

CURRICULUM VITAE

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SUMMARY

Throughout my career I have managed teams of ocean scientists and engineers, and conducted interdisciplinary research in ocean acoustics. I have made significant contributions to fish acoustics, marine mammal bioacoustics, physical oceanography, arctic science and marine geoaoustics. As a result, I have developed close associations with scientists from a broad spectrum of oceanographic disciplines. While at the Naval Research Laboratory I collaborated with scientists at the Woods Hole Oceanographic Institution, Scripps Institution of Oceanography, Harvard University and the NOAA National Marine Fisheries Science Centers. When I was Chief Scientist of the NATO Undersea Research Center, I collaborated with oceanographers from Ifremer (France's NOAA) and interacted with European Union Marine Science and Technology Program Managers. While at APL I chaired a multi-agency working group on the geoaoustics of the upper crust.

I am familiar with, and have interacted with Program Managers from ONR, NSF and NOAA. I have contributed to the NSF Ocean Observatory Program, participated in NOAA sponsored workshops on fisheries science, and contributed to Census of the Fishes Workshops. I have an excellent publication record, and have published a book. I am considered by my peers to be an excellent speaker, and am skilled at presenting complex concepts in readily understood terms to a lay audience.

Contributions to sonar design. While I was Head, Applied Acoustics Branch, Naval Research Laboratory, I formulated a sonar concept that enhanced the range of an existing sonar by a factor of five. I led a classified program that culminated in realization of the increase in detection range

and received an award from the Office of Naval Research (ONR's highest annual award for development of a new technology).

Contribution to fish acoustics. In my previous positions as Research Physicist, Marine Bioacoustics at the Naval Research Laboratory, and as Chief Scientist of the NATO Undersea Research Centre, I designed and directed the construction of novel instruments that permit estimation of the numbers and lengths of fish from measurements of transmission loss in littoral environments. I have been granted a patent for the design of these instruments. I collaborated with Ifremer in France and the Southwest Fisheries Science Center in San Diego, and organized multi-disciplinary, pioneering experiments that demonstrated the power of this method.

Contributions to marine mammal science. In my present position as Research Physicist at the Johns Hopkins University Applied Physics Laboratory, I formulated the theory that pairs of humpback whales detect frequency dependent resonant absorption of broadband signals at the resonance frequencies of fish swim bladders to detect and classify schools of fish, prior to casting their "bubble nets".

Contributions to Marine Geoacoustics. I have a well established record for my contributions to marine geoacoustics. I developed an effective method for accurate measurement of the physical properties of the upper oceanic crust, and coordinated, designed and directed a series of experiments to investigate the temporal evolution of the physical properties of the upper crust, in co-operation with the Scripps Institute of Oceanography, Lamont Doherty Geological Observatory and the Canadian Defense Research Establishment Pacific. I was the first scientist to accurately measure the anomalously low sound speed of newly formed, highly porous, upper crust near mid ocean ridges. While at APL I served as Chair of the Ardent Program's multi-agency working group on the geoacoustics of the upper crust, and was the lead author of the report on the geoacoustics of the upper crust at the Ardent 4 site.

Contribution to physical oceanography. During my tour as Head of the Applied Acoustics Branch at the Naval Research Laboratory I led a multidisciplinary, basic research program that firmly established matched field processing as a powerful, new method for probing temperature profiles of the ocean over great distances. This effort was conducted in collaboration with scientists at major oceanographic laboratories, including the Scripps Institution of Oceanography and Harvard University. I was awarded a patent for developing the method, based on matching of measured and calculated acoustic interference patterns. Subsequently, I was named Chief Scientist of the ONR sponsored High Gain Initiative's experimental program. In that capacity I interacted with the leading scientists in the oceanographic, acoustic, and signal processing communities in the United States, and provided reviews of my progress to the Jason Committee, and to the highest levels of ONR management. In 1998 I was awarded one of the Naval Research Laboratory's 75th Anniversary Awards for Innovation, for development of "Matched field processing", selected to be one of NRL's 75 most important contributions to science.

Contributions to Arctic Science. I have a well established record for my contributions in arctic science. I formulated the fundamental relationship between sea ice ridges and under-ice scattering, discovered the phenomenon of acoustic noise generation through ocean wave interaction with sea ice, and developed a tomographic approach for inverting and long term monitoring of sea ice parameters in the Arctic Ocean. My discovery of the phenomenon of noise generation at the ice-water boundary led to a multi-year, multimillion, international, ONR-led research program directed at understanding the phenomenology of this effect. My model of the effects of sea ice ridges on reflection loss has been incorporated into Navy models of transmission loss in the Arctic Ocean.

Publications. The results of my research, including my most recent work on estimation of bio-acoustic parameters of fish in littoral environments, have been documented in numerous publications. I have delivered many invited talks at scientific conferences, including the Plenary Lecture at the Oceans 92 Conference. I organized a conference on full field inversion methods; the Proceedings have been published by Plenum, as part of its series on Modern Approaches in Geophysics. I recently presented invited talks on biomass estimation from absorption spectroscopy measurements, and on marine mammal vocalizations at meetings of the American Fisheries Society, the Ocean Engineering Society and the Acoustical Society of America.

WORK EXPERIENCE

JOHNS HOPKINS UNIVERSITY APPLIED PHYSICS LABORATORY

Title: **Senior Research Physicist**

Period: February 2005 to present

NAVAL RESEARCH LABORATORY

Title: **Senior Research Physicist**

Period: April 1996 to February 2005

NATO UNDERSEA RESEARCH CENTRE

Title: **Chief Scientist**

Period: September 1992 to April 1996

NAVAL RESEARCH LABORATORY

Title: **Supervisory Research Physicist; Head of Applied Acoustics Branch**

Period: 1983- 1992

Title: **Supervisory Physicist; Head of Ambient Noise Section**

Period: 1976-1983

NAVAL OCEANOGRAPHIC OFFICE

Title: **Supervisory Oceanographer; Head of Boundary Effects Branch**

Period: 1975-1976

Title: **Oceanographer**

Period: 1970-1975

AWARDS

Naval Research Laboratory's 75th Anniversary Awards for Innovation, for development of "Matched field processing" (selected to be one of NRL's 75 most important contributions to science), 1998.

Patent for instruments and method for inversion of bio-acoustic parameters of fish from broadband transmission loss measurements, 2002.

Patent for Full Field Inversion Method, 1994.

Office of Naval Research (Office of Naval Technology) annual award for development of novel sonar concept.

Technical Chairman of the Meeting of the Acoustical Society of America, Baltimore, Md., 1991.

RECENT PUBLICATIONS (SINCE 1990)

Diachok, O. (2011), “Bioacoustic absorption/scintillation spectroscopy based classification of fish by size and depth. (A), J. Acoust. Soc. Am. **129**, 2695.

Diachok, O. (2011), Experimental evidence of bubble cloud resonances of fish schools. (A), *Invited*, J. Acoust. Soc. Am. **128**, 2278 (2010)

Orest Diachok, O. (2010) “Impact of David Weston’s discoveries on bio-acoustical oceanography”, *Invited*, Sonar Symposium in honor of David Weston, Cambridge, UK.

Orest Diachok and Fred Duennebier (2010), “Blue whale vocalizations and the seasonal variability of ambient noise levels at the Aloha Observatory”, Proceedings of the 159th Meeting of the Acoustical Society of America, April 21, 2010.

Diachok, O., S. Lutz and J. Cooper, S. Wales and T. Hayward, R. Dicus (2010), “Recommended geoacoustic model for transmission loss and ambient noise calculations in the vicinity of the Ardent 4 site”, APL Report NSTD-09-0814.

Diachok, O. (2009), Bioalpha, transmission loss and validation of scattering models in biologically intense shallow water environments. (A), *Invited*, J. Acoust. Soc. Am. **125**, 2643

Diachok, O (2008), “Bio-alpha, transmission loss and modeling of biological scattering”, Proceedings of the NATO Undersea Research Centre Conference on Reverberation and Clutter, *Invited*.

Diachok, O. (2006) “Do humpback whales exploit bioacoustic absorption spectroscopy to detect and classify fish schools ?” J. Acoust. Soc. Am., **119**, 3373.

Diachok, O. (2006). “Whale bubble nets and trumpet sounds for identifying and catching herring”, *Invited presentation* for the press, 151st Meeting of the Acoustical Society of America, Newport RI., and *Invited* presentation, radio program of the American Association for the Advancement of Science.

Diachok, O. and S. Wales (2005). “Concurrent inversion of bio and geo-acoustic parameters from transmission loss measurements in the Yellow Sea”, J. Acoust. Soc. Am., **117**, 1965-1976.

Diachok, O. (2005) “Contribution of fish with swim bladders to scintillation of transmitted signals” (*Invited*), in Proceedings of the First Conference on Underwater Acoustic Measurements: Technologies and Results, J. Papadakis and L Bjorno (Editors), Heraklion, Greece.

Diachok, O. (2005). "Bioacoustic absorption spectroscopy: a new approach to monitoring the number and lengths of fish in the ocean" (*Invited*), in *Sounds in the Sea: from Ocean Acoustics to Acoustical Oceanography*, H. Medwin, Editor, Cambridge University Press, New York.

Diachok, O. (2002), "Bioacoustic absorption spectroscopy: estimation of the biomass of fish with swim bladders" (*Invited*), *Bioacoustics*, 12, 271-274.

Diachok, O. (2001), "Interpretation of the spectra of energy scattered by dispersed anchovies", *J. Acoust. Soc. Am.*, 110, 2917-2923.

Diachok, O., B. Liorzou and C. Scalabrin (2001). "Estimation of the number density of fish from resonance absorptivity and echo sounder data", *ICES Journal of Marine Science*, 58, 137-153.

Diachok, O. (2000), "Absorption spectroscopy: a new approach to estimation of biomass" (*Invited*), *Fisheries Research*, 47, 231-244.

Diachok, O. (1999), "Effects of absorptivity due to fish on transmission loss in shallow water", *J. Acoust. Soc. Am.*, 105, 2107-2128.

Diachok, O., A. Caiti, P. Gerstoft and H Schmidt (Editors). (1995), *Full Field Inversion Methods in Ocean and Seismo-Acoustics*, Plenum, Dordrecht.

Diachok, O., R. Heitmeyer, E. Livingston, and R. Smith (1995), "Stochastic bathymetric effects on matched field processing", in *Full Field Inversion Methods in Ocean and Seismo-Acoustics*, O. Diachok, A. Caiti, P. Gerstoft and H Schmidt (Editors), Plenum, Dordrecht.

Diachok, O. and J. Preston (1994), "Effects of bottom reflectivity on volume (fish) and bottom reverberation in shallow water, in *Proceeding of the Oceans 94 Conference*, Brest, France.

Diachok, O. (1994), "Full field inversion methods", *Invited Tutorial*, in *Proceedings of the Oceans 94 Conference*, Brest, France.

Wolf, J., O. Diachok, T.C. Yang and S. Wales (1993), "Very low frequency under-ice reflectivity", *J. Acoust. Soc. Am.*, 93.

Diachok, O. (1992), "Advanced acoustic instrumentation and experimental design for matched field ocean monitoring" (*Invited Plenary Lecture*), in *Proceedings of the Oceans 92 Conference*, Newport, R.I.

Kerangelen, K. and O. Diachok (1992), "Experimental demonstration of sound speed inversion with matched field processing", *J. Acoust. Soc. Am.*, 93.

Abbott, D. C. Stein and O. Diachok (1992), "Topographic relief, sediment thickness and spreading rate: their effects on thermal evolution of the oceanic crust", *Geophysical Research Letters*, 19, 1975-8.

Tolstoy, A., O. Diachok and N. Frazer (1991), "Acoustic tomography via matched field processing", *J. Acoust. Soc. Am.*, 89, 1119.

Diachok, O. et al. (1991) "Compressional and shear velocities in the upper crust", in *Shear Waves in Marine Sediments*, Jens Hovem (Editor), Kluwer, Dordrecht.

