

This chapter lays the physical and conceptual foundations of *optical oceanography*, or more generally of *hydrologic optics*, the quantitative study of the interactions of light with the Earth's oceans, lakes, rivers and other water bodies.

The Level 1 material begins with an overview of our understanding of the nature of light itself. The following pages then develop the geometrical and physical foundations of *radiative transfer theory*, the branch of physics that deals with the propagation of light in material media such as water. We first show how to specify directions and other geometrical concepts such as solid angle in a manner suited to the mathematics of radiative transfer theory. We next define various quantities such as radiance and irradiance, which provide the building blocks for measurement of light in water, and for discussions of the absorbing and scattering properties of water.

After defining the basic terms, there are Level 2 discussions of blackbody radiation, light from the Sun, bioluminescence, and several other topics.

Much (but not all) of the work done in optical oceanography can be done without consideration of the state of polarization of the light. However, polarization carries important information and is increasingly being used to extract environmental information via remote sensing and to enhance underwater visibility. The last page of the Level 1 material begins the discussion of polarization. There is then a Level 2 page on the specification of scattering of polarized light.

Level 3 contains links to commercial instrument manufacturers.