal Zone: Complexities and Surprising Utility for Ocean Acidification Research. *Estuaries and Coasts* 40: 404-418. doi:10.1007/s12237-016-0168-z

202. Feely, R.A., Alin, S., Carter, D., Bednarsek, N., Hales, B., Chan, F., Hill, T.M., Gaylord, B., Sanford, E., **Byrne, R.H.**, Sabine, C.L., Greeley, D., and L. Juranek. 2016. Chemical and Biological Impacts on Ocean Acidification along the West Coast of North America. *Estuarine, Coastal and Shelf Science* 183: 260–270. https://doi.org/10.1016/j.ecss.2016.08.043

201. Chen, S., C. Hu, **R. H. Byrne**, L. L. Robbins, and B. Yang. 2016. Remote estimation of surface pCO2 on the West Florida Shelf. *Cont. Shelf. Res*. 128:10–25. http://dx.doi.org/10.1016/j.csr.2016.09.004

200. Schijf, J., Christenson, E.A., and **R.H. Byrne**. 2015. YREE scavenging in seawater: A new look at an old model. *Marine Chemistry* 177: 460–471. http://dx.doi.org/10.1016/j.marchem.2015.06.010

199. *Yang, B.,* **Byrne, R.H.** and M. Lindemuth. 2015. Contributions of organic alkalinity to total alkalinity in coastal waters: A spectrophotometric approach. *Marine Chemistry* 176: 199–207.

http://dx.doi.org/10.1016/j.marchem.2015.09.008

198. *Patsavas, M.C.*, **Byrne, R.H.**, Wanninkhof, R., Feely, R.A. and W-J. Cai. 2015. Internal Consistency of Marine Carbonate System Measurements and Assessments of Aragonite Saturation States: Insights from Two U.S. Coastal Cruises. *Marine Chemistry* 176: 9–20. http://dx.doi.org/10.1016/j.marchem.2015.06.022

197. Liu, X., **Byrne, R.H**., Lindemuth, M., *Easley, R*. and J.T. Mathis. 2015. An automated procedure for laboratory and shipboard spectrophotometric measurements of seawater alkalinity: continuously monitored single-step acid additions. *Marine Chemistry* 174: 141–146. http://dx.doi.org/10.1016/j.marchem.2015.06.008

196. Martz, T.R., Daly, K.L., **Byrne, R.H.**, Stillman, J.H., and Turk, D. 2015. Technology for ocean acidification research: Needs and availability. *Oceanography* 28(2): 40–47. http://dx.doi.org/10.5670/oceanog.2015.30

195. *Yang*, *B*., **R.H. Byrne**, and R. Wanninkhof. 2015. Subannual variability of total alkalinity distributions in the northeastern Gulf of Mexico. *Journal of Geophysical Research. Oceans* 129: 3805–3816. doi: 10.1002/2015JC010780

194. Wanninkhof, R., Barbero, L., **Byrne, R.H.**, Cai, W.-J., Huang, W.-J., Zhang, J.-Z., Baringer, M., Langdon, C. 2015. Ocean acidification along the Gulf Coast and East Coast of the USA. *Cont. Shelf Res.* 98: 54–71. http://dx.doi.org/10.1016/j.csr.2015.02.008

193. *M.C. Patsavas*, **R.H. Byrne**, *B. Yang, R. Easley*, R. Wanninkhof, X. Liu. 2015 Procedures for direct spectrophotometric determination of carbonate ion concentrations: Measurements in US Gulf of Mexico and East Coast waters. *Marine Chemistry* 168: 80–85. http://dx.doi.org/10.1016/j.marchem.2014.10.015

192. Ma, J., L. Adornato, **R.H. Byrne** and D. Yuan. 2014. Determination of Nanomolar Levels of Nutrients in Seawater. *Trends in Analytical Chemistry* 60: 1–5. doi:10.1016/j.trac.2014.04.013

191. **Byrne**, **R.H.** 2014. Measuring ocean acidification: New technology for a new era of ocean chemistry. *Environmental Science and Technology* 48: 5352–5360. dx.doi.org/10.1021/es405819p

190. *Yang, B., M.C. Patsavas*, **R.H. Byrne** and J. Ma. 2014. Seawater pH measurements in the field: A DIY photometer with 0.01 pH unit accuracy. *Marine Chemistry* 160: 75–81. doi.org/10.1016/j.marchem.2014.01.005

189. Ma, J., D. Yuan and **R.H. Byrne**. 2014. Flow injection analysis of trace chromium with a liquid waveguide capillary cell and spectrophotometric detection. *Environmental Monitoring Assessment* 186: 367–373. doi:10.1007/s10661-013-3381-2

188. Powell, K.J., P.L. Brown, **R.H. Byrne**, T. Gajda, G. Hefter, A-K. Leuz, S. Sjoberg, and H. Wanner. 2013. Chemical speciation of environmentally significant metals with inorganic ligands. Part 5: The Zn^{2+} + OH^-, Cl^-, CO_3^{2-}, SO_4^{2-}, and PO_4^{3-} systems (IUPAC Technical Report) *Pure*

Appl. Chem. 85 (12): 2249–2341. http://dx.doi.org/10.1351/PAC-REP-13-06-03

187. Soli, A.L., B.J. PAV and **R.H. Byrne**. 2013. The effect of pressure on meta-Cresol Purple protonation and absorbance characteristics for spectrophotometric pH measurements in seawater. *Marine Chemistry* 157: 162–169. http://dx.doi.org/1016/j.marchem.2013.09.003

186. Robbins, L.L., J.G. Wynn, J.T. Lisle, K.K. Yates, P.O. Knorr, **R.H. Byrne**, X. Liu, *M.C. Patsavas*, K. Azetsu-Scott and T. Takahashi. 2013. Baseline monitoring of the western Arctic Ocean estimates 20% of Canadian Basin surface waters are undersaturated with respect to Aragonite. *PLoS ONE* 8(9): e73796. doi:10.1371/journal.pone.0073796

185. Liu, X., **R.H. Byrne,** L. Adornato, K.K. Yates, E. Kaltenbacher, X. Ding and *B. Yang*. 2013. In situ spectrophotometric measurement of dissolved inorganic carbon in seawater. *Environmental Science and Technology* 47: 11106–11114. dx.doi.org/10.1021/es4014807

184. *Patsavas, M.C.*, **R.H. Byrne** and X. Liu. 2013. Physical-chemical characterization of purified cresol red for spectrophotometric pH measurements in seawater. *Marine Chemistry* 55: 158–164. http://dx.doi.org/10.1016/j.marchem.2013.06.007

183. Cross, J.N., J.T. Mathis, N.R. Bates and **R.H. Byrne**. 2013. Conservative and non-conservative variations of total alkalinity on the southeastern Bering Sea shelf. *Marine Chemistry* 154: 100–112. http://dx.doi.org/10.1016/j.marchem.2013.05.012

182. *L.D. Miranda*, **R.H. Byrne**, R.T. Short and R.J. Bell. 2013. Calibration of membrane inlet mass spectrometric measurements of dissolved gasses: Differences in the responses of polymer and nano-composite membranes to variations in ionic strength. *Talanta* 116: 217–222. http://dx.doi.org/10.1016/j.talanta.2013.05.014

181. *Patsavas, M.C.*, **R.H. Byrne**, and X. Liu. 2013. Purification of meta cresol purple and cresol red by flash chromatography: procedures for ensuring accurate spectrophotometric seawater pH measurements. *Marine Chemistry* 150: 19–24. http://dx.doi.org/10.1016/j.marchem.2013.01.004

180. Cardenas-Valencia, A.M., L. Adornato, R. Bell, **R.H. Byrne**, and R.T. Short. 2013. Evaluation of reagentless pH modification for in situ ocean analysis: determination of dissolved inorganic carbon using mass spectrometry. *Rapid Communications in Mass Spectrometry* 27: 1–8. doi:10.1002/rcm.6487

179. *Easley, R.A. M.C. Patsavas*, **R.H. Byrne**, X. Liu, R.A. Feely, and J.T. Mathis. 2013. Spectrophotometric Measurements of Calcium Carbonate Saturation States in Seawater. *Environmental Science and Technology* 47: 1468–1477. doi:10.1021/es303631g

178. Wang, Z.A., R. Wanninkhof, W-J. Cai, **R.H. Byrne**, X. Hu, T-H. Peng, and W-J. Huang. 2013. The marine inorganic carbon system along the Gulf of Mexico and Atlantic coasts of the United States: insights from a transregional coastal carbon study. *Limnology and Oceanography* 58(1): 325–342, doi:10.4319/lo.2013.58.1.0325

177. Feely, R.A., C.L. Sabine, **R.H. Byrne**, F.J. Millero, A.G. Dickson, R. Wanninkhof, A. Murata, L.A. Miller, and D. Greeley. 2012. Decadal changes in the aragonite and calcite saturation state of the Pacific Ocean. *Global Biogeochemical Cycles* 26: GB3001. doi: 10.1029/2011GB004157

176. Mathis, J.T., R.S. Pickart, **R.H. Byrne**, C.L. McNeil, G.W.K. Moore, L.W. Juranek, X. Liu, J. Ma, *R.A. Easley. M.M. Elliott,* J.N. Cross, S.C. Reinsdorph, F. Bahr, J. Morison, T. Lichendorf, and R. Feely. 2012. Storm-induced upwelling of high *p*CO2 waters onto the continental shelf of the western Arctic Ocean and implications for carbonate mineral saturation states. *Geophysical Research Letters* 39: L07606. doi: 10.1029/2012GL051574

175. *Easley, R.A.* and **R.H. Byrne**. 2012. Spectrophotometric calibration of pH electrodes in seawater using purified m-cresol purple. *Environmental Science and Technology* 46: 5018–024. dx.doi.org/10.1021/es300491s

174. Ma, J., *B. Yang*, and **R.H. Byrne**. 2012. Determination of nanomolar chromate in drinking water with solid phase extraction and a portable spectrophotometer. *Journal of Hazardous Materials* 219–220: 247–252.

173. Bell, R.J., W.B. Savidge, S.K. Toler, **R.H. Byrne**, and R.T. Short. 2012. In situ determination of porewater gases by underwater flow-through membrane inlet spectrometry. *Limnology and Oceanography: Methods* 10: 117–128.

172. Ma, J. and **R.H. Byrne**. 2012. Flow injection analysis of nanomolar silicate using long pathlength absorbance spectroscopy. *Talanta* 88: 484–489.

171. *Easley, R.A.* and **R.H. Byrne**. 2011. The ionic strength dependence of lead (II) carbonate complexation in perchlorate media. *Geochemica et Cosmochimica Acta* 75: 5638–5647.

170. *Miranda, L.D.*, R.J. Bell, R.T. Short, F.H.W. van Amerom, and **R.H. Byrne**. 2011. The influence of hydrostatic pressure on gas diffusion in polymer and nano-composite membranes: application to membrane inlet mass spectrometry. *Journal of Membrane Science* 385-386: 49–56.

169. Liu, X., *M. Patsavas*, and **R.H. Byrne**. 2011. Purification and characterization of meta-cresol purple for spectrophotometric seawater pH measurements. *Environmental Science and Technology* 45: 4862–4868.

168. *Bell, R.J.,* T. Short, and **R.H. Byrne**. 2011. In situ determination of total dissolved inorganic carbon by underwater membrane introduction mass spectrometry. *Limnol. Oceanogr. Methods* 9: 164–175.

167. Powell, H.J., P.L. Brown, **R.H. Byrne**, T. Gajda, G. Hefter, A-K. Leuz, S. Sjöberg and H. Wanner. 2011. Chemical speciation of environmentally significant metals with inorganic ligands. Part 4: the Cd^{2+} + OH^-, Cl^-, CO_3^{2-}, SO_4^{2-}, and PO_4^{3-} systems. *Pure and Applied Chemistry* 83: 1163–1214.

166. *Souder, H.C.,* B. McClosky, P. Hallock, and **R.H. Byrne** 2010. Shell anomalies observed in a population of *Archaias angulatus* (Foraminifera) from the Florida Keys (USA) sampled in 1982 – 83 and 2006–07. *Marine Micropaleontology* 77: 71–81.

165. **Byrne, R.H.** 2010. Comparative carbonate and hydroxide complexation in seawater. *Geochimica et Cosmochimica Acta* 74: 4312–4321.

164. **Byrne**, **R.H.,** W. Yao, Y. Luo, and F. J. Millero. 2010. Complexation of Pb(II) by chloride ions in aqueous solutions. *Aquatic Geochemistry* 16(3): 325–335.

163. Lee, K. T.-W. Kim, **R.H. Byrne**, F.J. Millero, R.A. Feely, and Y.-M. Liu. 2010. The universal ratio of boron to chlorinity for the North Pacific and North Atlantic oceans. *Geochimica et Cosmochimica Acta* 74:1801–1811.

162. **Byrne**, **R.H**., S. Mecking, R.A. Feely and X. Liu. 2010. Direct observations of basin-wide acidification of the North Pacific Ocean. *Geophysical Research Letters* 37: L02601. doi:10.1029/2009GL040999.

161. **Byrne**, **R.H.,** M.D. DeGrandpre, R.T. Short, T.R. Martz, L. Merlivat, C. McNeil, F.L. Sayles, R. Bell, and P. Fietzek. 2010. Sensors and systems for in situ observations of marine carbon dioxide system variables. In: J. Hall, D.E. Harrison, and D. Stammer (eds.) *Proceedings of "OceanObs'09: Sustained Ocean Observations and Information for Society" Conference (Vol. 2),* Venice, Italy, 21–25 September 2009, ESA Publication WPP-306.

160. Adornato, L., A. Cardenas-Valencia, E. Kaltenbacher, **R.H. Byrne**, K. Daly, K. Larkin, S. Hartman, M. Mowlem, R.D. Prien, and V. Garcon. 2010. In situ nutrient sensors for ocean observing systems. In: J. Hall, D.E. Harrison, and D. Stammer (eds.) *Proceedings of "OceanObs'09: Sustained Ocean Observations and Information for Society" Conference (Vol. 2),* Venice, Italy, 21–25 September 2009, ESA Publication WPP-306.

159. Powell, K.J., P.L. Brown, **R.H. Byrne**, T. Gajda, G. Hefter, A.-K. Leuz, S. Sjoberg, and H. Wanner. 2009. Chemical speciation of environmentally significant metals with inorganic ligands. Part 3: The Pb^{2+} + OH^-, CI^-, CO_3^{2-}, SO_4^{2-}, and PO_4^{3-} systems. *Pure and Applied Chemistry* 81: 2425–2476.

158. Lenes, J.M., J.J. Walsh, J.M. Prospero, and **R.H. Byrne**. 2009. Response to "Aerosol iron deposition to the surface ocean – Modes of iron supply and biological responses" by P.W. Boyd, D.S. Mackey, and K.A. Hunter. *Marine Chemistry* 116: 56–57.

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Research and Creative Activities (Patents)

16. U.S. Patent 10,620,129 B1. Systems and methods for determining carbon system parameters of water. **Robert H. Byrne**. April 14, 2020.

15. U.S. Patent 10,060,891 B1. Continuous acid-free measurements of total alkalinity. Inventors

Robert H. Byrne and Xuewu Liu. August 28, 2018.

14. U.S. Patent 8,785,207 B2. Method and apparatus for measuring multiple parameters in-situ of a sample collected from environmental systems. Inventors Ryan J. Bell, R. Timothy Short, Strawn K. Toler, **Robert H. Byrne**. July 22, 2014.

13. U.S. Patent 8,077,311. Spectrophotometric system for simultaneous flow-through measurements of dissolved inorganic carbon, pH and CO_2 fugacity. Inventors **R.H. Byrne**, E. Kaltenbacher and X. Liu. December 13, 2011.

12. U.S. Patent 8,071,031. Device for in situ calibrated potentiometric pH measurements. Inventor **R.H. Byrne**. December 6, 2011.

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10. U.S. Patent 8,012,760. Sensor for Direct Measurements of Carbonate Ions in Seawater. Inventor **R.H. Byrne**, September 6, 2011.

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8. U.S. Patent 7,727,770. System and method for spectophotometric measurement of total alkalinity using a liquid core waveguide. Inventors **R.H. Byrne**, E. Kaltenbacher and X. Liu. June 1, 2010.

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4a. U.S. Patent 6,813,427. Fluorescence-based liquid core waveguide. Inventors E. Kaltenbacher, L.C. Langebrake, **R.H. Byrne**, and R. Waterbury. Nov. 2, 2004.

4b. Canadian Patent 2,357,651. Fluorescence-based liquid core waveguide." Inventors E. Kaltenbacher, L.C. Langbrake, **R.H. Byrne** and R. Waterbury. Nov. 7, 2006.

3. U.S. Patent 6,744,045. Portable underwater mass spectrometer. Inventors D.P. Fries, R.T. Short, and **R.H. Byrne**. June 1, 2004. (Canadian patent CA2358254 issued December 21, 2010)

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1. U.S. Patent 5,925,572. Apparatus and method for in situ pH measurement of aqueous medium. Inventors **R.H. Byrne**, R.D. Waterbury, J.J. Kelly, B. Leader, R. Russell, C.W. Jones, J. Kolesar, and *S. McElligott*. July 20, 1999.

Articles in Non-Refereed Publications

12. Adornato, L., E. Kaltenbacher, **R.H. Byrne**, X. Liu, and *J. Sharp*. (2016) Development of a portable carbon system sensor for ocean acidification research. *IEEE*. OCEANS 2016 MTS/IEEE Monterey, 1–7. http://ieeexplore.ieee.org/document/7761163/

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8. Dickey, T., N. Bates, **R. Byrne**, F. Chavez, R. Feely, C. Moore, and R. Wanninkhof. A review of the NOPP Ocean-Systems for Chemical, Optical, and Physical Experiments (O-SCOPE) Project. Fifth Symposium on Integrated Observing Systems, Jan. 2001, Albuquerque, NM.

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Lieberman (ed.) *Chemical, Biochemical, and Environmental Fiber Sensors VIII*, SPIE Proc. Vol. 2836. SPIE – The International Society for Optical Engineering. pp.170–177.

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Technical Reports

3. K.A. Fanning, **R.H. Byrne**, and P.R. Betzer. 1980. *The West Florida Continental Shelf: A Study of Geothermal Flows and Other Processes Affecting Radionuclides and Trace Metals*. Dept. of Energy, 28 pp.

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Current Grants and Contracts

National Science Foundation, Award Number (FAIN): 2042935. Spectrophotometric Determinations of Carbonic Acid Dissociation Constants for Estuarine Conditions. R.H. Byrne (PI). February 1, 2021 – January 31, 2024. $ 339,608.

National Science Foundation, Award Number (FAIN): 1947489. Characterization of aragonite and calcite solubility products in seawater using modern CO2 system measurement techniques. R.H. Byrne (PI). February 15, 2020 – January 31, 2023. $405,933.

National Science Foundation, OCE-1657894. Development of Spectrophotometric pH Measurement Capabilities in Estuaries. R.H. Byrne (PI). February 1, 2017 – January 31, 2022. $440,893.

National Science Foundation, OCE. Award No. (FAIN) 1658321. Collaborative Research: Organic Alkalinity: Impacts of the [OTHER] Alkalinity on Estuary and Coastal Ocean Chemistry. R.H. Byrne (USF PI), Xuewu Liu (USF co-PI). January 25, 2017 – January 31, 2022. USF $335,606.

Previous Grants and Contracts

National Oceanic and Atmospheric Administration, NOAA-NOS-NCCOS-2015-2004160 (subcontract to Texas A&M University) Acidification of Coastal Estuaries Due to Climate Change, The Hydrological Switch: A Novel Mechanism Explains Eutrophication and Acidification of Estuaries. R.H. Byrne (USF PI). September 1, 2015 – August 31, 2019. USF $155,054.

National Science Foundation, PLR-1414586. Ocean Acidification: Collaborative Research: Development of a Compact Instrument for Field Measurements of pH, Total Dissolved Inorganic Carbon and Total Alkalinity. R.H. Byrne (USF PI), E. Kaltenbacher (SRI PI). August 1, 2014 – July 31, 2018. USF $312,764 total. SRI $617,951 total.

National Science Foundation, OCE-1220110. Ocean Acidification: Collaborative Research: Investigation of seawater CO_2 system thermodynamics under high pCO_2 conditions. R.H. Byrne (USF PI), X. Liu (USF co-PI), L. Adornato (SRI co-PI). Sept. 15, 2012 – March 31, 2018. USF $650,603 total, SRI $313,416 total.

U.S. Geological Survey, G14AC00384. pH Photometer: Next Generation pH Measurements. R.H. Byrne (PI) September 1, 2014 – August 31, 2017. USF $126,704.
National Oceanic and Atmospheric Administration, USF-6282016 (Sponsored through Sunburst Sensors). Development of an In-Situ Total Carbonate Ion Detector for Marine Use. R.H. Byrne (PI). June 13, 2016 – December 13, 2016. $40,000.

National Science Foundation, IIP (FAIN) -1620072. I-Corps: Commercialization of Novel CO_2 Measurement Technologies. R.H. Byrne (PI), X. Liu (co-PI). January 1, 2016 – June 30, 2016. $50,000.

National Oceanic and Atmospheric Administration, NA09OAR4310067. Development of a novel sensor for in situ measurements of carbonate ion concentrations in seawater. R.H. Byrne (PI), E. Kaltenbacher and L. Adornato (co-PIs). Sept. 1, 2009 – Aug. 31, 2014. USF $186,644 total, SRI $413,356 total.

National Oceanic and Atmospheric Administration, USM-GR04148-003. Time series and underway assessments of ocean acidification and carbon system properties in coastal waters: year 2. R.H. Byrne (PI) October 1, 2011–September 30, 2012. $93,400; Year 3. R.H. Byrne (PI) October 1, 2012 – September 30, 2014. $97,910.

National Science Foundation, OCE-0927108. Development of methods for direct determinations of carbonate ion concentrations in seawater. R.H. Byrne (PI). Aug. 15, 2009–July 31, 2013. $457,059.

National Science Foundation, OCE-1029778. Collaborative Research: Development of an in situ sensor for high-resolution measurements of total dissolved inorganic carbon. R.H. Byrne (USF PI). L. Adornato and E. Kaltenbacher (SRI PIs). September 1, 2010–August 31, 2013. $144,347.

National Science Foundation, OCE-0727082. Purification and calibration of indicators for measurement of seawater pH. R.H. Byrne (PI), X. Liu and W. Yao (co-PIs). Sept. 15, 2007–Aug. 31, 2012. $598,244.

St. Petersburg Downtown Partnership, GRT11175. Metal stability and sea water research funding. R.H. Byrne (PI) Jan. 16, 2012–Jan. 15, 2013. $3,000.

National Oceanic and Atmospheric Administration, UAF 11-0027 (Sponsored through University of Alaska Fairbanks). Mooring observations of ocean acidification in high latitude seas. R.H. Byrne (P.I.) Nov. 1, 2010 – May 31, 2012. $138,725.

Office of Naval Research, N00014-10-1-0787. Construction and intensive field testing of miniature SEAS sensors for trace element, nutrient and CO_2 system analyses. R.H. Byrne (PI) and J. Patten (co-PI). May 1, 2010 –Apr. 30, 2012. $309,519.

National Oceanic and Atmospheric Administration, USM-GR04148-003. Time Series and Underway Assessments of Ocean Acidification and Carbon System Properties in Coastal Waters. R.H. Byrne (PI) July 1, 2010 –December 31, 2011. $100,000.

Office of Naval Research, N0014-10-0784. Profiling Platforms for use in Coastal Waters. C. Lembke, J. Patten, R. Russell, R.H. Byrne and R.H. Weisberg. May 2010 – October 2011. $366,758.

Office of Naval Research, N00014-03-1-0612. Construction and intensive field testing of SEAS-II sensors for trace element, nutrient, and CO_2 system analyses. R.H. Byrne (PI), E. Kaltenbacher (co-PI, May 1, 2003–Jan. 31, 2007), and J. Patten (co-PI, Feb. 1, 2007–Apr. 30, 2010). May 2003–Apr. 30, 2011. $2,139,741.

Office of Naval Research, N0014-04-1-0573. Bottom Stationed Ocean Profiler Design Improvements. C. Lembke, J. Patten, R. Russell, R.H. Byrne and R.H. Weisberg. June 2004 – April 2011. $1,851,034.

National Science Foundation, OCE-0551676. Collaborative research: RUI – Dissolution kinetics of biogenic calcium carbonate in the upper water column of the North Pacific. V. Fabry (PI), R.H. Byrne (co-PI), and J. Schijf. Mar. 1, 2006–Feb. 28, 2010. $133,870 (Byrne portion).

U.S. Geological Survey. Mapping Florida shelf pCO_2 and carbonate parameters to derive saturation state. R.H. Byrne (PI). Aug. 2008–Aug. 2009. $15,000.

SRI International. Development and deployment of in situ mass spectrometers. R.H. Byrne (PI). Oct. 2007–Dec. 2008. $20,035.

U.S. Dept. of Commerce. Collaborative study/testing and deployment of CO_2 measurement systems. R.H. Byrne (PI) and E.A. Kaltenbacher (co-PI). May 2004–Apr. 2008. $561,911.

U.S. Dept. of Energy. Molecular regulation of photosynthetic carbon fixation in coastal microorganisms. J. Paul (PI) and R.H. Byrne (co-PI). Apr. 2005–Mar. 2008. $45,291 (Byrne portion).

National Oceanic and Atmospheric Administration. Collaborative study, testing, and deployment of CO_2 measurement systems. R.H. Byrne (PI) and E.A. Kaltenbacher (co-PI). July 2005–Dec. 2007. $400,000.

National Oceanic and Atmospheric Administration (through Univ. Miami). Cooperative sensor-development laboratory for oceans and climate. R.H. Byrne (PI) and L. Langebrake (co-PI). June 2004–Dec. 2007. $399,927.

Office of Naval Research. Development and deployment of in situ mass spectrometers. Mar. 2003–Apr. 2007. R.T. Short (PI), D.P. Fries, S.K. Toler, and R.H. Byrne (co-PIs). Cumulative total $1,774,760.

Office of Naval Research. Development of an in situ mass spectrometer for stable isotopes. Jan. 2002–July 2006. . R.T. Short (PI), R.H. Byrne, D. Hollander, and G. Kilbelka (co-PIs). Cumulative total $384,989.

National Science Foundation. Investigations of the influence of solution chemistry on YREE interactions with particle surfaces. R.H. Byrne (PI) and J. Schijf (co-PI). Mar. 2002–Feb. 2006. $450,000.

Office of Naval Research. The role of nutrients in the formation, maintenance, and transformation of phytoplankton thin layers. R.H. Byrne (PI) and E.A. Kaltenbacher (co-PI). July 2002–Dec. 2005. $249,985.

National Oceanic and Atmospheric Administration. Collaborative study/testing of CO_2 measurement systems. R.H. Byrne (PI) and E.A. Kaltenbacher (co-P.I.). Aug. 2003–June 2005. $123,401.

Office of Naval Research. Bottom Stationed Ocean Profiler. Jan. 2000–Apr. 2005. R. Weisberg (PI) $733,277, with RHB portion $118,109.

Office of Naval Research. Enhanced in situ spectroscopic analysis of trace seawater solutes. Jan. 1996–Dec. 1998. $953,296. Sept. 1998, title changed to: Autonomous in situ analysis of the upper ocean: Construction of a compact, long-pathlength absorbance spectrometer. Extended to Apr. 2005. Total funding: $3,258,865.

University of New Hampshire / National Oceanic and Atmospheric Administration. In situ monitoring of a reactive metal in riverine and estuarine mixing zones. R.H. Byrne (PI). Sept. 2001–Aug. 2004. $125,855.

Concurrent Technologies Corporation. Corrosion feasibility study. R.H. Byrne (PI) and E. Steimle (co-PI). Apr. 2001–Mar. 2002. $120,904.

NSF (through Woods Hole Oceanographic Institution). Development of a spectrophotometric sensor for autonomous measurement of dissolved iron in rainwater. E. Sholkovitz (PI) and R.H. Byrne (co-PI). Sept. 1999–Feb. 2002. $113,007.

Benthos / Office of Naval Research. Collaborative observations of subsurface biogeochemical phenomena at marine hydrothermal springs. R.H. Byrne (PI) and E. Kaltenbacher (co-PI). Feb. 2003–Aug. 2003. $19,270.

Office of Naval Research. Construction of an in situ mass spectrometer. Nov. 1997–Dec. 1998. $199,735. Aug. 6, 1998, title changed to: Phase II construction of an in situ mass spectrometer, extended to June 2003. R.T. Short (PI) and R.H. Byrne (co-P.I.). Total funding $2,004,671.

Office of Naval Research, National Oceanographic Partnership Program. Oceanographic systems for chemical, optical, and physical experiments. July 1998–Jan. 2001. $241,174.

National Science Foundation. The influence of pressure and ionic strength on rare earth element solution chemistry, surface chemistry, and coprecipitation behavior in seawater. Sept. 1996–Aug. 2000. $432,754.

Ocean Farming, Inc. (Sea Grant). Phase I experiments for Iron KE-MIN: Solubility, availability in sea water, and utilization by selected phytoplankton species. Sept. 1996–Dec. 1996. Extended to Nov. 1999. R.H. Byrne: $24,993. K.A. Fanning and G.A. Vargo had sister accounts with separate funding.

National Oceanic and Atmospheric Administration. Shipboard and in situ spectrophotometric measurements of seawater pH in the South Pacific Ocean. Apr. 1995–Apr. 1997. No-cost extension through Apr. 1998. $153,538.

U.S. Geological Survey. Retrospective analysis of Florida Bay salinity using the geochemistry of calcium carbonate organisms. Oct. 1996–Sept. 1997. $10,000.

National Oceanic and Atmospheric Administration. Spectrophotometric measurements of seawater pH and alkalinity in the Central and South Pacific Ocean. Feb. 1994–Mar. 1997. $226,374.

Office of Naval Research. Development of sensing systems and unmanned underwater vehicles for land margin, continental shelf, and oceanographic environmental measurements. Aug. 1994–July 1996. $124,391.

Office of Naval Research. Support of the research activities of a marine engineering institute at the University of South Florida. June 1994–May 1996. $29,202 of $2,000,000.

National Oceanic and Atmospheric Administration. Ocean measurements: Development of new instrument platforms and sensors. Aug. 1993–July 1995. $23,500 of $500,000.

National Science Foundation. Rare earth element solution and surface chemistry. Feb. 1991–Feb. 1995. $308,105.

National Science Foundation. The calibration of indicator dyes for measurement of oceanic pH. Jan. 1991–Feb. 1995. $210,765 (USF portion).

National Oceanic and Atmospheric Administration, administered by the National Science Foundation. Spectrophotometric measurement of pH and alkalinity in the Pacific Ocean. Dec. 1991–May 1994. $180,304.

National Science Foundation. The hydromechanics of sediment traps in the oceanic environment: Key to accurate particle flux measurements. With G. Gust and P. Betzer. Nov. 1988–Oct. 1990. $378,307.

National Science Foundation. Rare earth element surface and solution chemistry. Nov.1987–Oct. 1990. $214,502.

National Oceanic and Atmospheric Administration. Oxidation and dissolution of metal sulfides and sulfates in seawater. June 1988–Apr. 1989. $20,000.

National Oceanic and Atmospheric Administration. Oxidation and dissolution of metal sulfides and sulfates in seawater. Apr. 1987–Feb. 1988. $20,000.

National Oceanic and Atmospheric Administration. Oxidation and dissolution of metal sulfides and sulfates in Seawater. June 1985–June 1986. $20,000.

University of South Florida, Faculty Research and Creative Scholarship Award. Design, fabrication, and calibration of a small swimming tunnel for crustaceans. With G. Gust and J. Torres. May 1985–May 1986. $4,580.

U.S. Department of Energy. The role of aragonite in the marine carbon cycle. With P.R. Betzer. Dec. 1984–Dec.1985. $82,262.

National Science Foundation. Rare earth chemistry in the oceanic water column. May 1984–May 1987. $141,802.

National Science Foundation. Study of chemical complexation models: Trace metals in multicomponent solutions. Aug. 1983–Aug. 1984. $15,000.

National Oceanic and Atmospheric Administration. Fluxes and dissolution rates of biogenic carbonates in the North Pacific Ocean. With P.R. Betzer. Sept. 1981–Sept. 1983. $57,000.

National Science Foundation. Study of chemical complexation models: Trace metals in multicomponent solutions. July 1981–July 1983. $86,702.

University of South Florida, Faculty Research and Creative Scholarship Award. Development of a rapid response, in situ, dissolved CO_2 sensor. June 1982–June 1983. $3,300.

National Oceanic and Atmospheric Administration. Fluxes and dissolution rates of biogenic carbonates in the North Pacific Ocean. With P.R. Betzer. Oct. 1980–Dec.1981. $85,000.

National Science Foundation. Study of chemical complexation models: Trace metals in multicomponent solutions. Nov.1979–Oct. 1981. $48,468.

U.S. Department of Energy. Processes affecting radionuclides and trace metals on the West Florida

continental shelf. With K.A. Fanning and P.R. Betzer. Oct. 1980–Sept. 1981. $30,000.

U.S. Department of Energy. The properties and impact of submarine geothermal springs on the West Florida Shelf. With K.A. Fanning and P.R. Betzer. Oct. 1970–Sept. 1980. $54,000.

National Science Foundation. Ion pairing equilibria of borate and phosphate in seawater. Nov. 1976–Apr. 1977. $34,000.

Invited Presentations

Byrne, RH. 2018. Design and utilization of CO_2 system measurement technology: Choices, constraints, and consequences. Third Institute of Oceanography, Xiamen CN. June 22, 2018.

Byrne, RH. 2018. Design and utilization of CO_2 system measurement technology: Choices, constraints, and consequences. Second Institute of Oceanography, Hangzhou CN. June 25, 2018.

Byrne, RH. 2017. Comparative complexation of rare earths by carbonate and silicate in seawater. ASLO 2017. Honolulu Hawaii. March 2, 2017.

Byrne R.H. 2015. CMS pHish tales: The colorful history of H^+. USF College of Marine Science. January 9, 2015

Byrne R.H. 2015. Development of CO_2-system technologies at USF (1982-2015). University of Miami. November 19, 2015.

Byrne, R.H. 2014. (Keynote Address) Chemical sensors for observing our changing seas: Current capabilities and the need for rapid innovation. 2nd Seafloor Observation Symposium in Xiamen. Xiamen, CN. November 9, 2014.

Byrne R.H. 2014. Measuring ocean acidification in blue and green waters: Capabilities and challenges. First Advisory Committee Meeting – Dongshan Marine Research Station. State Key Laboratory of Marine Environmental Science, Xiamen University CN. July 6, 2014.

Byrne, R.H. 2014. Measuring ocean acidification in blue and green waters: Capabilities and challenges. SAML Acidification Workshop, May 22, 2014. Hawks Cay Resort, Summerland Key, FL.

Byrne, R.H. 2013. Ocean acidification: Measuring long-term acidification rates. November 12, 2013. University of Gothenburg. Gothenburg, Sweden.

Byrne, R.H. 2013. Advances in measurement technology for the CO_2 system. University of Gothenburg. November 14, 2013. Gothenburg, Sweden.

Byrne, R.H. 2012. Spectrophotometric methods for in situ measurements of carbon system parameters: pH, C_T, f_{CO2}, $[CO_3^{2-}]_T$, Ω_{CaCO3}. 2012 Environmental Sensors Conference. Sept. 23–28.

Anglet, France.

Byrne, R.H. 2011. Monitoring ocean acidification: evolving measurement strategies and capabilities. International Union of Geodesy and Geophysics General Assembly. July 2, 2011. Melbourne, Australia.

Byrne, R.H. 2011. Monitoring ocean acidification: evolving measurement strategies and capabilities. Florida ACS Award Symposium (FLACS). May 14, 2011. Innisbrook Resort, Florida.

Byrne, R.H. 2010. Development and application of spectrophotometric techniques for characterization of the marine CO_2 system. Chemical Speciation in Solution and at Solid/Solution Interfaces: Symposium in honour of Staffan Sjöberg. Umeå University, Umeå, Sweden. Sept. 24, 2010.

Byrne, R.H. and S. Mecking. 2010. Direct observations of basin-wide acidification of the North Pacific Ocean. Congressional Science Fair -- Coalition for National Science Funding's 16th Annual Exhibition and Reception: Building the Foundations of Innovation; STEM Research and Education. Washington, DC.

Byrne, R.H. 2009. Spectrophotometric CO_2-system measurements – principles and practice. 10^{th} Lingfeng Forum on Marine Analytical Techniques and Instrumentation. Xiamen University, Xiamen, China. Apr. 18, 2009.

Byrne, R.H. 2009. Equilibrium behavior of Pb(II) in natural waters. 10^{th} Lingfeng Forum on Marine Analytical Techniques and Instrumentation. Xiamen University, Xiamen, China. Apr. 18, 2009.

Byrne, R.H. 2007. Spectrophotometric and mass spectrometric sensors in the ocean. Gordon Research Conference in Chemical Oceanography. Tilton School, Tilton NH. Aug. 5–10, 2007.

Byrne, R.H. 2004. Yttrium and rare earth element patterns in the environment: The imprints of solution, surface, and solid state chemistries. Mediterranean Conference on Chemistry of Aquatic Systems. Reggio Calabria, Italy. Sept. 4–8, 2004.

Byrne, R.H. and E.A. Kaltenbacher. 2004. Development and application of SEAS sensors. Office of Naval Research, Progress Review – Southeast Region. College of Marine Science, Univ. South Florida, May 10–13, 2004.

Byrne, R.H., E.A. Kaltenbacher, and R.T. Short. 2003. In situ spectrophotometry and mass spectrometry for measurement of trace metals, nutrients, and dissolved gases. The Next Generation of In Situ Biological and Chemical Sensors in the Ocean. Woods Hole, MA, July 23–16, 2003.

Byrne, R.H. 2002. Spectrophotometric Elemental Analysis System. ONR Joint Review of Technology Applicable to Mine Countermeasures and Associated Missions. Coastal Systems Station, Panama City Beach, FL, Apr. 2–4, 2002.

Byrne, R.H. 2001. Design of autonomous in situ spectrophotometric systems for measurement of nutrients and CO_2 system parameters. International Workshop on Autonomous Measurements of Biogeochemical Parameters in the Ocean. Pacific Beach Hotel, Honolulu, HI, Feb. 20–21, 2001.

Byrne, R.H. 2001. Inorganic speciation in natural waters. 221st ACS National Meeting, Geochemistry Division Medal Symposium in Honor of Dr. Frank J. Millero: The Importance of Metal-Ligand Interactions in Natural Waters. San Diego, CA, Apr. 1–5, 2001.

Byrne, R.H. 1999. Rare earth complexation by inorganic environmental ligands. 22nd Rare Earth Research Conference (NERC), Argonne National Laboratory, Jul. 1999.

Byrne, R.H. 1999. Novel instrumental strategies for environmental analysis. International Symposium on Environmental Earth Science, Hokkaido University, Sapporo, Japan, Mar. 1999.

Byrne, R.H. 1999. Iron hydrolysis revisited. 217th American Chemical Society National Meeting & Exposition Program, Honoring Frank Millero: Thermodynamics and Kinetics of Natural Waters. Anaheim, CA, Mar. 1999.

Byrne, R.H. 1996. In situ measurements of seawater pH. CO_2 in the Oceans: An International Symposium hosted by the University of Puerto Rico, Mayaguez, PR, Jan. 22–26, 1996.

Byrne, R.H. 1995. Constructing a master variable: pH observations in seawater. Chemical Oceanography Gordon Research Conference. June 11–16, 1995.

Byrne, R.H. 1994. Application of pH measurements to in situ CO_2 system characterizations. PACON-94 Conference, Townsville, Australia, Jul. 3–9, 1994.

Byrne, R.H. 1993. Molecular perspectives in marine science: Studies of rare earth elements and the oceanic CO_2 system. Duke University, Durham, NC, Nov. 29, 1993.

Byrne, R.H. 1993. Chemistry of the lanthanides in natural waters. 205th ACS National Meeting, Denver, CO, Mar. 28–Apr. 2, 1993.

Byrne, R.H. 1992. Speculative aqueous speciation schemes in seawater. 204th ACS National Meeting, Washington, DC, Aug. 23–28, 1992.

Byrne, R.H. 1992. Reactivity of organic surfaces in seawater: Insights using rare earth elements (REE). ASLO Aquatic Sciences Meeting, Feb. 9–14, 1992.

Byrne, R.H. 1991. Comparative rare earth geochemistries in the marine environment. 19th Rare Earth Research Conference, Lexington, KY, Jul. 14–19, 1991.

Byrne, R.H. 1991. Oceanic behavior of the rare earth elements. 11th International Symposium, Chemistry of the Mediterranean, Primosten, Yugoslavia, May 9–16, 1990.

Byrne, R.H. 1988. Rare earth element adsorption in seawater. Spring meeting of the American

Geophysical Union, Baltimore, MD. *Eos, Transactions, American Geophysical Union* 69(16):373.

Byrne, R.H. 1988. Rare earth element solution and surface chemistry in seawater. X International Symposium, Chemistry of the Mediterranean, Primosten, Yugoslavia, May 1988.

Byrne, R.H. 1988. Rare earth element surface and solution chemistry. Florida Institute of Technology, Chemical Lecture Series, Mar. 1988.

Byrne, R.H. 1987. Rare earth element chemistry in seawater. University of Rhode Island, Marine Chemistry Seminar Series, Dec. 1987.

Byrne, R.H. 1986. Shallow water dissolution of aragonite in the North Pacific Ocean. Gordon Research Conference in Chemical Oceanography, Ventura, CA, Jan. 1986.

Byrne, R.H. 1986. Flux measurements of labile oceanic particulates. Upper Ocean Processes Workshop – Global Ocean Flux Study, Cambridge, MD, Mar. 1986.

Byrne, R.H. 1985. Chemical speciation in high complexation intensity systems. Symposium on Estuarine and Marine Chemistry, American Chemical Society 189th National Meeting, Miami, FL, May 1985.

Byrne, R.H. 1983. A worldwide chemical experiment: Man's addition of carbon dioxide to the atmosphere and oceans. USF Marine Science Public Lecture Series, May 1983.

Byrne, R.H. 1983. Problems in trace metal speciation models and suggested remedies. *Eos, Transactions, American Geophysical Union* 64(18):248.

Byrne, R.H. 1982. Mixed ligand complexation in high ligand variety natural media. Univ. Miami. Jan. 1982.

Byrne, R.H. 1980. Lead speciation in seawater. Graduate School of Oceanography, University of Rhode Island. Oct. 1980.

Byrne, R.H. 1980. Lead: A poison in your life? USF Marine Science Public Lecture Series, Oct. 1980.

Byrne, R.H. 1980. Inorganic speciation of lead in seawater. College of Marine Studies, Univ. Delaware. Aug. 1980.

Byrne, R.H. 1977. Measurement of ferric ion complexation by spectrophotometry. Dalhousie University, Dept. of Oceanography, June 1977.

Byrne, R.H. 1976. Studies of ferric ion equilibria in seawater and seawater analogs. School of Oceanography, Oregon State Univ., Jul. 1976.

Byrne, R.H. 1976. The speciation of iron in seawater. Univ. Maine, Ira C. Darling Center, May

1976.

Abstracts and Oral Presentations

Sharp, J. and **R.H. Byrne**. 2020. Total alkalinity determined by titration in the presence of dissolved organic matter. Poster presentation at Ocean Sciences Meeting, San Diego, CA. February.

Schockman, K. and **R.H. Byrne.** 2020. Accuracy of CO_2 system calculations improved with new spectrophotometric K_2 model for seawater. Poster presentation at Ocean Sciences Meeting, San Diego, CA. February.

Liu, X. and **R.H. Byrne.** 2020. Acid-free continuous alkalinity measurement by equilibration with CO_2 across a silicone membrane. Poster presentation at Ocean Sciences Meeting. San Diego, CA. February.

Schijf, J and **R.H. Byrne.** 2020. Speciation of yttrium and the rare earth elements in seawater: Review of a 20-year analytical journey. Poster presentation at Ocean Sciences Meeting. San Diego, CA. February.

Hunt, C.W., **R.H. Byrne**, X. Liu, and J. Salisbury. 2020. Organic alkalinity distributions and characteristics in two Gulf of Maine estuaries. Ocean Sciences Meeting 2020. San Diego, CA. February.

Schockman, K. and **R.H. Byrne.** 2019. Using novel spectrophotometric determination of CO_2 dissociation constant, K_2, to improve CO_2 system calculations. Poster presentation for Ocean Visions 2019 – Climate Summit, Atlanta, GA. April.

Sharp, J. and **R.H. Byrne**., 2019. Carbonate ion determinations in seawater: A decade of methodological development. Oral presentation for Aquatic Sciences Meeting, San Juan, PR. February.

Schockman, K. and **R.H. Byrne.** 2019. Spectrophotometric determination of carbonate dissociation constant, K_2, in seawater. Poster presentation for Aquatic Sciences Meeting, San Juan, PR. February.

Hudson-Heck, E. and **R.H. Byrne.** 2019. Purification and characterization of thymol blue for spectrophotometric pH measurements in rivers, estuaries, and seawater. Poster presented at ASLO meeting, San Juan, Puerto Rico. February.

Schockman, K. and **R.H. Byrne.** 2018. Spectrophotometric Determinations of Carbonate Dissociation Constants in Seawater. Goldschmidt Conference poster presentation #295, Boston, MA. August 2018

Liu, X. and **R.H. Byrne.** 2018. Spectrophotometric Measurements of Organic Contributions to Alkalinity: A Mixed Indicator Approach. Poster presentation at Ocean Sciences Meeting. Portland Oregon. February 14, 2018.

S. Beckwith, **R.H. Byrne**, P. Hallock Muller. 2018. Alternative saturation state calculations from measured calcium concentrations provide a measure of regionally-variable calcification potential. Oral presentation at Ocean Sciences Meeting. Portland Oregon. February 12, 2018.

Yang, B., **Byrne, R.H**., M. and Lindemuth. 2018. Contributions of organic alkalinity to total alkalinity in coastal waters: A spectrophotometric approach (Invited). Poster presentation at Ocean Sciences Meeting. Portland Oregon. February 14, 2018.

Douglas, N.K. and **R.H. Byrne**. 2018. Spectrophotometric pH measurements from river to sea: Calibration of mCP for $0 \leq S \leq 40$ and $278.15 \leq T \leq 308.15$ K. Poster presentation at Ocean Sciences Meeting. Portland Oregon. February 14, 2018.

Sharp, J.D., E. Hudson-Heck, K.M. Schockman, C. Tierney and **R.H. Byrne**. 2018, Acidification in the Gulf: Insights from measurements of pH and [CO_3^{2-}] on GOMECC-3. Poster presentation at Ocean Sciences Meeting. Portland Oregon. February 14, 2018.

Sharp, J.D., **R.H. Byrne**, X. Liu, R.A. Feely, *E.E. Cuyler,* and R. Wanninkhof. 2017. Direct UV measurements of seawater carbonate ion concentrations: Observations and angstrom-scale adjustments. Poster presentation. ASLO 2017 Aquatic Sciences Meeting. Honolulu, HI. March 1, 2017.

Cuyler, E.E. and **R.H. Byrne**. 2017. Simplified spectrophotometric measurements of carbonate saturation states. Poster presentation at ASLO 2017 Aquatic Sciences Meeting. Honolulu, HI. March 1, 2017.

Sharp, J.D., and **R.H. Byrne**. 2017. Direct measurements of seawater carbonate ion concentrations in the Gulf of Mexico: Implications for spatial mapping of $CaCO_3$ saturation states. Poster presentation at OCB 2017 Summer Workshop. Woods Hole, MA. July 17, 2017.

T.F. Duda, L.E. Freitag, L.R. Adornato, and **R.H. Byrne**. 2016. Potential impacts of climate change on acoustic propagation in the Arctic. *The Journal of the Acoustical Society of America*. doi:http://dx.doi.org/10.1121/1.4950551

N.K. Douglas, X. Liu, L.R. Adornato, and **R.H. Byrne**. 2015. Seawater CO_2 system thermodynamics under high-pCO_2 conditions. Poster presentation. 3rd U.S. Ocean Acidification PI Meeting. Woods Hole Oceanographic Institution. June 9–11, 2015.

E. Kaltenbacher, L. Adornato, **R. Byrne**, S. Liu. 2015. Development of a compact instrument for field measurements of pH, total dissolved inorganic carbon and total alkalinity. Poster presentation. 3rd U.S. Ocean Acidification PI Meeting. Woods Hole Oceanographic Institution. June 9–11, 2015.

Breithaupt, J. L., Smoak, J.M., Smith III, T.J., Sanders, C.J., Peterson, L.C. and **R.H. Byrne**. 2014.

Assessing 100 years of carbon burial and sediment accretion in the context of sea level rise, reduced freshwater input, and storms in the coastal Everglades. Oral presentation at the Joint Aquatic Sciences Meeting in Portland, OR.

N.K. Douglas, **R.H. Byrne,** and *M.C. Patsavas*. 2014. Development of an instrument for in situ spectrophotometric measurements of the aragonite saturation horizon. Poster presentation at the 2014 Ocean Sciences Meeting. Honolulu, HI

X. Liu, **R.H. Byrne**, L. Adornato, E. Kaltenbacher, and K.K. Yates. 2013. Integrated in situ DIC and pH sensors for comprehensive CO_2 system characterizations. Poster at 2013 Ocean Acidification Principal Investigators Meeting. Silver Spring, MD.

Jonathan G. Wynn, Lisa L. Robbins, Paul O. Knorr, **Robert H. Byrne**, Taro Takahashi, and Bogdan P. Onac. 2013. Ocean acidification research alongside extended continental shelf exploration in the western Arctic Ocean. Poster, AGU Fall Meeting, December 9.

R. Easley (presenting, oral), K. A. Quinn, and **R. Byrne**. 2013. Direct carbonate ion determinations using Pb(II) UV spectroscopy for in situ analysis in seawater. (Abstract ID: 248.) ACS Spring Meeting, New Orleans, LA, 7–11 April.

Liu, X., **R.H. Byrne**, M. Lindemuth, *R.A. Easley,* and *M.C. Patsavas*. 2012. A rapid automated procedure for laboratory and shipboard spectrophometric measurements of seawater alkalinity. (Poster, Abstract ID: OS51E.) AGU Fall Meeting, San Francisco, CA, Dec. 3–7.

Martens, C.S., Lindquist, N., Mendlovitz, H.P., Hoer, D., **R. Byrne,** X. Liu, Kintzing, M.D., and Hallock-Muller, P. 2012. Local controls on aragonite saturation in the benthic boundary layer of a coral reef ecosystem, Conch Reef, Florida Keys. (Oral presentation, Abstract ID: 12087.) Ocean Sciences Meeting, Salt Lake City, UT, Feb. 20 –24.

Kaltenbacher, E.A.; Adornato, L.R.; **R.H. Byrne**, and Gray, K. 2012. Modeled and experimental performance predictions and cautions for Type I AND Type II liquid core waveguides. (Poster, Abstract ID: 11261.) Ocean Sciences Meeting, Salt Lake City, UT, Feb. 20–24.

Patsavas, M.C., X. Liu, and **R.H. Byrne**. 2012. Improvements in seawater carbon system measurements based on the use of sulfonephthalein indicator dyes. (Poster, Abstract ID: 9448.) Ocean Sciences Meeting, Salt Lake City, UT, Feb. 20 –24.

Liu, X.; **R.H. Byrne,;** Yates, K.K., Kaltenbacker, E.A., and Adornato, L. 2012. In-situ spectrophotometric measurement of dissolved inorganic carbon in a biofouling-prone region. (Oral presentation, Abstract ID:9450.) Ocean Sciences Meeting, Salt Lake City, UT, Feb. 20 –24.

Easley, R.A., Patsavas, M C., Liu, X., Ding, X., *Yang, B.*, Kaltenbacher, E.A., Adornato, L.A., **R.H. Byrne**, Greeley, D., and Feely, R.A. 2012. Empirical optimization of the spectrophotometric measurement of carbonate ion in seawater using field observations. (Poster, Abstract ID: 9551.) Ocean Sciences Meeting, Salt Lake City, UT, Feb. 20 –24.

Patsavas, M.C., Easley, *R.A*., Liu, X., Ding, X., *Yang, B.,* Kaltenbacher, E.A., Adornato, L., **R.H. Byrne**, Feely, R.A., and Greeley, D. 2012. Spectrophotometric measurements of seawater carbonate ion concentrations and saturation states. Oral presentation, International Coral Reef Symposium, Cairns, Australia, July 11.

Wang, Z.A., R.H. Wanninkhof, W-J. Cai, **R.H. Byrne**, X. Hu, T.-H. Peng, and W.-J. Huang. 2011. The marine inorganic carbon system along the Gulf of Mexico and Atlantic coasts of the United States: Shelf –ocean exchange and ocean acidification status. AGU Fall Meeting, San Francisco California, Dec. 5 –9.

Short, R.T., S.K. Toler, R. Bell, and **R.H. Byrne**. 2011. Underwater membrane introduction mass spectrometers: recent developments and deployments. 8th Harsh Environment Mass Spectrometry Workshop, St. Petersburg Beach, Sept. 19–22.

Adornato, L.A., E.A. Kaltenbacher and **R.H. Byrne**. 2011. Carbon system measurements at SRI/USF. OCB Ocean Acidification Principal Investigators Workshop. Woods Hole, Mass. March 22–24. (poster)

Adornato, L., *R. Easley*, and **R.H. Byrne**. 2010. Investigation of spatial and temporal variability in primary nitrite and deep chlorophyll maxima. 2010 Ocean Sciences Meeting (AGU/ASLO), Portland, OR, Feb. 22–26. (poster)

Wang, Z.A. and **R.H. Byrne**. 2009. Summer-time CO_2 fluxes and carbonate system behavior in the Mississippi River and Orinoco River plumes. OceanObs'09: Sustained Ocean Observations and Information for Society Conference, Venice, Italy, Sept. 21–25. (poster)

Byrne, R.H., M.D. DeGrandpre, R.T. Short, T.R. Martz, L. Merlivat, C. McNeil, F.L. Sayles, *R. Bell,* and P. Fietzek. 2010. Sensors and systems for in situ observations of marine carbon dioxide system variables. OceanObs'09: Sustained Ocean Observations and Information for Society Conference, Venice, Italy, Sept. 21–25. (poster)

Bell, R.J., S.K. Toler, R.T. Short, and **R.H. Byrne**. 2009. In situ mass spectrometry for chemical measurements in the water column and on the sea floor. OceanObs'09: Sustained Ocean Observations and Information for Society Conference, Venice, Italy, Sept. 21–25. (poster)

Adornato, L., A. Cardenas-Valencia, E. Kaltenbacher, **R.H. Byrne**, K. Daly, K. Larkin, S. Hartman, M. Mowlem, R.D. Prien, and V. Garcon. 2010. OceanObs'09: Sustained Ocean Observations and Information for Society Conference, Venice, Italy, Sept. 21–25. (poster)

Adornato, L., E.A. Kaltenbacher, **R.H. Byrne**, X. Liu, and *R. Easley*. 2008. High-resolution chemical sensor for unattended underwater networks. In: Edward M. Carapezza (ed.) *Unmanned/Unattended Sensors and Sensor Networks V*, Proc. of the SPIE 7112:71120-71120R-10.

Bell, R.J., S.K. Toler , *P.G. Wenner* , R.T. Short, and **R.H. Byrne**. 2008. Measurements of horizontal and vertical gradients of dissolved gas concentrations using a calibrated underwater

membrane inlet mass spectrometer. 56th ASMS Conference on Mass Spectrometry and Allied Topics, Denver, CO, June 1–5.

Wang, Z.A. and **R.H. Byrne**. 2008. Summertime CO_2 fluxes and carbon system behavior in the Mississippi River and Orinoco River plumes. OCB Scoping Workshop on Terrestrial and Coastal Carbon Fluxes in the Gulf of Mexico, May 2008, St. Petersburg, FL. (poster)

Wang, Z.A. and **R.H. Byrne**. 2008. The summertime CO_2 fluxes and carbon systems in the Mississippi River and Orinoco River plumes. Ocean Science Meeting 2008, Orlando, FL.

Bell, R.J., S.K. Toler, *P.G. Wenner*, R.T. Short, and **R.H. Byrne**. 2007.Underwater mass spectrometry: Developments and calibration. Workshop on Harsh-Environment Mass Spectrometry, Cocoa Beach, FL, Sept. 17–20, 2007.

Short, R.T., S.K. Toler, F.H.W. van Amerom, A. Chaudhary, *P.G. Wenner, R.J. Bell*, L.D. Miranda, and **R.H. Byrne**. 2007. Development and deployment of in situ mass spectrometers. ONR Joint Review of Unmanned Systems Technology Development, Panama City Beach, FL, Jan. 22–26, 2007.

Byrne, R.H. and E.A. Kaltenbacher. 2007. Spectrophotometric in situ sensor technology: Progress and plans. ONR Joint Review of Unmanned Systems Technology Development, Panama City Beach, FL, Jan. 22–26, 2007.

Byrne, R.H., X. Liu, S. Mecking, and R.A. Feely. Acidification of the North Pacific Ocean: Direct observations of pH in 1991 and 2006. Poster OS21C-1598. AGU Fall Meeting, Dec. 11–15, 2006.

Short, R.T., S.K. Toler, F.H.W. van Amerom, A. Chaudhary, *R.J. Bell, P.G. Wenner*, and **R.H. Byrne**. 2006. In situ mass spectrometry: Underwater measurements and miniaturization. Proc. of AGU Fall Meeting, San Francisco, CA.

Short, R.T., S.K. Toler, F.H.W. van Amerom, *R.J. Bell, P.G. Wenner*, and **R.H. Byrne**. 2006. Monitoring of dissolved gases and volatile organics using in situ mass spectrometry. Proc. of Natural Gas Technologies Conference, Orlando, FL.

Bell, R.J., P.G. Wenner, S.K. Toler, F.H.W. van Amerom, R.T. Short, and **R.H. Byrne**. 2006. In situ mass spectrometry for field chemical analysis. Proc. of 33rd FACSS Meeting, Orlando, FL.

Toler, S.K., R.T. Short, F.H.W. van Amerom, *P.G. Wenner, R.J. Bell*, and **R.H. Byrne**. 2006. In situ quantification of dissolved gases using an underwater membrane introduction mass spectrometer. Proc. of ASLO conference, Victoria, BC.

Bell, R.J., F.H.W. van Amerom, S.K. Toler, *P.G. Wenner*, R.T. Short, and **R.H. Byrne**. 2006. Investigations of membrane introduction transport phenomena in an underwater mass spectrometer. Proc. of the 54th ASMS Conference on Mass Spectrometry and Allied Topics, Seattle, WA.

Toler, S.K., R.T. Short, *R.J. Bell*, *P.G. Wenner*, F.H.W. van Amerom, and **R.H. Byrne**. 2006. New developments in in situ mass spectrometry. ONR Joint Review of Unmanned Systems Technology Developments, Panama City Beach, FL.

Wenner, P.G., R.T. Short, S.K. Toler, *R.J. Bell*, F.H.W. van Amerom, J.E. Edkins, M.L. Hall, and **R.H. Byrne**. 2005. In situ mass spectrometry for environmental analysis. ONR Joint Review of Unmanned Systems Technology Development, Panama City Beach, FL, Feb. 2005.

Callahan, M.C., Kaltenbacher, E.A., and **R.H. Byrne**. 2003. In situ spectroscopy for the measurement of nutrients and metals. International Symposium for the Prevention of Pollution from Ships, Shipyards, Drydocks, and Harbors, New Orleans, LA, Nov. 5–7, 2003.

Bell, R.J., F.H.W van Amerom, R.T. Short, and **R.H. Byrne**. 2003. Underwater mass spectrometry for in situ monitoring of polar and non-polar molecules". 4th Workshop on Harsh Environment Mass Spectrometry, St. Pete Beach, FL, Oct. 7–10, 2003.

Callahan, M.C., E.T. Steimle, E.A. Kaltenbacher, and **R.H. Byrne**. 2003. In situ monitoring of a reactive trace metal in riverine and estuarine mixing zones. Estuarine Research Federation, 17th Biennial Conference, Seattle, WA, Sept. 14–18, 2003.

Byrne, R.H. and J. Schijf. 2003. Scavenging in seawater: Use of rare earths, yttrium, and platinum group elements to model the sorptive behavior of natural particles. Presentation at the EGS–AGU–EUG Joint Assembly, Nice, France, April 10, 2003.

Kibelka, G.P.G., R.T. Short, D.P. Fries, and **R.H. Byrne**. 2001. Membrane introduction mass spectrometry on unmanned underwater vehicles. *Proc. of the 28th Annual Federation of Analytical Chemistry and Spectroscopy Societies Meeting*, Detroit, MI.

Short, R.T., D.P. Fries, G.P.G. Kibelka, M.L. Kerr, S.K. Toler, *P.G. Wenner*, and **R.H. Byrne**. 2001. Field chemical analysis using real-time in-water mass spectrometry. *Proc. of Oceans 2001 MTS/IEEE*, Honolulu, HI.

Kaltenbacher, E., E.T. Steimle, and **R.H. Byrne**. 2000. A compact, in situ spectrophotometric sensor for aqueous environments: Design and applications. Proc. of the 2000 International Symposium on Underwater Technology, Toyko, Japan, May 23– 26, 2000.

Waterbury, R.D., **R.H. Byrne**, and W. Yao. 1998. Development of an in situ long pathlength spectrophotometric sensor for oceanic chemical analysis. Oceans '98 IEEE Conference, Nice, France, Sept. 28–Oct. 1, 1998.

Byrne, R.H., R.D. Waterbury, and W. Yao. 1998. Development of an in situ long pathlength spectrophotometric sensor for multielemental analysis. 216th Natl. Meeting of the ACS, Boston, MA, fall.

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