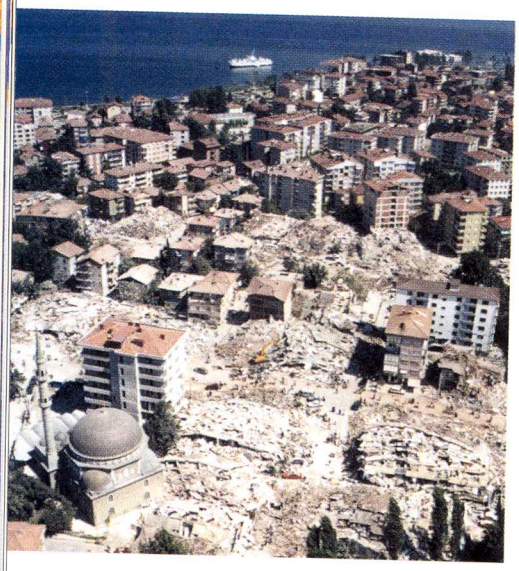

Figure 16
The 1999 earthquake in Turkey released about 32 times more energy than the 1994 Northridge earthquake did.

Studying Earthquakes Scientists who study earthquakes and seismic waves are seismologists. As you learned earlier, the instrument that is used to record primary, secondary, and surface waves from earthquakes all over the world is called a seismograph. Seismologists can use records from seismographs, called seismograms, to learn more than just where the epicenter of an earthquake is located.

Measuring Earthquake Magnitude The height of the lines traced on the paper record of a seismograph is a measure of the energy that is released, or the **magnitude,** of the earthquake. The Richter magnitude scale is used to describe the strength of an earthquake and is based on the height of the lines on the seismogram. The Richter scale has no upper limit. However, scientists think that a value of about 9.5 would be the maximum strength an earthquake could register. For each increase of 1.0 on the Richter scale, the height of the line on a seismogram is ten times greater. However, about 32 times as much energy is released for every increase of 1.0 on the scale. For example, an earthquake with a magnitude of 8.5 releases about 32 times more energy than an earthquake with a magnitude of 7.5. **Figure 16** shows damage from the 7.8-magnitude earthquake in Turkey in 1999. **Table 1** is a list of some large-magnitude earthquakes that have occurred around the world and the damage they have caused.

Most of the earthquakes you hear about are large ones that cause great damage. However, of all the earthquakes detected throughout the world each year, most have magnitudes too low to be felt by humans. Scientists record thousands of earthquakes every day with magnitudes of less than 3.0. Each year, about 55,000 earthquakes are felt but cause little or no damage. These minor earthquakes have magnitudes that range from approximately 3.0 to 4.9 on the Richter scale.

Table 1 Large-Magnitude Earthquakes

Year	Location	Magnitude	Deaths
1556	Shensi, China	?	830,000
1755	Lisbon, Portugal	8.8 (est.)	70,000
1811–12	New Madrid, MO	8.3 (est.)	few
1886	Charleston, SC	?	60
1906	San Francisco, CA	8.3	700 to 800
1923	Tokyo, Japan	9.2	143,000
1960	Chile	9.5	490 to 2,290
1964	Prince William Sound, AK	8.5	131
1976	Tangshan, China	8.2	242,000
1990	Iran	7.7	50,000
1995	Kobe, Japan	6.9	5,378
2000	Indonesia	7.9	90
2001	India	7.7	>20,000