Flame Absorption Profiles:

- Magnesium exhibits a maximum in absorbance at the middle of the flame. Then due to oxidation, a decrease in absorbance observed.
- The behavior of silver, which is not easily oxidized, is quite different. A continuous increase in the number of atoms, and thus the absorbance, is observed from the base to the periphery of the flame.
- Chromium, oxidizes readily and forms very stable oxides, shows a continuous decrease in absorbance beginning close to the burner tip.

These observations suggest that a different portion of the flame should be used for the determination of each of these elements.

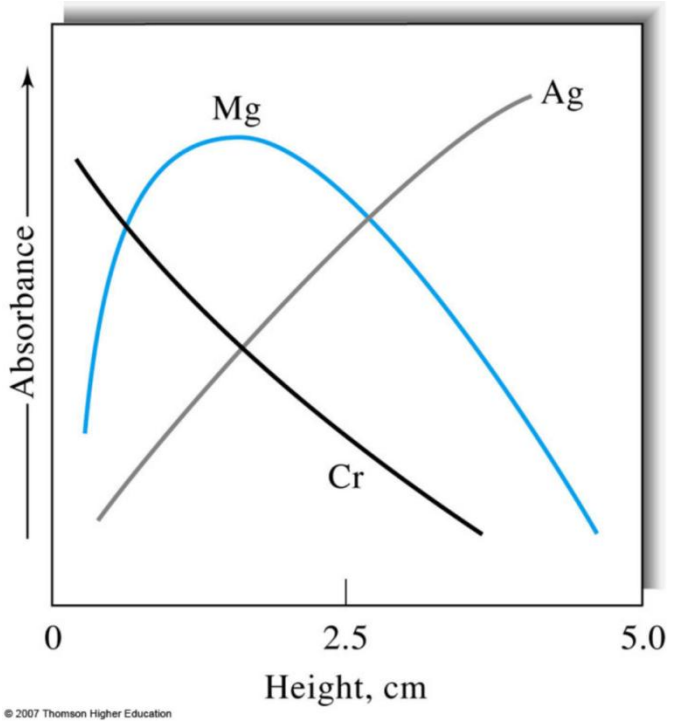

Fig. 9-4 Typical absorption profiles for three elements

To achieve maximum analytical sensitivity the flame must be adjusted up and down with respect to the beam until the region of maximum absorbance is located

Flame Atomizers:

- The aerosol formed by the flow of oxidant, is mixed with fuel and passes a series of baffles that remove all but the finest solution droplets.
- The baffles cause most of the sample to collect in the bottom of the mixing chamber where it drains to a waste container.
- The aerosol, oxidant, and fuel are then burned in a slotted burner to provide a 5- to 10-cm high flame.
- The quiet flame and relatively long-path length minimizes noise and maximizes absorption. These features result in reproducibility and sensitivity improvements for AAS

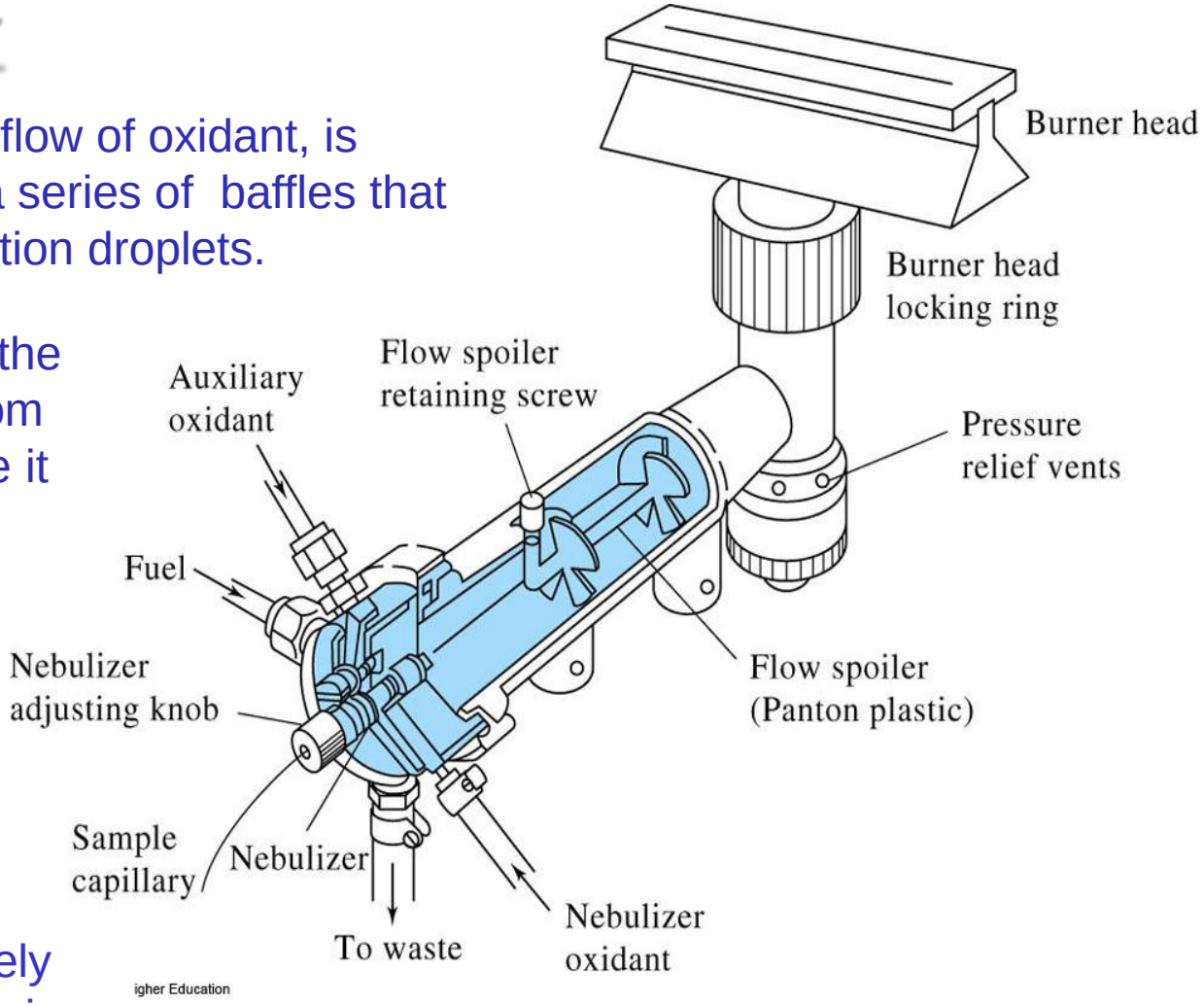

FIGURE 9-5 A laminar-flow burner.
(Courtesy of Perkin-Elmer Corporation, Norwalk, CT.)

Laminar-flow burners:

- produce a relatively quiet flame and a long path length for maximizing absorption.

- These properties tend to enhance sensitivity and reproducibility in AAS.

- The mixing chamber in this type of burner contains a potentially explosive mixture that can *flash back* if the flow rates are too low.
Note that the laminar-flow burner in Figure 9-5 is equipped with pressure relief vents for this reason.

- Other types of laminar-flow burners and turbulent-flow burners are available for atomic emission spectrometry and AFS.

Fuel and Oxidant flow-rate:

- It is desirable to be able to control the fuel and oxidant flow rate, over a broad range so that optimal atomization conditions can be achieved.
- Fuel and oxidant are usually combined in approximately stoichiometric amounts.

- For the determination of metals that form *stable oxides*, a flame that contains an excess of fuel is often desirable.
- Flow rates are usually controlled by means of double-diaphram pressure regulators followed by needle valves in the instrument housing.
- A widely used device for measuring flow rates is the rotameter. which consists of a tapered, graduated, transparent tube that is mounted vertically with the smaller end down. A lightweight conical or spherical float is lifted by the gas flow; its vertical position is determined by the flow rate.