fall as a real pollutant source. From longitudinal and lateral dye-dispersion data, a three-dimensional model was constructed and compared with theoretical results of Gifford (as extended by Okubo). Dispersion was observed to be anisotropic; however, the model yielded reasonable results. Analysis of data for vertical diffusion shows, inconclusively, that there may be a critical wind speed at which vertical diffusion increases rapidly; this is a point for future work.

Dye experiments on the Bahama Banks, where the water depth is about 5 meters over an area of some 30,000 square kilometers, were reported by M. Costin (Lamont Geological Observatory). Results showed less irregularity then in other coastal work, diffusion was slower and, typically, elongations and elliptical patterns were observed.

A. Okubo (Johns Hopkins University) presented a theoretical model of diffusion of dye patches which accounts for the elongations and elliptical patterns observed in field work. Using a model in which large-scale eddies are considered to be in a quasi-steady state, while small eddies are random and statistically isotropic, he predicted elliptical concentration patterns and related angular orientation and time variation of elongation to observable quantities such as shear and rotation in the mean flow. Application of data to theory yields good results. The model also predicts the observed windward-leeward depth dependence of dye patterns.

In a theoretical paper, D. Kirwan (New York University) used variational calculus techniques to estimate magnitudes of horizontal and vertical eddy diffusivities. When applied to Antarctic Intermediate Water data, acceptable estimates of the variation of salinity with depth were obtained. This work should revive interest in efforts to ascribe physical meaning to theoretically derived eddy coefficients and mixing lengths.

Three speakers were concerned with diffusion in the deep ocean. T. E. Pochapsky (Hudson Laboratories) described diffusion studies in the deep ocean [also reported in *Tellus* **15**, 352 (1963)] by means of floats designed to have neutral buoyancy at depth; the floats are tracked acoustically. Pairs of floats were observed to separate both vertically and horizontally, indicating float motion due to a complex interaction of internal waves, random turbulent motion, and inertial "bobbing" of the floats. The presence of vertical stratification and velocity shear causes difficulty in applying isotropic turbulence theory. M. P. Wennekens (Office of Naval Research) gave results of continuous profile measurements of sound velocity, temperature, and pressure in California continental borderland waters. A general structural pattern has emerged in which there is a "noisy" zone (about 200 to 800 m depth) where temperature fluctuates by about 0.5°C over depth changes of 10 to 50 m. The data have been interpreted as thin layers (or lenses) of water undergoing shear motion, with blobs of water apparently moving along constant density surfaces. Attempts to do dye or particulate diffusion studies in such waters would require precise knowledge of injection depths. W. Broecker (Lamont Geological Observatory) discussed large-scale oceanic diffusion determined by radiochemical methods. Since red clay bottom sediments in deep oceans are strong sources of radon-222, and the atmosphere represents an infinite sink for Rn^{222}, measurement of vertical profiles of decaying Rn should give information on eddy diffusion near the bottom. Although results to date on four such profiles are not conclusive, these preliminary results agree well with theory in the range of eddy diffusion coefficients from 5 to 500 cm^2/sec. Such new techniques should be of interest to physical oceanographers.

In one of two special lectures on atmospheric diffusion, H. E. Cramer (Massachusetts Institute of Technology) pointed out similarities and relations between atmospheric and oceanic diffusion phenomena. A significant and fortunate result in atmospheric physics is that Lagrangian and Eulerian statistics can often be used interchangeably. Another result which may be useful in oceanic research is that wind direction fluctuations (and spectra) are good indicators of the originating turbulent process. O. R. Coté (Geophysics Corporation of America) gave results of experiments on turbulent diffusion in sodium vapor trails in the upper atmosphere by means of rockets. He noted features qualitatively analogous to those observed by Wennekens, namely, large shears and direction reversals over short vertical distances; these results have possible implications for large rocket launches.

The papers read at this meeting showed in general that concerted attempts are being made to use classical, analytical models instead of statistical ones. The strong roles of both stratification and advection on turbulent processes are being recognized, and the importance of non-isotropy and vertical motion must be considered; in many oceanic situations there is an inextricable interweaving of effects of turbulence, internal gravity waves, and shear motion. There is a feeling that energy flow in cascade processes can occur in both wave number directions; this phenomenon should be looked for experimentally. Interactions between mean flow and turbulent flow should be investigated more fully. Finally, there was an appeal from several sources that engineers present data in both English and metric units; the difficulty of doing this is usually small compared to the difficulty of mentally converting units during a lecture.

The proceedings of the symposium are expected to be published by the end of this year.

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Forthcoming Events

December

21–23. American **Physical** Soc., Berkeley, Calif. (W. Whaling, California Inst. of Technology, 1201 East California St., Pasadena)

21–23. **Biology of Marine Microorganisms**, conf., Univ. of California, Berkeley. (R. Newton, Letters and Science Extension, Univ. of California, Berkeley 94720)

26–29. Society of **Systematic Zoology**/American Soc. Zoologists/Herpetologists' League, annual, Univ. of Tennessee, Knoxville. (J. G. Rozen, Jr., Dept. of Entomology, SSZ, American Museum Natural History, Central Park West and 79th St., New York, N.Y.; A. G. Richards, ASZ, Dept. of Entomology, Univ. of Minnesota, St. Paul 55101; J. M. Legler, HL, Dept. of Zoology, Univ. of Utah, Salt Lake City)

26–31. **American Assoc. for the Advancement of Science**, annual, Montreal, Canada. (R. L. Taylor, AAAS, 1515 Massachusetts Ave., NW, Washington, D.C.)

The following 44 organizations will meet in conjunction with the AAAS annual meeting in Montreal, Canada, 26–31 December:

Academy Conference (J. T. Self, Dept. of Zoology, Univ. of Montreal, Montreal)

Academy of Psychoanalysis (M. Ullman, Maimonides Hospital, 4802 Tenth Ave., Brooklyn 19, N.Y.)

Alpha Epsilon Delta (M. L. Moore, 7 Brookside Circle, Bronxville, N.Y. 10708)

AAAS Commission on Science Education (J. R. Mayor, AAAS, 1515 Massachusetts Ave., NW, Washington, D.C. 20005)

American Astronautical Soc. (E. van Dreist, Director, Space Science Laboratory, North American Aviation, Downy, Calif.)

American Astronomical Soc. (G. C. McVittie, Univ. of Illinois Observatory, Urbana)

American Economic Association (H. E. English, Private Planning Assoc., 712 Sun Life Bldg., Montreal 2)

American Meteorological Soc. (K. C. Spengler, AMS, 45 Beacon St., Boston, Mass.)

American Nature Study Soc. (V. Rockcastle, Cornell Univ., Ithaca, N.Y.)

American Soc. of Naturalists (S. Granick, Rockefeller Inst., 66th St. and York Ave., New York 10021)

American Political Science Assoc. (E. B. Skolnikoff, Massachusetts Inst. of Technology, Cambridge)

American Soc. of Criminology (W. C. Reckless, Dept. of Sociology, Ohio State Univ., Columbus)

American Soc. for Microbiology (S. J. Ajl, Director of Research, Albert Einstein Medical Center, York and Tabor Rds., Philadelphia 41, Pa.)

American Soc. of Zoologists, Animal Behavior and Sociobiology Div. (G. W. Barlow, Vivarium Bldg., Wright and Healey Sts., Univ. of Illinois, Champaign)

American Sociological Assoc. (W. E. Moore, Russell Sage Foundation, 230 Park Ave., New York, N.Y.)

Animal Behavior Soc. (J. P. Scott, Jackson Laboratory, Hamilton Station, Bar Harbor, Maine)

Association canadienne-française pour l'Avancement des Sciences (M. J. Beauregard, ACFAS, C.P. 6128, Univ. of Montreal, Montreal)

Association for Computing Machinery, Bio-group (M. Woodbury, New York Univ. Medical Center, New York, N.Y.)

Biometric Soc. (D. S. Robson, Cornell Univ., Ithaca, N.Y.)

Canadian Aeronautics & Space Inst. (H. C. Luttman, CASI, 77 Metcalf St., Ottawa 4)

Canadian Assoc. of Geographers (J. T. Parry, Morrice Hall, McGill Univ., Montreal)

Canadian Assoc. of Physicists (A. C. H. Hallett, Dept. of Physics, Univ. of Toronto, Toronto 5)

Canadian Science Fairs Council (H. I. Bolker, Pulp & Paper Research Inst. of Canada, 3420 University St., Montreal 2)

Canadian Soc. Zoologists (J. Marsden, McGill Univ., Montreal, Canada)

Ecological Soc. of America (G. M. Woodwell, Brookhaven Natl. Laboratory, Upton, L.I., N.Y.)

Engineering Institute of Canada (G. T. Page, EIC, 2050 Mansfield St., Montreal)

Entomological Soc. of Canada (I. S. Lindsay, Defence Research Board, 125 Elgin St., Ottawa)

History of Science Soc. (J. E. Murdoch, Harvard Univ., Cambridge, Mass.)

Institute of Management Sciences (B. V. Dean, Dept. of Management, Case Inst. of Technology, Cleveland, Ohio)

Metric Assoc. (R. P. Fischelis, Ohio Northern Univ., Ada)

National Assoc. of Biology Teachers (R. Beidleman, Colorado College, Colorado Springs)

National Assoc. of Science Writers (L. S. Zahn, Hill & Knowlton, Inc., 150 E. 42 St., New York, N.Y.)

National Council of Teachers of Mathematics (J. Gates, NCTM, 1201 16th St., NW, Washington, D.C.)

National Geographic Soc. (R. W. Gray, NGS, 16th and M Sts., NW, Washington, D.C.)

National Inst. of Social and Behavioral Science (D. P. Ray, NISBS, 863 Benjamin Franklin Station, Washington, D.C.)

National Science Teachers Assoc. (A. F. Eiss, NSTA, 1201 16th St., NW, Washington, D.C. 20006)

Pharmacological Soc. of Canada (C. W. Nash, Dept. of Pharmacology, Univ. of Alberta, Edmonton)

Sigma Delta Epsilon (S. C. Stevens, VA Hospital, Lincoln, Neb.)

Society for Computer Science in Biology and Medicine (R. S. Ledley, Natl. Biomedical Research Foundation, 8600 16th St., NW, Silver Spring, Md.)

Society for Economic Botany (Q. Jones, New Crops Research Branch, Plant Industry Station, Beltsville, Md.)

Society for General Systems Research (J. H. Milsum, Dept. of Electrical Engineering, McGill Univ., Montreal)

Society for the History of Technology (J. J. Beer, Dept. of History, Univ. of Delaware, Newark)

Society of the Sigma Xi (T. T. Holme, Sigma Xi, 51 Prospect St., New Haven, Conn. 06511)

Society of Technical Writers and Publishers (G. Marx, Director of Communications, Illinois Inst. of Technology, Research Inst., Chicago)

27–29. American **Philosophical** Assoc., Boston, Mass. (L. E. Hahn, Dept. of Philosophy, Southern Illinois Univ., Carbondale 62903)

27–30. American **Statistical** Assoc., Chicago, Ill. (D. C. Riley, ASA, 810 18th St., NW, Washington, D.C. 20006)

28–30. American **Economic** Assoc., annual, Chicago, Ill. (H. F. Williamson, AEA, 629 Noyes St., Evanston, Ill.)

28–30. American **Geophysical** Union, Seattle, Wash. (W. W. Kellogg, Rand Corporation, 1700 Main St., Santa Monica, Calif.)

28–30. **Linguistic** Soc. of America, New York, N.Y. (A. A. Hill, Post Office Box 8120, University Station, Austin, Tex.)

28–30. Western Soc. of **Naturalists**, Univ. of Washington, Seattle. (I. A. Abbott, Hopkins Marine Station of Stanford Univ., Pacific Grove, Calif.)

January

5–7. **Glass Formation, Phase Equilibria, Nucleation and Crystal Growth**, symp., Sheffield, England. (D. Hawksworth, Soc. of Glass Technology, Thorton, 20 Hallam Gate Rd., Sheffield 10)

5–8. **Solid State Physics**, 2nd annual conf., H. H. Wills Physics Laboratory, University of Bristol, England. (Administrative Assistant, Inst. of Physics and Physical Soc., 47, Belgrave Square, London, S.W.1)

6–8. **Industrial Electronics and Control Instrumentation**, 13th annual conf., Philadelphia, Pa. (E. Weiss, Sun Oil Co., Marcus Hook, Pa.)

6–9. **Psychopharmacological** Conf., Czechoslovak Medical Soc., Psychiatry Section, Jesenik Spa. (M. Vojtechovsky, Budejovicka 800, Pavilion A1, Prague, Czechoslovakia)

8–9. **Orthopaedic** Research Society, New York, N.Y. (R. A. Calandruccio, 869 Madison Ave., Memphis, Tenn.)

9–14. American Acad. of **Orthopedic Surgeons**, annual, New York, N.Y. (H. K. Hart, AAOS, 29 E. Madison, Chicago 2, Ill.)

10–16. The **New Science**, symp., Colorado Springs, Colo. (F. A. Sondermann, Colorado College, Colorado Springs)

11–14. **Civilian and Military Uses of Aerospace**, conf., New York, N.Y. (I. B. Laskowitz, New York Acad. of Sciences, 2 E. 63 St., New York)

12–14. **Reliability and Quality Control**, symp., Miami, Fla. (H. D. Hulme, Westinghouse R&D Center, Bldg. 601-1346, Churchill Boro, Pittsburgh, Pa.)

12–15. **Crustacea**, symp., Cochin, India. (Marine Biological Assoc. of India, Marine Fisheries P.O., Mandapam Camp, S. India)

14. American **Genetic** Assoc., Washington, D.C. (W. R. Singleton, Biology Bldg., Univ. of Virginia, Charlottesville)

18–20. **Solar Radiation Simulation**, intern. conf., Los Angeles, Calif. (H. F. Sander, Inst. of Environmental Science, 34 S. Main St., Mount Prospect, Ill.)

19. **Cor Pulmonale**, New York Heart Assoc., annual medical conf., New York, N.Y. (NYHA, 10 Columbus Circle, New York 10019)

19–20. **Die Design and Press Tooling** Conf., American Soc. of Tool and Manufacturing Engineers, Hartford, Conn. (M. Zapico, Asst. Conf. Director, ASTME, 10700 Puritan Ave., Detroit 38, Mich.)

20–22. **Instrumentation**, College Station, Tex. (P. T. Eubank, Chemical Engineering Dept., Texas A&M Univ., College Station)

20–23. National Soc. of **Professional Engineers**, New Orleans, La. (P. H. Robbins, 2029 K St., NW, Washington, D.C.)

22. **Bibliographical** Soc. of America, New York, N.Y. (Mrs. H. C. Ralph, P.O. Box 397, Grand Central Station, New York 10017)

22–1. **Earthquake Engineering**, 3rd world conf., Auckland and Wellington, New Zealand. (Administrative Secretary, Third World Conf. on Earthquake Engineering, P.O. Box 5180, Wellington)

22–23. **Blood**, annual symp., Detroit, Mich. (W. H. Seegers, Dept. of Physiology and Pharmacology, Wayne State Univ. College of Medicine, Detroit)

22–23. **Hydrocarbon Analysis**, symp., American Soc. for Testing and Materials, Houston, Tex. (ASTM, 1916 Race St., Philadelphia 3, Pa.)

25–26. **Fundamental Phenomena in the Material Sciences**, 3rd annual symp., Boston, Mass. (D. B. Fay, Ilikon Corp., Natick Industrial Centre, Natick, Mass.)

25–26. **Viruses of Laboratory Rodents**, symp., Atlanta, Ga. (R. Holdenried, Natl. Cancer Inst., NIH, Bethesda, Md. 20014)