Timothy Frederick Duda

Associate Scientist
Applied Ocean Physics and Engineering Department, MS 11
Woods Hole Oceanographic Institution
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Birthplace: Chicago, Illinois *Citizenship:* U. S. A.

Research Interests

Internal gravity waves, ocean turbulence and mixing, ocean acoustic propagation, acoustic remote sensing; recent focus on internal tides, submerged float technology and three-dimensional aspects of acoustic fields.

Education

1979	B.A., Physics, Cum Laude Pomona College, Claremont, CA
1986	Ph.D., Oceanography, Scripps Institution of Oceanography, University of California, San Diego (with Prof. Charles S. Cox)

Professional Experience

1986	Postdoctoral research, Ocean Research Division, Scripps Institution of Oceanography, UC San Diego (with Prof. Charles S. Cox)
1986—1988	Postdoctoral research, Division of Natural Sciences, University of California, Santa Cruz (with Prof. Stanley M. Flatté)
1988—1991	Research Oceanographer, Division of Natural Sciences, University of California, Santa Cruz
1991—1995	Assistant Scientist, Woods Hole Oceanographic Institution
1995—	Associate Scientist, Woods Hole Oceanographic Institution (Tenure, 1999)

Professional Affiliations

Member, American Geophysical Union, 1986 -
Member: American Meteorological Society 1987 -
Member, Acoustical Society of America, 1988 -
Senior Member, Institute of Electrical and Electronics Engineers (IEEE), 2006 -
Member, IEEE Oceanic Engineering Society, 2006 -

Refereed Publications

[1] Long, G. L., W. R. Ellington and T. F. Duda, Comparative enzymology and physiological role of D-lactate dehydrogenase from the foot muscle of two gastropod molluscs, *J. Exp. Zool., 207,* 237-248, 1979.

[2] Duda, T. F., and C. S. Cox, Vorticity measurement in a region of coastal ocean eddies by observation of near-inertial oscillations, *Geophys. Res. Lett., 14,* 793-796, 1987.

[3] Duda, T. F., C. S. Cox and T. K. Deaton, The Cartesian Diver: A self-profiling Lagrangian velocity recorder, *J. Atmos. Oceanic Technol., 5,* 16-33, 1988.

[4] Duda, T. F., S. M. Flatté and D. B. Creamer, Modelling meter-scale acoustic intensity fluctuations from oceanic fine structure and microstructure, *J. Geophys. Res., 93,* 5130-5142, 1988.

[5] Duda, T. F., and C. S. Cox, Vertical wave number spectra of velocity and shear at small internal wave scales, *J. Geophys. Res., 94,* 939-950, 1989.

[6] Flegal, A. R., T. F. Duda and S. Niemeyer, High gradients of lead isotopic composition in north-east Pacific upwelling filaments, *Nature, 339,* 458-460, 1989.

[7] Duda, T. F., Modeling weak fluctuations of undersea telemetry signals, *IEEE J. Oceanic Eng, 16,* 3-11, 1991.

[8] Duda, T. F., S. M. Flatté, J. A. Colosi, B. D. Cornuelle, J. A. Hildebrand, W. S. Hodgkiss, Jr., P. F. Worcester, B. M. Howe, J. A. Mercer and R. C. Spindel, Measured wavefront fluctuations in 1000-km pulse propagation in the Pacific Ocean, *J. Acoust. Soc. Am., 92,* 939-955, 1992.

[9] Duda, T. F., Analysis of finite-duration wide-band frequency sweep signals for ocean tomography, *IEEE J. Oceanic Eng, 18,* 87-94, 1993.

[10] Cornuelle, B. D., P. F. Worcester, J. A. Hildebrand, W. S. Hodgkiss Jr., T. F. Duda, J. Boyd, B. M. Howe, J. A. Mercer and R. C. Spindel, Ocean acoustic tomography at 1000-km range using wavefronts measured with a large aperture vertical array, *J. Geophys. Res., 98,* 16,365-16,377, 1993.

[11] Worcester, P. F., B. D. Cornuelle, J. A. Hildebrand, W. S. Hodgkiss Jr., T. F. Duda, J. Boyd, B. M. Howe, J. A. Mercer and R. C. Spindel, A comparison of measured and predicted broadband acoustic arrival patterns in travel time-depth coordinates at 1000-km range, *J. Acoust. Soc. Am., 95,* 3118-3128, 1994.

[12] Duda, T. F., and J. B. Bowlin, Ray-acoustic caustic formation and timing effects from ocean sound-speed relative curvature, *J. Acoust. Soc. Am., 96,* 1033-1046, 1994.

[13] Duda, T. F., and D. C. Jacobs, Comparison of shear measurements and mixing predictions with a direct observation of diapycnal mixing in the Atlantic thermocline, *J. Geophys. Res., 100,* 13,481-13,498, 1995.

[14] Duda, T. F., R. A. Pawlowicz, J. F. Lynch and B. D. Cornuelle, Simulated tomographic reconstruction of ocean features using drifting acoustic receivers and a navigated source, *J. Acoust. Soc. Am., 98,* 2270-2279, 1995.

[15] Washburn, L., T. F. Duda and D. C. Jacobs, Interpreting conductivity microstructure: Estimating the temperature variance dissipation rate. *J. Atmos. Oceanic Technol., 13,* 1166-1188, 1996.

[16] Preisig, J. C., and T. F. Duda, Coupled acoustic mode propagation through continental shelf internal solitary waves, *IEEE J. Oceanic Eng., 22,* 256-269, 1997.

[17] Duda, T. F., and D. A. Trivett, Predicted scattering of sound by diffuse hydrothermal vent plumes at mid-ocean ridges. *J. Acoust. Soc. Am., 103,* 330-335, 1998.

[18] Duda, T. F., and D. C. Jacobs, Stress/shear correlation: Internal wave/wave interaction and energy flux in the upper ocean, *Geophys. Res. Lett., 25,* 1919-1922, 1998.

[19] Duda, T. F., and J. C. Preisig, A modeling study of acoustic propagation through moving shallow-water solitary wave packets, *IEEE J. Oceanic Eng., 24,* 16-32, 1999.

[20] Rehmann, C. R., and T. F. Duda, Diapycnal diffusivity inferred from scalar microstructure measurements near the New England shelf/slope front, *J. Phys. Oceanogr., 30,* 1354-1371, 2000.

[21] Duda, T. F., and C. R. Rehmann, Systematic microstructure variability in double-diffusively stable coastal waters of nonuniform density gradient, *J. Geophys. Res., 107(C10),* 3144, doi:10.1029/2001JC000844, 2002.

[22] Duda, T. F., Acoustic mode coupling by nonlinear internal wave packets in a shelfbreak front area, *IEEE J. Oceanic Eng., 29,* 118-125, 2004.

[23] Duda, T. F., Finescale shear at 1660 and 2850 decibars over the Mid-Atlantic Ridge in the eastern Brazil Basin, *J. Phys. Oceanogr., 34,* 1281-1292, 2004.

[24] Duda, T. F., J. F. Lynch, J. D. Irish, R. C. Beardsley, S. R. Ramp, C.-S. Chiu, T. Y. Tang and Y. J. Yang, Internal tide and nonlinear internal wave behavior at the continental slope in the northern South China Sea, *IEEE J. Oceanic Eng., 29,* 1105-1130, 2004.

[25] Chiu, C.-S., S. R. Ramp, C. W. Miller, J. F. Lynch, T. F. Duda and T. Y. Tang, Acoustic intensity fluctuations induced by South China Sea internal tides and solitons, *IEEE J. Oceanic Eng., 29,* 1249-1263, 2004.

[26] Duda, T. F., J. F. Lynch, A. E. Newhall, L. Wu, and C.-S. Chiu, Fluctuation of 400 Hz sound intensity in the 2001 ASIAEX South China Sea experiment, *IEEE J. Oceanic Eng., 29,* 1264-1279, 2004.

[27] Ramp, S. R., T. Y. Tang, T. F. Duda, J. F. Lynch, A. K. Liu, C.-S. Chiu, F. Bahr, H.-R. Kim and Y. J. Yang, Internal solitons in the northeastern South China Sea part I: Sources and deep water propagation, *IEEE J. Oceanic Eng., 29,* 1157-1181, 2004.

[28] Beardsley, R. C., T. F. Duda, J. F. Lynch, S. R. Ramp, J. D. Irish, C.-S. Chiu, T. Y. Tang, Y. J. Yang, and G. Fang, Barotropic tide in the northeast South China Sea, *IEEE J. Oceanic Eng., 29,* 1075-1086, 2004.

[29] Wei, R.-C., C.-F. Chen, A. E. Newhall, J. F. Lynch, T. F. Duda, C.-S. Liu and P.-C. Lin, Preliminary examination of the low-frequency ambient noise field in the South China Sea, *IEEE J. Oceanic Eng., 29,* 1308-1315, 2004.

[30] Ledwell, J. R., T. F. Duda, M. Sundermeyer, and H. Seim, Mixing in a coastal environment part I: A view from dye dispersion, *J. Geophys. Res., 109(C10013),* doi:10.1029/2003JC002194, 2004.

[31] Wang, S. Q., L. X. Wu, H. W. Wang, R. H. Zhang, J. F. Lynch, and T. F. Duda, Observations on fluctuations of sound transmission and temperature field from the ASIAEX 2001 South China Sea experiment and inversion of the characterizations of internal tides (waves) *Prog. Nat. Sci., 14,* 793-799, 2004.

[32] Duda, T. F., Ocean sound channel ray path perturbations from internal-wave shear and strain, *J. Acoust. Soc. Am., 118,* 2899-2903, 2005.

[33] Lynch, J. F., J. A. Colosi, G. Gawarkiewicz, T. F. Duda, A. D. Pierce, M. Badiey, B. G. Katznelson, J. H. Miller, W. Siegmann, C.-S. Chiu, and A. Newhall, Consideration of fine-scale coastal oceanography and 3-D acoustics effects for the ESME sound exposure model, *IEEE J. Oceanic Engineering,* 31, 33-48, 2006.

[34] Duda, T. F., Comparison of deep-ocean finescale shear at two sites along the Mid-Atlantic Ridge, *Deep-Sea Research II, 53,* 207-225, 2006.

[35] Duda, T. F., Temporal and cross-range coherence of sound traveling through shallow-water nonlinear internal wave packets, *J. Acoust. Soc. Am.,* 119, 3717-3725, 2006.

[36] Heaney, K. D., G. Gawarkiewicz, T. F. Duda and P. F. J. Lermusiaux, Non-linear optimization of autonomous undersea vehicle sampling strategies for oceanographic data assimilation, *J. Field Robotics, 24,* 437-448, 2007.

[37] Tang, D. J., J. N. Moum, J. F. Lynch, P. Abbot, R. Chapman, P. Dahl, T. Duda, G. Gawarkiewicz, S. Glenn, J. A. Goff, H. Graber, J. Kemp, A. Maffei, J. Nash and A. Newhall, Shallow Water 2006: a joint acoustic propagation/nonlinear internal wave physics experiment, *Oceanography, 20(4),* 156-167, 2007.

[38] Duda, T. F. and L. Rainville, Diurnal and semidiurnal internal tide energy flux at a continental slope in the South China Sea, *J. Geophys. Res. C (Oceans), 113,* C03025, 2008.

[39] Collis, J. M., T. F. Duda, J. F. Lynch, and H. A. Deferrari, Observed limiting cases of horizontal field coherence and array performance in a time-varying internal wavefield, *J. Acoust. Soc. Am., 124,* EL97-EL103, 2008.

[40] Duda, T. F., Revisiting experimental methods for studies of acidity-dependent ocean sound absorption, *J. Acoust. Soc. Am., 125,* 1971-1981, 2009.

[41] Li, Q., D. M. Farmer, T. F. Duda, and S. Ramp, Acoustical measurement of nonlinear internal waves using the inverted echo sounder, *J. Atmos. Oceanic Technol., 26,* 2228-2242, 2009.

[42] Lin, Y.-T., T. F. Duda, and J. F. Lynch, Acoustic mode radiation from the termination of a truncated nonlinear internal gravity wave duct in a shallow ocean area, *J. Acoust. Soc. Am., 126,* 1752-1765, 2009.

[43] Lynch, J. F., Y.-T. Lin, T. F. Duda and A. E. Newhall, Acoustic ducting, reflection, refraction, and dispersion by curved nonlinear internal waves in shallow water, *IEEE J. Oceanic Engineering,*, accepted for publication, 2010.

Other Publications

Duda, T. F., *Observations of Horizontal Flow, Vertical Shear and Microstructure in the Upper Ocean,* Ph. D. Dissertation, University of California, San Diego, 151 pages, 1986.

Duda, T. F., and S. M. Flatté, Remote sensing of ocean turbulence using unsaturated acoustic transmission, in *Preprints from the Eighth Symposium on Turbulence and Diffusion,* American Meteorological Society, pp. 168-171, 1988.

Duda, T. F., and C. S. Cox, Quasi-Lagrangian measurements of microstructure and shear near a front in the coastal California thermocline, Scripps Inst. Oceanog. Reference Series 88-15, 33 pages, 1988.

Howe, B. M., J. A. Mercer, R. C. Spindel, P. F. Worcester, J. A. Hildebrand, W. S. Hodgkiss, Jr., T. F. Duda and S. M. Flatté, SLICE89: A single slice tomography experiment, in *Proceedings of the Workshop on Ocean Variability and Acoustic Propagation*, J. Potter and A. Warn-Varnas, Eds., Kluwer, pp. 81-86, 1991.

Flatté, S. M., J. Colosi, G. L. Rovner and T. F. Duda, Impulse response analysis of ocean acoustic propagation, in *Proceedings of the Workshop on Ocean Variability and Acoustic Propagation,* J. Potter, A. Warn-Varnas, Eds., Kluwer, pp. 161-172, 1991.

Duda, T. F., and J. F. Lynch, Smoothly modulated frequency-bounded impulse signals for tomography, Woods Hole Oceanographic Institution Tech. Rept. WHOI-91-13, 19 pages, 1991.

Cornuelle, B. D., P. F. Worcester, J. A. Hildebrand, W. S. Hodgkiss, Jr., T. F. Duda, B. M. Howe, J. A. Mercer and R. C. Spindel, Vertical slice ocean acoustic tomography at 1000-km range in the North Pacific Ocean, Scripps Inst. Oceanog. Reference Series 92-17, 44 pages, 1992.

Bowlin, J. B., J. L. Spiesberger, T. F. Duda and L. E. Freitag, Ocean acoustical ray-tracing software RAY, WHOI Tech Rept., WHOI-93-10, 47 pages, 1993

Duda, T. F., and D. C. Jacobs, Stress/shear correlation: Observations of internal wave/wave interaction and energy flux in the upper ocean, in *Preprints from the 11th Conference on Atmospheric Oceanic Fluid Dynamics,* American Meteorological Society, pp. 287-291, 1997.

Duda, T. F., and D. C. Webb, The drifting, rotating deep-ocean shearmeter, in *Oceans'97 Conference Proceedings,* MTS/IEEE, pp. 794-799, 1997.

Duda, T. F., C. R. Rehmann and J. R. Ledwell, Mixing in a Bottom Layer Associated with the New England Shelf/Slope Water Front, in Coastal Ocean Processes Symposium: A tribute to William D. Grant, WHOI Tech Rept., WHOI-99-04, pp. 57-60, 1999.

Duda, T. F., and D. M. Farmer, Editors, *The 1998 WHOI/IOS/ONR Internal Solitary Wave Workshop: Contributed Papers*. WHOI Tech. Rept., WHOI-99-07, 251 pages, 1999.

Duda, T. F., and J. C. Preisig, Acoustic mode coupling within internal solitary wavs and wave groups, in *The 1998 WHOI/IOS/ONR Internal Solitary Wave Workshop: Contributed Papers*. WHOI Tech. Rept., WHOI-99-07, 22-28, 1999.

Newhall, A., L. Costello, T. Duda, J. Dunn, G. Gawarkiewicz, J. Irish, J. Kemp, N. McPhee, S. Liberatore, J. Lynch, W. Ostrom, T. Schroeder, R. Trask, and K. Von der Heydt, Preliminary acoustic and

oceanographic observations from the ASIAEX 2001 South China Sea Experiment, WHOI Tech. Rept., WHOI-2001-12, 93 pages, 2001.

Duda, T. F., B. J. Guest, C. M. Wooding, C. M. Jones, S. Lelievre, and D. C. Webb, Shearmeter floats in the area of the WHOI Brazil Basin Tracer Release Experiment: Technical and Oceanographic Data, WHOI Tech. Rept., WHOI-2002-01, 44 pages, 2002.

Duda, T. F., Relative influences of various environmental factors on 50-1000 Hz sound propagation in shelf and slope areas, in *Impact of Littoral Environmental Variability on Acoustic Predictions and Sonar Performance,* N. G. Pace and F. B. Jensen, Eds., Kluwer, Dordrecht, pp. 393-400, 2002.

Duda, T. F., Internal wave effects on acoustic propagation, in *Proceedings of 1st International Conference on Underwater Acoustic Measurements: Technologies and Results,* J. S. Papadakis and L. Bjorno, Eds., 2005.

Heaney, K. D., and T. F. Duda, Non-linear optimization of multi-vehicle ocean sampling networks for cost-effective ocean prediction studies, in *Oceans'06 (Singapore) Conference proceedings,* IEEE/MTS, May 2006.

Duda, T. F., A. K. Morozov, B. M. Howe, M. G. Brown, K. Speer, P. Lazarevich, P. F. Worcester, and B. D. Cornuelle, Evaluation of a long-range joint acoustic navigation/thermometry system, in *Oceans'06 (Boston) Conference proceedings,* IEEE/MTS, Sept 2006. (6 pp.)

Duda, T. F., B. M. Howe and B. D. Cornuelle, Acoustic systems for global observatory studies, in *Oceans '06 (Boston), Conference proceedings,* IEEE/MTS, Sept 2006. (6 pp.)

Duda, T. F., Initial results from a Cartesian three-dimensional parabolic equation acoustical propagation code, WHOI Tech. Rept., WHOI-2006-14, 2006. (20 pp.)

Duda, T. F., B. M. Howe and J. H. Miller, Acoustics in global process ocean observatories, *Sea Technology, 48,* 35-38, 2007.

Duda, T. F., Examining the validity of approximations to fully three-dimensional shallow-water acoustic propagation through nonlinear gravity waves, in *Oceans'07 (Aberdeen) Conference proceedings,* IEEE, June 2007. (5 pp.)

Duda, T. F., and J. Collis, Acoustic field coherence in four-dimensionally variable shallow water environments: Estimation using co-located horizontal ans vertical line arrays, in *Proceedings of 2nd International Conference on Underwater Acoustic Measurements: Technologies and Results,* J. S. Papadakis and L. Bjorno, Eds., 2007 (8 pp.)

Irish, J. D., J. F. Lynch, J. N. Kemp, T. F. Duda and A. E. Newhall, A moored array for measuring internal solitary waves during Shallow Water 06, Oceans 2007 Vancouver Conference Proceedings, doi 10.1109/OCEANS.2007.4449170, 2007 (6 pp.)

Newhall, A. E., T. F. Duda, K. von der Heydt, J. D. Irish, J. N. Kemp. S. A. Lerner, S. P. Liberatore, Y.-T. Lin, J. F. Lynch, A. R. Maffei, A. K. Morozov, A. Shmelev, C. J. Sellers, W. E. Witzell, Acoustic and oceanographic observations and configuration information for the WHOI moorings from the SW06 experiment, Woods Hole Oceanog. Inst. Tech. Rept., WHOI-2007-04, 2007.

Reeder, D. B., T. F. Duda and B. Ma, Short-range acoustic propagation variability on a shelf area with strong nonlinear internal waves, in *Oceans '08 Kobe Conference Proceedings,* IEEE, April 2008 (8 pp.)

Duda, T. F. and A. D. Pierce, History of environmental acoustics, 1960's to 2000's, in *Oceans '08 Quebec Conference Proceedings,* IEEE/MTS, September 2008 (7 pp.)

Duda, T. F., S. M. Faluotico, E. M. Hobart, J. Ware, and S. Lelievre, The variable-buoyancy drifting DIMES shearmeter instrument, in *Oceans '09 Bremen Conference Proceedings,* IEEE, May 2009 (5 pp.)

Dushaw, B., W. Au, A. Beszczynska-Möller, R. Brainard, B. Cornuelle, T. Duda, M. Dzieciuch, E. Fahrbach, A. Forbes, L. Freitag, J.-C. Gascard, A. Gavrilov, J. Gould, B. Howe, S. Jayne, O. M. Johannessen, J. Lynch, D. Martin, D. Menemenlis, P. Mikhalevsky, J. H. Miller, W. H. Munk, J. Nystuen, R. Odom, J. Orcutt, T. Rossby, H. Sagen, S. Sandven, J. Simmen, E. Skarsoulis, R. Stephen, S. Vinogradov, K. B. Wong, P. F. Worcester, and C. Wunsch, A Global Ocean Acoustic Observing Network, Community white paper, in *Proceedings of "Ocean information for society: sustaining the benefits, realizing the potential, OceanObs'09",* September 21-25, 2009, Venice, Italy, 2009.

Sagen, H., S. Sandven, A. Beszczynska-Moeller, O. Boebel, T. F. Duda, L. Freitag, J. C. Gascard, A. Gavrilov, C. M. Lee, D. K. Mellinger, P. Mikhalevsky, S. Moore, A. K. Morozov, M. Rixen, E. Skarsoulis, K. Stafford, E. Tveit, and P. F. Worcester, Acoustic technologies for observing the interior of the Arctic Ocean, in *Proceedings of "Ocean information for society: sustaining the benefits, realizing the potential, OceanObs'09",* September 21-25, 2009, Venice, Italy, 2009.

Workshops and Panels

WOCE *Ad Hoc* Motional Electromagnetic Measurements Group, UW-APL, February 1989.

Office of Naval Research Acoustic Tomography Review, Arlington VA, November 1989.

North Atlantic Current Workshop, University of Rhode Island, March 1992.

ONR Shallow-Water Acoustics Workshop, Naval Research Lab, Stennis Space Center, October 1996.

ONR Long-Range Acoustics Workshop, Lake Arrowhead, CA, March 1997.

ONR/IOS/WHOI Internal Solitary Wave Workshop, October 1998 (See ''Other Professional Activities'').

ONR Acoustic Observatory/Robust Passive Sensor (AO/RPS) Testbed Workshop, Newport, RI, June 2002.

ONR Internal Solitary Wave Workshop, Williamsburg, VA, July 2003.

ONR Nonlinear Littoral Internal Wave and Assessing the Effectiveness of Parameterizations Workshops, Herndon, VA, May 2004.

ONR Nonlinear Littoral Internal Wave Initiative Workshop, San Fransicso, CA, August 2005.

ORION Observatory OOI Design and Implementation Workshop, Salt Lake City, March 27-30 2006.

NRL-sponsored Sensor Fusion meeting, December 2006.

NSF Workshop on Strongly Nonlinear Internal Waves, New Jersey Institute of Technology, March 19, 2007

Four ONR Shallow-Water'06/Nonlinear Internal Wave Workshops, 2007, 2008(2) and 2009.

DIMES Southern Ocean Workshop, 2008.

Naval Research Lab. Technical Metrics Workshop, 2008.

Oceanographic Cruises and Field Work

July 1980: *RV Ellen B. Scripps*, San Diego, CA, Chief Scientist C. Cox. Cartesian Diver velocity and microstructure profiler testing.

June 1980: *RV Melville*, San Diego, CA to La Paz, BCS Mexico, Co-chief Scientists J. McClain and K. McDonald. Navigated-cable ocean bottom seismometer array deployment at East Pacific Rise (21 N); bottom dredging.

November 1980: *RV New Horizon*, San Diego, CA, Co-Chief Scientists C. Cox and L. Regier. AMETEK ADCP testing against VMCM mooring; Cartesian Diver profiler deployment.

November 1983: *RV Acania*, Monterey, CA, Co-Chief Scientists T. P. Stanton and R. Lueck. Cartesian Diver deployment; concurrent turbulent dissipation profiling (CAMEL 2); mixed-layer tow-yoing near the drifting platform R/P *FLIP* (MILDEX program).

March 1984: *RV Ellen B. Scripps*, San Diego, CA, Chief Scientist C. Cox. Cartesian Diver velocity profiling in San Diego Trough; electric field recorder tests.

May 1984: *MV Fisherette*, San Diego, CA, Chief Scientist T. Duda. Cartesian Diver velocity profiling in San Diego Trough.

August 1984: *RV John D. Isaacs*, San Diego, CA, Chief Scientist T. Duda. Cartesian Diver velocity profiling in a coastal jet offshore of San Luis Obispo, CA.

April 1985: *RV Robert G. Sproul*, San Diego, CA, Chief Scientist C. Cox. Cartesian Diver profiling west of Baja California; attempted drag recovery of stranded active electromagnetic crustal sounding gear.

September 1985: *MV Sand Dollar*, San Diego, CA, Chief Scientist T. Duda. Cartesian Diver velocity profiling in San Diego Trough.

October 1985: *MV Sand Dollar*, San Diego, CA, Chief Scientist T. Duda. Cartesian Diver velocity profiling in San Diego Trough.

August 1988: *RV Columbus Iselin*, Miami, FL, Chief Scientist H. Deferrari. Set and recover deep-sea acoustic source and receiver array moorings for a 300-km propagation study. (Two 6-day trips.)

May 1989: *RV Columbus Iselin*, Miami, FL, Chief Scientist H. Deferrari. Set and recover source and receiver moorings for acoustic propagation study. (Two 6-day trips.)

April/May 1993: *CSS Hudson*, Halifax, NS, Canada to Las Palmas, Gran Canaria, Spain, Chief Scientist N. Oakey. Sample J. Ledwell's intentional-release chemical tracer; sample microstructure; Cartesian Diver velocity profiling (NATRE mixing study, 39 days).

September 1995: *RV Oceanus*, Woods Hole, MA, Chief Scientist J. Ledwell. Inject and sample dye; physical measurements (Coastal Mixing and Optics (CMO) Tracer Diffusion Expt., 6 days).

September 1995: Shearmeter testing at Seneca Lake, New York, with Douglas Webb (Webb Research Corp.). Small boats.

June 1996: Shearmeter testing at Seneca Lake, New York, with Douglas Webb and Clayton Jones (Webb Research Corp.). Small boats.

September 1996: *RV Oceanus*, Woods Hole, MA, Chief Scientist J. Ledwell. Inject and sample dye; physical measurements; microstructure profiling (EPSONDE, N. Oakey) (CMO, 14 days).

August 1997: *RV Oceanus*, Woods Hole, MA, Chief Scientist J. Ledwell. Inject and sample dye; physical measurements; microstructure profiling (EPSONDE, N. Oakey); towed microstructure recording (CMO, 14 days).

April 2000: *RV Revelle*, Pusan, Korea to Kaohsiung, Taiwan, Chief Scientist J. Lynch. ASIAEX pilot study: moorings, CTD, bottom sampling, seismic survey. (20 days)

February 2001: *RV Oceanus*, Bridgetown, Barbados to Fortaleza, Brazil, Chief Scientist R. Limeburner. Mooring and CTD's in Antarctic Bottom Water at the equator in the Atlantic; deployment of Shearmeter abyssal drifting floats in the Guiana Basin. (14 days)

April 2001: *RV Ocean Researcher 1*, Kaohsiung, Taiwan, Chief Scientist Y. J. Yang. ASIAEX South China Sea mooring deployment cruise, instruments deployed at 31 sites, CTD's. (7 days)

May 2001: *RV Ocean Researcher 1*, Kaohsiung, Taiwan, Chief Scientist Y. J. Yang. ASIAEX South China Sea mooring recovery cruise. Mooring recoveries, CTD casts, compromised mooring search, drag, and salvage. (8 days)

August 2004: *RV Endeavor*, Narragansett, RI, Chief Scientist T. Duda. Towed instrument study of continental shelf turbulent mixing. (7 Days)

July-Sept. 2006: *RV Knorr*, Woods Hole, MA, Chief Scientist J. Lynch. ONR SW06 mooring cruises. Environmental and acoustic mooring deployment and recovery. (2 cruises, 17 days total)

May 2008: *RV Robert Gordon Sproul*, San Diego, CA. Chief Scientist T. Duda. DIMES Shearmeter testing in San Diego Trough. (3 days)

Sept. 2009: *RV Ocean Researcher 1*, Keelung, Taiwan, Chief Scientist Y.-J. Yang. ONR QPE program adaptive acoustic and environmental sampling NE of Taiwan. (8 days)

Journal and Book Reviews

Cambridge University Press

Continental Shelf Research

Deep-Sea Research

Geophysical Research Letters

IEEE Journal of Oceanic Engineering

Journal of Atmospheric and Oceanic Technology

Journal of Geophysical Research

Journal of Marine Research

Journal of Ocean Technology

Journal of Physical Oceanography

Journal of the Acoustical Society of America
Marine and Freshwater Research
U.S. Navy Journal of Underwater Acoustics

Government Service

Natural Environment Research Council-UK: Reviewer

Natural Sciences and Engineering Research Council of Canada: Reviewer

U.S. National Science Foundation Reviewer (Physical Oceanography, Polar Programs, Ocean Instrumentation)

U.S. National Science Foundation Panel (Geoscience Instrumentation SBIR, twice)

Other Professional Activities

ONR/IOS/WHOI Workshop: Internal Solitary Waves in the Ocean: Their Physics and Implications for Acoustics, Biology and Geology, October 1998. Co-organizer with Dr. David Farmer of IOS.

Member and Chair, WHOI Scientific Staff Executive Committee. (3-yr term)

Member and Chair, WHOI Staff Committee. (3-yr term)

Chair, IEEE-OES Technical Committee on Environmental Acoustics, 2005- .

Member, Technical Committee on Acoustical Oceanography (AO), Acoustical Society of America (Two 3-yr terms)

Member, ASA-AO Subcommittee on Integrated Acoustics Systems for Ocean Observatories (IASOO)

Society Meeting organization:

Acoustical Society of America (ASA) meeting technical program organizer (TPOM; twice)
Oceans '08 Kobe meeting (Asian Seas Acoustics session organizer)
Spring 2009 ASA meeting (Coherence and Acoustical Sensing session organizer)
Fall 2009 ASA meeting (Ocean acidity and acoustics session organizer; S. Flatté session co-organizer)

Advisor of one WHOI Postdoctoral Fellow (Chris Rehmann), one Joint Program PhD student (Jinshan Xu) and one WHOI Summer Student Fellow (Ngoc Tran)

PhD thesis committee member, three WHOI/MIT joint program students, one URI student, one Northeastern University student. Thesis reader, two University of New South Wales students.