

Joseph J. Vallino, Ph.D.

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Ecosystems Center
Marine Biological Laboratory
Woods Hole, MA 02543

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Professional Experience

Marine Biological Laboratory

Woods Hole, MA

Associate Scientist, August 2005 - Present
Assistant Professor, MBL/Brown University Joint Program, July 2004 – Present
Assistant Scientist, June 1997 – August 2005.
Research Associate, January 1997 - May 1997.

Metabolic Ecosystem Model: This model views an ecosystem as an optimized set of metabolic reactions constrained by thermodynamics, resource allocation, and mass conservation. The optimization is based on the theory of maximum entropy production (MEP).

Estuarine Transport Model, 2D: Developed 2D finite element, intra-tidal, hydrodynamic model for Plum Island Estuary Long-Term Ecological Research (LTER) project.
(<http://eco37.mbl.edu/kinematic>).

Data Assimilation: Data assimilation techniques have been employed for system identification and parameterization of marine ecosystem models. (<http://eco37.mbl.edu/DataAssim.html>).

Advection Dispersion Model, 1D: Developed a 1D, inter-tidal advection-dispersion model coupled to an estuarine food web model for the Land Margin Ecosystem Research project.
(http://eco37.mbl.edu/adv_disp.htm).

Isotope Tracer Models: An ¹⁵N-tracking estuarine biogeochemistry model has been developed and coupled to USGS FEQ 1D, branched hydrodynamic model.

Watershed Biogeochemistry Model: Used Hydrological Simulation Program Fortran (HSPF) to model hydrology and N-biogeochemistry in the Ipswich watershed.

Micro- and Mesocosm Experiments: Several microcosm and bioassay experiments have been conducted to examine kinetics and stoichiometry of bacterial utilization of organic matter.

Flow Analysis: Developed flow analysis model that uses first order approximation for flows, time-scale separation, and dimensional analysis to analyze food web data from the Kuparuk River, AK.

Bioremediation: Investigating use and biogeochemistry of permeable reactive barriers to remove nitrate from groundwater in both laboratory and field settings.

Scripps Institution of Oceanography, UCSD

La Jolla, CA

Mellon Postdoctoral Fellow, February 1991-1993

Bacteriophage Model: Developed structured model to follow ³²P incorporation into phage and bacteria as part of a study to measure bacteriophage production rates using ³²P phosphate.

DOC Utilization: Examined temperature and nutrient dependency of microbial growth (measured via ³H leucine and ³H thymidine uptake and DAPI counts) on dissolved organic carbon.

Massachusetts Institute of Technology

Cambridge, MA

Research and Teaching Assistantships, August 1985 - February 1991

Biochemical Flux Analysis Model: Developed model to estimate C and N flows through primary metabolic pathways in bacteria and yeast from measurements of extracellular constituents.

Fermentor Instrumentation: Setup experimental fermentor monitoring equipment, including on-line mass spectrometry and HPLC, to provide data for flux analysis modeling.

Metabolic Analysis: Combined flux analysis modeling with experimental perturbations of *Corynebacterium glutamicum* metabolism to identify pathway restrictions that limit lysine overproduction.

California Institute of Technology

Pasadena, CA

Research Assistantships, August 1983 - June 1985

State Estimator: Employed Kalman filter observer to estimate fermentation state variables from on-line measurements.

Education

Marine Biological Laboratory

Woods Hole, MA

Postdoctoral Fellow, July 1994 - January 1997.

Lakian Postdoctoral Scholar, July 1993 - July 1994.

Scripps Institution of Oceanography, UCSD

La Jolla, CA

Mellon Postdoctoral Fellow, February 1991-1993 (with Prof. Farooq Azam).

Massachusetts Institute of Technology

Cambridge, MA

Ph.D. Chemical Engineering, February 1991. *Advisor:* Prof. Gregory Stephanopoulos.

Thesis: *Identification of Branch-Point Restrictions in Microbial Metabolism Through Metabolic Flux Analysis and Local Network Perturbations*. Course emphasis: Estimation Theory, Stochastic and Optimal Control, Microbiology, Biotechnology.

California Institute of Technology

Pasadena, CA

M.S. Chemical Engineering, June 1985. *Advisor:* Prof. Gregory Stephanopoulos.

Thesis: *On-Line Estimation of the Oxygen-Mass-Transfer Coefficient and Other State Variables in a Chemostat*. Course emphasis: Multivariable Control Theory, Applied Mathematics, and Biochemical Engineering.

University of California

Berkeley, CA

B.S. Chemical Engineering, June 1983. Course emphasis: Biochemical Engineering and Mathematics. Undergraduate research project in kinetics of cellulase.

University of California

Los Angeles, CA

Chemical Engineering, September 1979 - June 1981

Publications, Peer Reviewed

Vallino, J.J. (2009) Ecosystem biogeochemistry considered as a distributed metabolic network ordered by maximum entropy production. *Phil. Trans. R. Soc. B* (Accepted with revisions).

Wan, Z., **Vallino, J.J.**, and Peterson, B.J. (2008) Study of the inter-annual food web dynamics in the Kuparuk River with a first order approximation inverse model. *Ecol. Model.* **211** (1-2), 97-112, doi: 10.1016/j.ecolmodel.2007.08.022.

- Lyons, M.M., Lau, Y.-T., Carden, W.E., Ward, J.E., Roberts, S.B., Smolowitz, R., **Vallino, J.**, Allam, B. (2007) Characteristics of marine aggregates in shallow-water ecosystems: Implications for disease ecology. *EcoHealth*, **4** (4), 406-420, doi: 10.1007/s10393-007-0134-0.
- Deegan, L.A., Bowen, J.L., Drake, D., Fleeger, J.W., Friedrichs, C.T., Galván, K.A., Hobbie, J.E., Hopkinson, C., Johnson, J.M., Johnson, D.S., Lemay, L.E., Miller, E., Peterson, B.J., Picard, C., Sheldon, S., **Vallino, J.**, Warren, R.S. (2007). Susceptibility of salt marshes to nutrient enrichment and predator removal. *Ecological Applications*, **17** (sp5), S42-S63.
- Claessens, L., Hopkinson Jr, C., Rastetter, E. and **Vallino, J.** (2006). Effect of historical changes in land-use and climate on the water budget of an urbanizing watershed. *Water Resources Research*, **42**, W03426, doi:10.1029/2005WR004131.
- Wan, Z. and **Vallino, J.** (2005). An Inverse Ecosystem Model of Year-to-year Variations with First Order Approximation to the Annual Mean Fluxes. *Ecol. Model.*, **187**, 369-388.
- Vallino, J.J.**, Hopkinson, C.S., and Garritt, R.H. (2005). Estimating estuarine gross production, community respiration and net ecosystem production: A nonlinear inverse technique. *Ecol. Model.*, **187**, 281-296
- Williams, M., Hopkinson, C., Rastetter, E., **Vallino, J.** and Claessens, L. (2005). Relationships of land use and stream solute concentrations in the Ipswich River basin, Northeastern Massachusetts. *Water, Air and Soil Pollution*, **161**, 55-74.
- Hopkinson, C.S. and **Vallino, J.J.** (2005). Efficient export of carbon to the deep ocean through dissolved organic matter. *Nature*, **433**, 142-145.
- Williams, M., Hopkinson, C., Rastetter, E., **Vallino, J.** (2004). N Budgets and Aquatic Uptake in the Ipswich River Basin, Northeastern Massachusetts. *Water Resources Research*, **40** (11), W11201, 12 pp
- Filoso, S., **Vallino, J.**, Hopkinson, C. and Rastetter, E. (2004). Modeling Nitrogen Processing and Transport in the Ipswich River Basin, Massachusetts, Using HSPF: Present Conditions and Future Scenarios. *J. Amer. Wat. Res. Assoc.*, **40**(5), 1365-1384.
- Giblin, A.E. and **Vallino, J.** (2003). The role of models in addressing coastal eutrophication problems. In: Canham, C. D., Cole, J. J. and Lauenroth, W. K. (eds), *The Role of Models in Ecosystem Science*. Princeton University Press, 327-343.
- Tobias, C.R., Cieri, M., Peterson, B.J. Deegan, L.A., **Vallino, J.** and Hughes, J. (2003). Processing watershed-derived nitrogen in a well-flushed New England estuary. *Limnol. Oceanogr.*, **48**, 1766-1778.
- Vallino, J.J.** (2003). Modeling microbial consortiums as distributed metabolic networks. *Biol. Bull.*, **204**, 174-179.
- Hopkinson, C.S., **Vallino, J.J.** and Nolin, A. (2002). Decomposition of dissolved organic matter from the continental margin. *Deep-Sea Res. II*, **49**, 4461-4478.
- Vallino, J.J.** (2000). Improving marine ecosystem models: use of data assimilation and mesocosm experiments. *J. Mar. Res.* **58**, 117-164.

- Vallino, J.J.** and Stephanopoulos, G. (2000). Metabolic flux distributions in *Corynebacterium glutamicum* during growth and lysine overproduction. *Biotechnol. Bioeng.* **67**, 872-885.
- Vallino, J.J.** and Hopkinson, C.S. (1998). Estimation of Dispersion and Characteristic Mixing Times in Plum Island Sound Estuary. *Estuarine, Coastal and Shelf Science* **46**, 333-350.
- Hopkinson, C.S, Buffam, I., Hobbie, J., **Vallino, J.**, Perdue, M., Eversmeyer, B., Prahl, F., Covert, J., Hodson, R., Moran, M.A., Smith, E., Baross, J., Crump, B., Findlay, S., and Foreman, D. (1998). Terrestrial inputs of organic matter to coastal ecosystems: an intercomparison of chemical characteristics and bioavailability. *Biogeochemistry* **43**, 211-234.
- Jay, D.A., Uncles, R.J., Largier, J., Geyer, W.R., **Vallino, J.**, and Boynton, W.R. (1997). A Review of Recent Developments in Estuarine Scalar Flux Estimation. *Estuaries* **20**, 262-280.
- Vallino, J.J.**, Hopkinson, C.S., and Hobbie, J.E. (1996). Modeling Bacterial Utilization of Dissolved Organic Matter: Optimization Replaces Monod Growth Kinetics. *Limnol. Oceanogr.* **41**, 1591-1609.
- Hopkinson, C.S. and **Vallino, J.J.** (1995). The Relationship Between Man's Activities in Watersheds and Rivers and Patterns of Estuarine Community Metabolism. *Estuaries* **18**, 598-621.
- Hopkinson, C.S. and **Vallino, J.J.** (1994). Toward the Development of Generally Applicable Models of the Microbial Loop in Aquatic Ecosystems. *Microb. Ecol.* **28**, 321-326.
- Vallino, J.J.** and Stephanopoulos, G. (1994). Carbon Flux Distributions at the Pyruvate Branch Point in *Corynebacterium glutamicum* during Lysine Overproduction. *Biotech. Prog.* **10**, 320-326.
- Vallino, J.J.** and Stephanopoulos, G. (1994). Carbon Flux Distributions at the Glucose 6-Phosphate Branch Point in *Corynebacterium glutamicum* during Lysine Overproduction. *Biotech. Prog.* **10**, 327-334
- Wikner, J., **Vallino, J.J.**, Steward, G., Smith, D., and Azam, F. (1993). Nucleic acids from the host bacterium as a major source of nucleotides for three marine bacteriophages. *FEMS Microbiol. Ecol.* **12**, 237-248.
- Vallino, J.J.** and Stephanopoulos, G. (1993). Metabolic flux distributions in *Corynebacterium glutamicum* during growth and lysine overproduction. *Biotechnol. Bioeng.* **41**, 633-646.
- Stephanopoulos, G. and **Vallino, J.J.** (1991). Network rigidity and metabolic engineering in metabolite overproduction. *Science* **252**, 1675-1681.
- Vallino, J.J.** and Stephanopoulos, G. (1990). Intracellular flux analysis as means of identifying limiting nodes in amino acid fermentations. In: Proc. - Eur. Congr. Biotechnol., 5th, Vol. 2., Christiansen, C., Munck, L., Villadsen, J. (Eds.), Munksgaard, Copenhagen, Den. 1063-1066.
- Vallino, J.J.** and Stephanopoulos, G. (1990). Flux determinations in cellular bioreaction networks: applications to lysine fermentations. In: Frontiers in Bioprocessing. Sikdar, S. K., Todd, P. W., and Bier, M. (Eds.), CRC Press, Florida, 205-219.
- Vallino, J.J.** and Stephanopoulos, G. (1987). Intelligent sensors in biotechnology: applications for the monitoring of fermentations and cellular metabolism. *Ann. N.Y. Acad. Sci.* **506**, 415-430.

Proceedings Papers

Pontius Jr, R.G., L. Claessens, C. Hopkinson Jr, A. Marzouk, E.B. Rastetter, L.C. Schneider, **J. Vallino**. (2000). Scenarios of land-use change and nitrogen release in the Ipswich watershed, Massachusetts, USA. in Parks, B.O., K.M. Clarke, M.P. Crane, editors. 2000. Proceedings of the 4th international conference on integrating geographic information systems and environmental modeling: problems, prospects, and needs for research; 2000 Sep 2-8; Boulder, CO. Boulder: University of Colorado, Cooperative Institute for Research in Environmental Science. (www and CD ROM).

Vallino, J. J. , C. S. Hopkinson, R. Garritt, J. Tucker. (1999). A non-linear inverse technique to estimate estuarine ecosystem metabolism from whole system oxygen measurements, Proceedings of the 3rd International Symposium on Ecohydraulics, Salt Lake City, UT, July 1999 (CD ROM)

Seminars, Lectures and Conferences

"How can the principle of maximum entropy production improve modeling of watershed hydrology and biogeochemistry?" CUAHSI Capstone Symposium, Vancouver, Canada, Aug 2009 (**Invited**).

"Modeling Groundwater Biogeochemistry by Maximizing Entropy Production Averaged Over Space and Time." Maximum Entropy Production Workshop, Jena, Germany, May 2009.

"Use of the maximum entropy production principle for modeling microbial biogeochemistry." Maximum Entropy Production Workshop, Jena, Germany, May 2008.

"Use of the maximum entropy production principle for modeling microbial biogeochemistry." Ecosystems Center Departmental Seminar, Marine Biological Laboratory, Woods Hole, MA, Dec 2007.

"Can Dynamic Trophic Structures Be Captured in Structurally Fixed Models?" Ocean Carbon and Biogeochemistry Workshop, Woods Hole, MA, July 2007 (**Invited**).

"Relationships between microbial consortia and microbial metabolic networks" American Society of Microbiology General Meeting, Toronto, Canada, May 2007 (**Invited**).

"Can the coordination and expression of distributed microbial metabolic networks be explained by the theory of maximum entropy production?" American Society of Limnology and Oceanography, Santa Fe, NM, February 2007 (**Session Chair**).

"Can the coordination and expression of distributed microbial metabolic networks be explained by the theory of maximum entropy production?" Department of Marine Biology, Avery Point, University of Connecticut, Avery Point, CT, Dec 2006 (**Invited**).

"Does non-equilibrium thermodynamics govern metabolic network expression in microbial communities?" Microbial Ecology Workshop, Mathematical Biosciences Institute, Ohio State University, Columbus, OH, May 2006 (**Invited**).

"Does non-equilibrium thermodynamics govern metabolic network expression in microbial communities?" Department of Marine Sciences Seminar, University of Georgia, Athens, GA, Dec 2005 (**Invited**).

"Viewing microbial biogeochemistry as a distributed metabolic network governed by thermodynamics". Lawrence Livermore National Laboratory, Livermore CA, December 2004 (**Invited**).

“Viewing microbial biogeochemistry as a distributed metabolic network governed by thermodynamics”. University of New Mexico, Albuquerque NM, November 2004 (**Invited**).

“Is ecosystem biogeochemistry governed by nonequilibrium thermodynamics and resource allocation constraints?”. Gordon Conference on *Metabolic Basis Of Ecology*, Bates College, ME, July 2004 (**Invited**).

“Optimal resource allocation, distributed metabolism, and microbial biogeochemistry”. Ecosystems Center, MBL, Woods Hole, MA, May 2004.

“Modeling Diagenetic Processes As An Optimized Metabolic Network”. American Society of Limnology and Oceanography, Honolulu, HI, February 2004 (**Invited**).

“Modeling Microbial Consortia as Distributed Metabolic Networks”, American Society of Limnology and Oceanography, Salt Lake City, UT, February 2003 (**Session Chair**).

“Viewing Microbial Biogeochemistry as a Distributed Metabolic Network”, Outcomes of Genome-Genome Interactions, Woods Hole, MA, May 2002 (**Invited**).

“Viewing Microbial Biogeochemistry as a Distributed Metabolic Network”, University of Rhode Island, Narragansett, RI, April 2002 (**Invited**).

"Viewing Ecosystem Biogeochemistry as an Optimized Metabolic Network", Institute of Ecosystem Studies, Millbrook, NY, November 2001 (**Invited**).

“Using Whole-System ^{15}N -Tracer Experiments To Improve Estuarine Biogeochemistry Models”, Estuarine Research Federation Biannual Meeting, St. Pete Beach, FL, November, 2001.

"Ecosystem biogeochemistry viewed as an optimized metabolic network", Boston University, Boston MA, April 2001 (**Invited**).

"Model Evaluation Of Land-Use Transformations On Nutrient Dynamics In The Ipswich River, Ma", American Society of Limnology and Oceanography, Albuquerque, NM, February 2001.

"A Thermodynamically Constrained Metabolic Ecosystem Model", American Society of Limnology and Oceanography, Copenhagen, Denmark, June 2000.

"Use of a ^{15}N Enrichment Experiment for the Development and Calibration of an Estuarine Biogeochemistry Model", Estuarine Research Federation, New Orleans, LO, September 1999.

"A non-linear inverse technique to estimate estuarine ecosystem metabolism from whole system oxygen measurements", 3rd International Symposium on Ecohydraulics, Salt Lake City, UT, July 1999.

"Improving Marine Ecosystem Models: Use of Data Assimilation and Mesocosm Experiments", American Society of Limnology and Oceanography, Santa Fe, NM, February 1999.

"Do terrestrial organic matter inputs stabilize aquatic food webs?", American Society of Limnology and Oceanography, St. Louis, MO, June 1998.

"Developing estuarine ecosystem models." Seminar course on Estuarine Ecosystem Dynamics, University of New Hampshire, NH, April 1998. (**Invited**).

"Seasonal patterns in estuarine metabolism from whole system measurements of oxygen: A pseudo-inverse technique", Estuarine Research Federation, Providence, RI, October 1997.

"Estuarine metabolism: coupling models with observations", Ecosystems Seminar Series, MBL, Woods Hole, MA, March 1997.

"Synthesis of Whole System Metabolic Measurements with an Estuarine Model to Assess Heterotrophic Processes", American Society of Limnology and Oceanography, Santa Fe, NM, February 1997.

"Approaches to Modeling DOM Based Food Webs: LMER PISCES Modeling Effort", Modelling Nitrogen in Coastal Ecosystems (Sea Grant workshop), MIT, Cambridge, MA, January 1996. **(Invited)**

"Mesocosm Study to Assess Impact of DOM Input on Estuarine Food Webs", 13th International Estuarine Research Federation, Corpus Christi, TX, November 1995.

"A Bioenergetic Analysis of Bacterial Utilization of Dissolved Organic Matter", Gordon Research Conference: Estuarine and Coastal Processes, Plymouth, NH, June 1995. **(Invited)**

"A Bioenergetic Analysis of Bacterial Utilization of Dissolved Organic Matter", American Society of Limnology and Oceanography, Reno, NV, June 1995.

"A Bioenergetic Approach to Modeling Microbial Food Webs", Marine Chemistry Seminar Series, Woods Hole Oceanographic Institute, Woods Hole, MA, May 1995. **(Invited)** This seminar was also given at Tufts **(Invited)**, Yale **(Invited)**, and Harvard **(Invited)** Universities.

"A Bioenergetic Approach to Modeling Microbial Food Webs," NATO Workshop on Ecosystem Modeling for the Black Sea, Sofia, Bulgaria, March 1994. **(Invited)**

"Elucidation of the Enzyme Control Architecture Associated with Metabolic Rigidity in Lysine Synthesis," Annual Meeting of the American Institute of Chemical Engineers, Chicago, IL, November 1990.

"Metabolic Perturbations as a Means of Identifying Rate Limiting Fluxes in Amino Acids Production," Annual Meeting of the American Institute of Chemical Engineers, San Francisco, CA, November 1989.

"Directed Metabolic Flux as a Means of Product Yield Improvement," Annual Meeting of the American Institute of Chemical Engineers, Washington, DC, November 1988.

"On-Line Monitoring of Cellular Metabolism," Annual Meeting of the American Institute of Chemical Engineers, New York, November 1987.

"Algorithmic Sensor for the Monitoring of Cellular Metabolism," Frontiers in Bioprocessing Conference, Boulder, CO, June 1987. **(Invited)**

"Intelligent Sensors in Biotechnology: Applications for the Monitoring of Fermentations and Cellular Metabolism," Fifth International Biochemical Engineering Conference, Henniker, NH, July 1986.

Teaching

Marine Biological Laboratory**Woods Hole, MA**Semester in Environmental Science Program (see <http://www.mbl.edu/SES>)

Course Instructor, Microbial Methods in Ecology (fall 1999-present): Undergraduate course combines lectures on microbial biogeochemistry and ecology with laboratory methods. Lectures and labs on bacterial counts, leucine-¹⁴C bacterial productivity, hydrogen sulfide and methane production in Winogradsky columns, extracellular enzyme assays, bacterial grazers, bacteria-phytoplankton competition, and PCR (see <http://ecosystems.mbl.edu/SES/MicrobialMethods>).

Co-Instructor, Microbial Methods in Ecology (fall 1998)

Co-Instructor, Microbial Methods in Ecology (fall 1997)

SES Undergraduate Research Projects, Advisor to:

Sarah Gillig (2008) Nanosilver and its Effects on Freshwater Microbial Communities.

Rob Gordon (2008) Visualizing changes in the community structure of sulfur cycling bacteria in nitrogen enriched salt marsh sediments

Amy Snyder (2007) The Effect of Microbe Invasions on the Methanotroph Metabolism and Community Structure in Microcosms.

Megan Carpenter (2007) The Effect of Iron Oxide on Dissimilatory Nitrate Reduction to Ammonium (DNRA) in Lignin Cellulose medium.

Angela Vincent (2006) The Effects of Seawater Intrusion on Microbial Nitrate and Sulfate Reduction within a NITREXTM Permeable Reactive Barrier Designed to Mitigate Groundwater N-Pollution.

Kaitlyn S. Lucey (2006) Permeable Reactive Barriers as Long-Term Solutions for Groundwater Remediation: Dynamics of Groundwater Properties, Methane Concentrations, Dissolved Inorganic Carbon Concentrations, and Rates of Carbon Oxidation Processes, Across the NITREX Permeable Reactive Barrier in Waquoit Bay, Cape Cod.

Whitney Eng (2006) Using benthic infauna abundance and genetic markers in oysters as indicators of hypoxia downstream from a NITREX permeable reactive barrier.

Hilary Smith (2005) Microcosm analysis of the impact of nutrients and allochthonous carbon on microbial production of autotrophic and heterotrophic biomass.

Jennifer Reimer (2005) Nitrogen dynamics in flow-through microcosms of NITREX® reactive media.

Sabrina Moreau (2005) Influence of NITREX barrier on groundwater flow paths, dissolved organic carbon and nitrate concentrations.

Emily Sampson (2004) Carbon Dioxide and Methane Production along a Moisture/Organic Matter Gradient in Atlantic White Cedar Swamps.

Lisa Brunie (2004) Effects of Temperature and Sediment Water Content on Carbon Dioxide and Methane Fluxes in Peat Cores from Atlantic White Cedar Swamps.”

Lindsay O'Reilly (2003) A Comparison of Microbial Diversity and Rates of Nitrification Across Nutrient and Salinity Gradients in the Backus and Quashnet Rivers.

Gabriella Engelhart (2002) Creating Micro-Anaerobic Zones to Facilitate Denitrification.

Josh Havassy (2002) Testing Beijerinck's Principle: Using DGGE to Track the Development of a Saltwater Bacterial Community Originating from a Freshwater Inoculum.

Kirk Webster (2002) Functional Complementarity in Bacterial Communities along Salt Gradients.

Sarah Leahy (2002) Probiotic Effectiveness in Re-stabilizing a Closed System and Effects on *Fundulus heteroclitus*.

Louise K. Charkoudian (2001) The Effects of Microbial Diversity on Biogeochemical Processes in Brackish Water Microcosms.

Uri Y. Levine (2001) PCR Analysis of Microbial Diversity in Brackish Water Microcosms.

Noah A. Bleich (1997) Alkaline Phosphatase Activity Under Oxidic and Anoxic Conditions, In mats of *Cladophora vagabunda*, and Organic Matter Additions.

Published Notes associated with NSF's Research Education for Undergraduates Program:

Kirkby, R., L. Claessens, C. Hopkinson, E. Rastetter, **J. Vallino** (2000). Modeling the effects of land-use change on nitrogen biogeochemistry in the Ipswich watershed, Massachusetts. *Biol. Bull.* **199**, 218-219.

Perring, A., M. Williams, C. Hopkinson, Jr, E. Rastetter, and **J. Vallino** (2000). Solute dynamics in storm flow of the Ipswich River basin: effects of land use *Biol. Bull.*, **199**, 219-221.

Pease, K.M., L. Claessens, C. Hopkinson, E. Rastetter, **J. Vallino**, and N. Kilham (1999). Ipswich River nutrient dynamics: preliminary assessment of a simple nitrogen-processing model. *Biol. Bull.* **197**, 289-290.

Canfield, S., L. Claessens, C. Hopkinson, E. Rastetter and **J. Vallino** (1999). Long-term effect of municipal water use on the water budget of the Ipswich River basin. *Biol. Bull.* **197**, 295-297.

Carini, S., N. Weston, C. Hopkinson, J. Tucker, A. Giblin and **J. Vallino**. (1996). Gas exchange rates in the Parker River estuary, Massachusetts. *Biol. Bull.* **191**, 333-334.

Alderman, D., B. Balsis, I. Buffam, R. Garritt, C. Hopkinson and **J. Vallino**. (1995). Pelagic metabolism in the Parker River/Plum Island Sound Estuarine System. *Biol. Bull.* **189**, 250-251.

Balsis, B., D. Alderman, I. Buffam, R. Garritt, C. Hopkinson and **J. Vallino**. (1995). Total system metabolism in the Plum Island Sound estuary. *Biol. Bull.* **189**, 252-254.

Uhlenhopp, A. G., J. Hobbie and **J. Vallino**. (1995). Effects of land use on the degradability of dissolved organic matter in three watersheds of the Plum Island Sound estuary. *Biol. Bull.* **189**, 256-257.

Ingram, K., C. S. Hopkinson, K. Bowman, H. Garritt and **J. Vallino**. (1994). From watershed to estuary: assessment of nutrient loading, retention and export from the Ipswich River Basin. *Biol. Bull.* **187**, 277-278.

Thesis Committees

Jennifer Bowen. Boston University, Ph.D. Program, 2002-2007.

Yawei Luo. Brown University, Ph.D. Program, 2007-2009.

Postdoctoral Students Mentored

Liuzhi Zhao (2006-present)

Lora Harris (2005-2007)

Zhenwen Wan (2002-2004)

Solange Filoso (2001-2003)

Massachusetts Institute of Technology
Chemical Engineering Department

Cambridge, MA

Teaching Assistant, Unit Operations (spring 1989)

Honors

To commemorate papers of special significance, "Metabolic flux distributions in *Corynebacterium glutamicum* during growth and lysine overproduction", was one of 20 selected for the Anniversary Issue of *Biotechnology & Bioengineering* from 40 years of publications in this journal. March 2000.

Lakian Postdoctoral Scholar Award at Marine Biological Laboratory, 1993-1994.

Mellon Postdoctoral Fellowship Award at Scripps Institution of Oceanography. 1991-1993.

Corning Glass Fellowship, Caltech. 1983-1984.

Outstanding Senior Award, American Institute of Chemical Engineers, UC Berkeley. 1983.

Outstanding Sophomore Award, American Institute of Chemical Engineers, UCLA. 1981.

Professional Services

LTER Site Review Committee, Dry Valleys, Antarctica. Jan 2008.

Nature Reader Panel. 2008 - Present.

Review Editor, *Aquatic Microbial Ecology*. 2007 - Present.

Editorial Board, *Wetlands Ecology and Management*. 1999 - 2001.

Editorial Board, *Mangroves and Salt marshes*, 1998 - 1999.

NSF Ecosystems Cluster panel member, 2006.

NOAA Coastal Hypoxia Research Program panel member, 2005.

NSF Biocomplexity Math/Theory/Computation panel member, 2000.

EPA Water and Watersheds Program panel member, 1999.

NSF JGOFS-Southern Ocean Modeling panel member, 1995.

NATO Science of Stability Program: Member of advisory committee for the TU-Black Sea Project, 1994 - 1995.

Session Chair/Organizer for:

Understanding and Modeling Aquatic Ecosystems Using Fundamental Laws, ASLO, Santa Fe, NM, Feb 2007.

Ecology and Population Biology, MBL General Scientific Meeting, Woods Hole, Aug 2003.

Novel Approaches to Modeling Food Web and Ecosystem Biogeochemistry, ASLO, Salt Lake City, UT, Feb 2003.

Reviewed numerous proposals for: NSF, NOAA, UNH CICEET, EPA, DOE, Sea Grant, and Hudson River Foundation.

Reviewed manuscripts for: *American naturalist*, *Aquatic Microbial Ecology*, *Biogeochemistry*, *Biological Bulletin*, *Biotechnology & Bioengineering*, *Biotechnology Progress*, *Deep-Sea Research*, *Ecological Modelling*, *Ecological Monographs*, *Ecosystems*, *Environmental Modeling Software*, *Estuaries*, *Estuarine Coastal and Shelf Science*, *Journal of Geophysical Research*, *Journal of Marine Research*, *Journal of Marine Systems*, *Limnology and Oceanography*, *Marine Ecology Process Series*, and *Microbiology*.

Organizations: Society for Mathematical Biology, American Geophysical Union; American Society of Limnology and Oceanography, Estuarine Research Federation.

Funding

PI NSF-EF-0928742 Sep 2009-Aug 2012, \$750,000: Theory: Biological systems organize to maximize entropy production subject to information and biophysicochemical constraints.

PI NSF-OCE-0852263 Jul 2009-Jun 2012, \$482,144: Collaborative Research: Environmental Controls on Anammox and Denitrification Rates in Estuarine and Marine Sediments.

PI NSF-CBET-0756562 Apr 2008-Feb 2011, \$300,000: Modeling Microbial Biogeochemistry in Permeable Reactive Barriers.

PI NSF-DEB-0542682 Feb 2006-Jan 2010, \$92,827: Collaborative Research: Benthic Microalgal Regulation of Carbon and Nitrogen Turnover in Land Margin Ecosystems: A Dual Stable Isotope Tracer Approach.

PI NASA- NNH04ZSS001N Astrobiology, \$74,000, Aug 2005-July 2006: Do thermodynamic goal functions describe microbial biogeochemical dynamics?

PI NOAA-CICEET, \$210,000, Sep 2004-Aug 2007: Effectiveness of Reactive Barriers for Reducing N-Loading to the Coastal Zone.

CO-PI NSF-OCE-0423565, Aug 2004-Jul 2010: \$4,920,000: Plum Island Ecosystems LTER.

CO-PI NSF-EF-0429004, \$1,053,000, Sep 2004-Aug 2007: Linking Marine Pathogens to Molluscan Shellfish; The Ecological Role of Marine Aggregates.

CO-PI NSF-0301231, \$240,000 plus \$120,000 MBL cost share. Jul 2003-Jun 2005: Controlled Environment Facilities for Examination of the Effects of Climate Change and Human Land Use on Terrestrial and Aquatic Ecosystems. (Equipment Grant)

CO-PI NSF-DEB-0213767, \$2,699,971, Oct 2002-Sep 2006. Trophic Cascades and Interacting Control Processes in a Detritus-Based Aquatic Ecosystem.

CO-PI NSF-OPP-9911278, \$3,257,870, Jul 2000-Jun 2005. Aquatic Ecosystem Responses to Changes in the Environment of an Arctic Drainage Basin.

CO-PI NSF-EAR-0083839, \$67,211, Oct 2000-Mar 2003. BIOCOMPLEXITY – INCUBATION ACTIVITY: Quantitative Description Of The Response of a Complex System to Disturbance: Subsurface Microbial Communities and Chemical Contaminants.

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