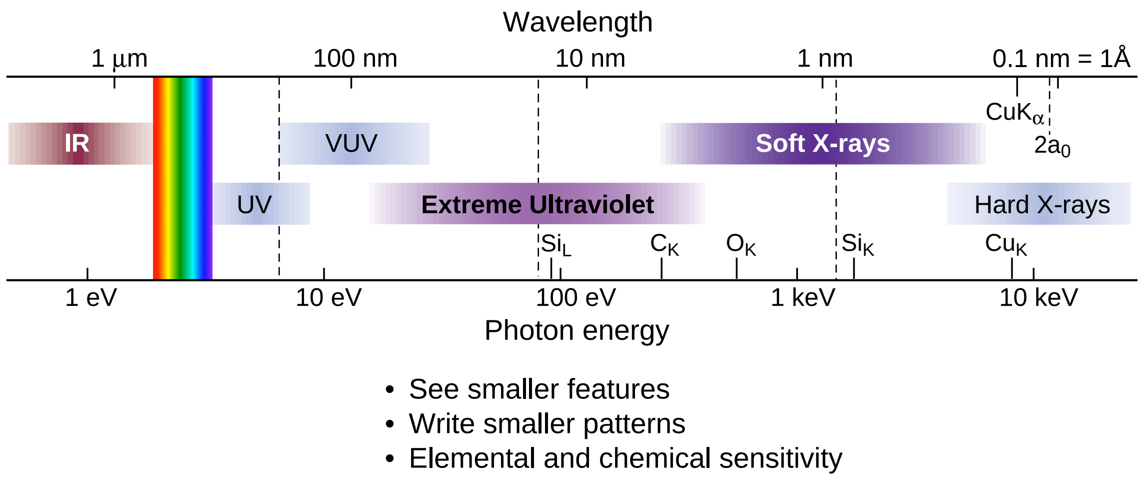
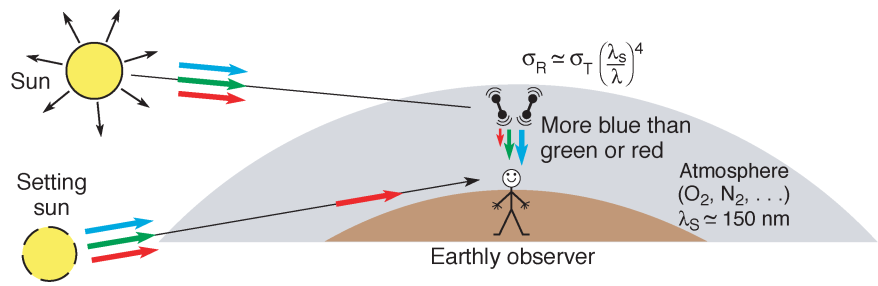
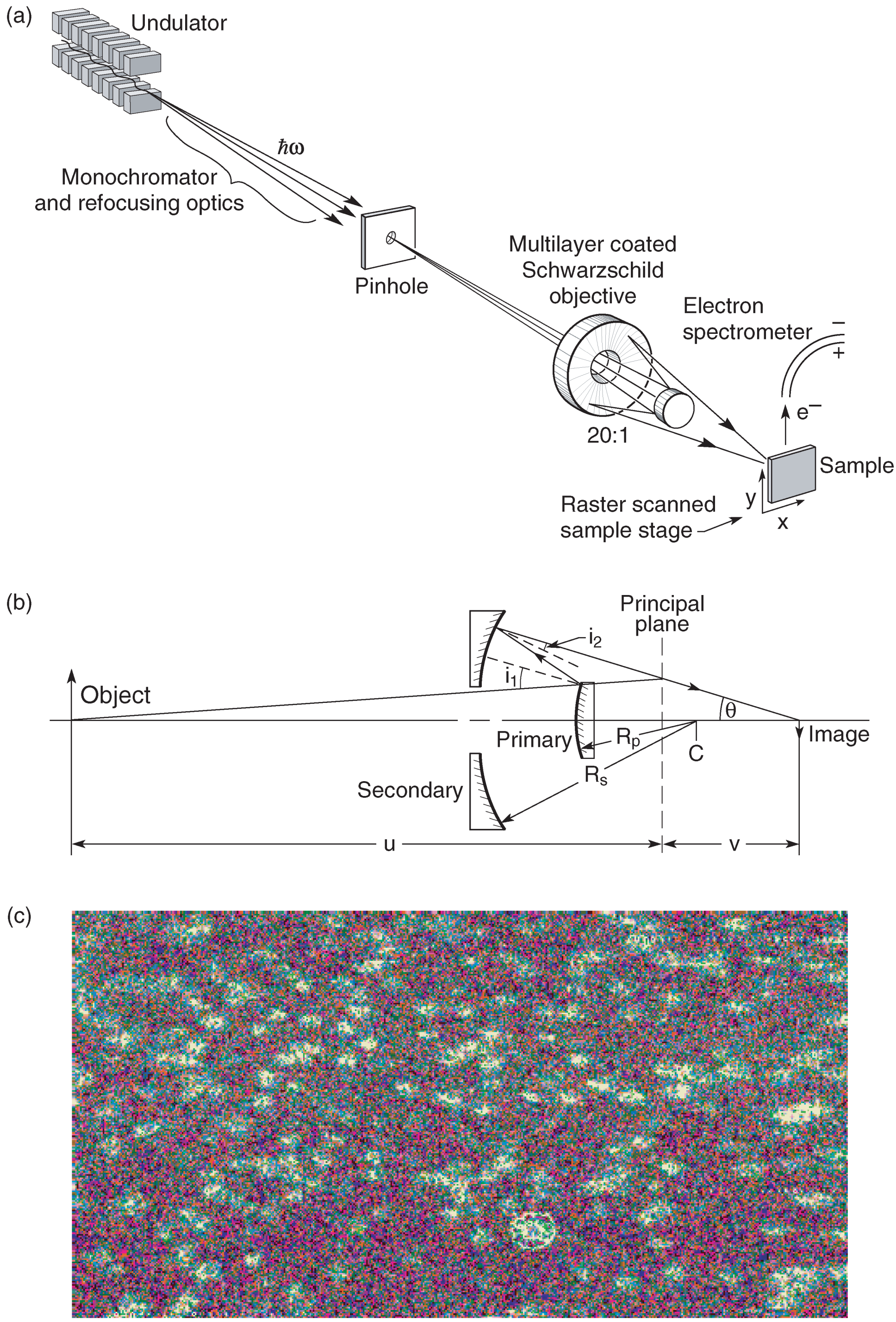


COLORPLATE I. The electromagnetic spectrum as it extends from the infrared (IR) to the x-ray regions. Visible light is shown with red (650 nm), green (530 nm), and blue (470 nm) wavelengths. At shorter wavelengths are ultraviolet (UV) radiation, extreme ultraviolet radiation (EUV), soft x-rays (SXR), and hard x-rays. Shown for reference are the silicon L-absorption edge at 99.2 eV (12.5 nm wavelength), the carbon K-absorption edge at 284 eV (4.37 nm), the oxygen K-absorption edge at 543 eV (2.28 nm), the silicon K-absorption edge at 1.84 keV (0.674 nm), the copper K-absorption edge at 8.98 keV (0.138 nm), the copper K_α-emission line at 0.154 nm or 1.54 Å (8.05 keV), and twice the Bohr radius at $2a_0 = 1.06$ Å, the diameter of the $n = 1$ orbit in Bohr's model of the hydrogen atom, but more generally a dimension within which resides most of the charge for all atoms. Vertical dashed lines correspond to the transmission limits of common window materials used to isolate vacuum. Shown are approximate transmission limits for common thicknesses of fused silica (pure SiO_2) at 200 nm, a thin film of silicon nitride ($\sim$100 nm thick Si_3N_4) at 15 nm, and an 8-μm thick beryllium foil at a wavelength of about 1 nm. See text, p. 2.



COLORPLATE II. Looking upward, the earthly observer at night sees only blackness or the occasional star. However during daylight, indirect light is scattered toward the observer when looking overhead. This scattering is caused by non-uniformities in the atmospheric density of O_2 and N_2, and appears blue because of the strong wavelength dependence of light scattering by bound electrons. Upon direct viewing of the sun, particularly at sunset, the light path is long and passes through the most dense portion of the atmosphere. As much of the residual light reaching the observer at sunset is greatly depleted in blue and green, the sun appears red, as do any clouds off which this reddish light might reflect. Very fine atmospheric dust, such as volcanic ash, causes a similar effect. See text, p. 44.



COLORPLATE III. (a) The photoemission microscope of Cerrina, Underwood, and colleagues, employing a multilayer coated Schwarzschild objective to focus monochromatic undulator radiation to a nominal 100 nm spot size. Photoelectron energy distributions are measured as a function of position as the sample position (x, y) is raster scanned. (b) Details of the Schwarzschild optics are shown. The object is a pinhole demagnified ($u/v = 20$) to a reduced focal spot size. (c) A secondary electron photoemission micrograph of an AlGaN thin film. The incident photon energy is 126 eV, and the collected secondary electrons have a kinetic energy of 5 eV. Lateral inhomogeneities show a mean grain size of about 2 μm in this 30 μm $\times$ 60 μm image. (Courtesy of J.F. Lorusso and F. Cerrina, University of Wisconsin, Madison.) See text, p. 109.