

Peter Olson, a geophysicist who conducts convection experiments in oil-filled tanks at Johns Hopkins University in Baltimore, likens a fresh cup of hot coffee into which a liquid creamer has been poured to the mantle of the planet Earth. Both the coffee and the mantle stir themselves by a process called convection. As heat escapes at the top of the mug, the upper layer of coffee cools and grows denser, sinking toward the bottom in sheets. The descending currents force warmer liquid to rise.

The earth's mantle warms mostly from within – some 80 percent of its heat coming from the decay of radioactive elements distributed throughout the mantle layer. "The remaining fraction of heat comes from the core below," according to Richard Monastersky in an offbeat little piece in the December 1, 1990 issue of **Science News**. "At the top of the mantle, heat escapes upward through the tectonic plates that form a thin, broken shell encasing the mantle. These plates continuously rearrange their positions on the surface, bumping and grinding against each other with Earth-shaking consequences."

In the mug, after addition of the cream, you can witness a miniature imitation of the grand geophysical process – where sheets of cold ocean floor sink into the hot mantle, a process called subduction. Volcanoes grow over subduction zones because some of the oceanic rock melts as it plows down into the hot mantle, causing molten magma to rise and then erupt at the planet's surface.

"Of course, java is not lava," Monastersky admits, "and you can carry the mug-mantle analogy only so far. Given that geophysicists have difficulty simulating mantle and plate motion even with complex computer models costing a million dollars, how much can you expect from a 60-cent cup of coffee?"