

PREFACE

The major emphasis in this volume of Hydrologic Optics is on the optical properties of the sea that govern the penetration of natural light into its depths. (The optical properties of artificial light fields were discussed in Section 1.5.) Because seas and lakes are largely horizontally stratified, we begin our studies with a simple irradiance model for light fields which describes the downward and upward flow of radiant energy in terms of a pair of coupled ordinary differential equations. This system of equations goes back in essence to the modern originator of our subject, Arthur Schuster [279]. In one sense the solution of these equations would constitute a simple exercise in an elementary differential equations course; in another and more profound sense these equations hold the conceptual keys to the subject of radiative transfer in scattering-absorbing media. It is not the mathematical simplicity of these equations that we shall exploit, but rather their conceptual content. Thus, throughout Chapter 8, we have an example of how to mine an unexpectedly deep vein of physical ideas centering on a system of equations ((8) of 8.5) that could otherwise be easily solved, and then forgotten in a few minutes, by an impatient young physical oceanographer who has visions of sun-glittered curling breakers awaiting him at the ocean's shore.

In Chapter 9 we step carefully into deeper waters to search for and distinguish between, those optical properties of the sea that are either inherent or apparent. We begin with the apparent properties given us by the Schuster two-flow equations of Chapter 8. Then in ever more comprehensive terms we generalize these concepts and study their behavior under varying lighting conditions and physical settings, reaching a general classification in the closing section of Chapter 9.

In Chapter 10 we return again to the stratified light field, so prevalent in oceanography and limnology, and explore in detail the special and interesting behavior of the light field and its attendant apparent optical properties at both small and great depths in the sea.

Ms. Louise F. Lembeck typed the camera ready manuscript and assisted in editorial matters. The camera ready manuscript is an unchanged version of an earlier draft written in 1965. Parts of the chapters have been used in various course and seminar lectures over the years at Scripps Institution of oceanography, La Jolla; the Naval Postgraduate School at Monterey, California; and at the Hawaii Institute of Geophysics, University of Hawaii.

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