

CURRICULUM VITAE: ANN ELIZABETH GARGETT

January 2009

Present Position: Emerita Professor
Center for Coastal Physical Oceanography
Department of Ocean, Earth and Atmospheric Sciences
Old Dominion University
Norfolk VA 23529 USA

Emerita Senior Scientist
Institute of Ocean Sciences, Patricia Bay
9860 West Saanich Rd.
Sidney, B. C. V8L 4B2 Canada

Citizenship: Canadian

Advanced Degrees:

1966 BSc. (Hons.) in Mathematics and Physics, University of Manitoba
1970 PhD. (Physics), University of British Columbia

Professional History:

1966 Summer Woods Hole Oceanographic Institution, Summer Student Fellow

1967-1970 National Research Council of Canada Graduate Scholarships, for graduate program at the Institute of Oceanography, University of British Columbia

1969 Summer NATO Student Fellow, Advanced Study Institute in Fluid Dynamics, Bangor, Wales

1971 NATO Post-Doctoral Fellowship, held at the National Institute of Oceanography (now S.O.C.), U.K.

1972 Research Scientist 2, Institute of Ocean Sciences, Patricia Bay

1977 Guest Investigator, Woods Hole Oceanographic Institution

1980 Visiting Scientist, Department of Oceanography, University of Washington

December 1982 - June 1983 Green's Fellow at Institute of Geophysics and Planetary Physics, Scripps Institution of Oceanography

1984 Research Scientist 3, Institute of Ocean Sciences, Patricia Bay

1989 Research Scientist 4, Institute of Ocean Sciences, Patricia Bay

1992 Research Scientist 5, Institute of Ocean Sciences, Patricia Bay

1994-1995 Visiting Scientist, Centre IFREMER, Brest, France

2001-2008 Professor, Dept. of Ocean Earth and Atmospheric Sciences
Old Dominion University

2001- Emerita Scientist, Institute of Ocean Sciences, Patricia Bay
2005- Adjunct Professor, Skidaway Institute of Oceanography, University of Georgia
2008- Emerita Professor, Old Dominion University

Science Service Activities:

1990-96 Associate Editor, Journal of Physical Oceanography
1991-1994 Member: AGU Regional Advisory Committee for United States and Canada
1996-1999 Council of The Oceanography Society
1997-2000 NSERC (Natural Sciences and Engineering Research Council) Grant Selection Committee, Environmental Earth Sciences
1997-2001 SCOR WG-108 on Double Diffusion in Oceanography
1999-2003 NATO Advisory Panel of the Environmental and Earth Science and Technology Sub-Program
1999 Member, Research Review Committee for the Scripps Institution of Oceanography
1999-2001 Section Editor (Dispersion and Diffusion), The Encyclopedia of Oceanography
2000 - 2001 Science Committee for NEPTUNE Canada
2001 Member, Dalhousie University Oceanography Department Review Committee
2002-2004 Member of Scientific Steering Committee, Coastal Ocean Processes (CoOP) Project
2002 Member of Scientific Steering Committee, Scientific Cabled Observatories for Time Series (SCOTS)
2002-2003 Member NAS/NRC Committee on the Implementation of Seafloor Observatories
2003- Board of Editors, Journal of Marine Research
2004 Member, ORION Committee on Sensors for Ocean Observatories
2004 Member, ORION Committee on Coastal Observing Systems
2005 Chair, Visiting Committee for the Physical Oceanography Dept, Woods Hole Oceanographic Institution

- 2005-6 Member, Regional Cabled Observatory Joint Advisory Committee (RCOJAC) for ORION-NeptuneCanada
- 2006- Member, ORION STAC (Science and Technology Advisory Committee)

Awards and Recognition:

- 1991 Fellow of the Royal Society of Canada, Science Academy (Canadian equivalent of the U. S. National Academy of Science)
- 1991 H. Burr Steinbach Visiting Scholar, Woods Hole Oceanographic Institution/MIT Joint Program
- 1992 Editor's Award, American Meteorological Society
- 1993 Editor's Award, Journal of Geophysical Research (Oceans)
- 1994 Invited speaker, Pacific Northwest Oceanography Graduate Students Retreat
- 1996 Science Visitor, Dalhousie University Oceanography Graduate Student Society
- 2003 Inaugural "Henry Stommel Visiting Scholar", Woods Hole Oceanographic Institution

Invited Plenary Lectures:

Joint Oceanographic Assembly: Halifax, 1982

The Oceanography Society Inaugural Meeting, Monterey, 1989.

NATO Advanced Study Institute in "Advanced Physical Oceanographic Numerical Modelling", 1985

ASLO Special Symposium "What controls phytoplankton production in nutrient-rich areas of the open sea?", Feb. 1991.

The Oceanography Society Meeting, "Fluxes in the Vertical Ocean", April 1997.

Chapman Conference on "Coastal Oceanography", June 1997.

ICES Symposium on "Recruitment Dynamics of Exploited Populations: Physical-Biological Interactions", September 1997.

University of Washington Warren Wooster Lecture in Ocean and Fisheries Sciences, March 1999.

ICES Annual Science Symposium, September 2000.

Acoustical Society of America 142nd Meeting, December 2001: Special Session on "Turbulence and Finescale Studies"

CAIMS (Canadian Applied and Industrial Mathematics Society) 2002 Annual Meeting

Rachel Carson Lecture, AGU/CGU/SEG Joint Assembly, 2004

Research Funding:

NSF(OPP) Interactive effects of UV and vertical mixing on phytoplankton and bacterioplankton in the Ross Sea
04/01/02 - 08/31/08 \$248,429

NSF(OCE) Doppler turbulence techniques for ocean observatories: an interactive approach using in situ measurements and LES models.
04/01/02 - 03/31/09 \$819,734

NSF(OTIC) A two-stage towing system for swath-mapping ocean turbulence
04/01/02 - 07/31/08 \$160,167

Recent Conference Presentations:

Whitney, F., **A. Gargett** and M. McQuoid. "Patterns of biological productivity in Saanich Inlet, British Columbia" Invited oral presentation, 2006 Joint Statistical Meetings, Seattle WA, August 2006.

Neale, P., C. Sobrino, **A. Gargett**, H.-C. Kim, L. Franklin and J. Phillips-Kress. "Interaction of ultraviolet radiation and vertical mixing: effects on photosynthesis in the Ross Sea polynya". oral presentation, Annual Meeting of the American Society of Photobiology, July 2006.

Gargett, A., R. Zimmerman and D. Burdige. 2006. "Biological implications of Langmuir supercells". oral presentation, 2006 ASLO Summer Meeting, June 2006.

Savidge, W., R. Jahnke, D. Savidge, J. Nelson, G. Voulgaris, **A. Gargett** and T. Short. "BOTTOMS-UP: a benthic observatory for studying processes in permeable sediments on the continental shelf off Georgia". poster presentation, Gordon Research Conference on Permeable Sediments, June 2006.

P. Neale, C. Sobrino and **A. Gargett**. 2007. Ultraviolet Radiation Effects on Phytoplankton Productivity in a Changing Global Climate. oral presentation, European Photobiology Conference (UK September 2007).

Gargett, A. and D. Savidge. 2008. The role of Langmuir supercells in seasonally tuned cross-shelf transport of bioactive material. Ocean Sciences Meeting (March 2008).

Voulgaris, G., D. Savidge, **A. Gargett**, J. Morin, J. Amft, J. Nelson and W. Savidge. 2008. Physical controls on benthic exchanges on the mid-shelf of the South Atlantic Bight: ripple evolution and turbulence measurements. Ocean Sciences Meeting. (March 2008).

Book chapters:

Gargett, A. E. 2001. Oceanographic dispersion. *in* Encyclopedia of Environmetrics Vol.3, ed. A. H. El-Shaarawi and W. W. Piegorsch. J. Wiley & Sons Ltd, 1446-1461.

Gargett, A. E. and J. Marra. 2002. Effects of upper ocean physical processes – turbulence, advection, and air-sea interaction – on oceanic primary production. *The Sea*, Vol.12, ed. A. Robinson, B. Rothschild and J. McCarthy, John Wiley & Sons, Inc., New York, 19-49.

Di Orio, D. and **A. E. Gargett**. 2005. Studies of turbulent processes using Doppler and acoustical scintillation techniques. Ch. 20 in *Acoustical Oceanography*, H. Medwin. Cambridge University Press, Cambridge UK, 643pp

Refereed publications:

Gargett, A.E. and B.A. Hughes. 1972: On the interaction of surface and internal waves. *J. Fluid Mechanics*, 52(1), 179-191.

Gargett, A.E. 1975: Horizontal coherence of oceanic temperature structure. *22*, 767-776.

Gargett, A.E. 1976: Generation of internal waves in the Strait of Georgia, British Columbia. *Deep Sea Research*, 23, 17-32.

Gargett, A.E. 1976: An investigation of the occurrence of oceanic turbulence with respect to finestructure. *J. Phys. Oceanogr.*, 6, 139-156.

Gargett, A.E. 1978: Microstructure and finestructure in an upper ocean frontal regime. *J. Geophys. Res.*, 83(C10), 5123-5133.

Gargett, A.E., T.B. Sanford and T.R. Osborn. 1979: Surface mixing layers in the Sargasso Sea. *J. Phys. Oceanogr.*, 9(6), 1090-1111.

Gargett, A.E. and T.R. Osborn. 1981: Small-scale shear measurements during the Fine and Microstructure Experiment (FAME). *J. Geophys. Res.*, 86, 1929-1944.

Gargett, A.E., P.J. Hendricks, T.B. Sanford, T.R. Osborn and A.J. Williams, III. 1981: A composite spectrum of vertical shear in the upper ocean. *J. Phys. Oceanogr.*, 11(9), 1258-1271.

Gargett, A.E. 1982: Turbulence measurements from a submersible. *Deep-Sea Res.*, 29A, 1141-1158.

Gargett, A.E. and R.W. Schmitt. 1982: Observations of salt fingers in the central waters of the eastern North Pacific. *J. Geophys. Res.*, 87, 8017-8029.

Denman, K.L. and **A.E. Gargett**. 1983: Time and space scales of vertical mixing and advection of phytoplankton in the upper ocean. *Limn. and Oceanogr.*, 28(5), 801-815.

Gargett, A.E. 1984: Vertical eddy diffusivity in the ocean interior. *J. Mar. Res.*, 42, 359-393.

Gargett, A.E. and G. Holloway. 1984: Dissipation and diffusion by internal wave breaking. *J. Mar. Res.*, 42, 15-27.

Gargett, A.E., T.R. Osborn, P.W. Nasmyth. 1984: Local isotropy and the decay of turbulence in a stratified fluid. *J. Fluid Mech.*, 144, 231-280.

Gargett, A.E. 1985: Evolution of scalar spectra with the decay of turbulence in a stratified fluid. *J. Fluid Mech.*, 159, 379-407.

Gargett, A.E., G. Östlund and C.S. Wong. 1986: Tritium time series from Ocean Station P. *J. Phys. Oceanogr.*, 16(10), 1720-1726.

Holloway, G. and **A.E. Gargett**. 1987: The inference of salt-fingering from towed microstructure observations. *J. Geophys. Res.*, 92(C2), 1963-1965.

Dewey, R.K., W.R. Crawford, **A.E. Gargett** and N.S. Oakey. 1987: A microstructure instrument for profiling oceanic turbulence in coastal bottom boundary layers. *J. Atmosph. and Oceanic Tech.*, 4, 288-297.

Gargett, A.E. 1988: A "large-eddy" approach to acoustic remote sensing of turbulent kinetic energy dissipation rate ε . *Atmosph-Ocean*, 26(4), 483-508.

Gargett, A.E. 1988: The scaling of turbulence in the presence of stable stratification. *J. Geophys. Res.*, 93(C5), 5021-5036.

Denman, K.L. and **A.E. Gargett**. 1988: Multiple thermoclines are barriers to vertical exchange in the subarctic Pacific during SUPER, May 1984. *J. Mar. Res.*, 46, 77-103.

Cummins, P.F., G. Holloway and A.E. **Gargett**. 1990: Sensitivity of the GFDL ocean general circulation model to a parameterization of vertical diffusion. *J. Phys. Oceanogr.*, 20(6): 817-830.

Gargett, A.E. 1990: Do we really know how to scale the turbulent kinetic energy dissipation rate ε due to breaking of oceanic internal waves? *J. Geophys. Res.*, 95(C9), 15971-15974.

Gargett, A.E. 1991: Physical processes and the maintenance of nutrient-rich euphotic zones. *Limnol. Oceanogr.*, 36, 1527-1545.

Gargett, A.E. and G. Holloway. 1992: Sensitivity of the GFDL ocean model to different diffusivities for heat and salt. *J. Phys. Oceanogr.*, 22(10), 1158-1177.

Gargett, A.E. 1994: Observing turbulence with a modified acoustic Doppler current profiler. *J. Atmosph. Oceanic Tech.*, 11(6), 1592-1610.

Gargett, A.E. and J.N. Moum. 1995: Mixing efficiencies in turbulent tidal fronts: results from direct and indirect measurements of density flux. *J. Phys., Oceanogr.*, 25, 2583-2608.

Gargett, A.E. and B. Ferron. 1996: The effects of differential vertical diffusion of T and S in a box model of thermohaline circulation. *J. Mar. Res.*, 54(5), 827-866.

Gargett, A.E. 1997: "Theories" and techniques for observing turbulence in the ocean euphotic zone. In *Lecture Notes on Plankton and Turbulence*, eds. C. Marrasé., E. Saiz and J.M. Redondo, Scientia Marina, 61(Suppl), 25-45.

Gargett, A. E. 1997: The optimal stability "window": a mechanism underlying decadal fluctuations in North Pacific salmon stocks? *Fish. Oceanogr.*, 6(2), 109-117.

Ferron, B., H. Mercier, K. Speer, **A.E. Gargett** and K. Polzin 1997: Mixing in the Romanche Fracture Zone. *J. Phys. Oceanogr.*, 28, 1929-1945.

Merryfield, W.J., G. Holloway and **A.E. Gargett**. 1998: Differential vertical transport of heat and salt by weak stratified turbulence. *Geophys. Res. Letters*, 25, 2773-2776.

Merryfield, W. J., G. Holloway, and **A.E. Gargett**. 1999. A global ocean model with double-diffusive mixing, *J. Phys. Oceanogr.*, 29, 1124-1142.

Gargett, A. E. 1999: Velcro measurement of turbulence kinetic energy dissipation rate ϵ . *J. Atmosph. Oceanic Tech.*, 16(12), 1973-1993.

Li, M. , **A. E. Gargett** and K. Denman. 1999: Seasonal and interannual variability of estuarine circulation in a box model of the Strait of Georgia and Juan de Fuca Strait. *Atmosphere-Ocean*, 37(1), 1-19.

Li, M., **A. Gargett** and K. Denman. 2000: What determines seasonal and interannual variability of phytoplankton and zooplankton in strongly estuarine systems? Application to the semi-enclosed estuary of Strait of Georgia and Juan de Fuca Strait. *Est. Coastal and Shelf Sci.* 50, 467-488.

Gargett, A. E., M. Li and R. M. Brown. 2001: Testing mechanistic explanations of observed correlations between environmental factors and marine fisheries. *Can. J. Fish. Aq. Sci.* 58(1), 208-219.

Gargett, A. E. 2003. Differential diffusion: an oceanographic primer. *Progr. Oceanogr.* 56 (3-4), 559-570.

Gargett, A. E., D. Stucchi and F. Whitney. 2003. Physical processes associated with high primary productivity in Saanich Inlet, British Columbia. *Estuarine, Coastal and Shelf Sci.* 56, 1141-1156.

Ruddick, B. and **A. E. Gargett**. 2003. Oceanic double-diffusion: introduction. *Progr. Oceanogr.* 56 (3-4), 381-393.

Gargett, A. E., W. J. Merryfield and G. Holloway. 2003. Direct numerical simulation of differential scalar diffusion in three-dimensional stratified turbulence. *J. Phys. Oceanogr.* 33(8), 1758-1782.

Gargett, A. J. Wells, A. E. Tejada-Martinez and C. E. Grosch. 2004. Langmuir supercells: a dominant mechanism for sediment resuspension and transport in shallow shelf seas. *Science* 306, 1925-1928.

Gargett, A. E. and J. R. Wells. 2007. Langmuir turbulence in shallow water: Part I. Observations. *J. Fluid Mechanics*, 576, 27-61.

Gargett, A. E. and T. Garner. 2008. Determining Thorpe scales from ship-lowered CTD profiles. *J. Atmos. Oceanic Tech.*,

Gargett, A.E., A.E. Tejada-Martinez and C.E. Grosch. Measuring turbulent large eddy structures with an ADCP. 1. Vertical velocity variance. *J. Mar. Res.* 66(2), 157-189.

Papers submitted to refereed journals:

Gargett, A. E. 2008. Couette vs. Langmuir circulations: Comment on "On the helical flow of Langmuir circulation – approaching the process of suspension freezing" by Dethleff, Kempema, Koch and Chubarenko. *Cold Regions Science and Technology*, accepted.

Gargett, A. E. 2006. Differential diffusion. Encyclopedia of Ocean Sciences, ed. Steele, Turekian and Thorpe, Elsevier, submitted November 2006.

Gargett, A.E., A.E. Tejada-Martinez and C.E. Grosch. Measuring turbulent large eddy structures with an ADCP. 1. Horizontal velocity variance. J. Mar. Res., submitted.

Papers submitted to non-refereed publications:

Invited review articles or book chapters:

Gargett, A.E. 1989: Ocean turbulence. Ann. Rev. Fluid. Mech., **21**, 419-451.

Denman, K.L. and **A.E. Gargett**. 1995: Biological-physical interactions in the upper ocean: the role of vertical and small scale transport processes. Ann. Rev. Fluid Mech., **27**, 225-255.

Gargett, A.E. and J. Marra. 2001: Effects of upper ocean physical processes - turbulence, advection, and air-sea interaction – on oceanic primary production. The Sea, Vol.12. Biological-Physical Interactions in the Ocean. Ed. A.R. Robinson, J.J. McCarthy and B.J. Rothschild. John Wiley & Sons, NY, 19-49.

Gargett, A. E. 2001: Oceanographic dispersion. in Encyclopedia of Environmetrics Vol.3, ed. A. H. El-Shaarawi and W. W. Piegorsch. J. Wiley & Sons Ltd, 1446-1461.

Di Orio, D. and **A. Gargett**. 2005. Studies of turbulent processes using Doppler and acoustical scintillation techniques. Ch. 20 in Sounds in the Sea: From Ocean Acoustics to Acoustical Oceanography, H. Medwin. CUP, 643pp. ISBN 0 521 82950 X

Committee Reports:

(major contributions to written reports)

Glenn, S. and T. Dickey. 2003. Scientific Cabled Observatories for Time Series (SCOTS) Report.

Detrick, R. S. Jr et al. 2003. Enabling Ocean Research in the 21st Century: Implementation of a Network of Ocean Observatories. Ocean Studies Board, National Research Council.

Non-refereed publications:

LeBlond, P.H. and **A.E. Gargett** 1970: Les ondes internes. Quebec Science, **12**, 12-14.

Gargett, A.E. 1980: Turbulence measurements through a train of breaking internal waves in Knight Inlet, B.C. In Fjord Oceanography, ed. H.J. Freeland and D.M. Farmer, Plenum Publ.

Gargett, A.E. 1984. Internal waves and mixing in the ocean: Observations and speculations. In Proceedings of The Second 'Aha Haliko'a Hawaiian Winter Workshop, ed P. Muller, Dept. of Oceanography, University of Hawaii.

- Gargett, A.E.** 1986: Small-scale parameterization in large-scale ocean models. In Advanced Physical Oceanographic Numerical Modelling, ed. J.J. O'Brien. Reidel Publishing Co., 145-154.
- Gargett, A.E.** 1988: Reynolds number effects on turbulence in the presence of stable stratification. Small-Scale Turbulence and Mixing in the Ocean, ed. J.C.J. Nihoul and B.M. Jamart. Elsevier Science Publishers, 517-528.
- Gargett, A.E., P. Cummins and G. Holloway** 1989: Effects of variable diffusivity in the GFDL model. Parameterization of Small-Scale Processes, Proceedings of the Hawaiian Winter workshop, University of Hawaii at Manoa, ed. P. Muller and D. Henderson, 11-20.
- Gargett, A.E.** 1993: Parameterizing the effects of small-scale mixing in large-scale numerical models. Modelling Oceanic Climate Interactions, ed. J. Willebrand and D.L.T. Anderson. Springer-Verlag, 185-204.
- Gargett, A.E.** 1993: Measurement and analysis of the energy-containing eddies of turbulent flows in the coastal ocean. Statistical Methods in Physical Oceanography, Proceedings of the Ah'a Hulikoa Hawaiian Winter Workshop 1993, ed. P. Muller, SEOST, U. of Hawaii at Manoa, 1000 Pope Road, Honolulu HI 96822.
- Gargett, A. E.** 1997. Physics to fish: interactions between physics and biology on a variety of scales. *Oceanography* 10, 128-131.
- Gargett, A.E., M. Li and R. Brown** 1998: Testing the concept of an optimal stability "window". Biotic Impacts of Extratropical Climate Variability in the Pacific, Proceedings of the Ah'a Hulikoa Hawaiian Winter Workshop 1998, ed. G. Holloway, P. Muller and D. Henderson, SEOST, U. of Hawaii at Manoa, 1000 Pope Road, Honolulu HI 96822.
- Holloway, G., **A. E. Gargett** and W. Merryfield. 2001. Differential diffusion in bistable conditions. *in* From Stirring to Mixing in a Stratified Ocean, ed. P. Muller and C. Garrett. Proceedings of the 'Aha Huliko'a Hawaiian Winter Workshop 2001, U. of Hawaii at Manoa, 1000 Pope Road, Honolulu HI 96822, 187-190.
- Gargett, A. E.** and J. Wells. 2005. Characteristics of Langmuir turbulence observed in shallow water. *Proceedings of Turbulence and Shear Flow Phenomena*, Eds. J. A. C. Humphrey, T. B. Gatski, J. K. Eaton, R. Friedrich, N. Kasagi and M. A. Leschziner, Volume 2, pp. 443-447

Data Reports:

- 1965 **A. Gargett:** Long term fluctuations in the Toronto temperature and precipitation record. Canadian Dept. of Transport, Meteorological Branch, Cir. 4199, Tech. 550. Awarded second place, Father James B. Macelwane Awards in Meteorology; A.M.S., 1966.
- 1976 **A.E. Gargett:** A method of examining the vertical background of ocean microstructure data obtained from horizontal tow. Inst. Of Ocean Sciences, P.O. Box 6000, Sidney, B.C., Canada, 29 pp.
- 1978 **A.E. Gargett** and T.R. Osborn: Dissipation measurements from the Fine and Microstructure Experiment. Man. Rep. No. 33, Inst. Of Oceanography, Univ. of British Columbia, Vancouver, B.C., Canada, 87 pp.
- 1980 **A.E. Gargett:** Data report and calibrations for turbulence measurements in Knight Inlet,

B.C. from the PISCES IV submersible: November 1978. Inst. Of Ocean Sciences, P.O. Box 6000, Sidney, B.C., Canada, 71 pp.

1980 **A.E. Gargett**, P.J. Hendricks, T.B. Sanford, T.R. Osborn and A.J. Williams III. A composite spectrum of vertical shear in the upper ocean from the profilers EMVP, SCIMP and CAMEL. Inst. Of Ocean Sciences, P.O. Box 6000, Sidney, B.C., Canada, 38 pp.

Graduate Training Institutes:

MAST Course on "Ocean Turbulence: A Basic Environmental Property for Plankton"
Sept. 1995

NATO Advanced Study Institute in "Modelling Oceanic Climate Interactions", Feb. 1992.

JGOFS Summer Workshop on the Physics of Equatorial Oceans, June 1991.