

## A POST-GRADUATE VIEW [ CONTINUED FROM PAGE 13 ]

Thirdly, graduate schools need to recognize that entering students come from a variety of backgrounds, each with its own inherent strengths and weaknesses. Some allowance must be made for this in the graduate curricula.

One step that has been taken in this direction by the Joint Program is the introduction of a math course in the first summer, designed to help ensure that students do not start their first semester with a disadvantage in this area. Finally, departments offering bachelor's degrees in oceanography should track their graduates and see how they have fared in their further education and careers. This information, along with statistics from graduate departments of oceanography on the rate of acceptance of applicants and the fate of the admittees, classified by undergraduate major, should be useful in future evaluation of under-

graduate programs.

### REFERENCES

- Maynard, S.D. 1986. Undergraduate marine science degrees: pros and cons. Proceedings of the Pacific Congress on Marine Technology, PACON 86, Honolulu, MRM7: 38-46.
- TABLE 1. A PARTIAL LIST OF INSTITUTIONS OFFERING BACHELOR'S DEGREES IN OCEANOGRAPHY OR MARINE SCIENCE.
- Florida Institute of Technology, FL  
Humboldt State College, CA  
Millersville State College, PA  
Southampton College, NY  
Stockton State College, NJ  
Texas A&M University at Galveston, TX  
U.S. Naval Academy, MD  
University of Miami, FL  
University of Michigan, MI  
University of South Carolina, SC  
University of Washington, WA

## SATELLITE OCEAN COLOR [ CONTINUED FROM PAGE 20 ]

- Gordon, H.R., J.W. Brown and R.H. Evans. 1988. Exact Rayleigh scattering calculations for use with the Nimbus-7 Coastal Zone Color Scanner. *Applied Optics* 27:862-871.
- Holligan, P.M., V. Viollier, D.S. Harbour, P. Camus, and M. Champagne-Phillippe. 1983. Satellite and ship studies of coccolithophore production along a continental shelf edge. *Nature* 304:339-342.
- Joint EOSAT/NASA SeaWiFS Working Group. 1987. System concept for wide-field-of-view observations of ocean phenomena from space. EOSAT, 4300 Forbes Blvd., Lanham, MD 20706.
- McClain, C.R., L.J. Pietrafesa and J.A. Yoder. 1984. Observations of Gulf Stream-induced and wind-driven upwelling in the Georgia Bight using ocean color and infrared imagery. *J. Geophys. Res.* 89:3705-3723.
- Perry, M.J. 1986. Assessing marine primary production from space. *Biosci.*

36:461-467.

- Rampino, M.R. and T. Volk. 1988. Mass extinctions, atmospheric sulphur and climatic warming at the K/T boundary. *Nature* 332:63-65.
- Smith, R.C., O.B. Brown, F.E. Hoge, K.S. Baker, R.H. Evans, R.N. Smith and W.E. Esaias. 1987. Multiplatform sampling (ship, aircraft, and satellite) of a Gulf Stream warm core ring. *Applied Optics* 26:2068-2081.
- U.S. Global Ocean Science Program Working Group. 1987. The U.S. Global Ocean Science Program. A strategy for understanding the role of the ocean in global change.
- Yoder, J.A., C.R. McClain, J.O. Blanton and L.-Y. Oey. 1987. Spatial scales in CZCS-chlorophyll imagery of the Southeastern U.S. continental shelf. *Limn. Oceanogr.* 32:929-941.

## OPTICAL OCEANOGRAPHY [ CONTINUED FROM PAGE 23 ]

### ACKNOWLEDGMENTS

There are some 80 - 100 researchers active in ocean optics in the Western world. Regrettably, space did not allow fair representation of all their efforts, past and present. The author is indebted to the community as a whole. Several individuals are owed special thanks for their comments and advice: Ros Austin, Ken Carder, Howard Gordon, Frank Hoge, Curt Moble, Hasong Pak, Ray Smith, Charlie Yentsch and Ron Zaneveld.

### REFERENCES

- Baker, E.T., J.W. Lavelle, and G.J. Massoth. 1985: Hydrothermal particle plumes over the southern Juan de Fuca Ridge. *Nature*, 316:342-344.
- Bauer, D. and A. Morel. 1967: Etude aux petits angles de l'indicatrice de diffusion de la lumière par les eaux de mer. *Ann. Geophys.*, 23:109-123.
- Biscaye, P.E. and S.L. Eitrem. 1977: Suspended particulate loads and transports in the nepheloid layer of the abyssal Atlantic Ocean. *Mar. Geol.*, 23:155-172.
- Secchi, A., 1866: Relazione della esperienze fatta a bordo della Pontificia Pirocorvetta L'Immacolata Concezione per determinare la trasparenza del

- mare [Reports on experiments made on board the Papal steam sloop L'Immacolata Concezione to determine the transparency of the sea] in *Sul moto ondoso del mare e su correnti di esso specialmente su quelle litorali*, by Comm. Alessandro Cialdi. 2d Ed., Rome 1866, pp. 258-288. Translation available, Dept. of the Navy, Office of the Chief of Naval Operations, O.N.I. Trans. No. A-655, Op-923 M4B, 21 Dec., 1955.
- Smith, R.C. and K.S. Baker. 1978: The bio-optical state of ocean waters and remote sensing. *Limnol. Oceanogr.*, 23:247-259.
- Spinrad, R.W. and J.R.V. Zaneveld. 1982: An analysis of the optical features of the near-bottom and bottom nepheloid layers in the area of the Scotian Rise. *J. Geophys. Res.*, 87:9553-9561.
- Thorndike, E.M. and M. Ewing. 1967: Photographic nephelometers for the deep sea in Deep-Sea Photography, v.3 Johns Hopkins University Press, pp. 113-116.
- Weatherly, G.L., E.A. Kelley, J.R.V. Zaneveld, H.Pak, M.J. Richardson. 1980: A deep, narrow, thin filament of the western boundary undercurrent. *Eos Trans. AGU*, 61:1016.
- Yentsch, C.S. and D.W. Menzel. 1963: Absorption curves of acetone extracts of deep water particulate matter. *Deep-Sea Res.*, 10:443-448.
- Yentsch, C.S. and J.H. Ryther. 1959: A method for the determination of phytoplankton chlorophyll and phaeophytin by fluorescence. *Deep-Sea Res.*, 6:72-74.

## OCEANOGRAPHY SOCIETY [ CONTINUED FROM PAGE 21 ]

strength to a society in their own specialty. A new society would provide a mechanism for evaluating this strength, for focusing it, and maximizing its application. The changes which can be brought about in the world of social organizations by the activities of The Oceanography Society could well be comparable to the changes which were brought on-campus by the establishment of oceanography departments.

As in the universities, where all departments cooperating in the marine sciences saw those programs strengthened by the existence of an oceanography department in their midst, it is likely that the ocean-oriented programs of brother societies would be strengthened by their association with The Oceanography Society. A broader and deeper basis for support of all applications of ocean science, engineering, and technology could be tapped.

The potential of oceanography seems unlimited. The oceans constitute a major part of our planet. Understanding and fully utilizing the oceans will require all the knowledge of the basic sciences and all of the skills of engineering and technology. To obtain appropriate support and to seek this understanding effectively requires the coordination and focusing of the many different participating institutions and societies. A missing element has been a dedicated Oceanography Society.

### REFERENCES

- Knudsen, Vern O., Redfield, A. C., Revelle, R., and Shrock, R. R., Education and Training for Oceanographers. *Science*, 111(2895), p. 700-703. June 23, 1950.
- Leipper, Dale F., The establishment of the Department of Oceanography in the Agricultural and Mechanical College of Texas [Now Texas A&M University] *Trans. Am. Geophys. Un.*, 31 (5), October 1950.
- Leipper, Dale F., Oceanography - A definition for Academic Use, *Trans. Am. Geophys. Un.*, 42 (4), December 1961.