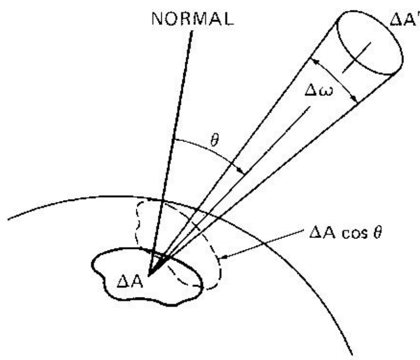

Figure J.1. Geometry used to define flux and intensity.

area appears smaller and smaller until at $\theta = 90^\circ$ the apparent area is zero. Likewise, as θ increases, the apparent brightness decreases until at $\theta = 90^\circ$ it reaches zero. The projected area is $\Delta A \cos\theta$.

Combining all of the above ideas, it can be said that the energy emitted (ΔE) in a time interval (Δt) into the cone is proportional to the size of the cone ($\Delta\omega$), the wavelength interval ($\Delta\lambda$), and the projected surface area ($\Delta A \cos\theta$). Symbolically,

$$\frac{\Delta E}{\Delta t} \propto (\Delta A \cos\theta)\, \Delta\lambda\Delta\omega. \tag{J.1}$$

The "constant of proportionality" must contain the information that describes the radiation emerging from the star through its surface. Its value is set by the physical conditions in the star's atmosphere such as temperature, pressure, and gravity. This quantity, called the *specific intensity,* I_λ, is defined by rearranging Equation J.1 and taking the limit as Δt, $\Delta\omega$, $\Delta\lambda$, and ΔA go to zero. Then

$$I_\lambda \equiv \lim_{\substack{\Delta t\to 0\\ \Delta\omega\to 0\\ \Delta\lambda\to 0\\ \Delta A\to 0}} \frac{\Delta E_\lambda}{\Delta t \Delta A \cos\theta\, \Delta\omega\, \Delta\lambda}. \tag{J.2}$$

or

$$I_\lambda = \frac{dE_\lambda}{dt\, dA \cos\theta\, d\omega d\lambda}. \tag{J.3}$$