and even their presence, must be inferred from data gathered from many outcrops and plotted on a map.

Describing Surface Orientation

You will see on geologic maps curious little Ts called **strike and dip** symbols (Fig. 14.3). These are used to describe the orientation of bedding planes and other planar features so that the overall geometry of tilted and folded layers can be described and visualized on maps. The long top part of the T parallels the **strike,** which represents the intersection of a tilted bedding plane with a *horizontal* plane (Fig. 14.3B). It gives the trend of that plane. For example, if you hold a credit card at a 45° angle to a table and draw a line along where it touches the table, you get the strike of the plane defined by your credit card. Hold the card against the strike line and notice how the strike indicates which way a plane trends, but not which way it tilts. The **dip direction** of a plane is shown by a short line drawn perpendicular to the strike and pointing downhill (Fig. 14.3B). Draw a short line perpendicular to your strike, away from the credit card, and you have the dip direction. Write, for example, 45° (the **dip angle**) at the end of your dip line and you uniquely define the orientation of your credit card. You can easily visualize the orientation of a plane described by a strike and dip symbol by holding your hand parallel to the strike and tilted down toward the dip. Try it on the perspective drawings later in the chapter.

A geologist measures the orientation, or **attitude,** of a tilted bedding plane by holding a compass in a horizontal position, with a straight side against the bedding plane (Fig. 14.3C). While the compass arrow points north, the compass body points in the direction of strike, a certain number of degrees east or west of north. Figure 14.3C shows a strike line pointing 30° west of north, which is written as N30°W. Strike measurements are commonly given with the number of degrees less than 90. Thus, N95°E becomes N85°W, and N90°E is written E-W.

The dip angle, or **angle of inclination,** is measured from the horizontal plane down to the bedding plane (Fig. 14.3B). The measuring device must be held in a vertical plane that is perpendicular to the strike in order to be accurate. Because a dip can point either direction from a strike line, it is necessary when recording dips to specify the dip direction. Since the dip is always perpendicular to strike, it is necessary only to indicate the compass quadrant toward which the surface dips (i.e., NW, NE, SE, or SW). For example, with a strike of N30°W, the dip direction could either be NE or SW (Fig. 14.3C). In the example used in Figure 14.3B, the complete strike and dip of the bedding plane is written N30°W, 50°SW.

Geologists also measure the attitudes of fault planes, fracture surfaces, and other geologic features. Figure 14.4 shows special symbols for vertical, horizontal, and overturned sedimentary layers, plus symbols for folds and faults. The arrows used in

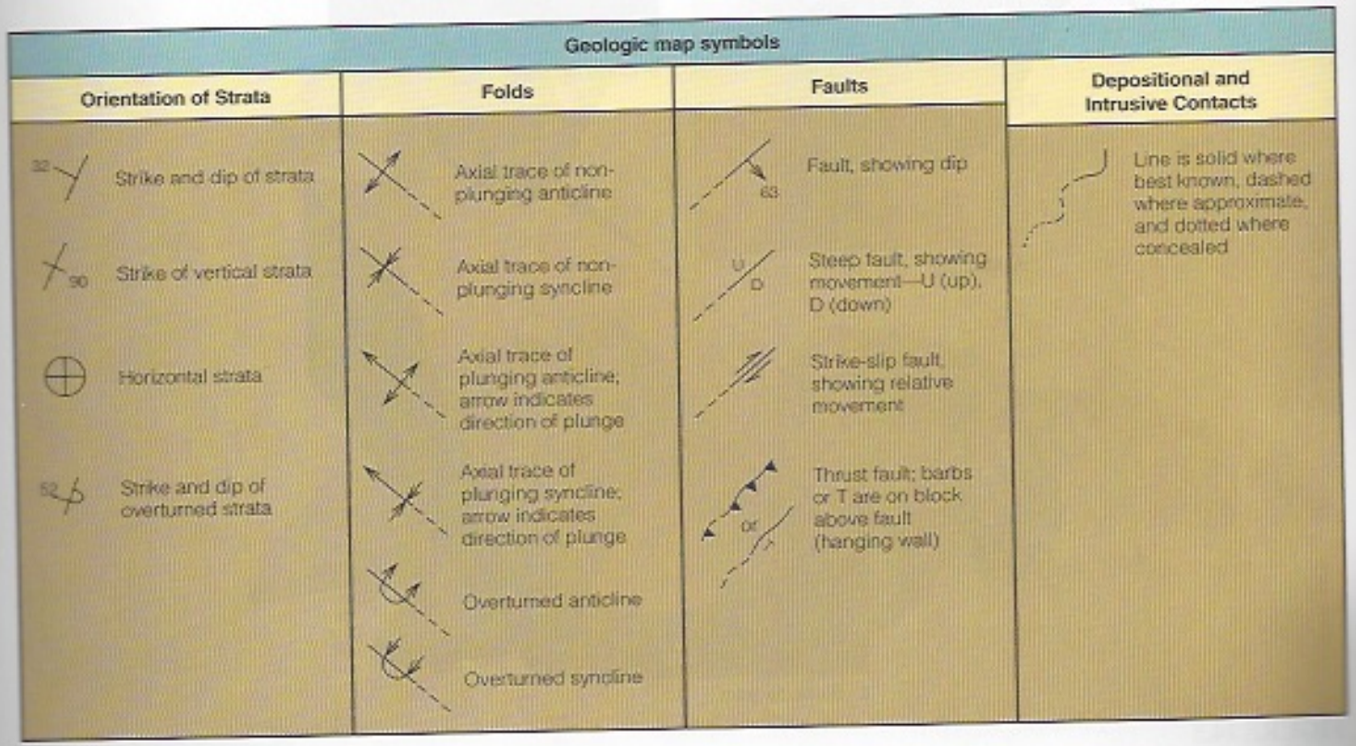

FIGURE 14.4
Geologic map symbols.
Sources: American Geological Institute and others.