Of course with these *don'ts* go important positive observances of the usual kind, especially for alternatives (iv) and (v): recording of lighting conditions above the air-water surface, the state of the air-water surface, the proximity and state of the bottom, the state of polarization, and so on.

Problem Three: To Establish A Unified Automatic Computation Program for Prediction Computations and Data Reduction Computations in Geophysical Optics (the GEOVAC)

The theory of radiative transfer is now well founded with many excellent means of solution of the equations of the theory, as explained at length at appropriate points throughout the remainder of this work, or in Ref. [251], and in other works on the subject. In need at present are workable *computer programs* which will take α and σ and boundary lighting conditions (either unpolarized or polarized) and yield internal radiance distributions throughout the medium of interest, regardless of its shape and size. In other words we envision a hardware realization of the Mode IA classification of natural optical media. Conversely, the computation programs should be able to convert experimental documentations of the (unpolarized or polarized) radiance distributions (or at least irradiance quartets), as a function of wavelength and depth, into the appropriate determination of the inherent and apparent optical properties of the medium. In this way we can also achieve a hardware realization of the Mode IB (or, respectively, the Mode II) classification of natural optical media. The applications of such a program-complex to the problems cited in the opening remarks of Sec. 1.0 are manifold, and many uses of such a program are undoubtedly yet to be conceived. The geophysical optics automatic variable computer--the'GEOVAC'--program envisioned above will serve to tie together efforts on both Problems One and Two above, as well as help solve the everyday problems arising in the engineering applications of meteorologic and hydrologic optics.

1.12 Bibliographic Notes for Chapter 1

In addition to the mention of various references given at the appropriate points in the discussions of this chapter, the following references are noted for especial attention, as they form a relatively immediate point of entry into the domain of hydrologic optics, either directly or via their references. First there is the survey article of light in the sea by Duntley [78] which covers the gist of the hydrologic optics work of the Visibility Laboratory of the University of California over the twenty year period 1944-1964. Contemporary and earlier work in hydrologic optics by other organizations and individuals is surveyed in the annotated bibliography on transmission of light in water by Du Pré and Dawson [84]. This bibliography covers approximately 650 abstracts

by over 400 authors in more than 150 European and American journals, extending over the period from 1818 to 1959. Two symposia on radiant energy in the sea resulted in published papers relevant to hydrologic optics: the Helsinki meeting of I.U.G.G. in August 1960 is summarized in [124]; and papers presented at the Hawaiian meeting of the tenth Pacific Science Congress are in [303]. Reference [109] contains a summary of a small amount of theory and a relatively larger amount of practical experimental results along with descriptions of instrumentation used in hydrologic optics. Reference [109], accordingly, is a useful supplement to the present work. The paper and recent book by Jerlov [125] also surveys recent developments in the field. Of some historical interest in the developmental aspects of the field of hydrologic optics are Chapters I-IV of [82] which are the synthesis of the experimental work by Duntley and the early theoretical work of the author. The roots of this chapter trace back in part to some early studies presented in [210]. The basis of the subsequent chapters of this work are given in the bibliographic notes appended to each chapter.

The numbering of the bibliography items in this volume and succeeding volumes follows that of the master bibliography given in the final volume (VI) of the present work.