1.1: Introduction to Radiation Theory

An understanding of any discipline must include a familiarity with and understanding of the words used within that discipline, and the theory of radiation is no exception. The theory of radiation includes such words as radiant flux, intensity, irradiance, radiance, exitance, source function and several others, and it is necessary to understand the meanings of these quantities and the relations between them. The meanings of most of the more commonly encountered quantities and the symbols recommended to represent them have been agreed upon and standardized by a number of bodies, including the International Union of Pure and Applied Physics, the International Commission on Radiation Units and Measurement, the American Illuminating Engineering Society, the Royal Society of London and the International Standards Organization. It is rather unfortunate that many astronomers appear not to follow these conventions, and frequent usages of words such as "flux" and "intensity", and the symbols and units used for them, are found in astronomical literature that differ substantially from usage that is standard in most other disciplines within the physical sciences.

In this chapter I use the standard terms, but I point out when necessary where astronomical usage sometimes differs. In particular I shall discuss the astronomical usage of the words "intensity" and "flux" (which differs from standard usage) in sections 1.12 and 1.14 . Standard usage also calls for SI units, although the older CGS units are still to be found in astronomical writings. Except when dealing with electrical units, this usually gives rise to little difficulty to anyone who is aware that $1\ \mathrm{watt} = 10^7 \mathrm{erg\ s}^{-1}$. Where electrical units are concerned, the situation is much less simple.