

PREFACE

My first encounter with radiometry and photometry was as a student reading Sears' *Optics*.^{*} The lucid exposition in Sears' book, ably illuminated by the lectures of Prof. S. Q. Duntley, awakened my interest in the subject. Soon afterward the geometer in me took over as I sought the foundations of the subject. Following graduation from Massachusetts Institute of Technology in 1952, and during my first years as a mathematics graduate student at Scripps Institution of Oceanography, I had the opportunity to develop my awakened interest in radiometry, and to find the foundations of this subject in measure theory. Eventually I found that radiometry, a beautiful union of Euclid's geometry and the axiomatized notion of radiant flux, is the ground on which radiative transfer theory could be built. For a few heady years I had the leisure to explore this foundation (see, e.g., [210], [211], [216]) much as the ancient geometers explored the world of euclidean geometry and the beginnings of mechanics. For one need not know much about the physical world beyond what his senses reveal in order to be qualified to pursue radiometry, radiative transfer, and their applications to problems of visibility and radiant energy flow in the sea. In this sense radiometry and probability theory are very much alike. While radiometry is the marriage of geometry and radiant flux, probability theory is the union of geometry and chance. In both disciplines, the mathematical vehicle for the physical concept is the notion of a *measure*. Indeed, the parallel between radiative transfer and that branch of probability known as 'Markov chains' is exact, as I showed sometime later in Chapter XIII of my monograph [251] on radiative transfer theory.

This volume, then, is the product of a labor of love, wherein very deep geometric predilections took over my first years of scientific research, years in which for better or worse I half-shut my eyes to the multifarious richness of the real world, and tried by thought alone to order my visual experiences in a suitable mathematical frame. I was successful in that effort. For if one carves out of the chaos of his experience a small enough piece, he can examine it and understand it, and eventually make its secrets part of himself once and for all. But the price of this victory is quite dear: the remaining portions of the world sweep by and onward while one remains anchored to a spot, examining a few grains of earth for order and meaning.

^{*}Sears, F. W., *Optics*, Addison Wesley, Cambridge, Mass. (1949), 3rd ed.

The interested student of radiative transfer theory may take the following as a base on which to rest his own work. He will then be spared the necessity for remaining overly long at a relatively isolated point in the conceptual landscape of radiative transfer theory. If he can then see farther and clearer because of this work, my efforts will have done some good. If he feels that the final answer has yet to be found in the quest for the foundations, then I wish him good luck and a full measure of joy in pursuing that quest.

The final manuscript was typed by Ms. Judy Marshall.

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