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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 he 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 particulate 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.