Passive electro-optical remote sensing involves the collection of energy from a scene relying on natural sources, such as solar/lunar reflection and thermal emission for radiation. With current technology, tens to hundreds of bands are available to be analyzed in order to understand the materials, objects, and effluents in the scene as well as the characteristics of the atmosphere between the sensor and the ground. I will discuss three related research topics which are necessary to understand the passive remote sensing process. The first is atmospheric radiation transport (RT) which is necessary to describe the propagation of light along a line-of-sight. In particular, I will discuss the development of Modtran6, the DoD standard RT software. Second, given an application of interest and drawing from Modtran for the spectral background content, a sensor can be modeled or designed. I will discuss such an example of a sensor performance modeling concept. Finally, after a sensor is built and data is acquired, the scene content needs to be ascertained. Atmospheric compensation is required to invert the at-sensor radiance to ground reflectance or emissivity. I will discuss one such method of atmospheric compensation for longwave hyperspectral imagery as well as the temperature-emissivity separation process. I will conclude with several ideas for future imaging spectroscopy.