Ices and rock have similar changes in compressibility with changing pressure, because the quantum mechanical factor that determines this is the overlap of bound electron orbitals. There are two metrics for compressibility behavior with pressure used in this chapter:

\[
\frac{dK}{dP} \quad [\text{change in bulk modulus with respect to pressure; i.e. how much a material's "stiffness" changes as external pressure increases}]
\]

\[
\Pi = \frac{d\ln P}{d\ln \rho} \quad [\text{I think of this as the inverse of a material's change in density as external pressure increases}]
\]

(side note: the \(d\ln\)'s just mean that we're considering the slope of the line on a log-log scale... see Fig 1 in chapter)

These aren't the same, but they get at the same
description of a material's behavior.

Ices and rocks both have $\Gamma \sim 4$, even though their individual densities at low pressure are different.

Exoplanet measurements have a lot of uncertainty relative to the differences in observable consequences of individual ices or rock compositions. So, for exoplanets, it’s not important to know which rocks make up the core in order to model the structure.

Remember, our ultimate goal in modeling a planet’s interior is to get an equation of state (EoS) (pressure as a function of density), which is why we care about the value of $\Gamma$.

What happens when you have a mixture of two states? How do you get the EoS?

Turns out just adding the partial volumes of the different components and using that to get an EoS is a reasonable approximation.
At high pressure, everything (rock, ice, hydrogen, etc) becomes a Fermi gas (electrons no longer bound), at which point $\eta \to \frac{5}{3}$ for all materials. (nonrelativistic)