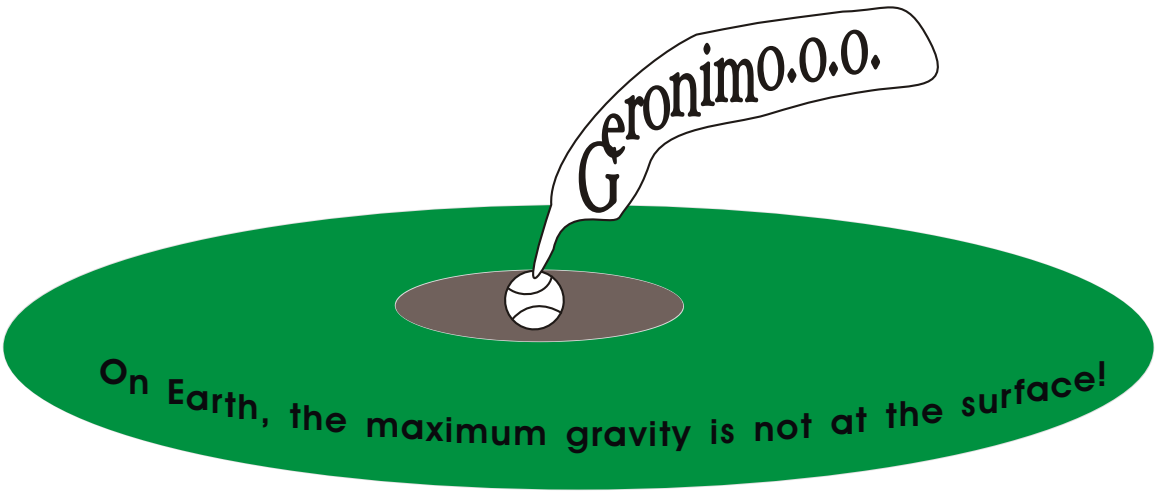
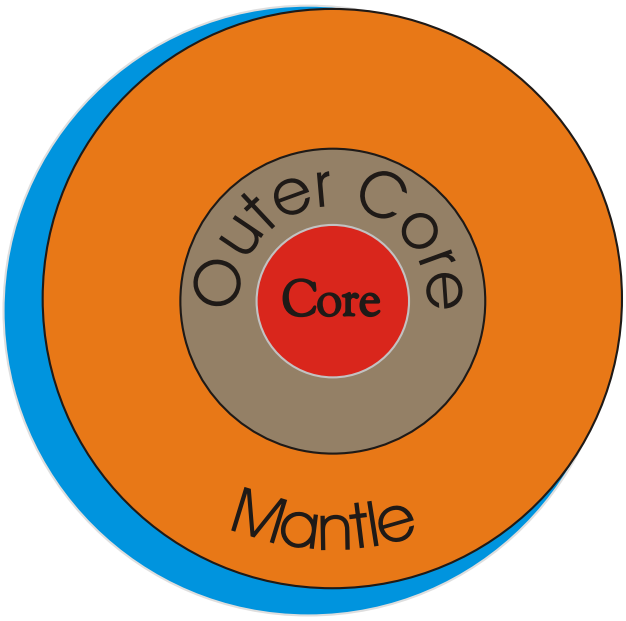
Why Does the Ball Fall on Earth?



Because on Earth, the density is non-linear.
If the density increases with depth, so does the gravitational strength (curvature).
Somewhere at the densest part of the core, the Earth's gravity starts to decrease.
(Zero at the exact center)



Hint: To make matters really more difficult, there may be several density zone changes on Earth as the depth is increased. The crust-mantle, mantle-core, outer core-inner core boundaries may each have a local maximum curvature.

There may be several local zones of maximum curvature, to which the ball would fall and remain stationary. At each boundary, the ball could find a local minimum energy "resting spot".