

CURRICULUM VITAE

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Education:

A.S., Chemistry, Henry Ford Community College, 1966.

B.S., Chemistry, University of Michigan, 1968.

Ph.D., Chemistry, University of Washington, 1971.

Professional Experience:

All at Woods Hole Oceanographic Institution, Department of Marine Chemistry and Geochemistry

Postdoctoral Fellow, 1971 to 1972

Assistant Scientist, 1972 to 1974.

Research Associate, 1974 to 1977.

Research Specialist, 1977 to 1982.

Senior Research Specialist, 1982 to Present.

Professional Affiliations:

Member, American Chemical Society.

Member, American Society for Mass Spectrometry.

Member, American Geophysical Union.

Research Interests:

Sources, composition and distribution of surface-active organic materials in the marine microlayer; effects of biogenic surfactants on air-sea gas exchange; satellite estimation of air-sea gas fluxes; applications of high resolution gas chromatography, liquid chromatography, and mass spectrometry to characterization of marine organic matter.

Publications:

Frew N.M., E.J. Bock, R.K. Nelson, W.R. McGillis, J.B. Edson and T. Hara (2002). Spatial variations in surface microlayer surfactants and their role in modulating air-sea exchange. In: *Gas Transfer at Water Surfaces*, M.A. Donelan, E.S. Saltzman, R. Wanninkhof, and W.M. Drennan (eds.), Geophysical Monograph Series, Vol. 127, AGU Press, 153-159.

Glover D.M., N.M. Frew, S.J. McCue and E.J. Bock (2002). A multi-year time series of global gas transfer velocity from the TOPEX-dual frequency, normalized backscatter algorithm. In: *Gas Transfer at Water Surfaces*, M.A. Donelan, E.S. Saltzman, R. Wanninkhof, and W.M. Drennan (eds.), Geophysical Monograph Series, Vol. 127, AGU Press, 325-331.

Bock, E.J., J.B. Edson, N.M. Frew, T. Hara, H. Haussecker, B. Jaehne, W.R. McGillis, S.P. McKenna, R.K. Nelson, U. Schimpf and M. Uz (2002). Overview of the CoOP experiments: physical and chemical measurements parameterizing air-sea gas exchange. In: *Gas Transfer at Water Surfaces*, M.A. Donelan, E.S. Saltzman, R. Wanninkhof, and W.M. Drennan (eds.), Geophysical Monograph Series, Vol. 127, AGU Press, 39-44.

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- Caruso, M.J., D.M. Glover, N.M. Frew and S.J. McCue (2002). Estimation of air-sea gas transfer velocity using radar backscatter from dual frequency altimeters and conically scanning scatterometers for 1993-2000. *Trans. Am. Geophys. Union*, **83(4)**: OS346.
- McGillis, W.R., J.W.H. Dacey, N.M. Frew, E.J. Bock and R.K. Nelson (2000). Water-air transfer of dimethylsulfide. *J. Geophysical Research*, 105, 1187-1193.
- Bock, E.J., T. Hara, N.M. Frew and W.R. McGillis (1999). Relationship between air-sea gas transfer and short wind waves. *J. Geophysical Research*, **104**, 25821-25831.
- Frew, N.M. (1997). The Role of Organic Films in Air-Sea Gas Exchange. In: *The Sea Surface and Global Change*, P. Liss and R. Duce (eds.), Cambridge University Press, Cambridge, pp. 121-172.
- Asher, W., E. Bock, N. Frew, L. Hasse, B. Jahne, G. Korenowski, P. Liss, L. Merlivat, L. Philips, P. Schluessel, A. Watson and D. Woolf (1997) Report Group I. Physical Processes in the Microlayer and the Air-Sea Exchange of Trace Gases. In: *The Sea Surface and Global Change*, P. Liss and R. Duce, eds., Cambridge University Press, Cambridge, pp. 1-33.
- Bock, E.J., J.B. Edson, N.M. Frew, A. Karachintsev, W.R. McGillis, R.K. Nelson, K. Hansen, T. Hara, M. Uz, B. Jahne, J. Dieter, J. Klinke, and H. Haubecker (1995). Description of the science plan for the April 1995 CoOP experiment, Gas Transfer in Coastal Waters, performed from the Research Vessel New Horizon. In: *Air-Water Gas Transfer. Selected papers from the Third International Symposium on Air-Water Gas transfer, 24-27 July 1995, Heidelberg University*, B. Jahne and E.C. Monahan (eds.), AEON Verlag & Studio, Hanau, 801-808.
- DeGrandpre, M.D., W.R. McGillis, N.M. Frew and E.J. Bock (1995). Laboratory measurements of seawater CO₂ gas fluxes. In: *Air-Water Gas Transfer. Selected papers from the Third International Symposium on Air-Water Gas Transfer, 24-27 July 1995, Heidelberg University*, B. Jahne and E. Monahan (eds.), AEON Verlag & Studio, Hanau, 376-383.
- Frew, N.M., E.J. Bock, W.R. McGillis, A.V. Karachintsev, T. Hara, T. Muensterer and B. Jahne (1995). Variation of air-water gas transfer with wind stress and surface viscoelasticity. In: *Air-Water Gas Transfer. Selected papers from the Third International Symposium on Air-Water Gas Transfer, 24-27 July, Heidelberg University*, B. Jahne and E. Monahan (eds.), AEON Verlag & Studio, Hanau, 529-541.
- Hara, T., E.J. Bock, N.M. Frew and W.R. McGillis (1995). Relationship between air-sea gas transfer velocity and surface roughness. In: *Air-Water Gas Transfer. Selected papers from the Third International Symposium on Air-Water Gas Transfer. 24-27 July, Heidelberg University*, B. Jahne and E. Monahan (eds.), AEON Verlag & Studio, Hanau, 611-616.
- McGillis, W.R., E.J. Bock and N.M. Frew (1995). Mass transfer from gas bubbles in fresh and seawater. In: *Air-Water Gas Transfer. Selected papers from the Third International Symposium on Air-Water Gas Transfer. 24-27 July, Heidelberg University*, B. Jahne and E. Monahan (eds.), AEON Verlag & Studio, Hanau, 363-372.
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- Frew, N.M., and R.K. Nelson (1992). Isolation of marine microlayer film surfactants for ex situ study of their surface physical and chemical properties. *J. Geophys. Res.*, **97**, 5281-5290.

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- Frew, N.M., J.C. Goldman, M.R. Dennett, and A.S. Johnson (1990). The impact of phytoplankton-generated surfactants on gas exchange at the air-sea interface. *J. Geophys. Res.*, **95**, 3337-3352.
- Frew, N.M., C.G. Johnson, and R.H. Bromund (1988). Supercritical fluid-mass spectrometry of carotenoid pigments. In: *Supercritical Fluid Extraction and Chromatography - Techniques and Applications* (B. Carpentier and M. Sevenants, eds.), ACS Symposium Series 366, pp. 208-228.
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- Frew, N.M. and T.L. Isenhour (1972). Mass spectrometric isotope ratio measurements and peak area integration using the peak-switching feature of the AEI MS-902. *Anal. Chem.*, **44**, 668-671.
- Frew, N.M., J.J. Leary, and T.L. Isenhour (1972). Isotopic analysis of chromium in lunar materials by mass spectrometry of the trifluoroacetylacetonate. *Anal. Chem.*, **44**, 665-671.
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Manuscripts Submitted:

- Frew, N.M., R.K. Nelson and C.G. Johnson. Sea-slicks: variability in chemical composition and surface elasticity, to *Surface Slicks and Remote Sensing of Air-Sea Interactions*, M. Gade, J. Scott, and N. Thomas (eds), Springer-Verlag; revised.
- Frew, N.M., R.K. Nelson and C.G. Johnson. Correlation studies of mass spectral patterns and elasticity of sea-slick materials, to *Surface Slicks and Remote Sensing of Air-Sea Interactions*, M. Gade, J. Scott, and N. Thomas (eds), Springer-Verlag; revised.