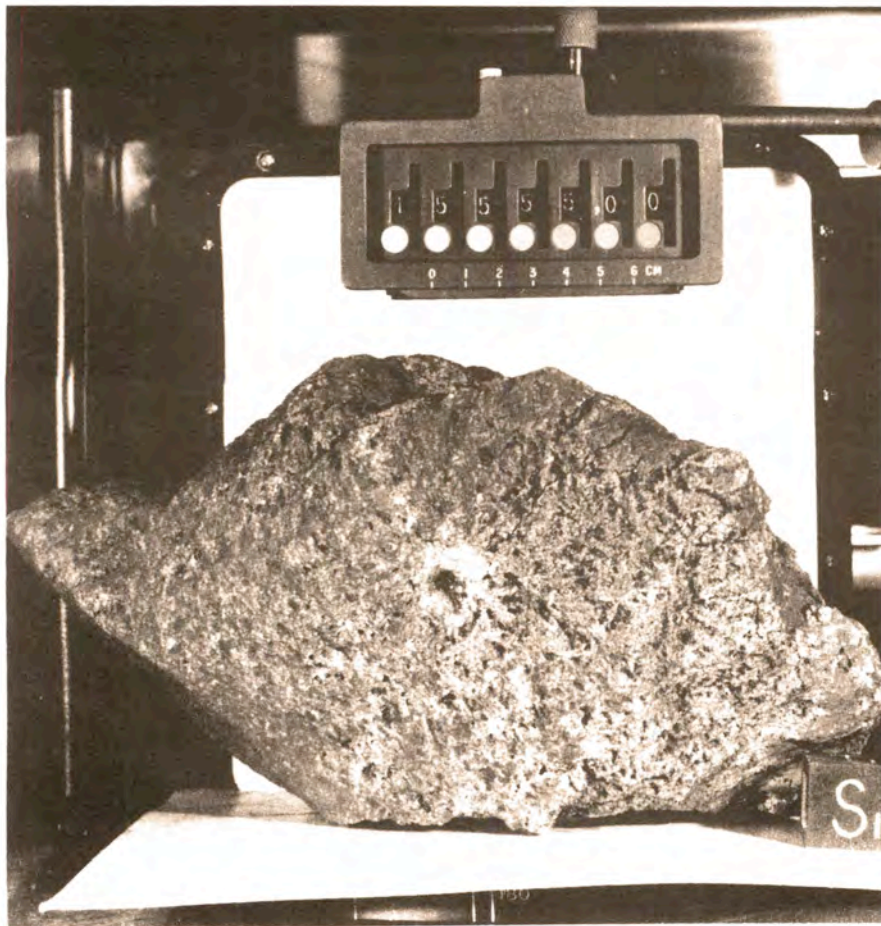


entire planet and causing its dramatic transformation: *radioactive heating*, *gravitational friction*, and *cosmic bombardment*.

**Radioactive Heating.** As the radioactive elements such as uranium and thorium present in the body of the Earth decayed, they released heat as a byproduct. This heat slowly accumulated during the half billion years preceding the great melting. Initial heating from this source is thought to have been far greater than it is today because the radioactive elements have decayed through time.

**Gravitational Heating.** As the Earth slowly began to heat up from the accumulation of radioactive heat, it is thought that the denser (heavier) materials began to sink toward the center. The lighter materials would tend to rise toward the surface. The gravitational friction



**FIGURE 4.9**

"Great Scott" rock. This lunar sample, a brownish-grey vesicular mare basalt, is the largest collected up through the Apollo 15 mission. (Courtesy NASA.)