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

Elected to the Academy of Science, Engineering and Medicine of Florida (2021)
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)
Co-Founder of Ocean Optics Inc. (1989), now Ocean Insight

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)

Editorial Board Member, *Chemosensors* (2020 – present)
Associate Editor, *Geochimica et Cosmochimica Acta* (1993–2022)
Associate Editor, *Limnology and Oceanography: Methods* (2003–2006)
Associate Editor, *Chemical Speciation and Bioavailability* (1993–1999)

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 to the Tiawan Strait Marine Ecosystem (T-SMART) (July 20, 2023 to July 19, 2028)
International Advisory Committee Member for the Dongshan Marine Research Station of The State Key Lab of Marine Environmental Science, Xiamen University (2014– 2022)

National Science Foundation, Advisory Panel Member for Ocean Science Research – Chemical Oceanography (1987 – 1990, 1993, 2008, 2020)
Ocean Acidification Task Force of the U.S. Ocean Research & Resources Advisory Panel (15 March 2010 – 31 March 2011)
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)
Chair, Tenure and Promotion Committee (co-Chair Pam Hallock Muller), USF College of Marine Science (2017–present)
Member, USF Institute for Advanced Discovery and Innovation, University of South Florida (2015–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, Curriculum Committee, USF College of Marine Science (2003–present)
Member, Search Committee for two chemical oceanography faculty positions, USF College of Marine Science (2022–2023)
Member, USF College of Marine Science Dean Search Advisory Committee (2019–2020)
Chair, Committee for Revision of Tenure and Promotion Guidelines, USF College of Marine Science (2016–2017)
Chair, Search Committee for chemical oceanography faculty position, USF College of Marine Science (2015–2016)
Member, Search Committee for two physical oceanography faculty positions, USF College of Marine Science (2014–2015)
Chair, Search Committee for two chemical oceanography faculty positions, USF College of Marine Science (2012–2013)
Chair, Search Committee for two faculty positions: global-scale ocean–atmosphere modeler and mesoscale ocean–atmosphere modeler, USF College of Marine Science (2008–2009)
Chair, Graduate Admissions and Awards Committee, USF Dept. of Marine Science (1980–1982)
Member, University Recommending Committee for Distinguished University Professors (2013–

2015)
Member, Dean's Advisory Council, USF College of Marine Science (2013–2015)
Member, University Search Committee for Dean of the USF College of Marine Science (2009–2010)
Member, University Search Committee for St. Petersburg Downtown Progress – Peter R. Betzer Endowed Chair (2010)
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 or employees in Byrne labs, current and former. An asterisk (*) indicates a coauthor who conducted the work under the direct supervision or co-supervision of R.H. Byrne.

240. Carter, B.; *J. Sharp*, A. Dickson; M. Álvarez, M. Fong, M.I. García-Ibáñez, R. Woosley, Y. Takeshita, L. Barbero, **R.H. Byrne**, W-J. Cai, M. Chierici, S. Clegg, *R. Easley*, A. Fassbender, *K. Fleger*, X. Li, *M. Martín-Mayor*, *K. Schockman*, and Z.A. Wang. 2024. Uncertainty sources for measurable ocean carbonate chemistry variables. *Limnology and Oceanography* 69 (1) 1-21. https://doi.org/10.1002/lno.12477

239. *Moore, C.S.*,* **Byrne R.H.,** and Yates, K.K. 2023. An assessment of Hg^{II} to preserve carbonate system parameters in organic-rich estuarine waters. *Limnology and Oceanography: Methods*. https://doi:10.1002/lom3.10593

238. *Martell-Bonet, L.** and **R.H. Byrne.** 2023. A differential titration method for determining the dissociation characteristics of natural organic acids in the coastal zone. *Chemical Geology* 636 121634. https://doi.org/10.1016/j.chemgeo.2023.121634

237. Cetiner, J.E.P., Berelson, W. M., Rollins, N.E., Barnhart, H.A., *Liu, X.*, Dong, S., **Byrne, R.H.**, and Adkins, J.F. 2023. Novel device to collect deep-sea porewater in situ: A focus on benthic carbonate chemistry. *Limnology and Oceanography: Methods*. https://doi.org/10.1002/lom3.10530

236. *Yang, B.* and **R.H. Byrne.** 2023. Sub-annual and inter-annual variations of total alkalinity in the northeastern Gulf of Mexico. *Marine Chemistry*. https://doi.org/10.1016/j.marchem.2022.104195

235. *Hudson-Heck, E.** and **R.H. Byrne.** 2022 Spectrophotometric analysis of the CO_2 system in aqueous solutions: A freshwater example from the Snake River, Idaho, USA. *Limnology and Oceanography: Methods*. https://doi.org/10.1002/lom3.10525

234. *Schockman, K.M.** and **R.H. Byrne.** 2022. A hybrid conductometric/spectrophotometric method for determining the ionic strength of dilute aqueous solutions. *Analytica Chimica Acta*. Vol. 1220. https://doi.org/10.1016/j.aca.2022.340008

233. Subhas, A.V., Dong, S., Naviaux, J.D., Rollins, N.E., Ziveri, P., Gray, Rae, J.W.B., *Liu. X.*, **Byrne, R.H.**, Chen, S., Moore, C., *Martell-Bonet, L.*,* Steiner, Z., Antler, G., Hu. H., Lunstrum, A., Hou, Y., Kemnitz, N., Stutsman, J., Pallacks, S., Dugenne, M., Quay, P.D., Berelson, W.M. and Adkins, J.F. 2022. Shallow calcium carbonate cycling in the North Pacific Ocean. *Global Biogeochemical Cycles*. https://doi.org/10.1029/2022GB007388

232. Jiang, L. Q., Pierrot, D., Wanninkhof, R., Feely, R. A., Tilbrook, B., Alin, S., Barbero, L., **Byrne, R. H.**, Carter, B. R., Dickson, A. G., Gattuso, J. P., Greeley, D., Hoppema, M., Humphreys, M. P., Karstensen, J., Lange, N., Lauvset, S. K., Lewis, E. R., Olsen, A., Pérez, F. F., Sabine, C., *Sharp, J. D.*, Tanhua, T., Trull, T. W., Velo, A., Allegra, A. J., Barker, P., Burger, E., Cai, W. J., Chen, C. T. A., Cross, J., Garcia, H., Hernandez-Ayon, J. M., Hu, X., Kozyr, A., Langdon, C., Lee, K., Salisbury, J., Wang, Z. A. and *Xue, L.* 2022. Best practice data standards for discrete chemical oceanographic observations, *Frontiers in Marine Science*, 8, p. 705638. https://doi.org/10.3389/fmars.202.705638

231. Platz, M.C., Arias, M.E. & **R. H. Byrne**. 2022. Reef metabolism monitoring methods and potential applications for coral restoration. *Environmental Management*. https://doi.org/10.1007/s00267-022-01597-9

230. Schijf, J. and **R.H. Byrne**. 2021. Speciation of yttrium and the rare earth elements in seawater: Review of a 20-year analytical journey. *Chemical Geology*. https://www.sciencedirect.com/science/article/abs/pii/S0009254121004228

229. Takeshita Y., J.K. Warren, *X. Liu*, R.S. Spaulding, **R.H. Byrne**, B.R. Carter, M.D. DeGrandpre, A. Murata, and S. Watanabe. 2021. Consistency and stability of purified meta-cresol purple for spectrophotometric pH measurements in seawater. *Marine Chemistry* 236: 104018. https://www.sciencedirect.com/science/article/pii/S0304420321001031

228. *Hudson-Heck, E.*,* *X. Liu*, and **R.H. Byrne**. 2021. Purification and physical–chemical characterization of bromocresol purple for carbon system measurements in fresh waters, estuaries, and oceans. *ACS Omega* 6(8): 1794 –17951. https://pubs.acs.org/doi/10.1021/acsomega.1c01579

227. *Sharp*, *J.D.** and **R.H. Byrne**. Excess alkalinity in carbonate system reference materials. 2021. *Marine Chemistry* 233: 103965. https://doi.org/10.1016/j.marchem.2021.103965

226. Steiner, Z., A. Sarkar, *X. Liu*, W.M. Berelson, J.F. Adkins, E.P. Achterberg, P. Sabu, S. Prakash, P.N. Vinaychandran, **R.H. Byrne**, and A.V. Turchyn. 2021. On calcium-to-alkalinity

anomalies in the North Pacific, Red Sea, Indian Ocean and Southern Ocean. *Geochimica et Cosmochimica Acta* 303, 1–14. https://doi.org/10.1016/j.gca.2021.03.027

225. Jiang, J.Q., R.A. Feely, R. Wanninkhof, D. Greeley, L. Barbero, S. Alin, B.R. Carter, D. Pierrot, C. Featherstone, J. Hooper, C. Melrose, N. Monacci, *J.D. Sharp,* S. Shellito, Y. Xu, A. Kozyr, **R.H. Byrne**, W. Cai, J. Cross, G.C. Johnson, B. Hales, C. Langdon, J. Mathis, J. Salisbury, and D.W. Townsend. 2021. Coastal Ocean Data Analysis Product in North America (CODAP-NA) — an internally consistent data product for discrete inorganic carbon, oxygen, and nutrients on the North American ocean margins. *Earth System Science Data* 13 (6): 2777–2799. https://doi.org/10.5194/essd-13-2777-2021

224. *Schockman, Katelyn M.** and **Robert H. Byrne**. 2021. Spectrophotometric determination of the bicarbonate dissociation constant in seawater. *Geochimica et Cosmochimica Acta* 300: 231-245. https://doi.org/10.1016/j.gca.2021.02.008

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. https://doi.org/10.1016/j.dsr.2020.103338

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**, and 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. | https://doi.org/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. https://doi.org/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. *Continental Shelf Research* 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. https://doi.org/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. https://doi.org/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. https://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. https://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. https://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. https://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.2013.05.012s

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. https://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. https://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. https://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. https://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. https://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. https://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^-, Cl^-, 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.

157. *Miranda, L.D.*,* R.T. Short, F.H.W. van Amerom, *R.J. Bell*,* and **R.H. Byrne**. 2009. Direct coupling of a carbon nanotube membrane to a mass spectrometer: Contrasting nanotube and capillary tube introduction systems. *Journal of Membrane Science* 344(1–2): 26–31.

156. Dickey, T., N. Bates, **R.H. Byrne**, G. Chang, F.P. Chavez, R.A. Feely, A.K. Hanson, D.M. Karl, D. Manov, C. Moore, C.L. Sabine, and R. Wanninkhof. 2009. The NOPP O-SCOPE and MOSEAN Projects: Advanced Sensing for Ocean Observing Systems. *Oceanography* 22(2): 168–181.

155. Schijf, J. and **R.H. Byrne.** 2008. Comment on "An experimental study of the solubility and speciation of neodymium(III) fluoride in F-bearing aqueous solutions" by A.A. Migdisov and A.E. Williams-Jones. *Geochimica et Cosmochimica Acta* 72: 5574–5577.

154. **Byrne, R.H.** and W. Yao.* 2008. Procedures for measurement of carbonate ion concentrations in seawater by direct spectrophotometric observations of Pb(II) complexation. *Marine Chemistry* 112: 128–135.

153. Soli, A.L., Z.I. STEWART,* and **R.H. Byrne**. 2008. The Influence of temperature on $PbCO_3^0$ formation in seawater. *Marine Chemistry* 110: 1–6.

152. *Bell, R.J.*,* R.T. Short, F.H.W. van Amerom, and **R.H. Byrne**. 2007. Calibration of an in situ membrane inlet mass spectrometer for measurements of dissolved gases and volatile organics in seawater. *Environmental Science and Technology* 41: 8123–8128.

151. Yao, W., *X. Liu*, and **R.H. Byrne**. 2007. Impurities in indicators used for spectrophotometric seawater pH measurements: Assessment and remedies. *Marine Chemistry* 107: 167–172.

150. John, D.E., Z.A. Wang,* *X. Liu*, **R.H. Byrne**, J.E. Corredor, J.M. Lopez, A. Cabrera, D.A. Bronk, F.R. Tabita, and J.H. Paul. 2007. Phytoplankton carbon fixation gene (RuBisCO) transcripts and air-sea CO_2 flux in the Mississippi River plume. *The ISME Journal: Multidisciplinary Journal of Microbial Ecology* 1: 517–531.

149. Wang, Z.A.,* *X. Liu*, **R.H. Byrne**, R. Wanninkhof, *R. Bernstein*,* E.A. Kaltenbacher, and *J. Patten*.* 2007. Simultaneous spectrophotometric flow-through measurements of pH, carbon dioxide fugacity and total inorganic carbon in seawater. *Analytica Chimica Acta* 596: 23–36.

148. *Adornato, L.R.,* * E.A. Kaltenbacher, D.R. GREENHOW,* and **R.H. Byrne**. 2007. High-resolution *in situ* analysis of nitrate and phosphate in the oligotrophic ocean. *Environmental Science and Technology* 41: 4045–4052.

147. Powell, K. J., P.L. Brown, **R.H. Byrne**, T. Gajda, G. Hefter, S. Sjoberg, and H. Wanner. 2007. Chemical speciation of environmentally significant heavy metals with inorganic ligands. Part 2: The Cu^{2+} - Cl^{-}, OH^{-}, CO_3^{2-}, SO_4^{2-}, PO_4^{3-} systems. *Pure and Applied Chemistry* 79: 895–950.

146. Luo, Y-R.* and **R.H. Byrne**. 2007. The influence of ionic strength on yttrium and rare earth element complexation by fluoride ions in $NaClO_4$, $NaNO_3$ and NaCl solutions at 25°C. *Journal of Solution Chemistry* 36: 673–689.

145. Schijf, J.* and **R.H. Byrne**. 2007. Progressive dolomitization of Florida limestone recorded by alkaline earth element concentrations in saline, geothermal, submarine springs. *Journal of Geophysical Research – Oceans* 112: 1–17.

144. *Pillsbury, L.A.** and **R.H. Byrne**. 2007. Spatial and temporal chemical variability in the Hillsborough River system. *Marine Chemistry* 104: 4–16.

143. *Quinn, K.A.,* **R.H. Byrne** and J. Schijf.* 2007. Sorption of yttrium and rare earth elements by amorphous ferric hydroxide: Influence of temperature. *Environmental Science and Technology* 41: 541–546.

142. Cardenas-Valencia, A.M., **R.H. Byrne**, M. Calves, L. Langebrake, D. P. Fries, and E.T. Steimle. 2007. Development of stripped-cladding optical fiber sensors for continuous monitoring II: Referencing method for spectral sensing of environmental corrosion. *Sensors and Actuators B* 122: 410–418.

141. Short, R.T., S.K. Toler, G.P.G. Kibelka, D.T. Rueda Roa, *R.J. Bell*,* and **R.H. Byrne**. 2006. Detection and quantification of chemical plumes using a portable underwater membrane introduction mass spectrometer. *Trends in Analytical Chemistry* 25: 637–646.

140. Klochko, K., A.J. Kaufman, W. Yao,* **R.H. Byrne**, and J.A. Tossell. 2006. Experimental measurement of boron isotope fractionation in seawater. *Earth and Planetary Science Letters* 248: 276–285.

139. *Liu, X.*,* Z. Wang,* **R.H. Byrne**, E.A. Kaltenbacher, and *R.E. Bernstein*.* 2006. Spectrophotometric measurements of pH in situ: Laboratory and field evaluations of instrumental performance. *Environmental Science and Technology* 40: 5036–5044.

138. *Quinn, K.A.,* **R.H. Byrne**, and J. Schijf.* 2006. Sorption of yttrium and rare earth elements by amorphous ferric hydroxide: Influence of solution complexation with carbonate. *Geochimica et Cosmochimica Acta* 70: 4151–4165.

137. **Byrne, R.H.,** W. Yao,* K. Klochko, J.A. Tossell, and A.J. Kaufmam. 2006. Experimental evaluation of the isotopic exchange equilibrium $^{10}B(OH)_3 + {}^{11}B(OH)_4 = {}^{11}B(OH)_3 + {}^{10}B(OH)_4$ in aqueous solution. *Deep-Sea Research I* 53: 684–688.

136. *Quinn, K.A.,* **R.H. Byrne**, and J. Schijf.* 2006. Sorption of yttrium and rare earth elements by amorphous ferric hydroxide: Influence of pH and ionic strength. *Marine Chemistry* 99: 128–150.

135. Cardenas-Valencia, A.M., **R.H. Byrne**, and E.T. Steimle. 2006. Development of stripped-cladding optical fiber sensors for continuous monitoring I: Theoretical study of a referencing method for measuring refractive indices of fluids. *Sensors and Actuators B* 115: 178–188.

134. **Byrne, R.H.,** W. Yao,* Y.-R. Luo,* and *B. Wang*.* 2005. The dependence of Fe^{III} hydrolysis on ionic strength in NaCl solutions. *Marine Chemistry* 97: 34–48.

133. *Adornato, L.R.,* E.A. Kaltenbacher, T.A. Villareal, and **R.H. Byrne**. 2005. Continuous in situ determinations of nitrite at nanomolar concentrations. *Deep-Sea Research I* 52: 43–551.

132. Powell, K.J., P.L. Brown, **R.H. Byrne**, T. Gajda, G. Hefter, S. Sjoberg, and H. Wanner. 2005. Chemical speciation of environmentally significant heavy metals with inorganic ligands. Part I: The Hg^{2+}- Cl^-, OH^-, CO_3^{2-}, SO_4^{2-} and PO_4^{3-} aqueous systems. *Pure and Applied Chemistry* 77: 739–800.

131. Powell, K.J., P.L. Brown, **R.H. Byrne**, T. Gajda, G. Hefter, S. Sjoberg, and H. Wanner. 2004. Chemical speciation of Hg(II) with environmental inorganic ligands. *Australian Journal of Chemistry* 57: 993–1000.

130. *Quinn, K.A.,* **R.H. Byrne,** and J. Schijf.* 2004. Comparative scavenging of yttrium and the rare earth elements in seawater: Competitive influences of solution and surface chemistry. *Aquatic Geochemistry* 10: 59–80.

129. Daly, K.L., **R.H. Byrne**, A.D. Dickson, S.M. Gallager, M.J. Perry, and M.K. Tivey. 2004. Chemical and biological sensors for time-series research: Current status and new directions. *Marine Technology Society Journal* 38: 121–143.

128. Kibelka, G.P.G., R.T. Short, S.K. Toler, J.E. Edkins, and **R.H. Byrne**. 2004. Field-deployed underwater mass spectrometers for investigations of transient chemical systems. *Talanta* 64: 961–969.

127. *Wenner, P.G.,* R.J. Bell*,* F.H.W. van Amerom, S.K. Toler, J.E. Edkins, M.J. Hall, K. Koehn, R.T. Short, and **R.H. Byrne**. 2004. Environmental chemical mapping using an underwater mass spectrometer. *Trends in Analytical Chemistry* 24: 288–295.

126. Schijf, J.* and **R.H. Byrne**. 2004. Determination of $_{SO4}\beta_1$ for yttrium and the rare earth elements at I = 0.66 *m* and *t* = 25 ºC – Implications for YREE solution speciation in sulfate-rich waters. *Geochimica et Cosmochimica Acta* 68: 2825–2837.

125. Callahan, M.J.,* E.A. Kaltenbacher, and **R.H. Byrne**. 2004. In situ measurements of Cu in an estuarine environment using a portable spectrophotometric analysis system. *Environmental Science and Technology* 38: 587–593.

124. *Bernstein, R.E.** and **R.H. Byrne**. 2004. Acantharians and marine barite. *Marine Chemistry* 86: 45–50.

123. Luo, Y-R.* and **R.H. Byrne**. 2004. Carbonate complexation of yttrium and the rare earth elements in natural waters. *Geochimica et Cosmochimica Acta* 68: 691–699.

122. **Byrne, R.H.** 2003. Comment on "Solubility of platinum in aqueous solutions at 25°C and pHs 4 to 10 under oxidizing conditions" by Mohamed Azaroual, Bruno Romand, Philippe Freyssinet, and Jean-Robert Disnar. *Geochimica et Cosmochimica Acta* 67: 2509.

121. *Cosden, J.M.** and **R.H. Byrne**. 2003. Comparative geochemistries of Pd^{II} and Pt^{II}: Formation of mixed hydroxychloro and chlorocarbonato-complexes in seawater. *Geochimica et Cosmochimica Acta* 67: 1331–1338.

120. *Cosden, J.*,* J. Schijf,* and **R.H. Byrne**. 2003. Fractionation of platinum group elements in aqueous systems: Comparative kinetics of palladium and platinum removal from seawater by *Ulva lactuca* L. *Environmental Science and Technology* 37: 555–560.

119. Callahan, M.R.,* J.B. Rose, and **R.H. Byrne**. 2002. Long pathlength absorbance spectroscopy: Trace copper analysis using a 4.4-meter liquid core waveguide. *Talanta* 58: 891–898.

118. Soli, A.L. and **R.H. Byrne**. 2002. CO_2 system hydration and dehydration kinetics and the equilibrium CO_2/H_2CO_3 ratio in aqueous NaCl solution. *Marine Chemistry* 78: 65–73.

117. **Byrne, R.H.** 2002. Inorganic speciation of dissolved elements in seawater: The influence of pH on concentration ratios. *Geochemical Transactions* 3: 11–16.

116. Steimle, E.T.,* E.A. Kaltenbacher, and **R.H. Byrne**. 2002. In situ nitrite measurements using a compact spectrophotometric analysis system. *Marine Chemistry* 77: 255–262.

115. **Byrne, R.H.,** *X. Liu*,* E.A. Kaltenbacher, and K. SELL.* 2002. Spectrophotometric measurement of total inorganic carbon in aqueous solutions using a liquid core waveguide. *Analytica Chimica Acta* 451: 221–229.

114. Lamb, M.F., C.L. Sabine, R.A. Feely, R. Wanninkhof, R.M. Key, G.C. Johnson, F.J. Millero, K. Lee, T.-H. Peng, A. Kozyr, J.L. Bullister, D. Greeley, **R.H. Byrne**, D.W. Chipman, A.G. Dickson, C. Goyet, P.R. Guenther, M. Ishii, K.M. Johnson, C.D. Keeling, T. Ono, K. Shitashima, B. Tilbrook, T. Takahashi, D.W.R. Wallace, Y.W. Watanabe, C. Winn, and C.S. Wong. 2002. Consistency and synthesis of Pacific Ocean CO_2 data. *Deep-Sea Research* 49: 21–58.

113. Kaltenbacher, E.A., **R.H. Byrne**, and E.T. Steimle. 2001. Design and application of a chemical sensor compatible with autonomous ocean-sampling networks. *IEEE Journal of Oceanic Engineering* 26(4): 667–670.

112. Luo, Y-R.* and **R.H. Byrne**. 2001. Yttrium and rare earth element complexation by chloride ions at 25ºC. *Journal of Solution Chemistry* 30(9): 837–845.

111. Lenes, J.M., B.P. Darrow, C. Cattrall, C.A. Heil, M. Callahan,* G.A. Vargo, **R.H. Byrne**, J.M. Prospero, D.E. Bates, K.A. Fanning, and J.J. Walsh. 2001. Iron fertilization and the *Trichodesmium* response on the West Florida Shelf. *Limnology and Oceanography* 46(6): 1261–1277.

110. Short, R.T., D.P. Fries, M.L. Kerr, C.E. Lembke, S.K. Toler, *P.G. Wenner*,* and **R.H. Byrne**. 2001. Underwater mass spectrometers for in situ chemical analysis of the hydrosphere. *Journal of the American Society for Mass Spectrometry* 12: 676–682.

109. **Byrne, R.H.** and E. Kaltenbacher. 2001. Use of liquid core waveguide for long pathlength absorbance spectroscopy: Principles and practice. *Limnology and Oceanography* 46: 740–742.

108. Yao, W.* and **R.H. Byrne**. 2001. Spectrophotometric determination of freshwater pH using bromocresol purple and phenol red. *Environmental Science and Technology* 35: 1197–1201.

107. Schijf, J.* and **R.H. Byrne**. 2001. Stability constants for mono- and dioxalato-complexes of Y and the REE, potentially important species in groundwaters and surface freshwaters. *Geochimica et Cosmochimica Acta* 65: 1037–1046.

106. **Byrne, R.H.** and W. Yao.* 2000. Formation of palladium (II) hydroxychloride complexes and precipitates in sodium chloride solutions and seawater. *Geochimica et Cosmochimica Acta* 64: 4153–-4156.

105. Luo, Y.-R.* and **R.H. Byrne**. 2000. The ionic strength dependence of rare earth and yttrium fluoride complexation at 25ºC. *J. Solution Chemistry* 29: 1089–1099.

104. **Byrne, R.H**. and Y.R. Luo.* 2000. Direct observations of nonintegral hydrous ferric oxide solubility products: $K_{SO} = [Fe^{3+}][H^+]^{-2.86}$. *Geochimica et Cosmochimica Acta* 64: 1873–1877.

103. **Byrne, R.H**., Y.R. Luo,* and R.W. Young.* 2000. Iron hydrolysis and solubility revisited:

Observations and comments on hydrolysis characteristics. *Marine Chemistry* 70: 23–35.

102. *HOPKINS, A.E.*, K.S. SELL*,* A.L. Soli, and **R.H. Byrne**. 2000. In situ spectrophotometric pH measurements: The effect of pressure on thymol blue protonation and absorbance characteristics. *Marine Chemistry* 71: 103–109.

101. *Klungness, G.D.** and **R.H. Byrne**. 2000. Comparative hydrolysis behavior of the rare earths and yttrium: The influence of temperature and ionic strength. *Polyhedron* 19: 99–107.

100. **Byrne, R.H**., W. Yao,* E. Kaltenbacher, and R.D. Waterbury. 2000. Construction of a compact spectrofluorometer/spectrophotometer system using a flexible liquid core waveguide. *Talanta* 50: 1307–1312.

99. Lee, K., F.J. Millero, **R.H. Byrne**, R.A. Feely, and R. Wanninkhof. 2000. The recommended dissociation constants for carbonic acid in seawater. *Geophysical Research Letters* 27: 229–232.

98. **Byrne, R.H.** and S.H. Laurie. 1999. Influence of pressure on chemical equilibria in aqueous systems – with particular reference to seawater. *Pure and Applied Chemistry* 71: 871–890.

97. **Byrne, R.H.,** *S. McElligott*,* R.A. Feely, and F.J. Millero. 1999. The role of pH_T measurements in marine CO_2-system investigations. *Deep-Sea Research I* 46: 1985–1997.

96. Yao, W.* and **R.H. Byrne**. 1999. Determination of trace chromium(VI) and molybdenum(VI) in natural and bottled mineral waters using long pathlength absorbance spectroscopy (LPAS). *Talanta* 48: 277–282.

95. Short, R.T., D.P. Fries, S.K. Toler, C.E. Lembke, and **R.H. Byrne**. 1999. Development of an underwater mass-spectrometry system for in situ chemical analysis. *Measurement Science and Technology* 10: 1195–1201.

94. Schijf, J.* and **R.H. Byrne.** 1999. Determination of stability constants for the mono- and difluoro-complexes of Y and the REE, using a cation-exchange resin and ICP-MS. *Polyhedon* 18: 2839–2844.

93. *Liu, X.** and **R.H. Byrne**. 1998. Comprehensive investigation of yttrium and rare earth element complexation by carbonate ions Using ICP–mass spectrometry. *Journal of Solution Chemistry* 27: 803–815.

92. Yao, W.,* **R.H. Byrne**, and R.D. Waterbury. 1998. Determination of nanomolar concentrations of nitrite and nitrate in natural waters using long pathlength absorbance spectroscopy (LPAS). *Environmental Science and Technology* 32: 2646–2649.

91. **Byrne, R.H.** and J. Schijf.* 1998. Comment on "Rare earth elements as geochemical tracers of regional groundwater mixing" by K.H. Johanneson, K.J. Stetzenbach, and V.F. Hodge. *Geochimica et Cosmochimica Acta* 62: 2199–2200.

90. *McElligott, S.** and **R.H. Byrne**. 1998. A novel CO_2 system interaction in seawater: Formation

of the complex species $B(OH)_2CO_3^-$. *Aquatic Geochemistry* 3: 345–356.

89. Yao, W.* and **R.H. Byrne**. 1998. Simplified seawater alkalinity analysis: Use of linear array spectrometers. *Deep-Sea Research I* 45: 1383–1392.

88. *McElligott, S.,* *** R.H. Byrne**, K. Lee, R. Wanninkhof, F.J. Millero, and R.A. Feely. 1998. Discrete water column measurements of CO_2 fugacity and pH_T in seawater: A comparison of direct measurements and thermodynamic calculations. *Marine Chemistry* 60: 63–73.

87. *Bernstein, R.,* *** R.H. Byrne** and J. Schijf.* 1998. Acantharians: A missing link in the oceanic biogeochemistry of barium. *Deep-Sea Research I* 45: 491–505.

86. **Byrne, R.H.** and *X. Liu*.* 1998. A coupled riverine–marine fractionation model for dissolved rare earths and yttrium. *Aquatic Geochemistry* 4: 103–121.

85. Waterbury, R.D., W. Yao,* and **R.H. Byrne**. 1997. Long pathlength absorbance spectroscopy: Trace analysis of Fe(II) using a 4.5 m liquid core waveguide. *Analytica Chemica Acta* 357: 99–102.

84. *Li, B.** and **R.H. Byrne**. 1997. Ionic strength dependence of rare earth and yttrium nitrilotriacetate complexes at 25°C. *Aquatic Geochemistry* 3: 99–115.

83. *Liu, X.,* *** R.H. Byrne** and J. Schijf.* 1997. Comparative coprecipitation of phosphate and arsenate with yttrium and the rare earths. *Journal of Solution Chemistry* 26: 1187–1198.

82. **Byrne, R.H.** and *S.W. Thompson*.* 1997. Ferric borate formation in aqueous solution. *Journal of Solution Chemistry* 26: 729–734.

81. *Liu, X.** and **R.H. Byrne**. 1997. Rare earth and yttrium phosphate solubility in aqueous solution. *Geochimica et Cosmochimica Acta* 61: 1625–1633.

80. **Byrne, R.H.** and *X. Liu*.* 1996. Metal speciation assessments in natural waters: A comment on "Rare earth element complexation behavior in circumneutral pH ground waters: Assessing the role of carbonate and phosphate ions" by Kevin H. Johannesson, Klaus J. Stetzenbach, Vernon F. Hodge, and W. Berry Lyons. *Earth and Planetary Science Letters* 145: 135–137.

79. **Byrne, R.H.**, *X. Liu***,*** and J. Schijf.* 1996. The influence of phosphate coprecipitation on rare earth distributions in natural waters. *Geochimica et Cosmochimica Acta* 60: 3341–3346.

78. Soli, A.L. and **R.H. Byrne**. 1996. The hydrolysis and fluoride complexation behavior of Fe(III) at 25°C and 0.68 molal ionic strength. *Journal of Solution Chemistry* 25: 771–783.

77. **Byrne, R.H.** 1996. Specific problems in the measurement and interpretation of complexation phenomena in sea water. *Pure and Applied Chemistry* 68: 1639–1656.

76. *Zhang, H.*,* and **R.H. Byrne**. 1996. Spectrophotometric pH measurements of surface seawater at in situ conditions: Absorbance and protonation behavior of thymol blue. *Marine Chemistry* 52:

17–25.

75. *Liu, X.** and **R.H. Byrne**. 1995. Comparative complexation of yttrium and gadolinium at 25°C and 0.7 mol dm^{-3} ionic strength. *Marine Chemistry* 51: 213–221.

74. **Byrne, R.H.** and *B. Li*.* 1995. Comparative complexation behavior of the rare earths. *Geochimica et Cosmochimica Acta* 59: 4575–4589.

73. Johannesson, K.H., W.B. Lyons, K.J. Stetzenbach, and **R.H. Byrne**. 1995. The solubility control of rare earth elements in natural terrestrial waters and the significance of PO_4^{3-} and CO_3^{2-} in limiting dissolved rare earth concentrations: A review of recent information. *Aquatic Geochemistry* 1: 157–173.

72. Laurie, S.H. and **R.H. Byrne**. 1995. Use of cadmium to determine complexing capacities and conditional stability constants of other metal–ligand systems via anodic stripping voltametry. *Polyhedron* 14: 1759–1763.

71. *Clayton, T.D.,** **R.H. Byrne**, *J.A. Breland*,* R.A. Feely, F.J. Millero, D.M. Campbell, P.P. Murphy, and M.F. Lamb. 1995. The role of pH Measurements in modern oceanic CO_2-system characterizations: Precision and thermodynamic consistency. *Deep Sea Research* 42: 411–429.

70. Feely, R.A., R. Wanninkhof, C.E. Cosca, M.J. McPhaden, **R.H. Byrne**, F.J. Millero, F.P. Chavez, *T. Clayton*,* D.M. Campbell, and P.P. Murphy. 1994. The effect of tropical instability waves on CO_2 species distributions along the Equator in the Eastern Equatorial Pacific during the 1992 ENSO event. *Geophysical Research Letters* 21: 227–280.

69. *Lee, J.H.** and **R.H. Byrne**. 1994. Pressure dependence of gadolinium carbonate complexation in seawater. *Geochimica et Cosmochimica Acta* 58: 4009–4016.

68. **Byrne, R.H.** and *J.H. Lee*.* 1993. Comparative yttrium and rare earth element chemistries in seawater. *Marine Chemistry* 44: 121–130.

67. Millero, F.J., **R.H. Byrne**, R. Wanninkhof, R. Feely, *T. Clayton*,* P. Murphy, and M.F. Lamb. 1993. The internal consistency of CO_2 measurements in the Equatorial Pacific. *Marine Chemistry* 44: 269–280.

66. *Lee, J.H.** and **R.H. Byrne**. 1993. Complexation of trivalent rare earths by carbonate ions. *Geochimica et Cosmochimica Acta* 57: 295–302.

65. *Lee, J.H.** and **R.H. Byrne**. 1993. Rare earth element complexation by fluoride ions in aqueous solution. *Journal of Solution Chemistry* 22: 751–766.

64. *Clayton, T.D.** and **R.H. Byrne**. 1993. Spectrophotometric seawater pH measurements: Total hydrogen ion concentration scale calibration of *m*-cresol purple and at-sea results. *Deep-Sea Research I* 40: 2115–2129.

63. **Byrne, R.H.** and L.R. Kump. 1993. Comment on "Speciation of aqueous palladium(II) chloride solutions using optical spectroscopies" by C.D. Tait, D.R. Janecky, and P.S.Z. Rogers. *Geochimica et Cosmochimica Acta* 57: 1151–1156.

62. **Byrne, R.H.** and *K-H. Kim*.* 1993. Rare earth precipitation and co-precipitation behavior: The limiting role of PO_4^{3-} on dissolved rare earth concentrations in seawater. *Geochimica et Cosmochimica Acta* 57: 519–526.

61. *Breland, J.A.** and **R.H. Byrne**. 1993. Spectrophotometric procedures for determination of seawater alkalinity using bromocresol green. *Deep-Sea Research* 40: 629–641.

60. *Lee, J.H.** and **R.H. Byrne**. 1992. Examination of comparative rare earth element complexation behavior using linear free energy relationships. *Geochimica et Cosmochimica Acta* 56: 1127–1137.

59. Gust, G., **R.H. Byrne**, *R.E. Bernstein*,* P.R. Betzer, and W. Bowles. 1992. Particle fluxes and moving fluids: experience from synchronous trap collections in the Sargasso Sea. *Deep-Sea Research* 39: 1071–1083.

58. *Breland, J.A*.* and **R.H. Byrne**. 1992. Determination of sea water alkalinity by direct equilibration with carbon dioxide. *Analytical Chemistry* 64: 2306–2309.

57. *Bernstein, R.E.,** **R.H. Byrne**, P.R. Betzer, and A.G. Greco. 1992. Morphologies and transformations of celestite in seawater: The role of acantharians in strontium and barium geochemistry. *Geochimica et Cosmochimica Acta* 56: 3273–3279.

56. *Kim, K-H.,** **R.H. Byrne**, and *J.H. Lee*.* 1991. Gadolinium behavior in seawater: A molecular basis for gadolinium anomalies. *Marine Chemistry* 36: 107–120.

55. DeBaar, H.J.W., J. Schijf, and **R.H. Byrne**. 1991. Solution chemistry of the rare earths in seawater. *European Journal of Solid State and Inorganic Chemistry* 28: 357–373.

54. **Byrne, R.H.**, *J.H. Lee,** and *L.S. Bingler*.* 1991. Rare earth element complexation by PO_4^{3-} ions in aqueous solution. *Geochimica et Cosmochimica Acta* 55: 2729–2735.

53. *Stanley, J.K., Jr**. and **R. H. Byrne**. 1990. The influence of solution chemistry on REE uptake by *Ulva lactuca* L. in seawater. *Geochimica et Cosmochimica Acta* 54: 1587–1595.

52. *Stanley, J.K., Jr.** and **R.H. Byrne**. 1990. Inorganic complexation of Zn(II) in seawater. *Geochimica et Cosmochimica Acta* 54: 753–760.

51. Li, J.-H.* and **R.H. Byrne**. 1990. Amino acid complexation of palladium in seawater. *Environmental Science and Technology* 24(7): 1038–1041.

50. **Byrne, R.H**. and *K.-H. Kim*.* 1990. Rare earth element scavenging in seawater. *Geochimica et Cosmochimica Acta* 54: 2645–2656.

49. Soli, A.L. and **R.H. Byrne**. 1989. Temperature dependence of Cu(II) carbonate complexation in natural seawater. *Limnology and Oceanography* 34(1): 239–244.

48. Kump, L.R. and **R.H. Byrne.** 1989. Palladium chemistry in seawater. *Environmental Science and Technology* 23: 663–665.

47. **Byrne, R.H.** and *J.A. Breland*.* 1989. High precision multiwavelength pH determinations in seawater using cresol red. *Deep-Sea Research* 36(5): 803–810.

46. **Byrne, R.H.** and *L.S. Bingler*.* 1989. Comment on "Cerium: a chemical tracer for paleo-oceanic redox conditions" by U.G. Liu, M.R.U. Miah and R.A. Schmitt. *Geochimica et Cosmochimica Acta* 53: 1475–1476.

45. *Bingler, L.** and **R.H. Byrne**. 1989. Phosphate complexation of Gd(III) in aqueous solution. *Polyhedron* 8(10): 1315–1320.

44. *Bingler, L.S.,** **R.H. Byrne**, G.A. Vargo, and C.R. Tomas. 1989. Rare earth element uptake by the marine diatom *Skeletonema costatum*. *Chemical Speciation and Bioavailability* 1(3): 103–110.

43. *Acker, J.G.** and **R.H. Byrne**. 1989. The influence of surface-state and saturation-state on the dissolution kinetics of aragonite in seawater. *American Journal of Science* 289: 1098–1116.

42. *Thompson, S.W*.* and **R.H. Byrne**. 1988. Indicator ligands in metal complexation studies: Role of 4-(2-Pyridylazo) resorcinol in europium carbonate equilibrium investigations. *Analytical Chemistry* 60: 19–22.

41. Feely, R.A., **R.H. Byrne**, *J.G. Acker*,* P.R. Betzer, C-T.A. Chen, J.F. Gendron, and M.F. Lamb. 1988. Winter–summer variations of calcite and aragonite saturation in the Northeast Pacific. *Marine Chemistry* 25:227–241.

40. **Byrne, R.H.**, *G. Robert-Baldo,* S.W. Thompson*,* and C-T.A. Chen. 1988. Seawater pH measurements: an at-sea comparison of spectrophotometric and potentiometric methods. *Deep-Sea Research* 35: 1405–1410.

39. **Byrne, R.H.**, L.R. Kump, and *K.J. Cantrell*.* 1988. The influence of temperature and pH on trace metal speciation in seawater. *Marine Chemistry* 25: 163–181.

38. Feely, R.A., M. Lewison, G.J. Massoth, *G. Robert-Baldo*,* J.W. LaValle, **R.H. Byrne**, K.L. Von Damm, and H.C. Curl, Jr. 1987. Composition and dissolution of black smoker particulates from active vents on the Juan De Fuca Ridge. *Journal of Geophysical Research (B)* 92: 11347–11363.

37. *Cantrell, K.J.** and **R.H. Byrne**. 1987. Rare earth element complexation by carbonate and oxalate ions. *Geochimica et Cosmochimica Acta* 51: 597–605.

36. *Cantrell, K.J.** and **R.H. Byrne**. 1987. Temperature dependence of europium carbonate

complexation. *Journal of Solution Chemistry* 16(7): 555–566.

35. **Byrne, R.H.** 1987. Standardization of standard buffers by visible spectrometry. *Analytical Chemistry* 59: 1479–1481.

34. *Bernstein, R.E.*,* P.R. Betzer, R.A. Feely, **R.H. Byrne**, M.F. Lamb, and A.F. Michaels. 1987. Acantharian fluxes and strontium to chlorinity ratios in the North Pacific Ocean. *Science* 237: 1490–1494.

33. *Acker, J.G.,** **R.H. Byrne**, S. Ben-Yaakov, R.A. Feely, and P.R. Betzer. 1987. The effect of pressure on aragonite dissolution rates in seawater. *Geochimica et Cosmochimica Acta* 51: 2171-2175.

32. **Byrne, R.H.** and W. Miller.* 1986. Chemical speciation in high complexation intensity systems. In: M.L. Sohn (ed.) *Organic Marine Geochemistry*. ACS Symposium Series Publ. 305. Washington D.C. pp. 358–368.

31. *Robert-Baldo, G.L.**, M.J. Morris, and **R.H. Byrne**. 1985. Spectrophotometric determination of seawater pH using phenol red. *Analytical Chemistry* 57: 2564–2567.

30. Miller, W.L., N.J. Blake, and **R.H. Byrne**. 1985. Uptake of Zn^{65} and Mn^{54} into body tissues and renal concretions by the southern quahog, *Mercenaria campechiensis* (Gmelin): Effects of elevated phosphate and metal concentrations. *Marine Environmental Research* 17: 167–171.

29. Miller, W.L., N.J. Blake, and **R.H. Byrne**. 1985. Uptake of Mn^{54} by the beach clam, *Donax variabilis* (Say 1822), from a resin-buffered seawater system. *Marine Environmental Research* 17: 163–166.

28. **Byrne, R.H.** and W.L. Miller.* 1985. Copper(II) carbonate complexation in seawater. *Geochimica et Cosmochimica Acta* 49(8): 1837–1844.

27. **Byrne, R.H.** and F.J. Millero. 1985. Criticism of "The formation of lead(II) chloride complexes to 300°C: A spectrophotometric study." *Geochimica et Cosmochimica Acta* 49: 307–308.

26. Zuehlke, R.W. and **R.H. Byrne**. 1984. Thermodynamic and analytical uncertainties in trace metal speciation calculations. In: C.J.M. Kramer and J.C. Duinker (eds.) *Complexation of Trace Metals in Natural Waters*. Nyhoff/Junk Publ., The Hague. pp. 101–105.

25. Millero, F.J. and **R.H. Byrne**. 1984. Use of Pitzer's equations to determine the media effect on the formation of lead chloro complexes. *Geochimica Cosmochimica Acta 48*: 1145–1150.

24. Feely, R.A., **R.H. Byrne**, P.R. Betzer, J.F. Gendron, and *J.G. Acker*.* 1984. Factors influencing the degree of saturation of the surface and intermediate waters of the North Pacific with respect to aragonite. *Journal of Geophysical Research* 89: 10631–10640.

23. Betzer, P.R., **R.H. Byrne**, *J.G. Acker*,* C.S. Lewis, R.R. Jolley, and R.A. Feely. 1984. The

oceanic carbonate system: A reassessment of biogenic controls. *Science* 226: 1074–1077.

22. **Byrne, R. H.,** *J.G. Acker*,* P.R. Betzer, R.A. Feely, and M.H. Cates. 1984. Water column dissolution of aragonite in the Pacific Ocean. *Nature* 312: 321–326.

21. **Byrne, R.H.** 1984. Absorbance corrections in self-adjusting, variable pathlength-diameter high pressure cells. *Review of Scientific Instruments* 55(1): 31–132.

20. **Byrne, R.H**. and W.L. Miller.* 1984. The medium composition dependence of lead(II) complexation by chloride ion. *American Journal of Science* 284: 79–94.

19. **Byrne, R.H.**, C.H. van der Weijden, D.R. Kester, and R.W. Zuehlke. 1983. Evaluation of the $CuCl^+$ stability constant and molar absorptivity in aqueous media. *Journal of Solution Chemistry* 12(8): 581–595.

18. **Byrne, R.H.** 1983. Trace metal complexation in high ligand variety natural media. *Marine Chemistry* 12: 15–24.

17. **Byrne, R.H.** and R.W. Young.* 1982. Mixed halide complexes of lead: A comparison with theoretical predications. *Journal of Solution Chemistry* 11: 127–136.

16. Fanning, K.A., J.A. Breland, and **R.H. Byrne**. 1981. ^{226}Ra and ^{222}Rn in coastal waters and rivers of West-Central Florida: High concentration and atmospheric degassing. *Science* 215: 667–670.

15. Fanning, K.A., **R.H. Byrne**, J.A. Breland II, P.R. Betzer, W.S. Moore, R.J. Elsinger, and T.E. Pyle. 1981. Geothermal springs of the West Florida continental shelf: Evidence for dolomitization and radionuclide enrichment. *Earth and Planetary Science Letters* 52: 345–354.

14. **Byrne, R.H.,** R.W. Young,* and W.L. Miller.* 1981. Lead chloride complexation using ultraviolet molar absorptivity characteristics. *Journal of Solution Chemistry* 104: 243–251.

13. **Byrne, R.H**. and D.R. Kester. 1981. Ultraviolet spectroscopic study of ferric ions in chloride media. *Journal of Solution Chemistry* 10(1): 51–67.

12. **Byrne, R.H.** 1981. Determination of inorganic lead complexation in natural seawater by ultraviolet spectroscopy. *Nature* 290: 487–489.

11. **Byrne, R.H**. 1980. Theoretical upper bound limitations for mixed ligand complexes in solution. *Marine Chemistry* 9: 75–80.

10. **Byrne, R.H.** and D.R. Kester. 1978. Ultraviolet spectroscopic study of ferric hydroxide complexation. *Journal of Solution Chemistry* 7(5): 373–383.

9. Lowenthal, D.H., M.E.Q. Pilson, and **R.H. Byrne**. 1977. The determination of the apparent dissociation constants of arsenic acid in seawater. *Journal of Marine Research* 35(4): 653–669.

8. Kester, D.R., T.P. O'Conner, and **R.H. Byrne**. 1976. Solution chemistry, solubility and adsorption equilibria of iron, cobalt and copper in marine systems. *Thallasia Jugoslavica* 11(1/2): 121–134.

7. **Byrne, R.H.** and D.R. Kester. 1976. Solubility of hydrous ferric oxide and iron speciation in seawater. *Marine Chemistry* 4: 255–274.

6. **Byrne, R.H**. and D.R. Kester. 1976. A potentiometric study of ferric ion complexes in synthetic media and seawater. *Marine Chemistry* 4: 275–287.

5. Kester, D.R., **R.H. Byrne**, and Y-J. Liang. 1975. Redox reactions and solution complexes of iron in marine systems. In: *Marine Chemistry in the Coastal Environment*, Symposium Series. American Chemical Society, Washington, D.C. pp. 56–79.

4. **Byrne, R.H.** and D.R. Kester. 1974. Inorganic speciation of boron in seawater. *Journal of Marine Research* 38(2): 119–127.

3. Kester, D.R. and **R.H. Byrne**. 1972. Chemical forms of iron in seawater. In: D.R. Horne (ed.) *Ferromanganese Deposits on the Ocean Floor,* Lamont-Doherty Geological Observatory, Columbia University, pp. 107–116.

2. **Byrne, R.H.** and W.P. Bryan. 1970. An improved freeze-drying technique for the study of hydrogen exchange of proteins and polypeptides. *Analytical Biochemistry* 33: 414–428.

1. Bryan, W.P. and **R.H. Byrne**. 1970. Calcium chloride solution, dry-ice low temperature bath. *Journal of Chemical Education* 47: 361.

Research and Creative Activities (Patents)

17. U.S. Patent 11,808,710 B2. Methods and systems for determining an ionic strength of a dilute aqueous solution. **Robert H. Byrne**. November 7, 2023.

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.

11. U.S. Patent 7,943,391. Method of performing in situ calibrated potentiometric pH measurements. Inventor **R.H. Byrne**. May 17, 2011.

10. U.S. Patent 8,012,760. Sensor for direct measurements of carbonate ions in seawater. Inventor **R.H. Byrne**, September 6, 2011.

9. U.S. Patent 7,842,507. Sensor for Direct Measurements of Carbonate Ions in Seawater. Inventor **R.H. Byrne**, November 30, 2010.

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.

7. U.S. Patent 7,538,877. Variable exposure rotary spectrometer and method of use. Inventors E. Kaltenbacher, **R.H. Byrne**, and D.P. Fries. May 26, 2009.

6. U.S. Patent 7,453,572. Method and apparatus for continuous measurement of the refractive index of fluid." Inventors A.M. Cardenas-Valencia, E.T. Steimle, **R.H. Byrne**, and M. Calves. Nov. 18, 2008.

5. U.S. Patent 7,024,060. “Method and apparatus for continuous measurement of the refractive index of fluid." Inventors A.M. Cardenas-Valencia, E.T. Steimle, **R.H. Byrne**, and M. Calves. April 4, 2006.

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)

2. U.S. Patent 6,727,498. Portable underwater mass spectrometer." Inventors D.P. Fries, R.T. Short, and **R.H. Byrne**. April 27, 2004. (Canadian patent CA2358243 issued July 27, 2010)

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/

11. Powell, K.J., Brown, P.L., **Byrne, R.H.,** Gajda, T., Hefter, G., Leuz, A-K., Sjöberg, S., Wanner, H. (2015). Chemical Speciation of Environmentally Significant Metals: An IUPAC contribution to reliable and rigorous computer modelling. *Chemistry International* 37(1): 15–19, ISSN (Online) 1365-2192, ISSN (Print) 0193-6484, doi:10.1515/ci-2015-0105

10. Short, R.T., **R.H. Byrne**, D. Hollander, J. Schijf, S.K. Toler, and E.S. Van Vleet. 2008. Oceanography. In: R. Ekman, J. Silberring, A.M. Westman-Brinkmalm, and A. Kraj (eds.) *Mass Spectrometry: Instrumentation, Interpretation and Applications*. New York: John Wiley & Sons. Ch. 9.

9. **Byrne, R.H.** 2002. Speciation in seawater. In: A.M. Ure and C.M. Davidson (eds.) *Chemical Speciation in the Environment*, 2nd edition. Blackie Academic, Ch. 12, pp. 322–357.

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.

7. Johnson, K. and **R.H. Byrne**. 2000. Modern Autonomous Observing Systems Working Group summary. *Ocean Carbon Transport Exchange and Transformations*, Proc. of a Workshop, Mar. 7-10, 2000, Warrenton, VA, Airlie House. http://msrc.sunysb.edu/octet/

6. Kaltenbacher, E., E.T. Steimle, and **R.H. Byrne**. 2000. A compact, in situ spectrophotometric sensor for aqueous environments: Design and applications. *Proceedings of Underwater Technology*, May 23–26, Tokyo, Japan, pp. 41–45.

5. **Byrne, R.H**., E. Kaltenbacher, and R. Waterbury. 1999. Autonomous in situ analysis of the upper ocean. *Sea Technology,* Feb. 1, 4 pp.

4. **Byrne, R.H.** and E.R. Sholkovitz. 1996. Marine chemistry and geochemistry of the lanthanides. In: *Handbook of the Physics and Chemistry of the Rare Earths*. V. 23, Ch. 158. Elsevier.

3. Waterbury, R.D., **R.H. Byrne**, J. Kelly, B. Leader, *S. McElligott*, and R. Russell. 1996. Development of an underwater in situ spectrophotometric sensor for seawater pH. In: R.A. Lieberman (ed.) *Chemical, Biochemical, and Environmental Fiber Sensors VIII*, SPIE Proc. Vol. 2836. SPIE – The International Society for Optical Engineering. pp.170–177.

2. **Byrne, R.H.** 1991. Chemical and physical properties of seawater. *Encyclopedia Britannica.*

1. Fanning, K.A., J.A. Breland, and **R.H. Byrne**. 1980. Marine geothermal springs along Florida's West Coast. *Coastal Oceanogr. & Climatol. News* 2: 33–34.

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.

2. K.A. Fanning, **R.H. Byrne**, and P.R. Betzer. 1978. *The Properties and Impact of Submarine Geothermal Springs on the West Florida Continental Shelf*. Dept. of Energy, 35 pp.

1. K.A. Fanning, **R.H. Byrne**, and P.R. Betzer. 1977. *Environmental Studies of Hydrothermal Discharges on the West Florida Continental Shelf*. Dept. of Energy, 22 pp.

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, 2025. $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, 2025. $405,933.

Previous Grants and Contracts

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.

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. 221^{st} 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

Martín-Mayor, M.; **Byrne, R. H.**; Schockman K. M.; Liu, X. February 2024. Spectrophotometric determination of bicarbonate dissociation constants (K_2): a model for estuarine waters and seawater

(0<S<45) over a wide range of temperatures (2≤t≤35°C). Ocean Sciences Meeting, New Orleans, LA.

Bartoloni, S. E., **Byrne, R. H.**, Liu, X. February 2024. Predicting seawater pH at in-situ temperature. Ocean Sciences Meeting. New Orleans, LA.

Fleger, K., X. Liu, **R.H. Byrne**. February 2024. Spectrophotometric alkalinity measurement by direct CO2 equilibration—principles and applications. Poster presentation at Ocean Sciences Meeting, New Orleans, LA.

Schockman, K.M., **Byrne, R.H.**, Moore, C.S., Gomez, F.A., and Wanninkhof, R. June 2023. Influence of ionic strength on the characterization of the inorganic carbon system in riverine waters. Poster presentation at ASLO Aquatic Sciences Meeting, Palma de Mallorca, Spain.

Martín Mayor, M., Barbero, L., Osborne, E.B. and **Byrne, R.H.** June 2023. Ocean acidification in the Gulf of Mexico: a multi-decadal evaluation of pH. Poster presentation at ASLO Aquatic Sciences Meeting, Palma de Mallorca, Spain.

Schockman, K.M. and **Byrne, R.H.** June 2022. Low temperature evaluations of the CO2 system in seawater: Extension of bicarbonate dissociation constant (K2) parameterization and internal consistency assessments. Invited oral presentation at Ocean Carbonate System Intercomparison Forum (OCSIF) Year Four Meeting, Virtual.

Schockman, K.M., Carter, B.R., Feely, R.A., Greeley, D., Herndon, J., and **Byrne, R.H.** February 2022. Extension of bicarbonate dissociation constant (K2) parameterization and CO2 system internal consistency assessments for seawater at low temperatures. Oral Presentation at Ocean Sciences Meeting, Virtual.

Martín Mayor, M, Martell-Bonet, L., Millán-Otoya, J.C., **Byrne, R.H**. February 2022. Ocean acidification in the Gulf of Mexico: a multi-decadal evaluation of pH and carbonate ion concentration. Poster presentation at Ocean Sciences Meeting, Virtual.

AV Subhas, W Berelson, P Ziveri, S Dong, JWB Rae, WR Gray, **R Byrne**, J Adkins. July 2021. Shallow Calcium Carbonate Cycling in the Ocean Driven by Organic Matter Respiration. Goldschmidt2021• Virtual• 4-9 July

Schockman, K.M. and **Byrne, R.H.** June 2020. *Accuracy of CO_2 System Calculations Improved with New Spectrophotometric K_2 Model for Seawater*. Recorded oral presentation for Ocean Carbonate System Intercomparison Forum (OCSIF) Year Two Remote Meeting.

Sharp, J.D., **Byrne, R.H.** Alkalinity and Intercomparability: proton exchange with organic bases during TA titrations induces carbonate system inconsistencies. 2020 Ocean Carbonate System Intercomparison Forum. 6/29/2020 (talk).

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

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.

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.

Liu, X. and **R.H. Byrne**. 1997. Rare earth and yttrium phosphate solubilities in aqueous solution. 213th National Meeting of the ACS, San Francisco, CA, spring.

Byrne, R.H. 1995. Constructing a master variable: pH Measurements in the South Pacific. Sigma Xi presentation, spring.

Johannesson, K.H., K.J. Stetzenbach, W.B. Lyons, and **R.H. Byrne**. 1994. The solubility of rare earth elements in natural terrestrial waters: The limiting effect of PO_4^{3-}. *Eos, Transactions, American Geophysical Union* 75(44):246.

Gust, G., **R.H. Byrne**, P.R. Betzer, *R.E. Bemstein*, S. Giordano, R. Young, and C. Sabine. 1991. In situ observations of sediment trap hydrodynamics and particle collection rates. American Society of Limnology and Oceanography Annual Meeting, Halifax, Nova Scotia, June 10–14, 1991.

Betzer, P.R., *R.E. Bernstein*, **R.H. Byrne**, G. Gust, W. Deuser, H. Roberts, R. Berner, and C. Sabine. 1991. Particle flux measurements at the JGOFS site in the Sargasso Sea: Evidence for horizontal inputs from the Bermuda Pedestal. American Society of Limnology and Oceanography Annual Meeting, Halifax, Nova Scotia, June 10–14, 1991.

Bernstein, R.E., **R.H. Byrne**, P.R. Betzer, A.M. Greco, and G. Gust. 1991. Acantharian-derived particulates: Abundances, distributions, and the strontium/chlorinity linkage. American Society of Limnology and Oceanography Annual Meeting, Halifax, Nova Scotia, June 10–14, 1991.

Robert-Baldo, G. and **R.H. Byrne**. 1988. Marcasite and pyrite oxidation/dissolution rates in seawater and seawater analogs. *Eos, Transactions, American Geophysical Union* 69(44):1499.

Breland, J.A., II and **R.H. Byrne**. 1988. Spectrophotometric determinations of the total alkalinity of seawater. *Eos, Transactions, American Geophysical Union* 69(16):372.

Fabry, V.J., P.R. Betzer, **R.H. Byrne**, and R.A. Feely. 1987. Aragonite flux predicted from pteropod production in the subarctic Pacific. Transactions, AGU 68(50).

Byrne, R.H., J.K. Stanley, and S.W. Thompson. 1987. Rare earth element adsorption in seawater. Transactions, AGU 68(50).

Betzer, P.R., K.L. Carder, D.K. Costello, **R.H. Byrne**, and R.W. Young. 1987. In situ laser holography: Insights for basic processes/applications for global ocean flux. *Eos, Transactions, American Geophysical Union* 68(50).

Lewis, C.S., P.R. Betzer, and **R.H. Byrne**. 1986. Short-term temporal variability and transport of biogenic carbonate in the deep sea. *Eos, Transactions, American Geophysical Union* 67(44).

Byrne, R.H., P.R. Betzer, *J.G. Acker*, R.E. Bernstein, and R.A. Feely. 1986. Carbonate fluxes and aragonite dissolution in the water column at 50°N in the North Pacific Ocean. *Eos, Transactions, American Geophysical Union* 66(51).

Feely, R.A., P.R. Betzer, **R.H. Byrne**, C.T.A. Chen, and J. Gendron. 1986. In situ calcium carbonate dissolution in the North Pacific. *Eos, Transactions, American Geophysical Union,* 66(51).

Betzer, P.R., *R.E. Bernstein*, **R.H. Byrne**, and R.A. Feely. 1986. Acantharian fluxes and strontium to chlorinity ratios in the North Pacific Ocean. *Eos, Transactions, American Geophysical Union* 66(51).

Byrne, R.H. 1986. Sediment trap measurements of particulate ocean fluxes. U.S. GOFS Report 3 Workshop on Upper Ocean Processes, Mar. 18–21, 1986.

Feely, R.A., **R.H. Byrne**, P.R. Betzer, J.F. Gendron, and *J.G. Acker*. 1984. Factors influencing the degree of saturation of the surface and intermediate waters of the North Pacific Ocean with respect to aragonite. *Eos, Transactions, American Geophysical Union* 65(45).

Feely, R.A., **R.H. Byrne**, G.J. Massoth, and P.R. Betzer. 1983. Factors influencing the degree of saturation of the surface and intermediate waters of the North Pacific Ocean with respect to aragonite. Workshop on Chemical Variability in Ocean Frontal Areas. NSTL, Bay St. Louis, MS.

Zuehlke, R.N. and **R.H. Byrne**. 1983. Free metal concentration uncertainties as a guide to limitations of trace metal speciation calculations. International Symposium on Complexation of Trace Metals in Natural Waters. Netherland Institute for Sea Research, Texel, The Netherlands, May 2–6, 1983.

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

Feely, R.A., **R.H. Byrne**, C-T.A. Chen, and P.R. Betzer. 1982. The effect of excess CO_2 on calculated aragonite and calcite saturation horizons in the North Pacific Ocean. *Eos, Transactions, American Geophysical Union* 63(45):980.

Betzer, P.R., **R.H. Byrne**, and R.A. Feely. 1982. Mass flux variation in the upper kilometer of the North Pacific Ocean at 150°W. *Eos, Transactions, American Geophysical Union* 63(3):45.

Morris, M.J. and **R.H. Byrne**. 1982. Spectrophotometric determination of CO_2 production by individual zooplankton using changes in the absorbance spectra of phenol red. *Eos, Transactions, American Geophysical Union* 63(3):101.

Byrne, R.H. 1982. Trace metal complexation in high ligand variety media. *Eos, Transactions, American Geophysical Union* 63(3):49.

Byrne, R.H. 1980. Lead complexation in seawater. *Eos, Transactions, American Geophysical Union* 61(17):274.

Kester, D.R., A.J. Paulson, R.W. Zuehlke, and **R.H. Byrne**. 1980. Inorganic complexes of copper(II) in seawater. VI International Symposium on the Chemistry of the Mediterranean. Rovinj, Yugoslavia, May 5-10, 1980. *Thalassia Yugoslavia* (conference abstract) 16(2/3):95.

Breland, J.A., II, K.A. Fanning, **R.H. Byrne**, and P.R. Betzer. 1980. Hydrothermal processes on the West Florida shelf. *Eos, Transactions, American Geophysical Union* 61I(46):1003.

Byrne, R.H. and D.R. Kester. 1974. Solubility of hydrous ferric oxide in seawater. *Eos, Transactions, American Geophysical Union* 55(4):309.

Course Development and Instruction (Graduate)

CO_2-System Measurement Methods	(OCE 6934-603)
Seawater Analytical Techniques	(OCE 6934-608)
Mathematical Methods for Marine Science	(OCE 6934-605)
Physical Chemistry of Seawater	(OCE (934-609)
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