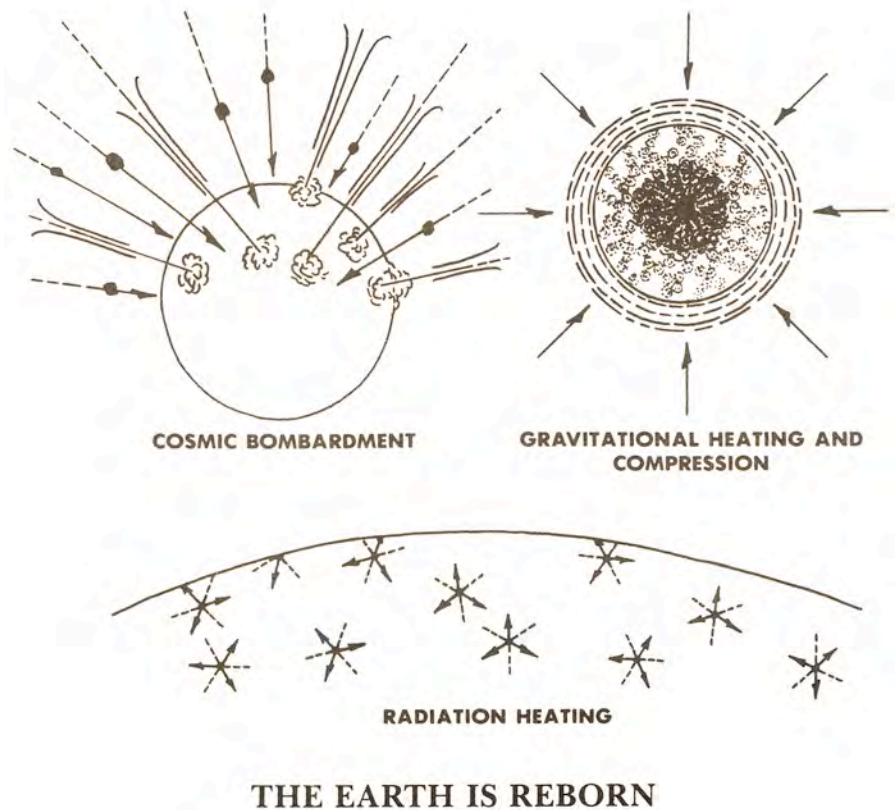


FIGURE 4.8.

The three sources of heat thought to have been responsible for the great melting or rebirth of the Earth between 4.2 and 3.8 billion years ago. Radiation heating, through the decay of radioactive elements, may have caused a slow but steady heat buildup since the planet's formation of 4.6 billion years ago. Gravitational heating through the frictional heat of particles moving past each other, together with compression into a small volume, would have been another important heat source. The principal catalyst for the great melting was probably cosmic bombardment. The impact of giant meteors would have generated enormous heat as their energy of motion was converted. Evidence from moon rocks indicates that a cosmic bombardment of major proportions struck the planets about 4 billion years ago.



The key to understanding the production of the Earth's atmosphere and water is to understand that our planet has been quite literally reborn. When the Earth first condensed from its nebular cloud of gas and dust, the planet was largely homogenous. That is, the Earth's interior from surface to center was unsorted. Both heavy and light materials are thought to have been distributed rather evenly throughout the cross section of the planet.

The cross section of the Earth today is illustrated in Figure 4.7. Note that the heavy materials such as the iron-rich core are at the center. Toward the surface or crust, the materials become lighter, less dense. The materials of the Earth have been stratified and sorted by density. For this to happen, it was necessary that the original Earth melt into a liquid or at least a semi-molten state. Geologists believe that the entire planet was melted about 4 billion years ago. This catastrophic event is termed the great melting (or remelting). There are three heat sources thought to have been involved in melting the