Journey to the Center of the Earth
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The center of Earth is at about the temperature of the surface of the Sun (about 6000K) but frozen because of the extreme pressure. I will place the Earth in a more general context of planets (including exoplanets) and explain how it is that the materials deep in Earth can behave differently from the same composition at low pressure. I will describe the sequence of layers and materials and conditions as one travels in a hypothetical probe from the surface to the center, emphasizing the things we do not understand well. I will talk about the extent to which Earth’s mantle is imperfectly mixed and may have a bottom layer above the core that is different in composition. I will discuss the Urey number puzzle (what explains Earth’s heat flow?). I will focus on the puzzle that Earth’s magnetic field presents: How is it generated and how has this worked for billions of years? It seems that we need another energy source. I will talk about how Earth has a memory of how it formed, in particular the high temperatures resulting from events such as the giant impact that led to our Moon. I will end with a discussion of what to do about the remaining puzzles, in particular the possible value of the geoneutrino experiment and attempts to directly probe the interior.