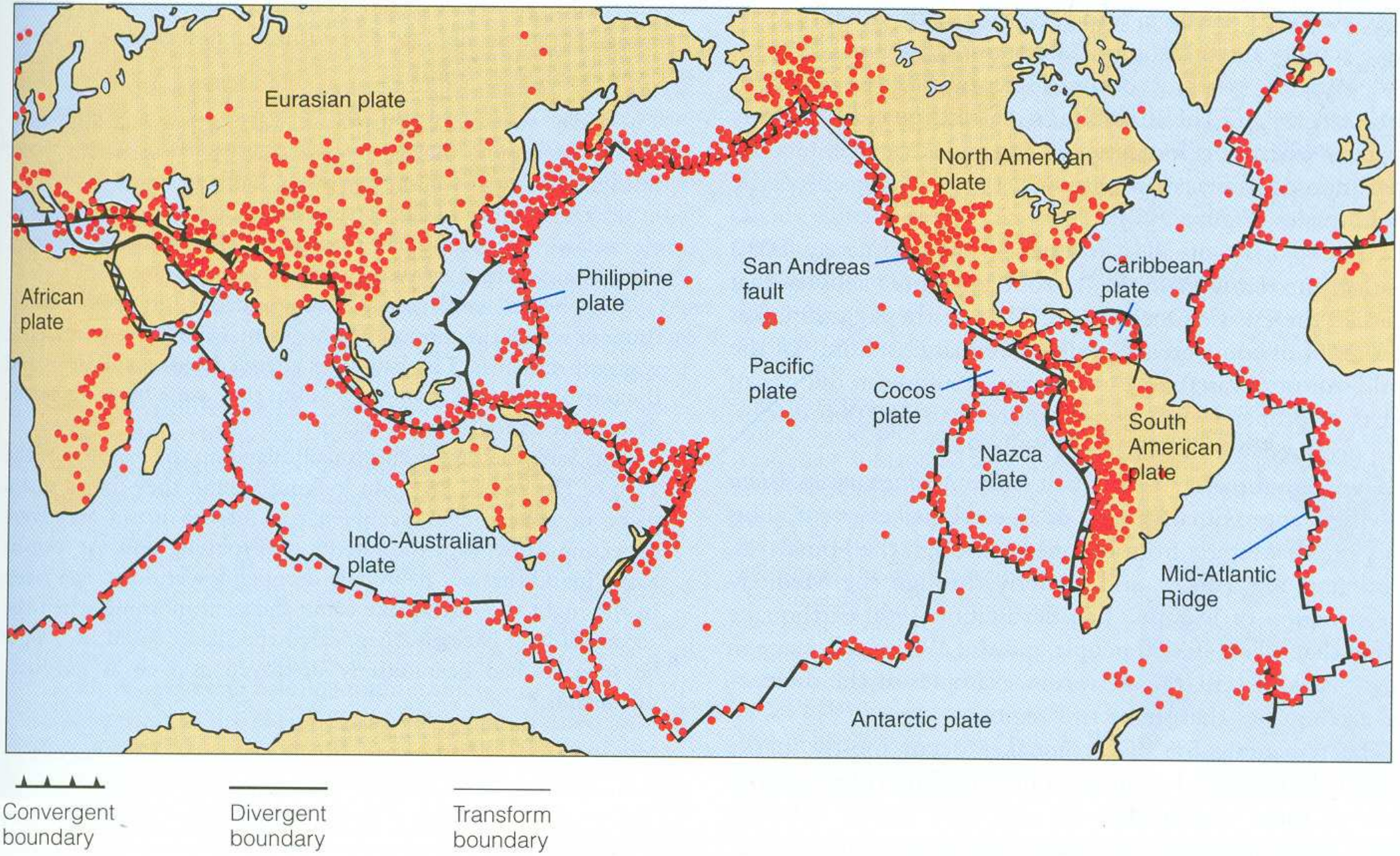
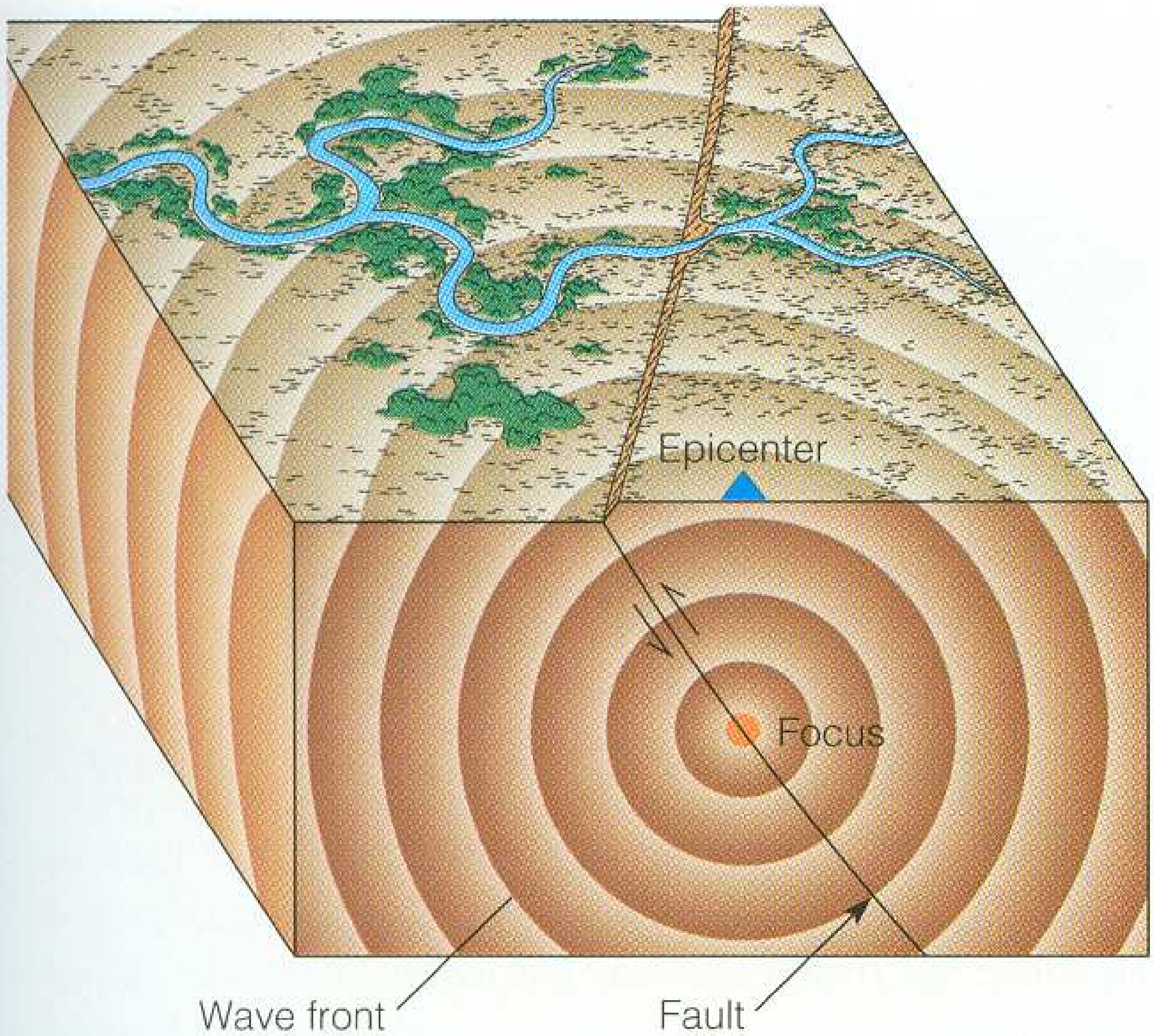
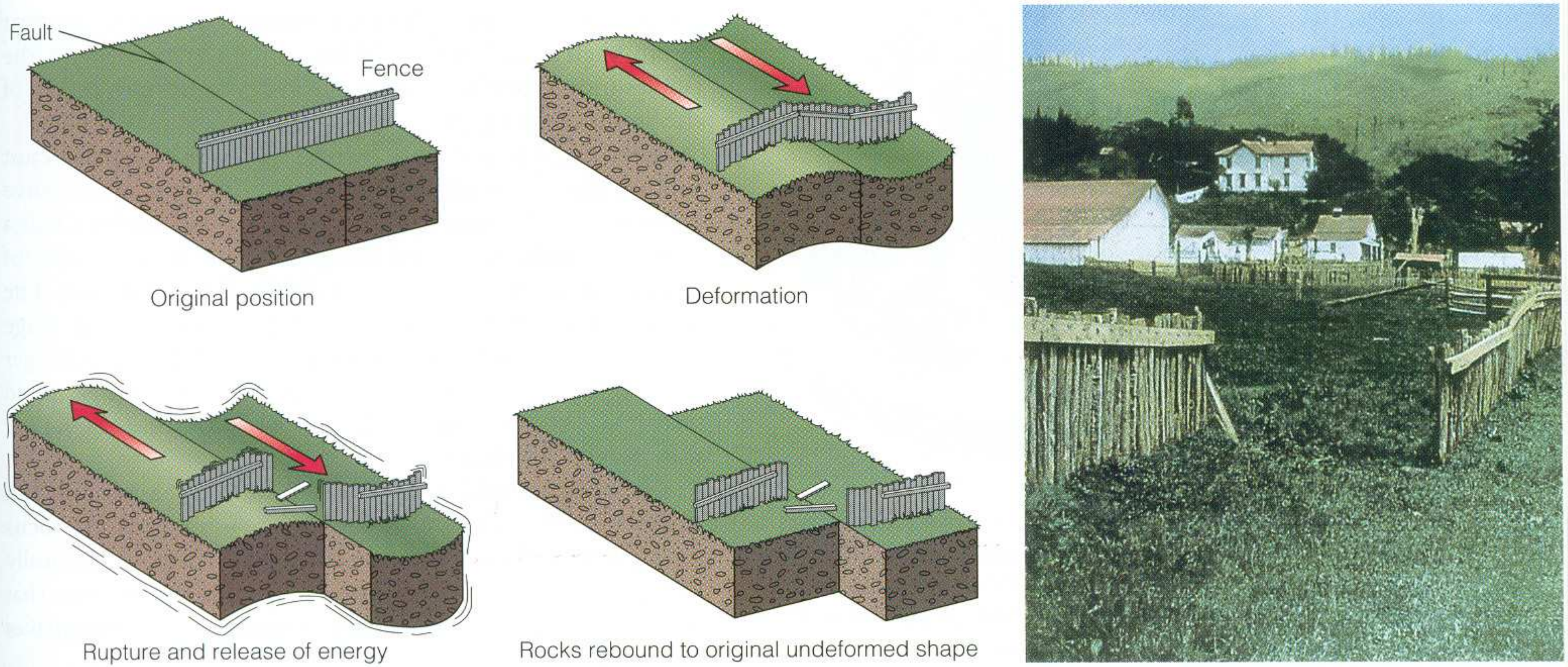
▶ FIGURE 9-7 The relationship between the distribution of earthquake epicenters and plate boundaries. Approximately 80% of earthquakes occur within the circum-Pacific belt, 15% within the Mediterranean-Asiatic belt, and the remaining 5% within the interiors of plates or along oceanic spreading ridge systems. Each dot represents a single earthquake epicenter.



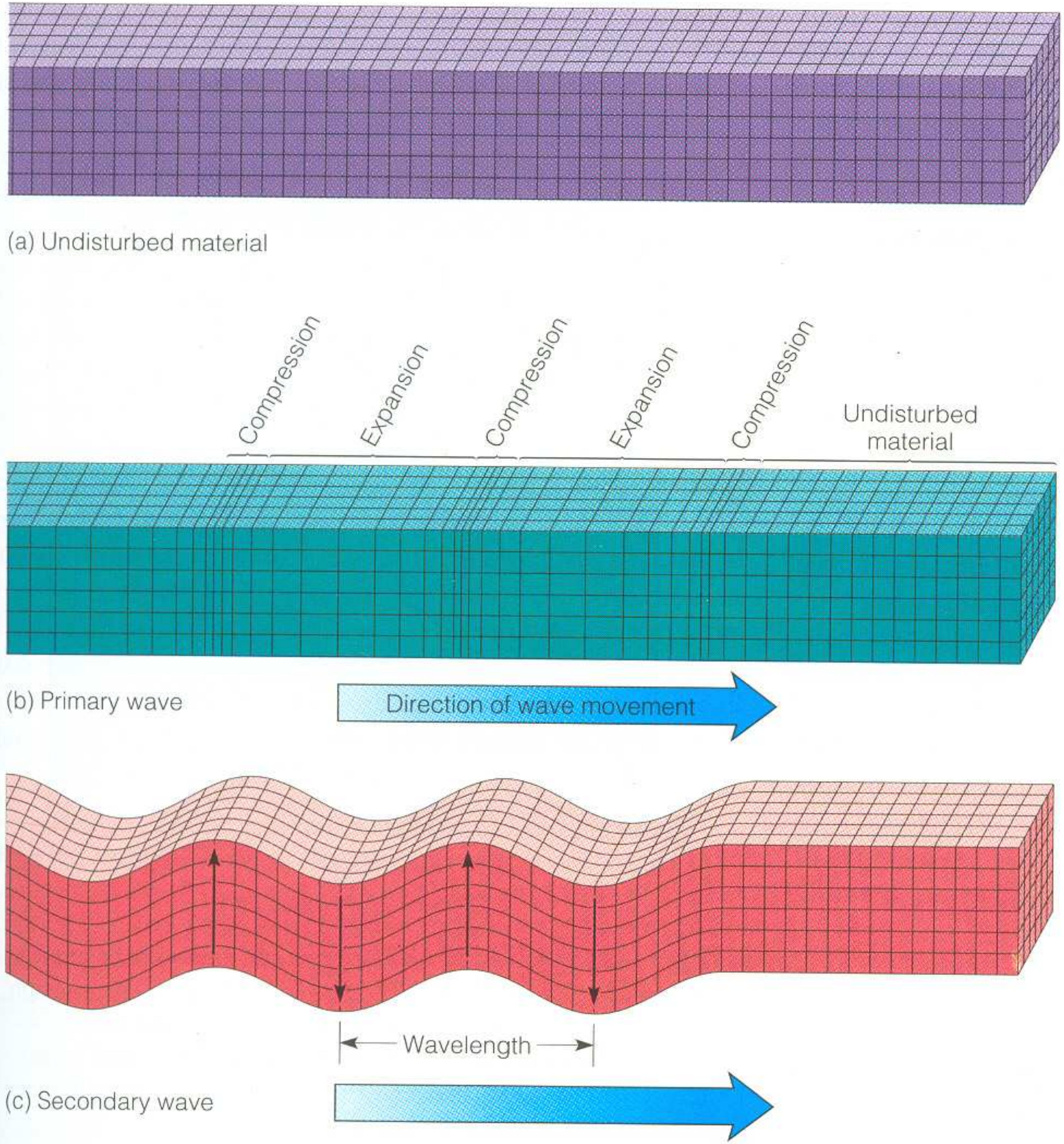


▶ FIGURE 9-6 The focus of an earthquake is the location where rupture begins and energy is released. The place on the Earth's surface vertically above the focus is the epicenter.



(a) (b)

▶ FIGURE 9-3 (*a*) According to the elastic rebound theory, when rocks are deformed, they store energy and bend. When the inherent strength of the rocks is exceeded, they rupture, releasing the energy in the form of earthquake waves that radiate outward in all directions. Upon rupture, the rocks rebound to their former undeformed shape. (*b*) During the 1906 San Francisco earthquake, this fence in Marin County was displaced 2.5 m.


(a) Undisturbed material
Compression
Expansion
Compression
Expansion
Compression
Undisturbed material
(b) Primary wave
Direction of wave movement
Wavelength
(c) Secondary wave

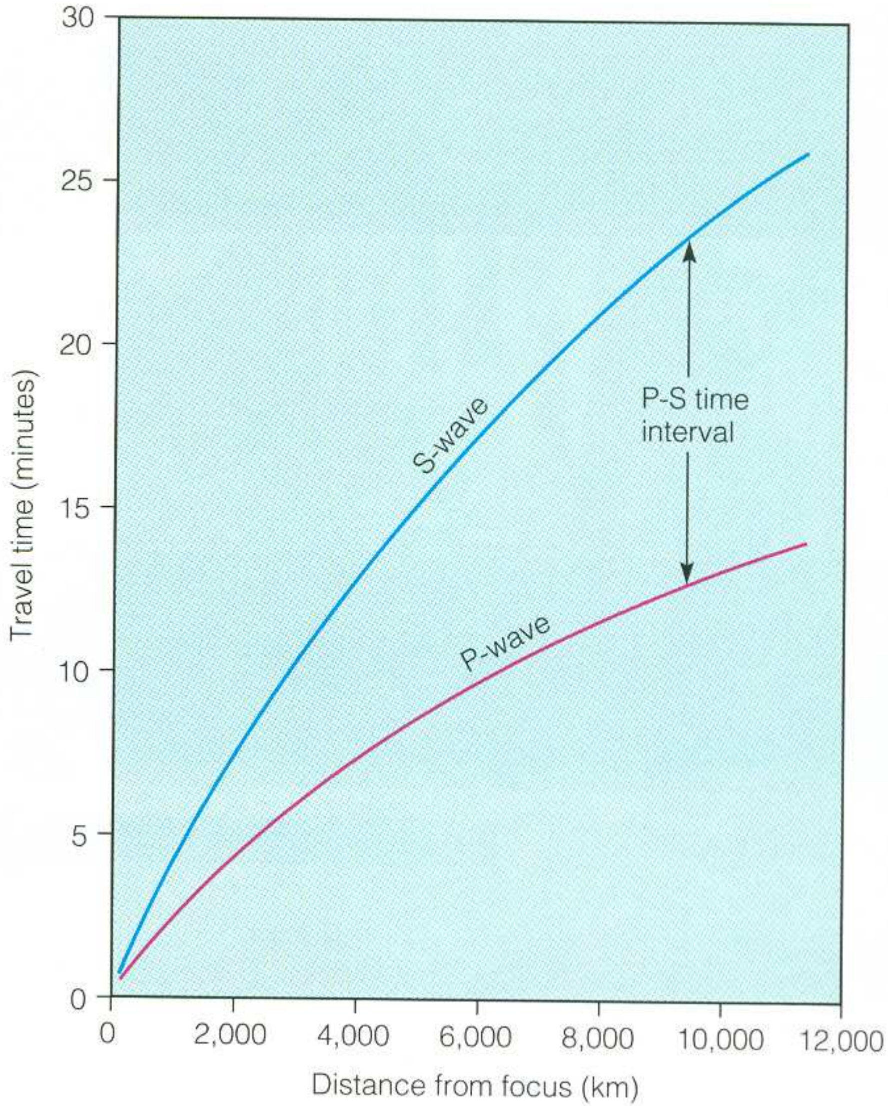
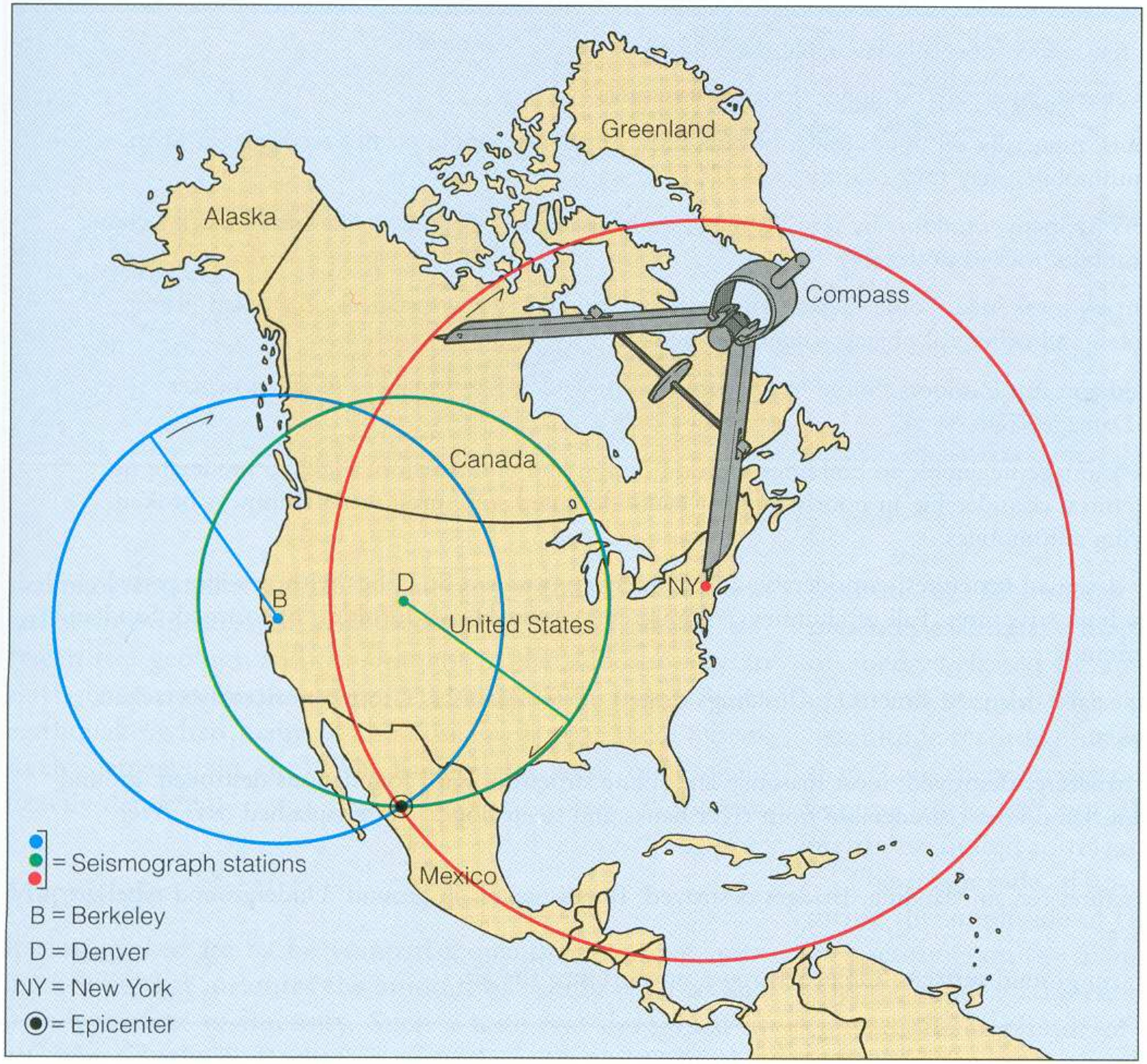
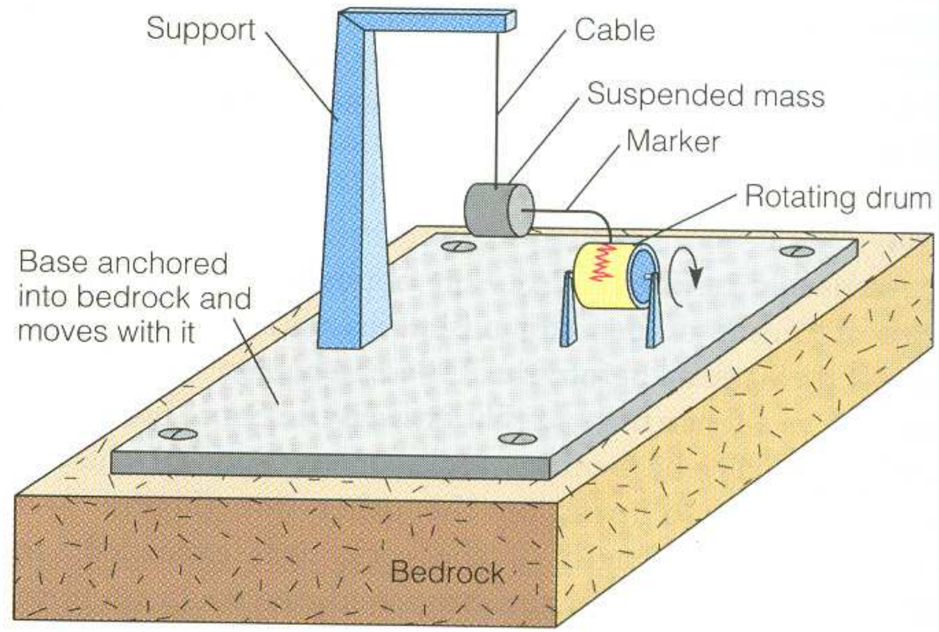


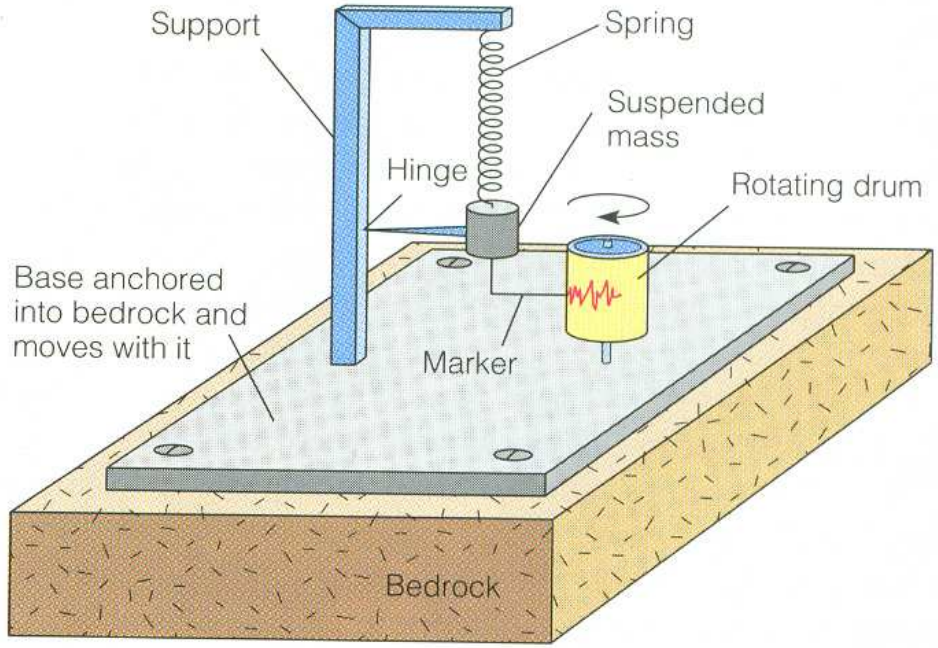
FIGURE 9-12 A time-distance graph showing the average :ravel times for P- and S-waves. The farther away a seismograph ;tation is from the focus of an earthquake, the longer the nterval between the arrivals of the P- and S-waves, and hence :he greater the distance between the curves on the time-distance ;raph as indicated by the P-S time interval.

▶ FIGURE 9-13 Three seismograph stations are needed to locate the epicenter of an earthquake. The P-S time interval is plotted on a time-distance graph for each seismograph station to determine the distance that station is from the epicenter. A circle with that radius is drawn from each station, and the intersection of the three circles is the epicenter of the earthquake.



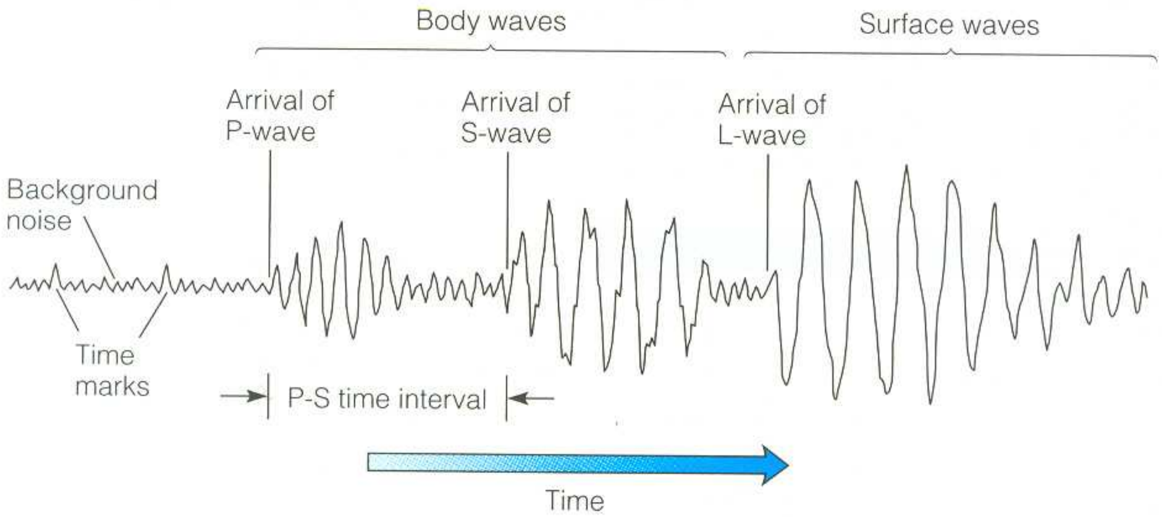

Support
Cable
Suspended mass
Marker
Rotating drum
Base anchored
into bedrock and
moves with it
Bedrock

(b)

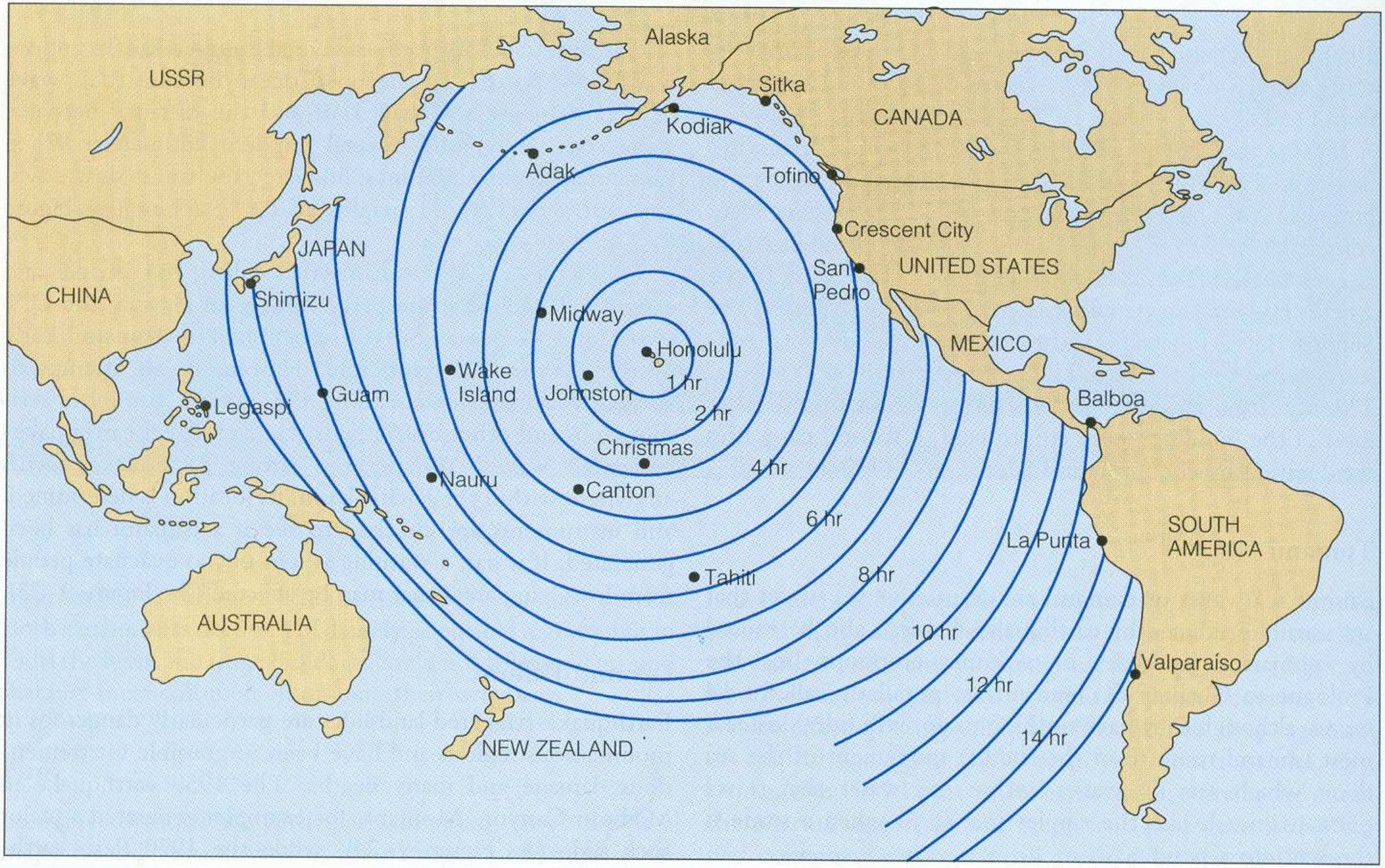

Support
Spring
Suspended
mass
Hinge
Rotating drum
Base anchored
into bedrock and
moves with it
Marker
Bedrock

(c)

▶ **FIGURE 9-11** A schematic seismogram showing the arrival order and pattern produced by P-, S-, and L-waves. When an earthquake occurs, body and surface waves radiate outward from the focus at the same time. Because P-waves are the fastest, they arrive at a seismograph first, followed by S-waves, and then by surface waves, which are the slowest waves. The difference between the arrival times of the P- and the S-waves is the P-S time interval; it is a function of the distance of the seismograph station from the focus.



▶ **FIGURE 9-23** Tsumani travel times within the Pacific Ocean basin to Honolulu, Hawaii.



▶ FIGURE 9-27 The relationship between dilatancy and various other earthquake precursors. The onset of dilatancy matches a change in each of the precursors illustrated. For example, a drop in seismic wave velocity corresponds to the onset of dilatancy and the development of cracks.