

Curriculum Vitae

Timothy John Shaw- Professor, Department of Chemistry and Biochemistry and Marine Science Program

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Education

1981 B.S. California State Polytechnic University, Pomona (Honors in Chemistry)

1988 Ph.D. University of California, San Diego (Chemical Oceanography)

Thesis Title: The Early Diagenesis of Transition Metals in Nearshore Sediments.

Research Interests

Environmental/Analytical Chemistry: Biogeochemical processes in coastal aquifers; Cycling and transport of trace elements and radionuclides in coastal environments; Incorporation of trace elements into biominerals; and, Evaluation of the magnitude and the biological impact of iron fertilization from ice rafted detritus in the Southern Ocean.

Professional Background

Currently **Professor**, Department of Chemistry and Biochemistry and Marine Science Program, University of South Carolina

2010-2011 **Fellow**, Hanse Institute for Advanced Study, Delmenhorst Germany.
Associate Editor, *Geochimica et Cosmochimica Acta*
Associate Editor, *Aquatic Geochemistry*

2006 **Co-Chairman** Gordon Research Conference Series on "Permeable Sediments"

2002 **Visiting Faculty**, University of Oldenburg, ICBM, Germany.

1999-2004 **Associate Professor**, Department of Chemistry and Marine Science Program, University of South Carolina

1999-2000 **Fellow**, Hanse Institute for Advanced Study, Delmenhorst Germany.

1999-2000 **Visiting Faculty**, University of Oldenburg, ICBM, Germany.

1993-1999 **Assistant Professor**, Department of Chemistry and Marine Science Program, University of South Carolina

1991-1993 **Assistant Research Scientist**, CEES, University of Maryland System

1990 **Visiting Scientist**, Massachusetts Institute of Technology

1988-1990 **Postdoctoral Investigator**, Woods Hole Oceanographic Institution

1981-1987 **Research Assistant**, University of California, San Diego

Funding History (last 10 years)

National Science Foundation, Environmental Chemistry, Reaction networks in environmental systems: connecting reactive oxygen species generation and particle formation during the oxidation of ferrous iron, J.L. Ferry (PI) T. J. Shaw 9/15/2013-9/14/2015, \$400,000.

National Science Foundation, Ocean Technology, Sensors for Characterization of Phytoplankton Size and Taxonomic Composition Using Spectral Fluorescence Signatures and Imaging Multivariate Optical Computing (IMOC). T. Richardson, M. Myrick, T.J. Shaw, 1/1/10-12/31/14, \$1,089,543.

National Science Foundation, Chemical Oceanography, Oxidant generation during Fe(II) oxidation in the mixing zone of subterranean estuaries: An integrated laboratory and field study, PIs, J. Ferry and T. Shaw, 2/15/2008-2/14/2011, \$492,000

National Science Foundation, MRI Program, MRI: Acquisition of ICPMS Instrumentation for Interdisciplinary Research, PIs R. Thunell, T.J. Shaw, H. Scher, M. Bizimas. 09/01/2008 – 08/31/2010, \$596,379

National Science Foundation, Ocean Technology, Collaborative Research: Oceanic Applications of Laser Induced Breakdown Spectroscopy: Laboratory Validation," PI: S. Michael Angel and T.J. Shaw, \$338,645 09/01/2008 – 08/31/2011

National Science Foundation, Marine Geology and Geophysics, Fundamental investigation of glacial/interglacial deep-sea pH and carbonate saturation effects on paired benthic foraminiferal trace element and stable isotope signatures PIs T.J. Shaw, G.T. Chandler, C. Hintz, and D. McCorkle \$251,000 4/1/07-3/31/09.

National Science Foundation, Ocean Technology, In-situ classification of bloom-forming phytoplankton by imaging multivariate optical computing (IMOC), PIs T.J., Shaw, M. Myrick, T. Richardson, B. Twining, \$525,000 8/15/07-2/14/11

National Science Foundation, Polar Programs, Collaborative Research: Free Drifting Icebergs as Proliferation Sites of Iron Enrichment, Organic Carbon Production and Export in the Southern Ocean. PIs T.J., Shaw and B. Twining \$574,947 7/1/07-6/30/10

National Science Foundation, Ocean Technology "Development of a Pump Array for the Two Dimensional Mapping of Chemical Tracers in the Upper Water Column" Shaw T.J. \$197,000 8/15/03-8/14/06

National Science Foundation, Marine Geology and Geophysics, Collaborative Research: Culturing studies of the controls on benthic foraminiferal shell chemistry.
J. Bernhart, G.T. Chandler, D. McCorkle, and T.J. Shaw
\$380,000
11/15/04-11-14-06

National Science Foundation: Chemical Oceanography. The Utility of the ²²⁷Ac and ²²⁸Ra Isotope Pair as Tracers of Upwelling and Lateral Mixing, T.J. Shaw, \$50,004, 6/1/01-5/31/03.

NOAA Sea Grant. A Novel Foraminiferal-Based Method to Determine Sublethal Toxicological Risks of Metal Mixtures in Estuarine Sediments. T. J. Shaw and G. T. Chandler, \$117,110, 4/1/02-3/31/03.

National Science Foundation: Marine Geology and Geophysics. Foraminiferal fidelity: Identification of intermediate-depth epibenthic species that faithfully record bottom-water chemistry. J.M. Bernhard, T.G. Chandler and T.J. Shaw , \$340,928, 1/1/01-12-31-03.

Publication History

S.A. Murphy, B.M. Solomon, S. Meng, J.M. Copeland, T.J. Shaw, J.L. Ferry. Geochemical Production of Reactive Oxygen Species From Biogeochemically Reduced Fe. *Env. Sci. Tech.* 48: 3815–3821, 2014.

K.L. Smith Jr., A.D. Sherman, T.J. Shaw, and J. Sprintall. Icebergs as Unique Lagrangian Ecosystems in Polar Seas. *Annu. Rev. Mar. Sci.* 5:14.1–14.19, 2013.

J. A. Swanstrom, L. S. Bruckman, M. Pearl, E. Abernathy, T. L. Richardson, T. J. Shaw, M. L. Myrick. Taxonomic Classification of Phytoplankton with Multivariate Optical Computing, Part II: Design and Experimental Protocol of a Shipboard Fluorescence Imaging Photometer. *Appl. Spec.* 67/6, 630-639, 2013.

M. Pearl, J. A. Swanstrom, L. S. Bruckman, E. Abernathy, T. L. Richardson, T. J. Shaw, H. Sosik, M. L. Myrick. Taxonomic Classification of Phytoplankton with Multivariate Optical Computing, Part III: Demonstration. *Appl. Spec.* 67/6, 640-649, 2013.

J.M. Burns, P.L. Pennington, P.N. Sisco, R. Frey, S. Kashiwada, M.H. Fulton, G.I. Scott, A.W. Decho, C.J. Murphy, T.J. Shaw and J.L. Ferry. Surface Charge Controls the Fate of Au Nanorods in Saline Estuaries. *Env. Sci. Tech.* 47: 12844-12851, 2013.

L. S. Bruckman, T. L. Richardson, J. A. Swanstrom, K. A. Donaldson, M. Allora, Jr., T. J. Shaw, M. L. Myrick. Linear Discriminant Analysis of Single-Cell Fluorescence Excitation Spectra of Five Phytoplankton Species *Appl. Spec.* 66:1, 60-65 (2012).

T.J. Shaw, R.W. Raiswell, C.R. Hexel, H.P. Vu, W.S. Moore, R. Dudgeon, K.L. Smith. Input, composition, and potential impact of terrigenous material from free-drifting icebergs in the Weddell Sea. *Deep-Sea Research II* 58, 1376–1383 (2011).

T.J. Shaw, C.R. Hexel, K.L. Smith, A.D. Sherman, R. Dudgeon, M. Vernet and R. Kaufmann. 234Th -based carbon export around free-drifting icebergs in the Southern Ocean *Deep-Sea Research II* 58, 1384–1391 (2011).

W.S. Moore, M. Beck, T. Riedel, M. Rutgers van der Loeff, O. Dellwig, T.J. Shaw, B. Schmetger, H.-J. Brumsack. Radium-based pore water fluxes of silica, alkalinity, manganese, DOC, and uranium: A decade of studies in the German Wadden Sea. *Geochim. Cosmochim. Acta* 75 (21), 6535-6555 (2011).

H. Lin, S. Rauschenberg, C.R. Hexel, T.J. Shaw and B.S. Twining Free-drifting icebergs as sources of iron to the Weddell Sea *Deep-Sea Research II* 58, 1392-1406 (2011)

- K.L. Smith, A.D. Sherman, T.J. Shaw, A.E. Murray, M. Vernet, A.O. Cefarelli . Carbon export associated with free-drifting icebergs in the Southern Ocean. *Deep-Sea Research II* 58, 1485-1496 (2011)
- J.M. Burns, P.S. Craig, T.J. Shaw, J.L. Ferry. Combinatorial parameter space as an empirical tool for predicting water chemistry: Fe(II) oxidation across a watershed. *Environ. Sci. Technol.* 45, 4023–4029 (2011).
- J.M. Burns, P.S. Craig, T.J. Shaw, J.L. Ferry. Short-Term Fe Cycling during Fe(II) Oxidation: Exploring Joint Oxidation and Precipitation with a Combinatorial System. *Environ. Sci. Technol.* 45, 2663-2669 (2011).
- J.M.; Craig, P.S.; Shaw, T.J. Ferry, J.L. Multivariate examination of Fe(II)/Fe(III) cycling and consequent hydroxyl radical yield. Burns, *Environmental Science & Technology* 44(19):7226-31(2010)
- L. S. Hill, T. L. Richardson, L. T. M. Profeta, T. J. Shaw, C. J. Hintz, B. S. Twining, E. Lawrenz, M. L. Myrick. Construction, figures of merit, and testing of a single-cell fluorescence excitation spectroscopy system *Rev. Sci. Instrum.* 81, (2010)
- W. S. Moore, M. Beck, T. Reidel, M. R. van der Loeff, O. Dellwig, T.J. Shaw, H-J. Brumsack, Fluxes of pore waters which transport metals and nutrients to the German Wadden Sea *Geochim. Cosmochim. Acta* 73:13 A900-A900 (2009)
- J.L. Ferry, P.S. Craig, C.R. Hexel, P. Sisco R. Frey, P. Pennington, M. Fulton, G. Scott, A. Decho, S. Kashiwada, C.J. Murphy, and T.J. Shaw. Transfer of Gold Nanoparticles from the Water Column to the Estuarine Food Web. *Nature:Nano* v4:441-444 (2009).
- Alkilany A. M., Nagaria P.K., Hexel C.R. , Shaw T.J., Murphy C.J., and Wyatt M.D., Cellular Uptake and Cytotoxicity of Gold Nanorods: Molecular Origin of Cytotoxicity and Surface Effects *Small* 5:6, 701-708 (2009)
- P.S. Craig, T.J. Shaw, P.L. Miller, P.J. Pellechia, J.L. Ferry. Use of Multiparametric Techniques To Quantify the Effects of Naturally Occurring Ligands on the Kinetics of Fe(II) Oxidation. *Env. Sci. Tech.* 43/2: 337-342 (2009).
- W.S. Moore and T.J. Shaw, Fluxes and behavior of radium isotopes, barium, and uranium in Southeastern US rivers and estuaries. *Mar. Chem.* 108: 236-254 (2008)
- McCorkle, D. C., J. M. Bernhard, C. J. Hintz, J. K. Blanks, G. T. Chandler, T. J. Shaw. The Carbon and Oxygen Stable Isotopic Composition of Cultured Benthic Foraminifera. *Geological Society of London, Special Publication* vol. 303. 2008; 303(1): 135 - 154.
- K.L. Smith, B.H. Robison, J.J. Helly, R.S. Kaufmann, H.A. Ruhl, T.J. Shaw, B.S. Twining, M. Vernet, “Free-Drifting Icebergs: Hot Spots of Chemical and Biological Enrichment in the Weddell Sea, *Science* 317: 478-482 (2007)

C.J. Hintz, T.J. Shaw, G.T. Chandler, J.M. Bernhard, D.C. McCorkle, J.K. Blanks. Trace/minor Element:Calcium Ratios in Cultured Benthic Foraminifera, Part I: Interspecies Differences. *Geochim. et Cosmochim. Acta* 70(8) 1952-1963(2006).

C.J. Hintz, T.J. Shaw, G.T. Chandler, J.M. Bernhard, D.C. McCorkle, J.K. Blanks. Trace/minor Element:Calcium Ratios in Cultured Benthic Foraminifera, Part II: Ontogenetic Variation. *Geochim. Cosmochim. Acta* 70(8) 1964-1976 (2006).

C. J. Hintz, G.T.Chandler, J.M. Bernhard, D.C. McCorkle, S. Havach, J.K. Blanks, and T.J. Shaw. A physicochemically-constrained seawater culturing system for production of viable, calcite-producing, paleoceanographically-important benthic foraminifera *Limnol. Oceanogr. Methods* 2, 160-170 (2004).

T.J.Shaw, Methods and models for estimating advective pore water exchange in tidal flats. in "Biogeochemistry of tidal flats" Forschungszentrum Terramare Berichte, Nr. 12 pp.103-105 (2003).

T. Duncan and T. J. Shaw. The mobility of rare earth elements and redox sensitive metals in the groundwater/seawater mixing zone of a shallow coastal aquifer. *Aquat. Geochem.* 9, 233-255 (2003).

T.J. Shaw. Preface: Biogeochemical processes in coastal aquifers and permeable sediments. *Aquat. Geochem.* 9, 1-5 (2003).

T. J. Shaw, T. Duncan, and B. Schnetger. A Preconcentration/Matrix Reduction Method for the Analysis of Rare Earth Elements in Seawater and Groundwaters by ID-ICP-MS *Anal. Chem.* 75, 3396-3403 (2003).

T. J. Shaw and W. S. Moore. Analysis of ^{227}Ac in seawater by delayed coincidence counting *Mar. Chem.* 78, 197-203(2002).

T. J. Shaw Subterranean Coastal Environments: Biogeochemical Processes, Fluxes and Impacts. *EOS Trans. Am. Geophys. Union*, 82 No. 50, pg 622-623 (2001).

S.M. Havach, G.T. Chandler, A. Wilson-Finelli and T.J. Shaw Experimental determinations of trace element partition coefficients in cultured benthic foraminifera *Geochim. Cosmochim. Acta* 65:1277-1283 (2001).

T.A. Hagopian, G.T. Chandler and T.J. Shaw. The acute toxic effects of sediment-associated metals, individually and in a mixture, to the meiobenthic harpacticoid copepod *Amphiascus tenuiremis* *Mar. Env. Res.* 51 (3) 247-264 (2001).

B. Schnetger, J. Hinrichs, O. Dellwig, T. Shaw, H.-J. Brumsack. The significance of radionuclides and trace elements in a back barrier tidal area: results from the German Wadden Sea. In: Inaba J. Hisamatsu S. & Ohtsuka Y. (eds.) Distribution and Speciation of Radionuclides in the Environment. Proceedings of the International Workshop on Distribution and Speciation of Radionuclides in the Environment, Rokkasho, Aomori, Japan, October 11-13, 200, p. 99-107. (2001)

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- H. Alegria and T. J. Shaw Rain deposition of atrazine and trifluralin in coastal waters of the South Atlantic Bight. *Env. Sci.Technol.*, 33, 850-856 (1999).
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T. J. Shaw, E. Sholkovitz, and G. Klinkhammer, Redox dynamics in the Chesapeake Bay: The effect on sediment/water uranium exchange, *Geochim. Cosmochim. Acta* 58, 2985-2995 (1994).

E. R. Sholkovitz, T. J. Shaw, and D. L. Schneider, The response of rare earth elements to seasonal anoxia in the water column and pore waters of Chesapeake Bay, *Geochim. Cosmochim. Acta* 56, 3389-3402 (1992).

T. J. Shaw and R. François, A fast and sensitive ICP-MS assay for the determination of ^{230}Th in marine sediments, *Geochim. Cosmochim. Acta* 55, 2075-2078 (1991).

T. J. Shaw, J. M. Gieskes, and R. A. Jahnke, Early diagenesis in differing depositional environments: The response of pore water transition metals, *Geochim. Cosmochim. Acta* 54, 1233-1246 (1990).

T. J. Shaw, An apparatus for fine-scale sampling of pore waters and solids in high porosity sediments, *J. Sed. Petrol.* 59, 633-634 (1989).

J. M. Gieskes, B. R. T. Simoneit, T. Brown, T. Shaw, Y-C. Wang, and A. Maggenheim, Hydrothermal fluids and petroleum in surface sediments of the Guymas Basin, Gulf of California: A case study, *Can. Mineral.* 26, 589-602 (1988).