

## VERA L. TRAINER

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### EDUCATION

Ph.D., Biochemistry and Molecular Biology, University of Miami, Miami, FL. 1990.

M.S., Biological Oceanography, University of Miami, Miami, FL. 1987.

B.S., Biology, Indiana University of Pennsylvania, Indiana, PA. 1981.

### EXPERIENCE

1996-present	Research Oceanographer NOAA/NMFS	Development of receptor-based assays for the detection of marine algal biotoxins, isolation of biotoxin receptors and binding proteins in marine species, oceanography of harmful algal blooms
1991-1995	Senior Fellow University of Washington School of Medicine Department of Pharmacology	Described allosteric interactions among marine biotoxins. Utilized a photosensitive brevetoxin derivative to localize its specific site of action.
1990-1991	Postdoctoral Research Associate University of Miami Rosenstiel School of Marine and Atmospheric Science	Characterized protein receptors to lipophilic marine toxins. Synthesized radiolabeled photoaffinity probes and purified antibodies for specific detection of protein receptors.
1986-1990	Graduate Research Assistant University of Miami Rosenstiel School of Marine and Atmospheric Science	Localized the brevetoxin receptor to the sodium channel $\alpha$ subunit. Developed an ELISA for the detection of brevetoxin and ciguatoxin.
1983-1986	Graduate Research Assistant U.S. Department of Commerce Atlantic Oceanog. Meteorog. Lab.	Determined radioisotope uptake and incorporation into subcellular components of three species of marine phytoplankton.

### PUBLICATIONS

Bates, S.S. and Trainer, V.L. 2006. Diatoms. In (Graneli, E., and Turner, J.T.) Ecology of Harmful Algae. vol. 189. 440 pp.

Bill, B.D., Cox, F.H., Horner, R.A., Borchert, J.A., Trainer, V.L. 2006. The first closure of shellfish harvesting due to domoic acid in Puget Sound, Washington, USA. *Afr. J. Mar. Sci.* 28(2): 437-442.

Baugh, K.A., Bush, J.M., Bill, B.D., Lefebvre, K.A., Trainer, V.L. 2006. Estimates of specific toxicity in several *Pseudo-nitzschia* species from the Washington coast, based on culture and field studies. *Afr. J. Mar. Sci.* 28(2).

Adams, N.G., MacFadyen, A., Hickey, B.M., Trainer, V.L. 2006. The nearshore advection of a toxigenic *Pseudo-nitzschia* bloom and subsequent domoic acid contamination of intertidal bivalves. *Afr. J. Mar. Sci.* 28(2): 271-276.

Trainer, V.L. 2005. Ecological linkages between physical oceanographic conditions and the seasonal growth and distribution of toxic algal blooms. pp. 23-25 in "The Big Eddy: Proceedings of the Western Juan de Fuca Ecosystem Symposium", Canadian Parks and Wilderness Society, British Columbia Chapter, Vancouver BC, April 2005, 141p.

GEOHAB 2005. Global Ecology and Oceanography of Harmful Algal Blooms, GEOHAB Core Research Project: HABs in Upwelling Systems. G. Pitcher, T. Moita, V. Trainer, R. Kudela, P. Figueras, T. Probyn (eds.) IOC and SCOR, Paris and Baltimore, 82 pp.

Wells, M.L., Trick, C.A., Cochlan, W.P., Hughes, M.P., Trainer, V.L. 2005. Domoic acid: The synergy of iron, copper, and the toxicity of diatoms. *Limnol. Oceanogr.* 50(6):1908-1917.

Trainer, V.L. and Suddleson, M. 2005. Monitoring approaches for early warning of domoic acid events in Washington State. *Oceanography* 18(2): 228-237.

Kudela, R., Pitcher, G., Probyn, T., Figueiras, F., Moita, T., and Trainer, V.L. 2005. Harmful algal blooms in coastal upwelling systems. *Oceanography* 18(2): 185-197.

V. M. Bricelj, Connell L., Konoki K., MacQuarrie S. P., Scheuer T., Catterall W. A., and Trainer V. L. 2005. Sodium channel mutation responsible for saxitoxin resistance in clams increases risk of PSP. *Nature* 434: 763-767

Trainer, V.L. and Bill, B.D. 2004. Characterization of a Domoic Acid Binding Site from Pacific Razor Clam. *Aquat. Toxicol.* 69: 125-132.

Holt, A., R.P. Stumpf, M.C. Tomlinson, V. Ransibrahmanakul, V. Trainer, D. Woodruff. 2003. Applications of satellite ocean color imagery for detecting and monitoring harmful algal blooms in the Olympic Peninsula region. Proceedings of the 13th Biennial Coastal Zone Conference, Baltimore, MD. July 13-17, 2003. NOAA Coastal Services Center Charleston, SC.

Lefebvre, K.A., Trainer, V.L., and Scholz N. L.. 2004. Morphological abnormalities and sensorimotor deficits in larval fish exposed to dissolved saxitoxin. *Aquat. Toxicol.* 66 (2): 159-170.

Trainer, V.L., Eberhart, B.-T. L., Wekell, J.C., Adams, N.A., Hanson, L., Cox, F., and Dowell, J. 2003. Paralytic shellfish toxins in Puget Sound, Washington State. *J.Shellfish Res.* 22(1): 213-224.

Trainer, V.L. and ORHAB collaborators. 2004. Microscopes to moorings: the Olympic Region Harmful Algal bloom partnership. In K.A. Steidinger, J.H. Landsberg, C.R. Tomas, and G.A Vargo [ed.], Proceedings of the Tenth International Conference on Harmful Algal Blooms, Florida Fish and Wildlife Conservation Commission, Intergovernmental Oceanographic Commission of UNESCO, St. Petersburg, FL.

- Trainer, V.L., and B.M. Hickey. 2003. The challenges of forecasting and managing toxigenic *Pseudo-nitzschia* blooms on the U.S. west coast. p. 55-60. In D.Scavia and N.Valetta-Silver [eds], Ecological forecasting: New Tools for Coastal and Marine Ecosystem Management, NOAA Technical Memo, NOS NCCOS 1
- Harmful algal blooms in the PICES region of the North Pacific. 2002. F.J.R. Taylor and V.L. Trainer, [eds.], PICES scientific report no. 23, PICES, Sidney, B.C., Canada.
- Trainer, V.L. 2002. Unveiling an ocean phantom. *Nature* 418: 925-926.
- Trainer, V.L., Hickey B. M., and Horner, R.A. 2002. Biological and physical dynamics of domoic acid production off the Washington U.S.A. coast. *Limnol. Oceanogr.* 47: 1438-1446.
- Trainer, V.L. 2002. Marine Mammals as Sentinels of Environmental Biotoxins. pp. 349-362, In: Handbook of Neurotoxicology, volume 1, (Massaro, E.J. ed.), Humana Press.
- Wekell, J.C., Trainer, V.L., Ayres, D., and Simons, D. 2002. A study of spatial variability of domoic acid in razor clams: recommendations for resource management on the Washington coast. *Harmful Algae* 3: 1-9.
- Stehr, C.M., Connell, L., Baugh, K.A., Bill, B.D., Adams, N.G., and Trainer, V.L. 2002. Morphological, toxicological, and genetic differences among *Pseudo-nitzschia* (Bacillariophyceae) species in inland embayments and outer coastal waters of Washington State, USA. *J. Phycol.* 38:55-65.
- Trainer, V.L., N.G. Adams, and J.C. Wekell. 2001. Domoic acid-producing *Pseudo-nitzschia* species off the U.S. west coast associated with toxification events, p. 46-48. In G.M. Hallegraeff, Blackburn, S.I., Bolch, C.J., Lewis, R.J. [eds.], Proceedings of the Ninth International Conference on Harmful Algal Blooms. Intergovernmental Oceanographic Commission of UNESCO.
- Juhl, A.R., Trainer, V.L. and Latz, M.I. 2001. Effect of fluid shear and irradiance on population growth and cellular toxin content of the dinoflagellate *Alexandrium fundyense*. *Limnol. Oceanogr.* 46(4):758-764.
- Scholin, C.A., Gulland, F., Doucette, G.J., Benson, S., Busman, M., Chavez, F.P. Cordaro, J., DeLong, R., DeVogelaere, A., Harvey, J., Haulena, M., Lefebvre, K., Lipwcomb, T., Loscutoff, S., Lowenstine, L.J., Marin III, R., Miller, P.E., McLellan, W.A., Moeller, P.D.R., Powell, C.L., Rowles, T., Silvagni, P., Silver, M., Spraker, T., Trainer, V.L., and VanDolah, F.M. 2000. Mortality of sea lions along the central California coast linked to a toxic diatom bloom. *Nature* 403, 80-84.
- Trainer, V.L., and Poli, M.A. 2000. Assays for Dinoflagellate Toxins, Specifically Brevetoxin, Ciguatoxin, and Saxitoxin. pp. 1-19 In Animal Toxins. Facts and Protocols (H. Rochat and M.-F. Martin-Eauclaire, eds.) Birkhauser, Berlin.
- Trainer, V.L., Adams, N.G., Bill, B.D., Stehr, C.M., Wekell, J.C., Moeller, P. Busman, M, and D. Woodruff. 2000. Domoic acid production near California upwelling zones, June 1998. *Limnol. Oceanogr.* 45(8)401-440.
- Adams, N.G., Lesoing, M., and Trainer, V.L. 2000. Environmental conditions associated with domoic acid in razor clams on the Washington coast. *J. Shellfish Res.* 19, 1007-1015.
- Curtis, K.M, Trainer, V.L. and Shumway, S.E. 2000. Paralytic shellfish toxins in geoduck clams (*Panope abrupta*): variability, anatomical distribution, and comparison of two toxin detection methods. *J. Shellfish Res.* 19(1), 313-319.

Trainer, V.L., and Baden, D.G. 1999. High Affinity Binding of Toxins to Marine Mammal Brain. *Aquatic Toxicol.* 46, 139-148

Trainer, V. L., Adams, N.G., Bill, B.D., Anulacion, B.F., and Wekell, J. C. 1998. Concentration and Dispersal of a *Pseudo-nitzschia* Bloom in Penn Cove, Washington, U.S.A. *Natural Toxins* 6, 1-13.

Trainer, V.L., Adams, N.G., Bill, B.D., Anulacion, B.F., and Wekell, J.C. 1998. A *Pseudo-nitzschia* bloom in Penn Cove, Washington during the summer 1997. Puget Sound Research '98. From Basic Science to Resource Management. Puget Sound Water Quality Authority, PO Box 40900, Olympia, WA 98504.

Trainer, V.L., Wekell, J.C., Horner, R.A., Hatfield, C.L., and Stein, J.E. 1998. Domoic Acid Production by *Pseudo-nitzschia pungens*, pp. 235-237. In Harmful Microalgae (B. Reguera, J. Blanco, M.L. Fernandez, and T. Wyatt, eds) IOC of UNESCO.

Wekell, J.C., Postel, J.R., Horner, R.A., Hatfield, C.L., Ross, A.M., and Trainer, V.L. 1998. In Situ Domoic Acid Levels in *Pseudo-nitzschia* Cells off the Washington State Coast in July 1996, pp. 235-236. In Harmful Microalgae (B. Reguera, J. Blanco, M.L. Fernandez, and T. Wyatt, eds) IOC of UNESCO.

Trainer, V.L., McPhee, J.C., Boutelet-Bouchan, H., Baker, C. Scheuer, T., Babin, D., Demoute, Jean-Pierre, Guedin, D., and Catterall, W.A. 1997. High Affinity Binding of Pyrethroids to the  $\alpha$  Subunit of Brain Sodium Channels. *Mol. Pharmacol.* 51, 651-657.

Trainer, V.L., Baden, D.G., and Catterall, W.A. 1996. Brevetoxin and Saxitoxin Binding to Sodium Channel Transiently Expressed in Human Kidney Cells, pp. 467-470 In Harmful and Toxic Algal Blooms (T. Yasumoto, Y. Oshima, and Y. Fukuyo, eds.) Intergovernmental Oceanographic Commission of UNESCO, Paris.

Trainer, V.L., Baden, D.G., and Catterall, W.A. 1996. Site of Covalent Labeling by a Photoreactive Batrachotoxin Derivative Near Transmembrane Segment IS6 of the Sodium Channel  $\alpha$  Subunit. *J. Biol. Chem.* 271(19), 11261-11267.

Trainer, V.L., Baden, D.G., and Catterall, W.A. 1994. Localization of the Brevetoxin Binding Domains on the Voltage-Sensitive Sodium Channel, pp. 359-364. In Toxic Marine Phytoplankton (P. Lassus, G. Arzul, E. Erard-le Denn, P. Gentien, C. Marcaillou-le Baut, eds.) Lavoisier Publishing Inc., Paris.

Trainer, V.L., Baden, D.G., and Catterall, W.A. 1994. Identification of Peptide Components of the Brevetoxin Receptor Site of Rat Brain Sodium Channels. *J. Biol. Chem.* 269(31), 19904-19909.

Trainer, V.L., Baden, D.G., and Catterall, W.A. 1994. Detection of Marine Toxins Using Reconstituted Sodium Channels. *J. of AOAC Internat.* 78(2), 570-573.

Baden, D.G., Melenek, R., Sechet, V., Trainer, V.L., Schultz, D.R., Rein, K.S., Tomas, C.R., Delgado, J., and Hale, L. 1994. Modified Immunoassays for Polyether Toxins: Implications of Biological Matrices, Metabolic States, and Epitope Recognition. *J. of AOAC Internat.* 78(2).

Trainer, V.L., Moreau, E., Guedin, D., Baden, D.G., and Catterall, W.A. 1993. Neurotoxin Binding and Allosteric Modulation at Receptor Sites 2 and 5 on Purified and Reconstituted Rat Brain Sodium Channels. *J. Biol. Chem.* 268(23), 17114-17119.

Baden, D.G. and Trainer, V.L. 1993. Mode of Action of Toxins of Seafood Poisoning, pp. 49-74. In Algal Toxins in Seafood and Drinking Water (I.R. Falconer, ed.) Academic Press, London.

Edwards, R.A., Trainer, V.L., and Baden, D.G. 1992. Brevetoxins Bind to Multiple Classes of Sites on Rat Brain Synaptosomes. *Mol. Brain. Res.* 14, 64-70.

Catterall, W.A., Trainer, V.L., and Baden, D.G. 1992. Molecular Properties of the Sodium Channel: A Receptor for Multiple Neurotoxins. *Bull. Soc. Path. Ex.* 85, 481-485.

Trainer, V.L., Thomsen, W.J., Catterall, W.A., and Baden, D.G. 1991. Photoaffinity Labeling of the Brevetoxin Receptor on Sodium Channels in Rat Brain Synaptosomes. *Mol. Pharmacol.* 40, 988-994.

Trainer, V.L. and Baden, D.G. 1991. Enzyme Immunoassay for Detection of Florida Red Tide Brevetoxins. *Toxicon.* 29(11), 1387-1394.

Trainer, V.L. 1990. Localization of the Brevetoxin Binding Site on the Voltage-Sensitive Sodium Channel. Ph.D. Dissertation, University of Miami, 120 pp.

Trainer, V.L. and Baden, D.G. 1990. Enzyme Immunoassay of Brevetoxins. pp. 430-435. In Toxic Marine Phytoplankton (E. Graneli, B. Sundstrom, L. Edler, and D. Anderson, eds.) Elsevier, New York.

Trainer, V.L., Edwards, R.A., Szmant, A.M., Stuart, A.M., Mende, T.J., and Baden, D.G. 1990. Brevetoxins: Unique Activators of Voltage-Sensitive Sodium Channels. pp. 166-175. In Marine Toxins: Origin, Structure, and Molecular Pharmacology (S. Hall and G. Strichartz, eds.) American Chemical Society, Washington, D.C.

Baden, D.G., Mende, T.J., Szmant, A.M., Trainer, V.L., and Edwards, R.A. 1989. Brevetoxin Binding to Rat Brain Synaptosomes: Inhibition Constants of Derivative Brevetoxins. pp. 431-434. In Red Tides: Biology, Environmental Science and Toxicology (T. Okaichi, D.M. Anderson, and T. Nemoto, eds.) Elsevier, New York.

Baden, D.G., Mende, T.J., Szmant, A.M., Trainer, V.L., Edwards, R.A., and Roszell, L.E. 1988. Brevetoxin Binding: Molecular Pharmacology Versus Immunoassay. *Toxicon* 26(1), 97-103.

Trainer, V.L. 1986. Night Protein Synthesis in Three Marine Phytoplankton. M.S. Thesis, University of Miami, 123 pp.

### **TEACHING EXPERIENCE**

2003-present Committee member, Nick Adams, School of Aquatic & Fishery Science

1996-present Lectured in Aquatic Microbiology class, University of Washington.

1995-present Supervised and trained technicians, work study students and summer interns, NOAA/NMFS, Seattle. WA

1992-1994 Supervised 3 students from the graduate program in pharmacology, University of Washington, Seattle, WA.

1990 Lectured in the graduate school class, "Marine Biochemistry", University of Miami, Miami, FL.

1987-1990 Supervised and instructed rotation students and laboratory technicians, University of Miami, Miami, FL.

### **HONORS AND AWARDS**

- ECOHAB grant for, "Understanding shellfish resistance strategies as a means to predict and manage PSP toxicity", 2006-2009, \$260,000 per year.
- NOAA Bronze medal, group award, Nicolaus Adams, Keri Baugh, Brian Bill, Bich-Thuy Eberhart, Sylvester Spencer, Marc Suddleson (NOS), Vera Trainer, and John Wekell for developing an unprecedented partnership, which has improved understanding and reduced impacts of harmful algal blooms on humans and the environment, September 2003.
- NWFSC Internal Grants Committee (2002-2004)
- NWFSC Special Act Award for ECOHAB proposal, \$2500, June 2002
- MERHAB review, panel member, June 2002
- ECOHAB Pacific Northwest regional grant, principal investigator, 2002-2007, \$9 million total
- NWFSC Employee of the Year Award, December 2001, \$3000
- ORHAB grant, principal investigator, 2000-2005, \$2.3 million total.
- ECOHAB grant for, "A molecular basis for differential susceptibility and accumulation of paralytic shellfish (PSP) toxins in commercial bivalves", 2002-2005, \$95,000 per year.
- ECOHAB grant for, "Mechanisms and Control of Toxin Accumulation in Shellfish", 1998-2001, \$426,022.
- Pioneer grant for, "Harmful Algal Blooms: WWW Presentation of Shellfish Toxicity on the West Coast of the United States" September 1998, \$12,000.
- National Research Council Award for, "A Rapid Receptor-Based Assay for the Detection of Domoic Acid", 1995-1998, \$35,000 per year.
- Travel Grant from the 7th International Conference on Marine Toxins, June 1995, \$2000.
- National Institute of Health, National Institute of Environmental Health Sciences, "Structure of the Sodium Channel Brevetoxin Receptor", #1 F32 ES05586-01, 1993-1996, \$25,000 per year.
- National Institute of Health, "NIEHS Marine and Freshwater Biomedical Center", University of Miami, collaborator, 1991-present.
- Travel Grant from the French Institute for the Exploration of the Sea (IFREMER), October 1993, \$1500.
- Florida Scholar's Grant for research supplies, 1988-1990, \$2000 per year.
- Participant, Expert Group, "Problems of Algal Blooms in Aquaculture", Sherkin Island Marine Station, County Cork, Ireland, June 1989.
- Travel Grant from the University of Miami, December, 1988, \$600.

## **REVIEWER**

Nature  
 Brain Research  
 Limnology and Oceanography  
 Aquatic Toxicology  
 Environmental Research  
 National Institute of Health  
 National Science Foundation

## **COMMITTEES**

International committee. Core Research Program: HABs in Upwelling Systems, Villefranche sur mer, France, January 2006.

North Pacific Marine Science Organization (PICES), Harmful Algal Bloom Section, co-chair with Hak-Gyoon Kim, October 2004-present

Steering committee, National Conference on Harmful Algal Blooms, Woods Hole, MA, December 2003.

## **INVITATIONS**

Co-chair, ASLO summer meeting, Session on Harmful Algal Blooms from Research to Management, June 2005.

Workshop participant, Public Health Risks: Coastal Observations for Decision Making, St. Petersburg, FL, January 2006.

Participant, National Plan for Algal Toxins and Harmful Algal Blooms workshop, Charleston, SC, March 21-25, 2004. Resulting publication: HARNESS, 2005. Harmful Algal Research and Response: A National Environmental Science Strategy 2005-2015. Ramsdell, J.S, Anderson, D.M., and Glibert, P.M. (eds.), Ecological Society of America, Washington, D.C. 96 pp.

Participant, International SCOR sponsored Open Science Meeting on HABs in Upwelling Systems, Lisbon, Portugal, November 2003.

Co-chair, HAB Data Harmonization Workshop, XII PICES Meeting, Seoul Korea, October 2003.

Session Chair, Research to Management: Adapting Research Tools for the Management of Harmful Algal Blooms, Estuarine Research Foundation Conference, Seattle, WA, September 2003.

Session Chair, Harmful Algal Blooms, Puget Sound Georgia Basin Research Conference, Vancouver, BC, Canada, April 2003.

Participant in US-EU Workshop on International Collaborations in HAB Science, Trieste Italy, September 2002.

### **SELECTED PRESENTATIONS**

“A Regional west coast observing system for toxigenic *Pseudo-nitzschia*”, Ocean Science Meeting, Honolulu, Hawaii, February 2006.

“Draft framework for a west coast HAB monitoring system”, PaCOOS board of governors meeting, Scripps, La Jolla, CA, December 2005

“Characteristics of the Juan de Fuca eddy, a source of domoic acid to the Washington coast”, coauthored with B. Hickey, E. Lessard, M. Wells, C. Trick, W. Cochlan, Third Symposium on Harmful Algae in the US, Monterey, CA, October 2005

“A seasonal eddy and a coastal upwelling region provide insights to HAB development”. Trainer, VL, BM Hickey, WP Cochlan, E Lessard, Trick, CG and ML Wells.. (presented by C. Trick), Ocean Sciences Conference. UNESCO, Paris. June 2005.

“Pseudo-nitzschia and domoic acid off the Washington coast: the first season of ECOHAB PNW cruises”, Second National Conference on Harmful Algal Blooms, Woods Hole, MA, December 2003.

“Increased Magnitude and Geographical Spread of Harmful Algal Blooms in Puget Sound”, Puget Sound Georgia Basin Research Conference, Vancouver, BC, Canada, April 2003.

“ORHAB”, Invited Speaker, Puget Sound Ambient Monitoring Program meeting, August 2002.

“Offshore Seedbeds for Domoic Acid”, Invited Speaker, 11<sup>th</sup> Annual Conference for Shellfish Growers, Olympia, WA, March 2001.

“Detection of Domoic Acid in the Lab and Field”, Invited Speaker, Session on Harmful Algal Blooms, Puget Sound Research Symposium, Bellevue, WA, February 2001.

“Biological and Physical Dynamics of Domoic Acid Production off the Washington U.S.A. Coast”, poster, 8<sup>th</sup> International Conference on Harmful Algal Blooms, Tasmania, Australia, February 2000.

“West Coast HAB Outreach Projects”, Pacific Rim Shellfish Sanitation Conference, Invited Speaker, Reno, Nevada, March 1999.

“Domoic Acid and Amnesic Shellfish Poisoning: New Technologies and Approaches”, Invited Speaker for the session “Harmful Algal Blooms: Impacts, Trends, and Current Developments”, American Association for the Advancement of Science, Anaheim, CA, January 1999.

“Harmful Algal Bloom Field Study Methodologies”, Invited Speaker, Conference on “Harmful Algal Blooms: The Encroaching Menace” sponsored by Alaska Science and Technology Foundation, Anchorage, AK, January 1999.

"California Coastal Sampling: June 1998", Monterey Bay Aquarium Research Institute Symposium on Domoic Acid, Moss Landing, CA, August 1998.

"West Coast Biotxin Awareness Meeting", Pacific Rim Shellfish Sanitation Conference, Session Organizer with Dr. Wekell, Portland, OR, April 1998.

"New Methods for Toxin Detection", Pacific Rim Shellfish Sanitation Conference, Portland, OR, April 1998.

"Harmful Algal Blooms: from Research to Management", Puget Sound Research '98, Session Chair, Seattle, WA, March 1998.

"Emerging Technologies for Biological and Biochemical Assays of Phycotoxins", VIII International Conference of Harmful Algae, Vigo, Spain, June 1997.

"Development of a Receptor-Based Assay for the Detection of Domoic Acid", AOAC Meeting, Bellingham, WA, June, 1996.

"Marine Biotoxins: Emerging Technologies in Oceanography", University of Washington, Dept. of Oceanography, February, 1996.

"Receptor-Binding Assay for Rapid and Sensitive Detection of Domoic Acid", Tenth Northwest Algal Symposium, Charleston, Oregon, March, 1996.

"Molecular and Immunological Techniques in Toxic Phytoplankton Research", Short Course, Lecturer and Organizer, 7th International Conference on Marine Toxins, Sendai, Japan, July 1995.

"Visionary Summary of the Conference on Mycotoxins and Phycotoxins", Gordon Research Conference, Plymouth, New Hampshire, June, 1995.

"Mapping Neurotoxin Binding Sites on Sodium Channels", Neuroscience Meeting, Neurotoxins in Neuroscience Session, Miami, Florida, November, 1994.

"Synergism of Toxin Binding to Sodium Channels", Invited Lecture, University of Miami, November 1994.

"Localization of the Brevetoxin Receptor Site on the Voltage-Sensitive Sodium Channel" Lecture, Sixth International Conference on Toxic Marine Phytoplankton, Nantes, France, October 1993.

"Detection of Marine Toxins Using Reconstituted Sodium Channels", Invited Lecture, AOAC International, Washington, D.C., July 1993.

"Toxin Receptor Sites on Voltage-Sensitive Sodium Channels", Lecture, Gordon Conference on Mycotoxins and Phycotoxins, Plymouth State College, Plymouth, New Hampshire, July 1993.

"Brevetoxin Enzyme-Linked Immunosorbent Assay: Practical Applications", Poster Presentation, Gordon Conference on Mycotoxins and Phycotoxins, Plymouth State College, Plymouth, N.H., July 1991.

"Immunological Detection of Brevetoxins", Invited Lecture, University of Kiel, Toxicology Division, Kiel, West Germany, July 1989.

"Toxicology", Invited Lecture, Problems of Algal Blooms in Aquaculture, Sherkin Island Marine Station, Cork County, Ireland, June 1989.

"Phytoplankton Blooms of North America and the Carribbean", Lecture, Sherkin Island Marine Station, Cork County, Ireland, June 1989.

"Enzyme Immunoassay of Brevetoxins", Lecture, Fourth International Symposium on Toxic Phytoplankton, Lund, Sweden, June 1989.

"Immunology in Oceanography: Enzyme Immunoassay of Brevetoxins", Lecture, American Geophysical Union, San Francisco, California, December 1988.

## **PROFESSIONAL SOCIETIES**

American Society for Limnology and Oceanography  
American Association for the Advancement of Science  
Harmful Algal Bloom Society  
Society for Neuroscience