

tional X-ray source.

Electron Energy Analyzers. Electron energies can be filtered with energy discriminators as shown in Fig. 14.5. Figure 14.5(a) shows two parallel charge plates with two openings. The electrons with the required energy enter and leave the holes as in a slit system. Electrons with other energies do not exit the second hole. Figure 14.5(b) shows a second type of energy discriminator, which is a simple grid discriminator. Electrons with insufficient energy are repelled by the second grid and do not penetrate. This system only discriminates against electrons with low energies. Any electrons that have sufficient energy penetrate the second grid. A third system uses cylindrical plates [Fig. 14.5(c)]. If the angle between the planes of the entry and exit slits is 127.17° [i.e., $\pi/(2)^{1/2}$ rad], a double focusing effect is obtained and the intensity of the electron beam is maintained as high as possible. Electrons with the incorrect energy are lost either to the sides of the cylindrical plates or on the sides of the exit slit. Similar modifications have led to the development of a 180° cylindrical system rather than parallel plates [Fig. 14.5(d)]. This system does not provide such fine-tuning of the energy bandwidth, but it increases the intensity of the electron beam. This is another example of gaining in beam intensity but losing in energy discrimination, or gaining in power and losing in resolution.

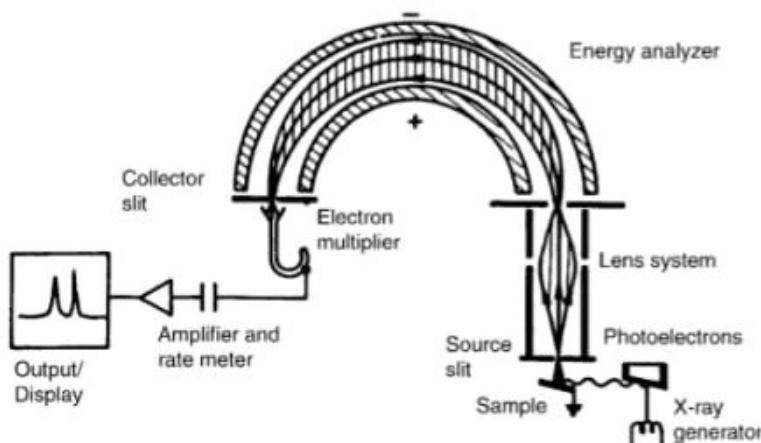


Figure 14.4 Schematic diagram of an ESCA instrument with a single channel electron multiplier detector.

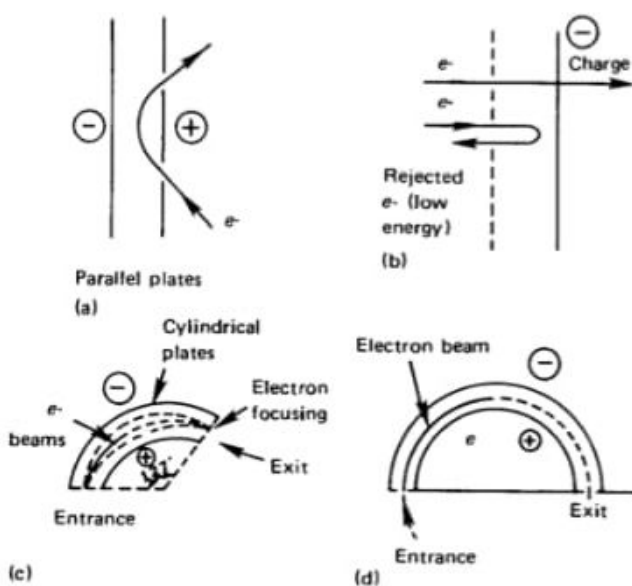


Figure 14.5 Schematic diagrams of several electron energy discriminators.

Electron energy analyzers are equivalent to the monochromators used in spectroscopy. Their function is to disperse the emitted photoelectrons based on their energies. The most commonly used electron energy analyzers incorporate an electrostatic field that is either symmetrical or hemispherical. These systems are in essence an extension of the electron energy filters shown in Fig. 14.5. All electron energy analyzers require shielding from stray magnetic fields as described subsequently. One system is shown schemati-